University of California, Riverside

Detailed Project Program

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Bechard Long & Associates, Inc.

UCR Project No. 950403

UNIVERSITY OF CALIFORNIA, RIVERSIDE
EAST CAMPUS INFRASTRUCTURE
PROJECT NO. 950403

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SECTION 1.0

EXECUTIVE SUMMARY

The University of California, Riverside Campus currently consists of 14,000 undergraduate and graduate students. The Campus is projected to grow to a total of 25,000 undergraduate and graduate students along with 15,000 faculty and staff members by the year 2015.

It is the purpose of this study to examine and document the impact of this projected growth on the east campus utility infrastructure systems. The following systems will be addressed:

1. Chilled Water
2. Steam and Condensate
3. Domestic Water
4. Sanitary Sewer
5. Electrical Distribution
6. Natural Gas
7. Storm Drain

Each of the above utility systems was investigated, and any existing deficiencies were noted. Each utility system was studied to determine their existing capabilities. The Office of Academic Planning and Budget provided proposed new building sizes, locations, and construction time periods. For purposes of this study, campus growth was broken down into three time periods, 2002-2005, 2006-2010, and 2011-2015. As projected campus growth is scheduled to occur, the existing infrastructure systems were analyzed for their capacity to meet these future load conditions.

Infrastructure projects were developed based on meeting these needs. The following table summarizes the total present day project costs for each utility and for each time period.

EAST CAMPUS INFRASTRUCTURE PROJECT SUMMARY

UTILITY	2002-2005	2006-2010	2011-2015	TOTAL
Chilled Water	$ 2,277,000	$ 8,225,000	$ 1,249,000	**$ 11,751,000**
Steam	$ 434,000	$ 3,896,000	$ 3,713,000	**$ 8,043,000**
Condensate Return	$ -	$ 149,000	$ 212,000	**$ 361,000**
Water	$ 1,155,000	$ 1,889,000	$ 5,109,000	**$ 8,153,000**
Sewer	$ 1,854,000	$ 2,888,000	$ 909,000	**$ 5,651,000**
Electric	$ 1,275,000	$ 2,044,000	$ 12,263,000	**$ 15,582,000**
All Utilities	**$ 6,995,000**	**$ 19,091,000**	**$ 23,455,000**	**$ 49,541,000**

1.1 Chilled Water Supply and Return System

The existing Central Plant consists of five electric centrifugal chillers that are capable of a combined output of approximately 4,600 tons. During the summer of 2001, the Central Plant struggled to maintain cooling throughout the campus. Chillers and HVAC equipment ran continuously in order to prepare for peak afternoon loads.

In light of the addition of the new Insectary Quarantine Building and the Entomology Seismic Replacement Building, the situation is predicted to worsen. For this reason, an urgent project to enhance the operation of the existing Central Plant is recommended. The new satellite plant is scheduled to be operational by the fall of 2003. Once the 4,000-ton plant is on line, contributing to the campus chilled water loop, peak cooling loads will be able to be met.

The time period 2002-2005 includes two urgent projects (CH-11, CH-12) totaling $1.4 million (urgent projects are further detailed in Section 1 on page 1-7). The remainder of the 2002-2005 chilled water projects consist of replacing chiller #1 (CH-12A), repiping tertiary pumps (CH-13), an extension of the existing 20" main starting north of the Student Center and running west to the edge of the Surge Building and then running north (CH-14), and finally an interconnection between the 12" existing lines in tunnel vault (TV-8A) due south of Computer Statistics and the new 24" mains running north on East Campus Drive (CH-15). These projects are also detailed in Section 1 on page 1-7. The cost for these four projects is $1.6 million.

The campus loop will eventually be interconnected on the north side of the east campus to close the loop, which will improve flow characteristics. This will be fully accomplished during the 2006-2010 time period, which has three infrastructure projects (CH-21, 22 & 23) totaling $8.2 million (see detailed project outlines in Section 1, page 1-10). The majority of the project cost for this period involves the installation of additional chillers and an additional Thermal Energy Storage Tank (TES) to meet the increasing cooling cost of the campus (CH-23).

There are three main infrastructure projects (CH-31, 32 & 33) for the final time period, 2011-2015, and they will occur in the future building development in parking lot 6 area to the south and the Science cluster to the south east. The total cost associated with this time period is $1.2 million (see detailed project outlines in Section 1, page 1-13).

1.2 Steam Supply and Condensate Return System

The Central Steam plant consists of four high pressure steam boilers that have a total capacity of 132,000 lb/hr. The majority of the steam and condensate pipe is located in underground utility tunnels. Pipe sizes range from 1 ½" to 8". The overall integrity of the steam and condensate piping system is good.

The boiler feed water line running from the deareator to the boilers along with boiler feed water pumps need to be increased in size in order to handle future load conditions, and buried steam and condensate lines must be run from the tunnel

location TV-8A across East Campus Drive to Physical Sciences #1. These projects are recommended for the 2002-2005 time period, and result in a total project cost for the three projects (ST-11, 12 & CR-11) of $0.3 million (see detailed project outlines in Section 1, page 1-7). In the 2006-2010 time period, two projects (ST-21, 22) are recommended to provide steam and condensate from the existing tunnel network to new buildings. Also, Central Plant upgrades of the existing steam header system (ST-23) and the installation of a 50,000 lb/hr. boiler (ST-24) will occur. In all, there are six infrastructure projects (ST-21 through ST-24, CR-21, 22) totaling $4.0 million (see detailed project outlines in Section 1, page 1-10).

The final time period, 2011-2015, consists of seven projects. Six projects (ST-31 through ST-33 & CR-31 through CR-33) extend steam and condensate piping to administration buildings and a science building in the northwest and northeast areas of the campus as well as the future building development in parking lot 6 to the south. The seventh project (ST-34) installs another 50,000 lb/hr. boiler increasing the total plant capacity to 174,000 lb/hr. These projects have a total cost of $3.9 million (see detailed project outlines in Section 1, pages 1-13, 14).

1.3 Domestic Water System

The current domestic water system infrastructure adequately accommodates the existing east campus load conditions. Water is supplied to the campus from a 5 million gallon city reservoir. The pumping station for campus distribution can either supply buildings directly or feed the two water storage (1.05 million gallons total) tanks located at a high elevation on the southeast side of campus. Fire protection water is also provided by the domestic water system.

There is also a backup source of water supply on the north side of campus. A 12" city water line provides redundancy for fire protection water flow and can be tapped into to serve the entire water needs of the campus.

During the first time period, 2002-2005, most new buildings are located toward the center of the campus. There are three projects (W-11, 12 & 13) that are designed to complete system loops and make interconnections, thereby increasing the capacity of the overall system. A fourth infrastructure project (W-14) that should be completed as soon as possible involves increasing the capacity of the pump station to meet the California Fire Code minimum fire flow requirements. All projects in this period total $1.15 million (see detailed project outlines in Section 1, page 1-8).

A total of three domestic water infrastructure projects (W-21, 22 & 23) will occur during the 2006-2010 time period. These projects mainly expand into undeveloped areas and extend water to new buildings. The total cost for all projects during this period is $1.9 million (see detailed project outlines in Section 1, page 1-10, 11).

As significant housing growth occurs on the north side of campus along with the future building development in parking lot 6 to the south, six projects (W-31 through W-36) will address the needs of these new building areas in the time period, 2011-2015. Included in these projects, which total $5.1 million (see detailed project

outlines in Section 1, pages1-14, 15), is the installation of a new 2 million gallon storage tank (W-31).

1.4 Sanitary Sewer System

The existing campus sanitary sewer system consists of three major arteries. It was reported that there are several trouble spots throughout the campus that experience blockages on a regular basis. The 15" sewer main (line D) which runs along North Campus Drive was recently tested and debris was found in the line.

This line was initially slated for replacement immediately based on a visual inspection at peak flow. In light of the new findings, this project (SS-21) has been moved to the 2006-2010 time period. In addition, this line is city owned and the City of Riverside will need notification by the University as to when a larger line will need to be installed based on sewer flows. We estimate that with proper maintenance, this line will be adequate until 2006-2010.

There are nine infrastructure projects that will occur in the 2002-2005 time period. The largest is the replacement of the 8" sewer main that runs along Eucalyptus Drive north to University Avenue (SS-11). The other eight smaller projects (SS-12 through SS-19) address the above mentioned trouble spots. The total cost for these projects is $1.8 million (see detailed project outlines in Section 1, page 1-8, 9).

In the time period, 2006-2010, there are three recommended projects. The replacement of the above mentioned 15" sewer main along North Campus Drive (SS-21), the replacement of an 8" sewer main running on the North side of Linden Avenue to accommodate new housing buildings (SS-22), and the extension of the 8" sewer main known as the B line to serve a new building to the south of the campus (SS-23). Also, the sewer mains on University Avenue and Canyon Crest Drive need to be evaluated for increased capacity. Since this is a city of Riverside line it is recommended that the University contact the city to discuss potential future demands on this line. These three infrastructure projects total $2.9 million (see detailed project outlines in Section 1, page 1-11, 12).

The final time period, 2011-2015, has two projects totaling $0.9 million (see detailed project outlines in Section 1, page 1-15). These projects increase line size to serve the Science cluster (SS-31), and extend the 8" B line to serve the future building development in parking lot 6 (SS-32).

1.5 Electrical Distribution System

The campus electrical distribution consists of a 4.16kV and 12kV system. The City of Riverside has two 69kV feeders to the main substation located at the West Side of Interstate 215/60. The main substation has a total capacity of 48 MW.

Portions of the 4.16kV system are approximately 50 years old and deteriorating. The University has made an effort to transfer some of the loads from the 4.16kV system to the sewer 12kV system as well as replace select equipment.

The projected growth for the campus results in a final estimated load of 49.6MW in 2015. Considering this growth, it is recommended that the University extend the existing 12kV system infrastructure to serve future buildings, and phase out the 4.16kV system.

The time period 2002-2005 includes one urgent project (EL-11), and this project totals $0.7 million (this urgent project is further detailed in Section 1 on page 1-9). The remainder of the 2002-2005 period consists of two projects (EL-12, 13) totaling $0.6 million (see detailed project outlines in Section 1, page 1-9). These projects provide 12kV service for several existing buildings and one new building. Time period 2006-2010 consists of three projects (EL-21, 22 & 23) that provide 12kV service for future buildings located on the west side of campus, in the northwest corner of the campus, and for future housing buildings to the northeast. These projects have a total cost of $2.0 million (see detailed project outlines in Section 1, page 1-12).

The final time period, 2011-2015, recommends seven projects in total with an associated cost of $12.3 million (see detailed project outlines in Section 1, page 1-16, 17). Five of these projects (EL-31 through EL-35) involve new 12kV services to the future building development in parking lot 6, the Science Cluster to the south and north, Administration buildings to the northwest, and the future housing off of Linden Street. The final two projects (EL-36, 37) involve the removal of the 5kV system and an upgrade to 12kV.

1.6 Natural Gas System

Southern California Gas Company provides Natural gas service to the campus at a pressure of 25 psi. Gas is delivered to the Central Plant and then is distributed throughout the campus at 5 psi. Housing buildings and non-academic buildings have their own gas service and are not served by the campus loop.

The existing distribution system is in good condition and is a mix of buried pipe and pipe inside the tunnel network. As buildings are added to the East Campus, gas service is tied into the existing 5 psi distribution system. No analysis was performed by Bechard Long to determine the capability of the existing lines to accommodate the added capacity.

It is anticipated that, another consultant will perform the analysis of the future growth of the natural gas demand, and Bechard Long awaits these planning documents for review. Peak hour natural gas demands have been developed for future buildings and these projections can be seen in Table 8-2.

1.7 Storm Drain System

The Phillip Williams & Associates (PWA) report titled, “University Arroyo Flood Control and Enhancement Plan”, dated 10/9/2001 was reviewed and studied. The results of this review can be seen in Section 9.

The purpose of the study was to determine the overall ability of the storm drain system to handle the 3-hour, 6-hour, and 24-hour duration of a 100-year storm. This study found that the existing storm drain system is not sufficient, recognized the system deficiencies, and provided several regional and on-campus alternatives to solve these problems.

Currently under serious consideration are one regional alternative and one on-campus alternative. Either alternative, if implemented, would improve the storm drain system infrastructure, and should adequately accommodate the planned building construction through 2015. These alternatives are discussed in Section 9. Also, future building roof drainage flows can be seen in Table 9.2

1.8 Project Summary

The following is a list of the utility identification that is used throughout this study.

Project I.D. Key	Infrastructure System
CH-XX	Chilled Water
ST-XX	Steam
CR-XX	Condensate Return
W-XX	Domestic Water
SS-XX	Sanitary Sewer
EL-XX	Electrical Distribution
NG-XX	Natural Gas
SD-XX	Storm Drain

The following Table 1.1 summarizes the infrastructure projects for all utilities. They are broken down by time period.

Peak load information, field conditions and findings for all utilities can be seen in Appendix A.

UCR Utility Infrastructure Project
Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2002-2005	**24**	**Citrus Drive Chilled Water Line Upgrade**	**CH-11**	**Demolish and remove direct buried 6" mains from Central Plant. Replace with direct buried 10" mains and connect to existing 8" lines for building 24 and reconnect to existing 6" direct buried mains continuing south.**	**$ 220,000**
2002-2005	**17**	**Central Plant**	**CH-12**	**The installation of new primary pumps and a bypass line for chiller #3 that will allow for chillers #3, 4 and 5 to be run in parallel. Replace existing 14" return line.**	**$ 443,000**
2002-2005	17	Central Plant	**CH-12A**	Replace chiller #1 with 1240 Ton chiller	$ 905,000
2002-2005	1 22 7A	Hinderacker Bachelor Humanities	**CH-13**	Repipe tertiary pumps	$ 148,000
2002-2005	59	Alumni Visitor Center	**CH-14**	Connect to existing 20" direct buried chilled water piping with 20" mains. Extend West and North with 4" valved stubs for 59 and 20" capped connections.	$ 369,000
2002-2005	-	South of Stat. Comp.	**CH-15**	Connect to 24" mains down East Campus Drive North: 12" CHWS & CHWR connection from 24" mains West and connect to existing 12" mains in TV 8A with valved connections, 6" valved stubs for 67 and 8" valved stubs for 68. Provides additional connection to campus chilled water loop system.	$ 192,000
2002-2005	68	Physical Science #1	**ST-11**	At West corner of the tunnel containing 8" HPS to 21 (Statistics-Computer Bldg), connect and run 6" from tunnel direct buried across East Campus Drive with 6" capped connection and North with 4" valved stub for 68. Cost Included in building project cost.	$ -
2002-2005	17	Central Plant	**ST-12**	Increase feedwater system capacity. Provide new feedwater pumps, associated piping and valves and electrical wiring.	$ 434,000
2002-2005	68	Physical Science #1	**CR-11**	At West corner of the tunnel containing 4" condensate return from 21 (Statistics-Computer Bldg),connect to and run 3" from tunnel direct buried across East Campus Drive with 3" capped connection and North with 2" valved stub for 68	$ -

URGENT PROJECTS SHOWN IN RED - these projects are recommended to be completed as soon as possible, and chilled water projects are to be completed before the summer of 2002.

Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2002-2005	65 69	East Carillon Mall	**W-11**	Install direct buried 6" main south connecting the end of the existing north-south 6" main that runs between 19 (Webber) and 16B (Spieth) to the east-west 12" transite main that runs down Eucalyptus, east of 66 (Biological Sciences). Install direct buried 6" main west connecting the end of the existing 6" east-west main north of Greenhouses 6-10 to the new 6" main above.	$ 255,000
2002-2005	59	Alumni/ Visitor Center	**W-12**	Install direct buried 8" main west connecting the existing 8" main running along North Campus Drive to the existing 8" north-south main running on the west side of Canyon Crest. Install 2 fire hydrants equally spaced along North Campus Drive. New fire hydrant cost to be included in building cost.	$ 155,000
2002-2005	65 69	West Carillon Mall	**W-13**	Install direct buried 6" main west connecting the end of the existing east-west 6 " main running through Carillon Mall to the north-south 12" transite main, north of 7A (Humanities). Install direct buried 6" main north connecting the end of the existing 6" north-south main that runs between 10 and 7 (Barn Group) to the new 6" main above.	$ 231,000
2002-2005	-	Pump Station	**W-14**	Replace all 4 pumps w/ 4 new 300 HP, 2,750 GPM @ 315 FT head pumps, for a total pumping capacity to 8,250 GPM, plus an additional 2,750 GPM back-up pump. Install VFD on two pumps, one for back-up.	$ 514,000
2002-2005	-	West Campus Drive, Eucalyptus Drive	**SS-11**	Replace existing 8" underground main in West Campus Drive and Eucalyptus between manholes A1 and A13 with 12" PVC pipe. Slope line at 1/8" per foot.	$ 1,306,000
2002-2005	-	Eucalyptus Drive	**SS-12**	Replace existing 8" sewer line between manholes A15 and A17.	$ 78,000
2002-2005	16A	Life Sciences	**SS-13**	Replace existing 6" sewer line between manholes A13c and A13d.	$ 39,000
2002-2005	16, 16B	Life Sciences	**SS-14**	Replace existing 8" sewer line between manholes A13c2 and A13c3.	$ 53,000
2002-2005	26A	Boyden Lab Building	**SS-15**	Replace existing 8" sewer line between manholes A18 and A18a	$ 53,000
2002-2005	13, 69	West of Pierce Hall	**SS-16**	Replace existing 8" sewer branch between manholes D4 and D4a.	$ 78,000
2002-2005	13	Pierce Hall	**SS-17**	Replace existing 8" sewer from manhole D4c south to Pierce	$ 53,000

UCR Utility Infrastructure Project
Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2002-2005	32	Student Service Center	**SS-18**	Replace existing 8" sewer line between manholes D6 and D6b	$ 78,000
2002-2005	43	Environmental Health and Safety	**SS-19**	Replace existing 4" sewer line between manholes A15i and A15k with new 6" line.	$ 116,000
2002-2005	**32,34**	**Veitch Student Center, Corporation Yard**	**EL-11**	**At the Veitch Student Center, extend 12kV circuits 2A-B from Vault V-24 to a new transformer pad located adjacent to the building. Provide cable in concrete encased ducts. Construct transformer pad and cut over the existing loads. Demolish existing substation serving the building.** **At the Corporate Yard, extend 12kV circuits 2A-B from Vault V-23 to a new transformer pad located adjacent to the existing substation. Provide cable in concrete encased ducts. Construct transformer pad and cut over the existing loads. Demolish existing substation serving the Corporate Yard.** **Disconnect and remove 5kV circuit number 4. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon demolition of substations at the Veitch Student Center and the Corporate Yard.**	**$ 717,000**
2002-2005	19,20,21	Webber Hall, Boyce Hall, Computer/Statistics	**EL-12**	Extend existing 12kV circuit 2A-B from Vault V-13 (East Campus Drive) west to Webber Hall. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide 12kV connections to Computer/Statistics and Boyce Hall for service at 12kV. At each building, utilize existing load interrupter switches and convert existing dual rated transformers for use at 12kV. Disconnect and remove 5kV service for Webber Hall, Computer/Statistics, and Boyce Hall. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 374,000
2002-2005	74	CHASS 2	**EL-13**	Extend existing 12kV circuit 1A-B, and 2A-B from Vault V-8 (north of the Central Plant) south along Citrus Drive. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 184,000
2002-2005	**Period Total**				**$ 6,995,000**

URGENT PROJECTS SHOWN IN RED - these projects are recommended to be completed as soon as possible.

2002-2005 Reference Dwgs- Ch Water- CH-10; Stm/Cond- ST-10, CR-10; Water- W-10S, W-10N; Sewer- SS-10S, SS-10N; Elec- E-10S, E-10N

UCR Utility Infrastructure Project
Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2006-2010	75 78	Engineering Unit #3 Performing Arts	**CH-21**	Extend 20" mains from 20" capped connections in **CH-12** North to North Campus Drive. Extend 24" mains from existing 24" capped connections to new 20" mains and connect to complete CHW loop. Include in new 24" mains, 6" valved stubs for 75. Continue piping West from new CHW loop connection with new 8" mains to 8" valved stubs for 78 and 6" capped connections.	$ 1,346,000
2006-2010	74	CHASS #2	**CH-22**	Demo and remove existing 6" mains in tunnel from central plant to TV-12. Replace with 12" mains, and extend mains South to 4" valved stubs for 74 and 10" capped connections.	$ 265,000
2006-2010	-	Satellite Plant	**CH-23**	Install (2) 2000 Ton chillers and TES Tank #3.	$ 6,614,000
2006-2010	75 78	Engineering Unit #3 Performing Arts	**ST-21**	At North corner of the tunnel containing 6" HPS to 58 (Fine Arts), connect new 6" steam to run from tunnel North and East with 4" valved stubs for 75 & 78	$ 631,000
2006-2010	74	CHASS Building #2	**ST-22**	At South corner of the TV-12 containing 6" HPS , connect and run 6" from tunnel direct buried steam service with 4" valved stub for 76 and 6" capped connection.	$ 86,000
2006-2010	17	Central Plant	**ST-23**	Demolish existing steam header system at Central Plant and install new larger capacity header and distribution from Plant to accommodate increasing loads	$ 656,000
2006-2010	17	Central Plant	**ST-24**	Replace existing 1958 30,000 Lb/hr steam boiler with new 50,000 Lb/hr steam boiler and associated accessories	$ 2,523,000
2006-2010	75 78	Engineering Unit #3 Performing Arts	**CR-21**	At North corner of the tunnel containing 3" condensate return from 58 (Fine Arts),connect new 3" condensate return to run from tunnel near 59, with 1-1/2" valved stub for 59 and 3"capped connectionExtend direct buried 2" condensate return North and East from 3" capped connection in CR-11 to 2" valved stubs for 75 & 78	$ 130,000
2006-2010	74	CHASS Building #2	**CR-22**	At South corner of the TV-12 containing 4" condensate return, connect and run 3" from tunnel direct buried condensate return to 2" valved stub for 76 and 3" capped connection	$ 19,000

Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2006-2010	74	CHASS Building #2	**W-21**	Install direct buried 6" main west from the end of the existing 6" east-west main south of 17 (Central Plant) to the western edge of 74. Install 2 fire hydrants, one at each end of the above new 6" main. New fire hydrant cost to be included in building cost.	$ 79,000
2006-2010	75 78 80 81	Engineering Unit #3 Performing Arts Housing Unit #4 Housing Unit #5	**W-22**	Install direct buried 8" main south connecting the end of the existing 6" north-south main on the east side of Aberdeen to the existing 8" east-west main at the corner of North Campus Drive and Aberdeen. Install direct buried 8" main east connecting the existing north-south main running along the east side of Canyon Crest to the intersection of the 8" mains in **W-11**, near 70. Interconnect the above 2 new 8" mains at their intersection, on the east side of Aberdeen. Install 2 fire hydrants, one on the east side of Canyon Crest, and one on the west side of Aberdeen.	$ 805,000
2006-2010	70 71 72	Pentland Hills #2 Housing Unit #2 Housing Unit #3	**W-23**	Install direct buried 8" main east between 70 and 61 (Pentland Hills) from existing north-south 8" main to the west side of Valencia Hill. Continue 8" main north up the west side of Valencia Hill to the south side Linden. Continue west down the south side of Linden with a 8" main connecting to the end of the existing Linden 8" main across from 53 (Parking Services). Install 5 fire hydrants equally spaced along Linden and Valencia Hill. New fire hydrant cost to be included in building cost.	$ 1,005,000
2006-2010	-	North Campus Drive	**SS-21**	Notify the City of Riverside that the existing 15" city owned sewer main from D1 to D6 needs to be evaluated for increased sewer capacity. The City of Riverside and the University need to negotiate fiscal responsibility for improvements to this line. It is recommended a new 18" line parallel to the existing 15" underground main in North Campus Drive be installed.	$ 996,000
2006-2010	71 72 80 81	Housing Unit #2 Housing Unit #3 Housing Unit #4 Housing Unit #5	**SS-22**	Replace existing 8" sewer main down the north side of Linden Street with a 12" pipe. Extend 12" pipe east to Watkins Drive, to serve Building 72, Housing Unit #3. Slope line at 1/4" per foot. Reuse existing manholes and fill voids created by re-alignment. Cost of connection to building from main is to be included in the cost of the building.	$ 1,741,000

UCR Utility Infrastructure Project
Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2006-2010	-	Canyon Crest Drive, University Avenue	-	Notify the City of Riverside that the existing 15" sewer main from D1 west down the north side of University Avenue needs to be evaluated for increased capacity. Notify the City of Riverside that the existing 8" sewer main from G1 to D1 needs to be evaluated for increased capacity.	$ -
2006-2010	74	CHASS #2	**SS-23**	Install new 8" underground sewer pipe from CHASS #2 west to existing B Line between manholes B9 and B10.	$ 151,000
2006-2010	22,77	Batchelor Hall, Genomics	**EL-21**	Extend existing 12kV circuit 2A-B from Vault V-10 along the east side of Batchelor Hall. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pads at Batchelor Hall for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 571,000
2006-2010	71,72,80,81,110	Housing Units #2, 3, 4, 5, 13	**EL-22**	Extend existing 12kV circuit 2A-B from Vault V-25 east along Linden Street. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 303,000
2006-2010	59,73, 75,78,84,85	Alumni Center, CHASS 1,Engineering Unit #3, Performing Arts, Student/Admin #3 & 4, Play Field, Pump Station	**EL-23**	Extend existing 12kV circuit 3A-B from Vault V-4C north to North Campus Drive. Reroute circuit along the north side of CHASS Building 1 to refeed Vault 4E. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pad at the Underground Pump Station and Field House for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 1,170,000
2006-2010	**Period Total**				**$ 19,091,000**

2006-2010 Reference Dwgs- Ch Water- CH-20; Stm/Cond- ST-20, CR-20; Water- W-20S, W-20N; Sewer- SS-20S, SS-20N; Elec- E-20S, E-20N

UCR Utility Infrastructure Project
Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	95 96	Physical Science #3 Science Building #11	**CH-31**	Install direct buried 8" mains East from 24" mains in East Campus Drive with 8" valved stubs for 95. Continue East with 6" valved stubs for 96.	$ 305,000
2011-2015	82 83	Student Admin. #1 Student Admin. #2	**CH-32**	Install direct buried 6" mains west from capped mains in CH-21 with 4" valved stubs for 83. Continue piping West with 4" valved stubs for 82.	$ 276,000
2011-2015	97 98 99 100 101 102	Lot 6 Devlpmnt #1 Lot 6 Devlpmnt #2 Lot 6 Devlpmnt #3 Lot 6 Devlpmnt #4 Lot 6 Devlpmnt #5 Lot 6 Devlpmnt #6	**CH-33**	Install direct buried 10" mains from capped 10" mains in **CH-22** West and South with 6" valved stubs for 97 & 98. Continue 10" mains South with 4" valved stubs for 99. Continue 8" mains South with 4" valved stubs for 100. Continue 8" mains South with 6" valved stubs for 101. Continue piping South and East with 4" valved stubs for 102.	$ 603,000
2011-2015	89 94	Science Building #4 Science Building #9	**CH-34**	Connect to 24" mains in East Campus Drive with 8" direct buried mains. Extend mains South with 8" valved stubs for 94 and 6" valved stubs for 89.	$ 65,000
2011-2015	82 83	Student Admin. #1 Student Admin. #2	**ST-31**	Extend direct buried 4" main West from 6" capped connection in **ST-21** to 4" valved stubs for 82 & 83	$ 243,000
2011-2015	95 96	Physical Science #3 Science Building #11	**ST-32**	Extend direct buried 4" main East from 6" capped connection in **ST-11** to 4" valved stub for 95 and 3" valved stub for 96.	$ 279,000
2011-2015	97 98 99 100 101 102	Lot 6 Devlpmnt #1 Lot 6 Devlpmnt #2 Lot 6 Devlpmnt #3 Lot 6 Devlpmnt #4 Lot 6 Devlpmnt #5 Lot 6 Devlpmnt #6	**ST-33**	Connect 6" direct buried main from 6" capped connection in **ST-22** West and South to 4" valved stub for 97 & 98. Continue South with 4" direct buried main to 3" valved stub for 99. Continue South with 4" direct buried main to 3" valved stub for 100. Continue South with 4" direct buried main to 4" valved stub for 101. Continue South and East with 3" direct buried main to 3" valved stub for 102.	$ 668,000
2011-2015	17	Central Plant	**ST-34**	Replace existing 1958 30,000 Lb/hr steam boiler with new 50,000 Lb/hr steam boiler and associated accessories	$ 2,523,000
2011-2015	82 83	Student Admin. #1 Student Admin. #2	**CR-31**	Extend direct buried 2" condensate return West from 3" capped connection in **CR-21** to 2" valved stubs for 82 & 83.	$ 44,000
2011-2015	95 96	Physical Science #3 Science Building #11	**CR-32**	Extend direct buried 2" condensate return East from 3" capped connection in **CR-11** to 2" valved stub for 95 and 1-1/2" valved stub for 96.	$ 49,000

Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	97 98 99 100 101 102	Lot 6 Devlpmnt #1 Lot 6 Devlpmnt #2 Lot 6 Devlpmnt #3 Lot 6 Devlpmnt #4 Lot 6 Devlpmnt #5 Lot 6 Devlpmnt #6	**CR-33**	Install 3" direct buried condensate return main from 3" capped connection in **CR-22** West and South to 2" valved stub for 97 & 98. Continue South with 2" direct buried main to 1-1/2" valved stub for 99. Continue South with 2" direct buried main to 1-1/2" valved stub for 100. Continue South with 2" direct buried main to 2" valved stub for 101. Continue South and East with 1-1/2" direct buried main to 1-1/2" valved stub for 102.	$ 119,000
2011-2015	-	N/A	**W-31**	Install new 2,000,000 gallon storage tank, and associated 12" piping to interconnect to existing tanks.	$ 1,137,000
2011-2015	87 88 89 90 91 92 93 94	Science Building #2 Science Building #3 Science Building #4 Science Building #5 Science Building #6 Science Building #7 Science Building #8 Science Building #9	**W-32**	Install a new 8" direct buried main originating at the new tank and connection piping in **W-31** to run parallel to the existing 8" main, down East Campus Drive, and connecting to the 8" line running down East Campus Drive in front of 87. Also interconnect this new 8" main to the 12" transite main at the corner of Eucalyptus and East Campus Drive. New fire hydrant cost to be included in building cost.	$ 533,000
2011-2015	97 98 99 100 101 102	Lot 6 Devlpmnt #1 Lot 6 Devlpmnt #2 Lot 6 Devlpmnt #3 Lot 6 Devlpmnt #4 Lot 6 Devlpmnt #5 Lot 6 Devlpmnt #6	**W-33**	Install a new 8" direct buried main originating at the new tank and connection piping in **W-31** to run parallel to the existing 6" main, down to South Campus Drive, south to West Campus Drive and north up West Campus Drive and connecting to the 12" transite main running down Eucalyptus in front of 10. Also interconnect this new 8" main to the 6" main from **W-21**. Install 5 new fire hydrants equally spaced along West Campus Drive. New fire hydrant cost to be included in building cost.	$ 987,000
2011-2015	95 96 111 112	Physical Science #3 Science Building #11 Housing Unit #14 Housing Unit #15	**W-34**	Install a new 8" direct buried main east on the north side of Big Springs, from the 8" main at the corner of East Campus Drive and Big Springs to the corner of Big Springs and Valencia Hill. Continue 8" main north along the west side of Valencia Hill, and connect to existing 8" from **W-11**. Install direct buried 8" main south crossing Big Springs in between 95 and 96 to serve 95 and 96. New fire hydrant cost to be included in building cost.	$ 789,000

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	103 104 105 106 107 108 109	Housing Unit #6 Housing Unit #7 Housing Unit #8 Housing Unit #9 Housing Unit #10 Housing Unit #11 Housing Unit #12	**W-35**	Demolish and remove existing direct buried piping as needed for new building construction (cost to be included in new building site prep cost). Replace existing direct buried 6" east-west main along Linden with a new direct buried 8" main to be connected with 8" piping to existing meter and 12" city main. Install 2 new north-south direct buried mains from the above new 8" east-west main, one along the west side of Canyon Crest north to the existing 6" main along Blaine, and one along the western side of 107-109, north to the existing 6" main along Blaine. Extend the existing north-south direct buried 6" main along the eastern side of 104 and 105 with new 6" direct buried pipe north to the 6" main along Blaine, and south with new 6" direct buried pipe to the new 8" main above. New fire hydrant cost to be included in building cost.	$ 1,405,000
2011-2015	82 83	Student/ Admin. #1 Student/ Admin. #2	**W-36**	Install a new 8" direct buried main west from the existing 8" north-south main on the east side of Canyon Crest. Route piping across Canyon Crest, to run along the north side of University, terminating at the west side of 82. New fire hydrant cost to be included in building cost.	$ 258,000
2011-2015	87 88 89 90 91 92 93 94	Science Building #2 Science Building #3 Science Building #4 Science Building #5 Science Building #6 Science Building #7 Science Building #8 Science Building #9	**SS-31**	Replace existing 8" and 6" underground sewer main in East Campus Drive with 12" pipe from manhole D8 to Building 89. Cost of connection to building from main is to be included in the cost of the building.	$ 535,000
2011-2015	97 98 99 100 101	Lot 6 Devlpmnt #1 Lot 6 Devlpmnt #2 Lot 6 Devlpmnt #3 Lot 6 Devlpmnt #4 Lot 6 Devlpmnt #5	**SS-32**	Install new 8" underground sewer main from existing manhole B11 to Building 101 to serve new buildings listed. Cost of connection to building from main is to be included in the cost of the building.	$ 374,000

Table 1.1 Capital Project Summary

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	11, 11A, 12, 97, 98, 99, 100, 101, 102	Olmstead Hall, Humanities-2, Theater, Art Annex, Lot 6 Devlpmnt #1, 2, 3, 4, 5, 6	**EL-31**	Extend existing 12kV circuit 3A-B from Vault V-4 southeast along West Campus Drive. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pads at the Humanities 2 building for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 1,297,000
2011-2015	14, 86	Geology, Science Cluster Building #1	**EL-32**	Reroute circuit outside of building footprint. Provide cable in concrete encased ducts. Provide transformer pads at Pierce Hall for 12kV service. At the Geology Building, utilize existing load interrupter switches and convert existing dual rated transformers for use at 12kV. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 683,000
2011-2015	82, 83	Student/Admin #1 &2	**EL-33**	Extend existing 12kV circuit 3A-B from Alumni Center west along University Ave. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 184,000
2011-2015	95, 96, 111, 112	Physical Science #3, Classroom Building #11, Housing Units #14 &15	**EL-34**	Extend existing 12kV circuit 2A-B from Vault V-15 east along Big Springs Road. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 487,000
2011-2015	103, 104, 105, 106	Housing Units #6, 7, 8, 9, 10, 11, 12	**EL-35**	Extend existing 12kV circuit 2A-B from Vault V-27 north to the Housing Units #6 through 12 site. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 671,000
2011-2015		Various	**EL-36**	Repair 5kV System Phase I - Demolish 4.16kV distribution system originating from the main substation located west of Interstate 215. Upgrade buildings/loads to receive primary service at 12kV. Replace all transformers and switchgear rated at 5kV with equipment rated for use at 12kV. Extend substructure and existing circuits 2A, 2B, 3A, & 3B. At selected locations, combine loads to reduce the number of substations/transformers, specially at buildings with multiple services.	$ 5,449,000

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015		Various	**EL-37**	Repair 5kV System Phase II - Demolish 4.16kV distribution system originating from the Central Power Plant. Upgrade buildings/loads to receive primary service at 12kV. Replace all transformers and switchgear rated at 5kV with equipment rated for use at 12kV. Extend substructure and existing circuits 1A, & 1B. At selected locations, combine loads to reduce the number of substations/transformers, specially at buildings with multiple services.	$ 3,492,000
2011-2015	**Period Total**				**$ 23,455,000**

2011-2015 Reference Dwgs- Ch Water- CH-30; Stm/Cond- ST-30, CR-30; Water- W-30S, W-30N; Sewer- SS-30S, SS-30N; Elec- E-30S, E-30N

2002-2015	**Grand Total**				**$ 49,541,000**

SECTION 2.0

DESCRIPTION OF CAMPUS

2.1 Current Campus

The University of California, Riverside is located 3 miles east of the downtown Riverside area. Interstate 215/60 splits the West Campus and the East Campus. This infrastructure study addresses only the East Campus. Most of the campus instructional and research space is accommodated on the East Campus, while the West Campus is primarily used for agricultural teaching and research.

The current campus enrollment is approximately 14,000 students (headcount). The campus contains approximately 50 major buildings comprising over 3.3 million overall gross square feet (OGSF). The existing buildings can be seen on the drawings M-00S and M-00N at the end of this section. The academic campus core is centered southeast of the intersection of University Avenue and Interstate 215/60. The two student centers and residence halls are situated north of this area. The key growth areas for the future are the south and east portions of the academic campus, north of North Campus Drive as well as east along North Campus Drive and University Avenue and west along Big Springs Road. Table 2-1 lists the existing building OGSF.

2.2 Future Campus to 2015

The campus is projected to grow from 14,000 to 25,000 students by the year 2015. This projected growth will require the addition of approximately 8.1 million square feet to the campus. The total OGSF will be over 8.1 million square feet. Table 2-1 and 2-2 (found in Section 2, pages 2-2 through 2-5) lists existing and future buildings and their GSF.

The drawings at the end of this section outline the projected growth by time period out to 2015; M-10S & M-10N (2002-2005), M-20S & M-20N (2006-2010), M-30S & M-30N (2011-2015).

Table 2.1: Existing Building Square Footage

Building	No.		O.G.S.F.
Aberdeen Hall	33		133,435
Administration - Hinderaker Hall	1		46,490
Anderson Hall	27B & C		See 27A
Art Annex	12A		2,645
Barn Group	7		5,600
Batchelor Hall (North & South)	22		114,860
Bookstore	48		33,400
Bourns Hall	54		145,309
Boyce Hall	20		109,932
Boyden Lab Building	26A		6,396
Campus Modular Building			21,960
Canyon Crest Student Family Housing	62		197,266
Carillon Tower	5		4,774
Central Power Plant	17		19,437
Chapman Hall -Soils & Plant Nutrition	27A		51,941
Chemical Sciences	13A		See 13
Child Development Center	51		12,000
College Building North & South	42		17,944
Commons	4		86,004
Computer Statistics	21		42,096
Corporation Yard	34		45,000
Costo	3		See 4
Custodial			7,446
Entomology	26		32,444
Entomology Annex	23		16,664
Entomology Research Museum	26B		8,988
Environmental Health and Safety	43		6,334
Fawcett Lab	28		20,997
Fine Arts	58		100,371
Geology	14		103,095
Greenhouse 11-13A	30		17,500
Greenhouse 1-3	30		15,000
Greenhouse 15-17	30		15,000
Greenhouse 18-21	30		20,000
Greenhouse 6-10	30		25,000
Humanities-1	7A		111,180
Humanities-2	11A		See 12
Insectary	26D		8,783
Lath House #1			5,000
Lath House #2			5,000
Life Sciences	16		150,994
Life Sciences	16A		See 16
Lothian Hall	31		163,250
Mobile Trailer Facilities	29		15,691
Olmstead Hall (Humanities-2)	12		141,049

Table 2.1: Existing Building Square Footage

Building	No.		O.G.S.F.
Parking Services	53		5,612
Pentland Hills	61		134,544
Physical Education	2		65,346
Physics	18		94,808
Physics 2000	18A		See 18
Pierce Hall (North & South)	13		139,912
Police Facility	36		9,320
Rivera Library	15		230,013
Science Library	60		167,358
Speith Hall -Life Sciences	16B		See 16
Sproul Hall	9		78,870
Student Recreation Center	55		80,000
Surge Building	64		84,375
Sweeney Art Gallery	39A		720
Telephone Building	40		2,584
Terrace Conference	47		4,880
Theatre	11		See 12
University Cottage	8		1,025
University Lab	25A		11,803
University Offices	25		19,650
USDA Salinity Lab	46		
Veitch Student Center	32		24,180
Watkins Hall	10		63,913
Webber Hall	19		50,801
SUBTOTAL			**3,355,989**

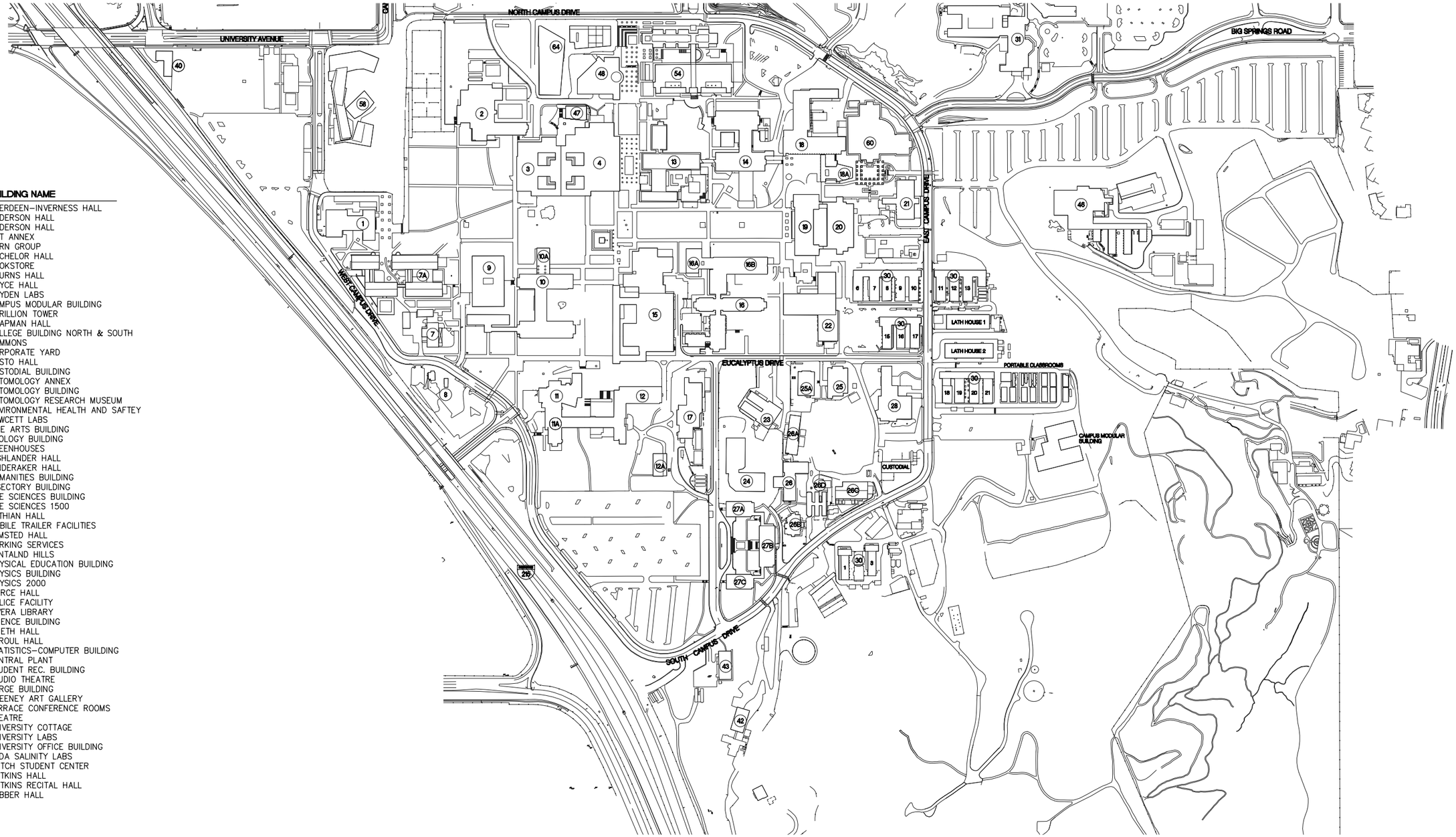
Table 2.2: Future Building Square Footage

Building	No.		G.S.F.
2002 - 2005			
Alumni/ Visitor Center	59		25,890
Biological Science	66		55,071
Boiler Plant (additional load)			
Commons Expansion	69		186,004
Demo Commons	4		(86,004)
Engineering Unit #2	67		152,010
Entomology	24		67,139
Insectory & Quarantine	26C		31,523
Physical Science #1	68		129,417
Satellite Central Plant			7,000
Science Lab #1	65		44,138
Pentland Hills #2	70		67,500
Housing Unit #2	71		60,000
Housing Unit #3	72		60,000
SUBTOTAL			**799,688**
CUMULATIVE TOTAL			**4,155,677**
2006 -2010			
CHASS Bldg 1	73		115,000
CHASS Bldg 2	74		85,000
Boiler Plant (additional load)			
Demo Art Annex	12A		(2,645)
Engineering Unit #3	75		150,000
Entomology #2	76		100,000
Demo Entomology Annex	23		(16,664)
Genomics	77		120,000
Performing Arts	78		75,000
Physical Science #2	79		130,000
Satellite Plant Expansion			0
Housing Unit #4	80		93,750
Housing Unit #5	81		93,750
SUBTOTAL			**943,191**
CUMULATIVE TOTAL			**5,098,868**
2011 -2015			
Student/ Administration Cluster:			
Boiler Plant (additional load)			
Building 1	82		100,000
Building 2	83		100,000
Building 3	84		120,000
Building 4	85		50,000
Science Cluster:			
Building 1 (lab)	86		100,000
Demo 20% of Pierce Hall	13		(27,982)
Building 2 (classroom)	87		100,000

Table 2.2: Future Building Square Footage

Building	No.		G.S.F.
Science Bldg. (lab)	88		100,000
Demo Greenhouse 15-17	30		(15,000)
Building 4 (classroom)	89		100,000
Demo Custodial			(7,446)
Demo Entomology	26		(32,444)
Demo Insectary	26D		(8,783)
Building 5 (lab)	90		100,000
Demo Greenhouse 11- 13A	30		(17,500)
Building 6 (classroom)	91		100,000
Demo Lath House #1			(5,000)
Building 7 (lab)	92		100,000
Demo Lath House #2			(5,000)
Building 8 (classroom)	93		120,000
Demo Greenhouse 18-21	30		(20,000)
Building 9 (lab)	94		120,000
Physical Science #3	95		130,000
Building 11 (classroom)	96		100,000
Future Bldg Devlpmnt in Prkg Lot 6:			
Building 1	97		100,000
Building 2	98		50,000
Building 3	99		75,000
Building 4	100		50,000
Building 5	101		150,000
Building 6	102		75,000
Housing Unit #6	103		112,500
Housing Unit #7	104		112,500
Housing Unit #8	105		112,500
Housing Unit #9	106		112,500
Housing Unit #10	107		112,500
Housing Unit #11	108		112,500
Housing Unit #12	109		112,500
Housing Unit #13	110		112,500
Housing Unit #14	111		112,500
Housing Unit #15	112		112,500
SUBTOTAL			**3,025,845**
GRAND TOTAL			**8,124,713**

NO.	BUILDING NAME
33	ABERDEEN–INVERNESS HALL
27B	ANDERSON HALL
27C	ANDERSON HALL
12A	ART ANNEX
7	BARN GROUP
22	BACHELOR HALL
48	BOOKSTORE
54	BOURNS HALL
20	BOYCE HALL
26A	BOYDEN LABS
–	CAMPUS MODULAR BUILDING
5	CARILLION TOWER
27A	CHAPMAN HALL
42	COLLEGE BUILDING NORTH & SOUTH
4	COMMONS
34	CORPORATE YARD
3	COSTO HALL
–	CUSTODIAL BUILDING
23	ENTOMOLOGY ANNEX
26	ENTOMOLOGY BUILDING
26	ENTOMOLOGY RESEARCH MUSEUM
43	ENVIRONMENTAL HEALTH AND SAFTEY
28	FAWCETT LABS
58	FINE ARTS BUILDING
14	GEOLOGY BUILDING
30	GREENHOUSES
49	HIGHLANDER HALL
1	HINDERAKER HALL
7A	HUMANITIES BUILDING
26D	INSECTORY BUILDING
16	LIFE SCIENCES BUILDING
16A	LIFE SCIENCES 1500
31	LOTHIAN HALL
29	MOBILE TRAILER FACILITIES
12	OLMSTED HALL
53	PARKING SERVICES
61	PENTALND HILLS
2	PHYSICAL EDUCATION BUILDING
18	PHYSICS BUILDING
18A	PHYSICS 2000
13	PIERCE HALL
36	POLICE FACILITY
15	RIVERA LIBRARY
60	SCIENCE BUILDING
16B	SPIETH HALL
9	SPROUL HALL
21	STATISTICS–COMPUTER BUILDING
17	CENTRAL PLANT
55	STUDENT REC. BUILDING
11A	STUDIO THEATRE
64	SURGE BUILDING
39A	SWEENEY ART GALLERY
47	TERRACE CONFERENCE ROOMS
11	THEATRE
8	UNIVERSITY COTTAGE
25A	UNIVERSITY LABS
25	UNIVERSITY OFFICE BUILDING
46	USDA SALINITY LABS
32	VIETCH STUDENT CENTER
10	WATKINS HALL
10A	WATKINS RECITAL HALL
19	WEBBER HALL



NORTH

0 50'100' 200' 400' 600'

1"=200'–0"

UCR

UNIVERSITY OF CALIFORNIA RIVERSIDE

EXISTING SITE MAP SOUTH

Bechard Long &Associates, Inc.

MECHANICAL AND ELECTRICAL CONSULTING ENGINEERS

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FAX (858) 578-8865
E-MAIL sd@bech.com

PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: M-00S

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27B	ANDERSON HALL
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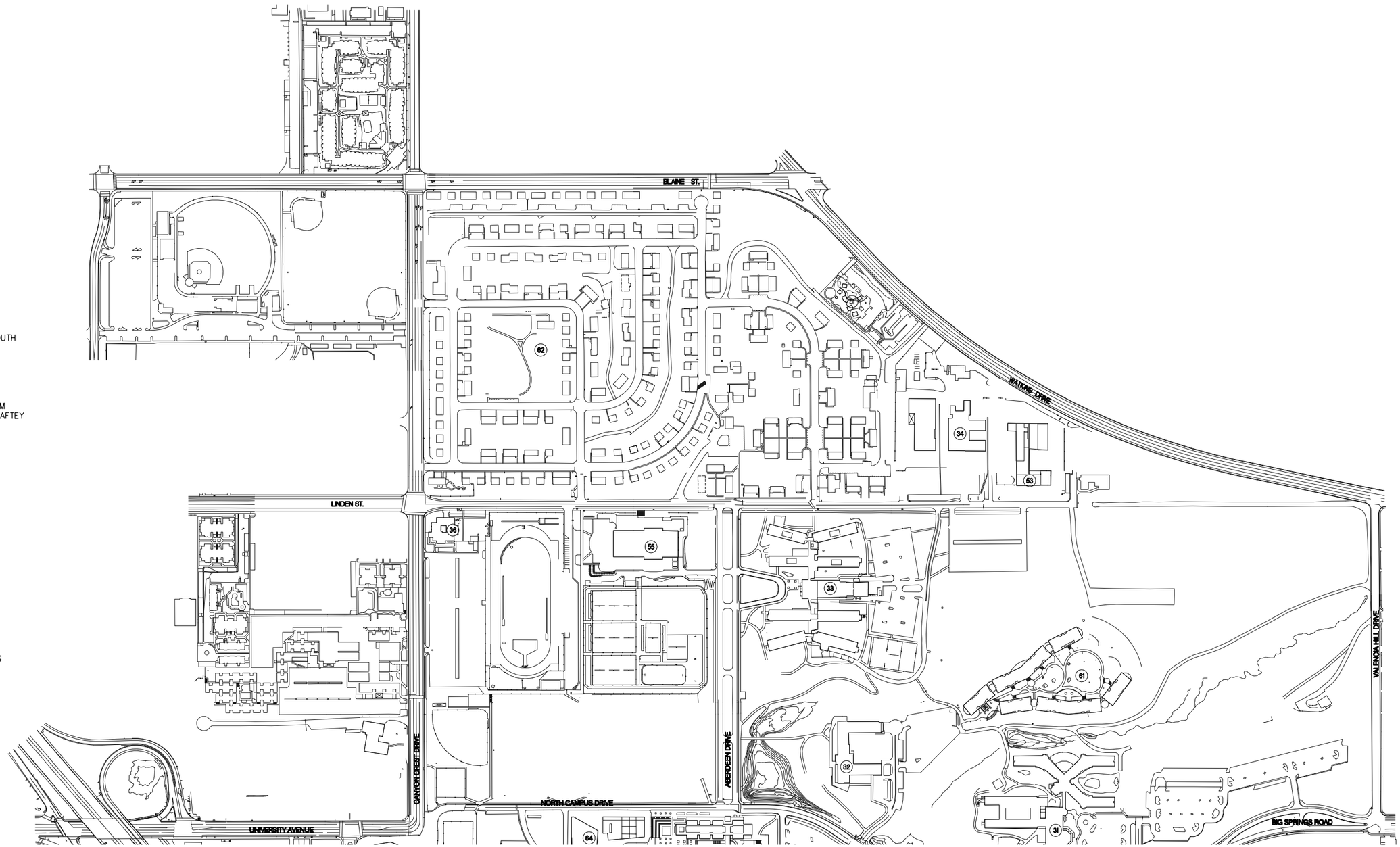
10	WATKINS HALL
10A	WATKINS RECITAL HALL
19	WEBBER HALL



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0 50'100' 200' 400' 600'

1"=200'-0"

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7A	HUMANITIES BUILDING
26D	INSECTORY BUILDING
16	LIFE SCIENCES BUILDING
16A	LIFE SCIENCES 1500
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29	MOBILE TRAILER FACILITIES
12	OLMSTED HALL
53	PARKING SERVICES
61	PENTALND HILLS
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18A	PHYSICS 2000
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25	UNIVERSITY OFFICE BUILDING
46	USDA SALINITY LABS
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19	WEBBER HALL

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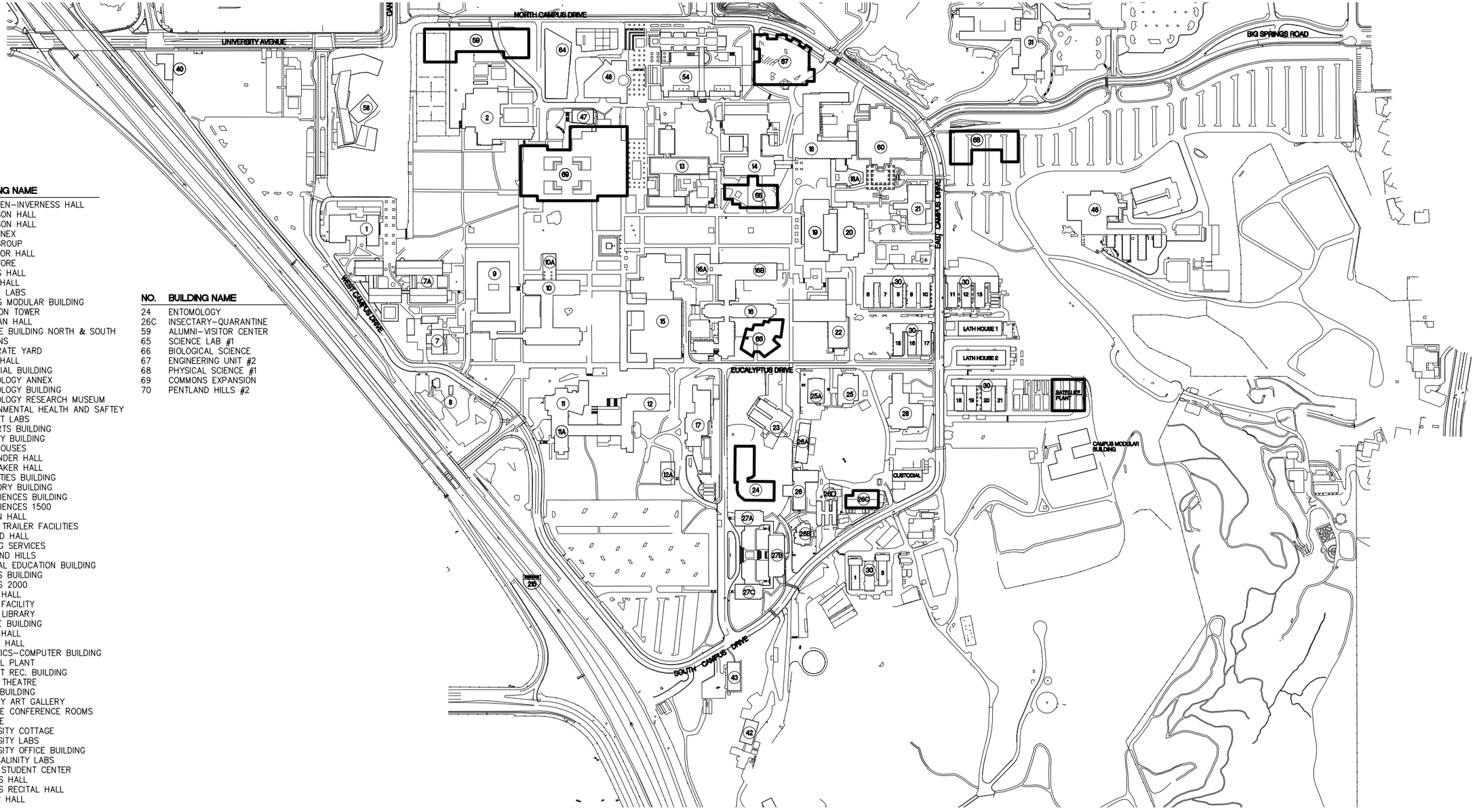

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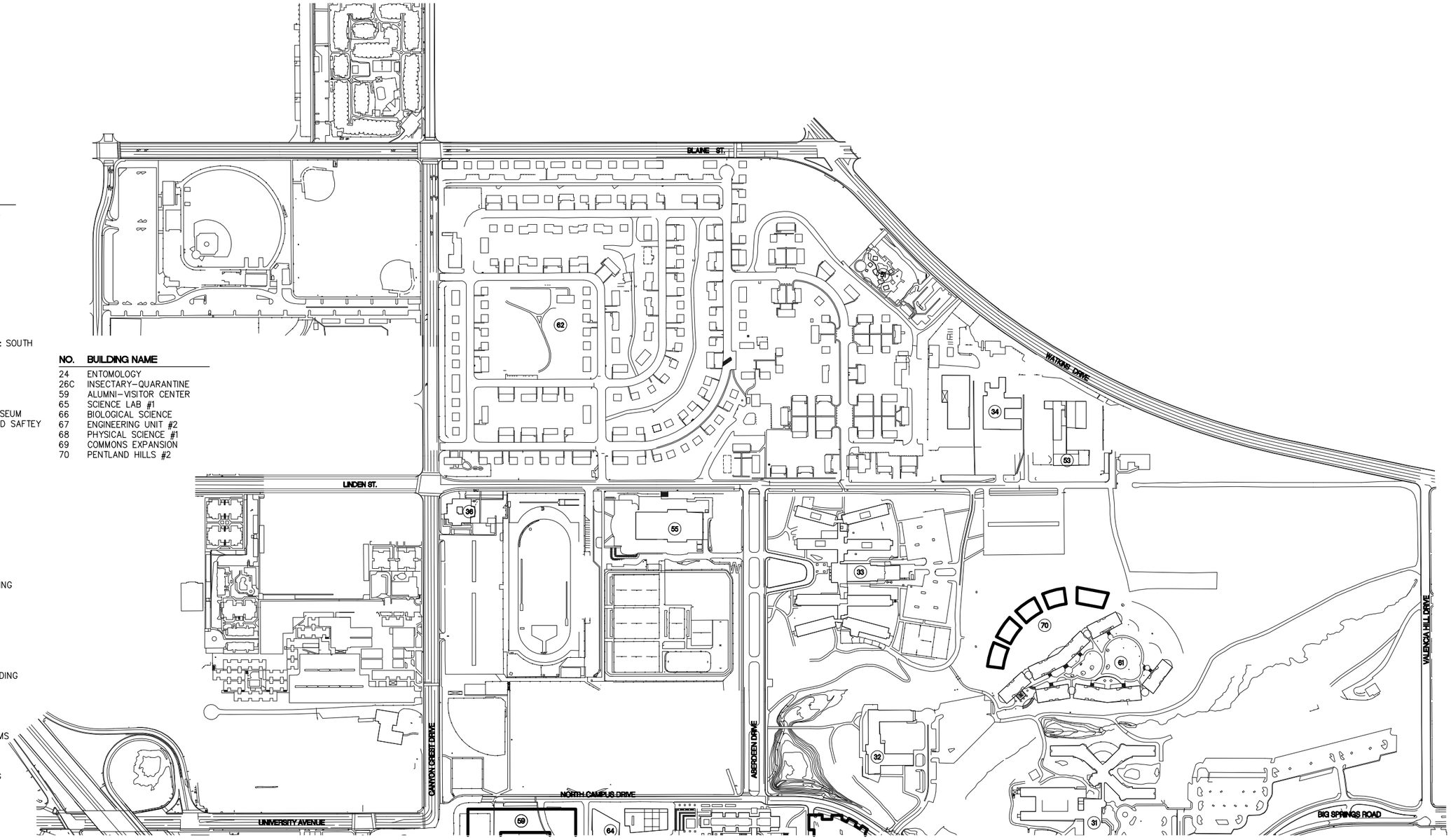

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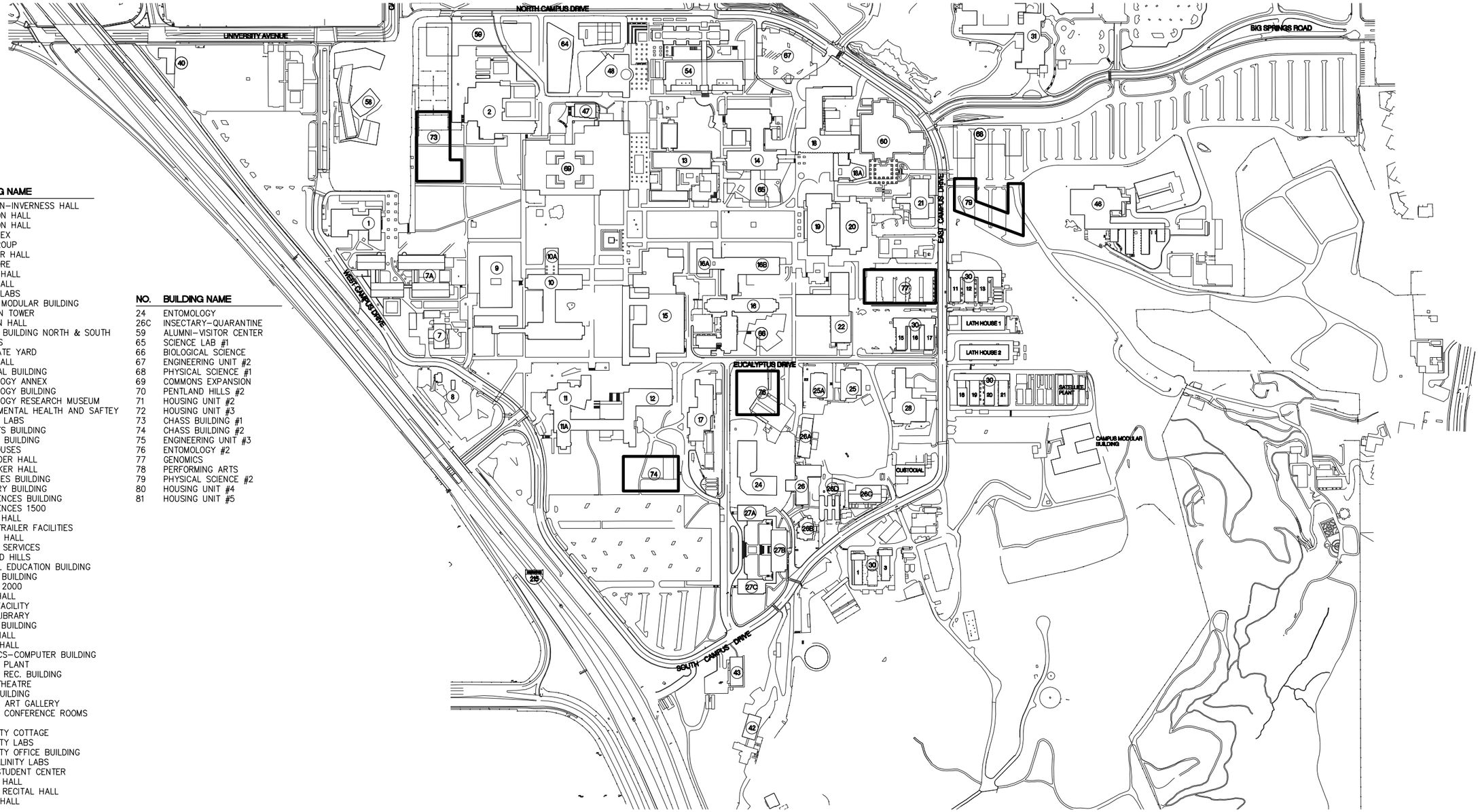

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73	CHASS BUILDING #1
74	CHASS BUILDING #2
75	ENGINEERING UNIT #3
76	ENTOMOLOGY #2
77	GENOMICS
78	PERFORMING ARTS
79	PHYSICAL SCIENCE #2
80	HOUSING UNIT #4
81	HOUSING UNIT #5

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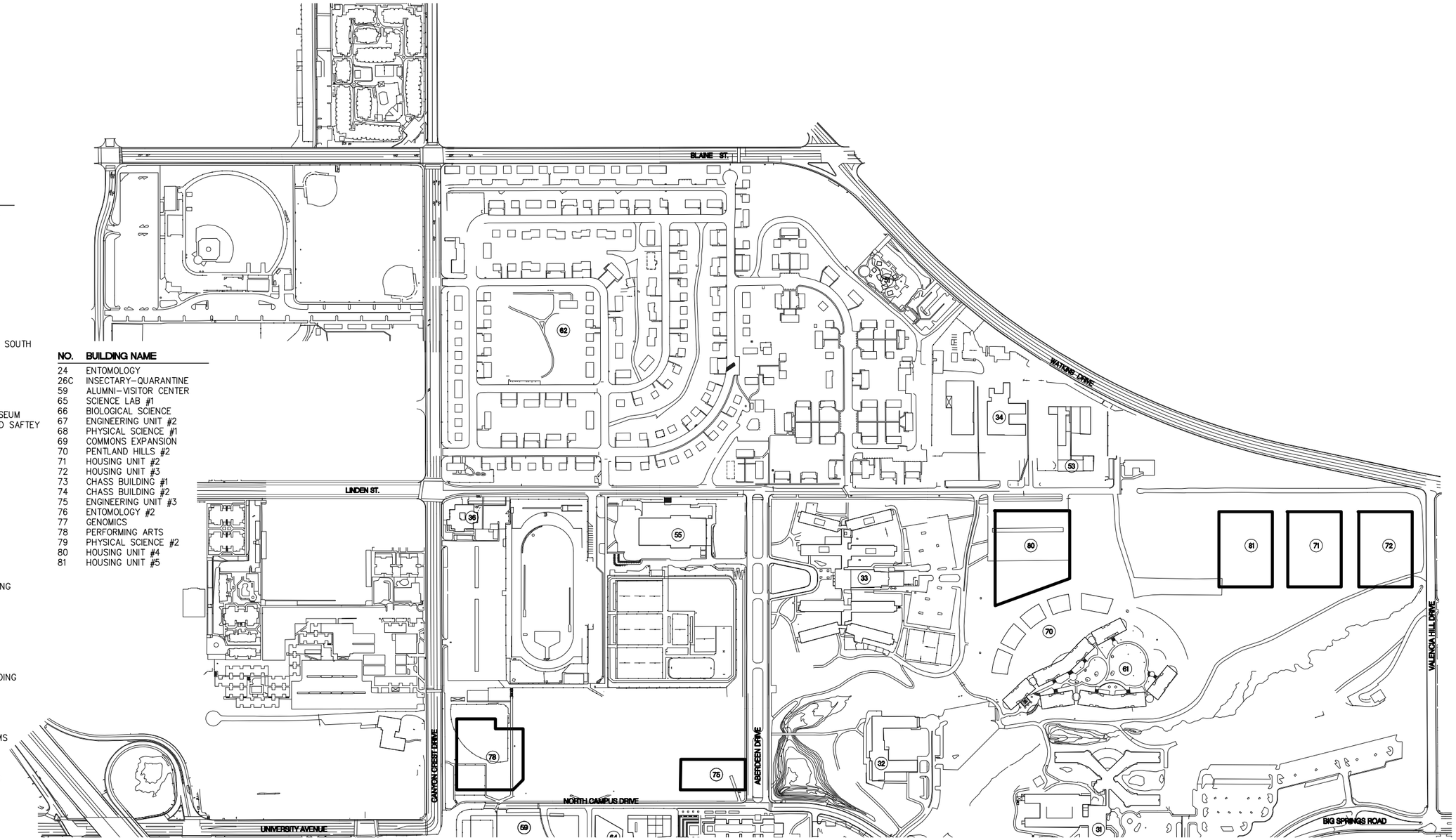

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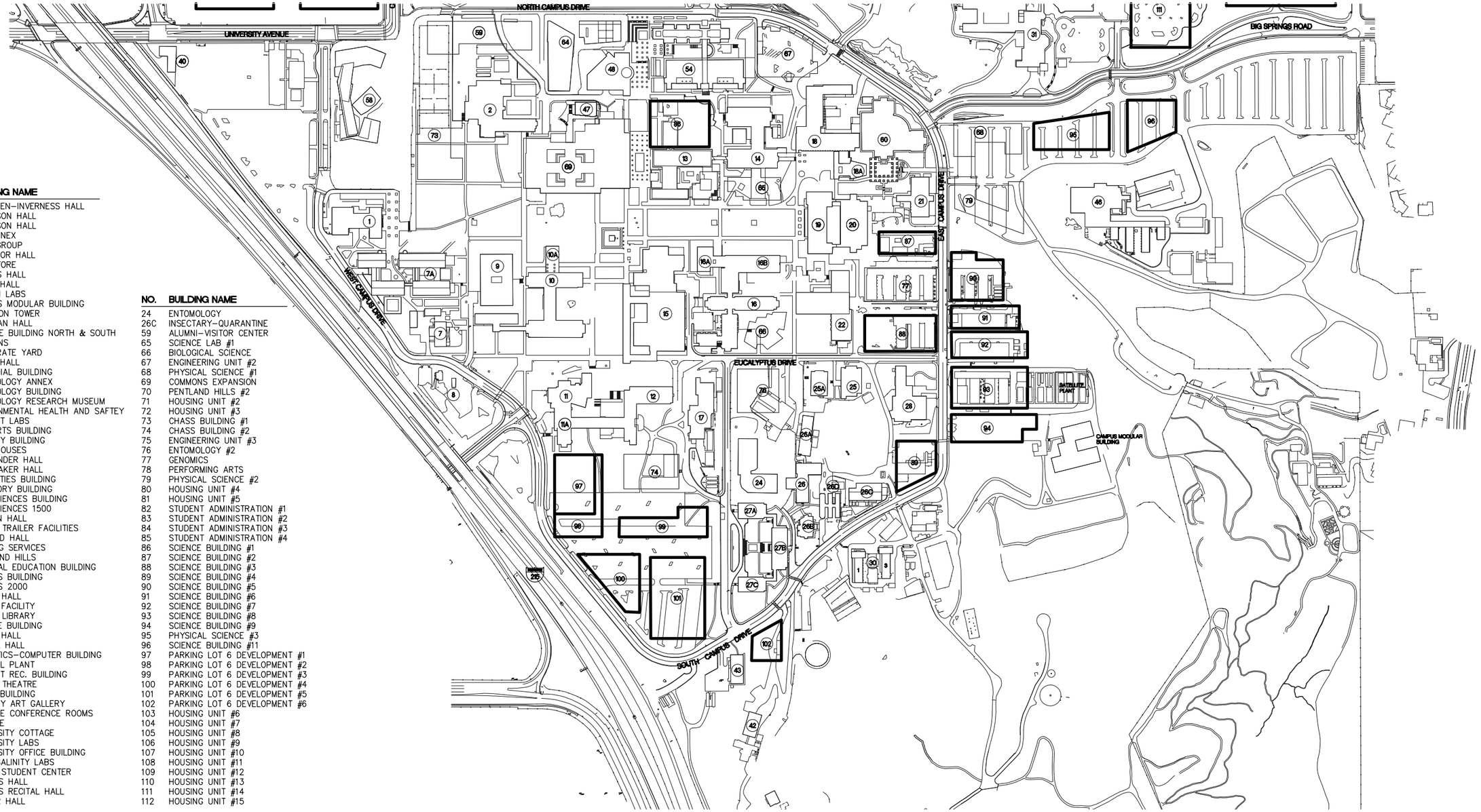

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95	PHYSICAL SCIENCE #3
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97	PARKING LOT 6 DEVELOPMENT #1
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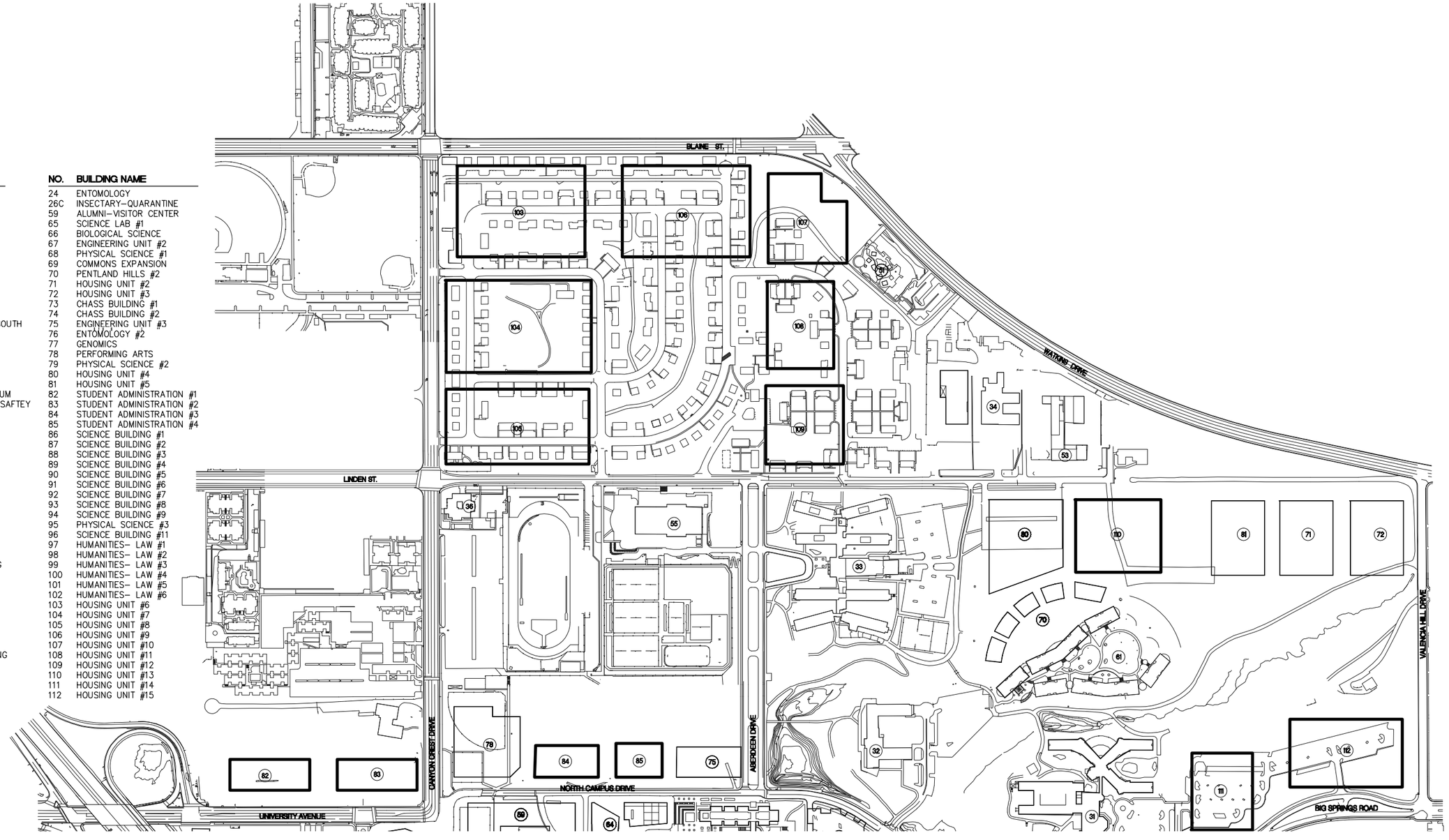

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SECTION 3.0

CHILLED WATER SUPPLY AND DISTRIBUTION SYSTEM

3.1 Existing System

The existing chilled water system at the University of California, Riverside Campus consists of a Central Plant and distribution piping. The piping distribution system relies primarily on an underground tunnel system, with a smaller portion of the piping being direct buried. The system circulates chilled water to the buildings on Campus. Five electric centrifugal chillers currently provide chilled water; CH-1 rated at 1050 tons (installed in 1983), CH-2 rated at 1100 tons (installed in 1987) and CH-3 through 5 rated 1240 tons each (installed 1993) for a total potential capacity of 5870 tons. The present chiller piping configuration however limits the ability of the plant to deliver full capacity. The maximum capacity deliverable to the campus at present is about 4600 tons. The system cooling towers were replaced in 2000.

A thermal energy storage (TES) tank provides storage for 2,000,000 gallons of chilled water used for building cooling. The TES system is able to store the equivalent of 20,000 ton-hours of chilled water (at 16 degrees delta T) and discharge its chilled water capacity over a six-hour period. This equates to a potential 3,333 tons per hour for six hours of additional chilled water capacity when the tank is filled.

The current peak Central Plant load is 5933 tons. As configured, the existing plant can only produce 4600 tons. This difference in tonnage was confirmed during the summer of 2001 when the plant struggled to maintain cooling throughout the campus.

Two new buildings were added in 2002. The first was the Insectary Quarantine building in January of 2000, and the second was the Entomology Seismic Replacement building in March of 2002. The peak cooling loads for these buildings are 151 tons and 258 tons, respectively. This adds over 400 tons to the overall campus cooling load thus compounding the plant's ability to meet the load.

A Thermal Energy Storage Tank is currently being installed at UCR. This project will provide an additional 2,400,000-gallon storage tank. The tank will have the capacity to store 24,000 ton-hours of chilled water (at 16 degrees delta T). This TES tank is scheduled for completion in the fall of 2002. Direct-buried insulated piping is being installed to connect the new TES Tank to the distribution system. The existing chillers will charge it initially until the new satellite plant is completed. A temporary connection to the existing systems will be limited to 3,000-gpm flow, which will take 13.3 hours to charge the new TES tank. The second phase of the TES project provides a new satellite chilled water plant with two 2,000-ton electrical centrifugal chillers and additional distribution piping on East Campus Drive. The new satellite plant is scheduled for completion in 2003. It will provide an additional 4000 tons of capacity for a system total of 8600 tons. This new TES tank will be connected and charged by the new system pumps in the satellite plant. The TES tanks are used during peak hours of electrical usage so chillers can be shut off.

Temperature loss through the distribution system is minimal to Campus outlying buildings. Chilled water delta temperatures vary in buildings from 10 to 16 degrees. The current piping distribution system consists of mainly insulated steel pipe, with some PVC piping. Drawing CH-00, located at the end of this section, shows the extent of the existing chilled water supply and return piping distribution system both in the tunnels and direct buried. A 20" piping loop was installed in 2000 to supplement the existing chilled water piping distribution system and provide flexibility towards serving future loads. Connections were made to the existing system at tunnel vault TV-5 and in the Pierce Hall basement.

Each building on the Central Plant chilled water system has tertiary pumps sized for its design flow. There are buildings where the tertiary pumps are pumping from the building chilled water system into the Campus piping distribution system (or backwards), causing flow problems.

3.2 Analysis Assumptions and Methodology

Table 3.1 (shown on page 3-3) presents the cooling demand of each of the connected buildings. This information was furnished by UCR and used as the basis for this study. Both peak demand (tons) and peak flow (gpm) are given along with diversified demand and flow for each building. Diversity is a factor that accounts for the fact that not all of the buildings reach their peak cooling load at the same time. A diversity of 75% was used for the calculations for the present buildings. This was applied to the UCR furnished peak tons and calculated gpm data.

The future building growth and time periods provided by UCR are listed in Table 3.2 (shown on page 3-4, 5). For estimating future cooling loads, the buildings are grouped into three cooling load groups; high (125 A.S.F./Ton), medium (250 A.S.F./Ton) and low (350 A.S.F./Ton) depending on the building use.

A piping network plan was developed for each time period to determine pipe sizes and impact of new piping connections to the present distribution system. The plan is based on flow demands from Table 3.1 and 3.2 and future piping systems to serve all the proposed buildings. The piping network is structured according to the proposed building construction sequence and existing piping system tie-in points.

The existing Central Plant capacity and piping distribution flow demand system were modeled using the building flow data from Table 3.1 to determine any existing problem areas and to determine flow values at all locations in the system. These findings were used to determine the point of connections for future distribution and to maximize the capacities of the present Central Plant and new satellite plant.

Pipe sizing for the distribution system is based on a piping friction loss of 4 feet per 100 feet was used (based on ASHRAE recommendations). A maximum velocity of 10 feet per second was used. The new piping systems were connected to the present system based on the building construction sequence. Drawings CH-10, CH-20, and CH-30, located at the end of this section, show the proposed piping networks to serve all the buildings connected to the Central Plant and satellite plant chilled water systems through 2015.

Table 3.1: Existing (2002) Building Peak Cooling Loads and Chilled Water Demand

BUILDING	No.	A.S.F	Date	Peak Tons	s.f./ Ton	Peak (Gpm)	Div. (Tons)	Div. (Gpm)
Administration - Hinderaker Hall	1	26,876	1960	146	184	219	110	164
Anderson Hall	27B & C		1917	See 27A				
Batchelor Hall (North & South)	22	60,876	1965	375	162	563	281	422
Bookstore	48	19,372	1991	71	273	107	53	80
Bourns Hall	54	113,598	1995	716	159	1,074	537	806
Boyce Hall	20	62,661	1974	688	91	1,032	516	774
Boyden Lab Building	26A	4,477	1961	25	179	38	19	28
Chapman Hall Soils, Plant Nutrition	27A	27,528	1931	250	110	375	188	281
Chemical Sciences	13A		1990	See 13				
Commons	4	63,643	1965	146	436	219	110	164
Computer Statistics	21	24,208	1974	125	194	188	94	141
Costo	3		1965	See 4				
Entomology	26	20,855	1932	150	139	225	113	169
Entomology Annex	23	10,685	1948	91	117	137	68	102
Fawcett Lab	28	15,538	1965	63	247	95	47	71
Fine Arts	58	55,150	2001	294	188	441	221	331
Geology	14	61,857	1952	490	126	735	368	551
Humanities-1	7A	62,261	1996	354	176	531	266	398
Humanities-2	11A		1963	See 12				
Insectory	26D	4,919	1959	47	105	71	35	53
Life Sciences	16	81,535	1948	665	123	998	499	748
Life Sciences	16A		1969	See 16				
Olmstead Hall (Humanities-2)	12	83,788	1963	313	268	470	235	352
Physical Education	2	43,128	1953	104	415	156	78	117
Physics	18	57,833	1965	375	154	563	281	422
Physics 2000	18A			See 18				
Pierce Hall (North & South)	13	84,634	1966	755	112	1,133	566	849
Rivera Library	15	184,010	1960	563	327	845	422	633
Science Library	60	107,109	1998	583	184	875	437	656
Speith Hall -Life Sciences	16B		1958	See 16				
Sproul Hall	9	46,533	1965	188	248	282	141	212
Theatre	11		1996	See 12				
Watkins Hall	10	34,513	1953	125	276	188	94	141
Webber Hall	19	27,432	1953	208	132	312	156	234
SUBTOTAL		**1,385,019**		**7,910**		**11,865**	**5,933**	**8,899**

Table 3.2: Future Building Peak Cooling Loads and Chilled Water Demand

BUILDING	No.	A.S.F	Date	Est. Tons	Est. sf/ton	Est GPM	Div. (Tons)	Div. (Gpm)
2002 - 2005								
Alumni/ Visitor Center	59	16,829	2,005	48	350	72	36	54
Biological Science	66	38,550	2,005	308	125	463	231	347
Commons Expansion	69	118,643	2,005	339	350	508	254	381
Demo Commons	4	(63,643)	2,005	(182)	350	(273)	(110)	(164)
Engineering Unit #2	67	106,400	2,005	426	250	638	319	479
Entomology Seismic Replacement	24	42,969	2,002	344	125	516	258	387
Insectory & Quarantine	26C	25,200	2,002	202	125	302	151	227
Physical Science #1	68	90,592	2,005	725	125	1,087	544	815
Science Lab #1	65	30,897	2,003	247	125	371	185	278
SUBTOTAL		**406,437**		**2,456**		**3,685**	**1,869**	**2,804**
CUMULATIVE TOTAL		**1,791,456**					**7,802**	**11,703**
2006 -2010								
CHASS Bldg 1	73	74,750	2,010	214	350	320	160	240
CHASS Bldg 2	74	58,500	2,010	167	350	251	125	188
Engineering Unit #3	75	105,000	2,010	420	250	630	315	473
Entomology #2	76	70,000	2,010	560	125	840	420	630
Demo Entomology Annex	23	(10,685)	2,010	(85)	125	(128)	(68)	(102)
Genomics	77	84,000	2,010	336	250	504	252	378
Performing Arts	78	52,500	2,010	150	350	225	113	169
Physical Science #2	79	91,000	2,010	728	125	1,092	546	819
SUBTOTAL		**525,065**		**2,489**		**3,734**	**1,863**	**2,794**
CUMULATIVE TOTAL		**2,316,521**					**9,665**	**14,497**

Table 3.2: Future Building Peak Cooling Loads and Chilled Water Demand

BUILDING	No.	A.S.F	Date	Est. Tons	Est. sf/ton	Est GPM	Div. (Tons)	Div. (Gpm)
2011 -2015								
Student/ Administration Cluster:								
Building 1	82	55,000	2,015	157	350	236	118	177
Building 2	83	55,000	2,015	157	350	236	118	177
Building 3	84	66,000	2,015	189	350	283	141	212
Building 4	85	27,500	2,015	79	350	118	59	88
Science Cluster:								
Building 1 (lab)	86	70,000	2,015	560	125	840	420	630
Demo 20% of Pierce Hall	13	(16,927)	2,015	(135)	125	(203)	(113)	(170)
Building 2 (classroom)	87	70,000	2,015	280	250	420	210	315
Building 3 (lab)	88	70,000	2,015	560	125	840	420	630
Building 4 (classroom)	89	70,000	2,015	280	250	420	210	315
Demo Entemology	26	(20,855)	2,015	(167)	125	(250)	(113)	(169)
Demo Insectory	26D	(4,919)	2,015	(39)	125	(59)	(35)	(53)
Building 5 (lab)	90	70,000	2,015	560	125	840	420	630
Building 6 (classroom)	91	70,000	2,015	280	250	420	210	315
Building 7 (lab)	92	70,000	2,015	560	125	840	420	630
Building 8 (classroom)	93	84,000	2,015	336	250	504	252	378
Building 9 (lab)	94	84,000	2,015	672	125	1,008	504	756
Physical Science #3	95	91,000	2,015	728	125	1,092	546	819
Building 11 (classroom)	96	70,000	2,015	280	250	420	210	315
Future Bldg Devlpmnt in Prkg Lot 6:								
Building 1	97	60,000	2,015	240	250	360	180	270
Building 2	98	30,000	2,015	120	250	180	90	135
Building 3	99	45,000	2,015	180	250	270	135	203
Building 4	100	30,000	2,015	120	250	180	90	135
Building 5	101	90,000	2,015	360	250	540	270	405
Building 6	102	45,000	2,015	180	250	270	135	203
SUBTOTAL		**1,279,799**		**6,536**		**9,804**	**4,897**	**7,346**
GRAND TOTAL		**3,596,320**					**14,562**	**21,842**

3.3 Growth Requirements

The new piping network system requires larger diameter lines (12" to 24" diameter) around the perimeter of the present system. This was determined by the pipe size and capacity of the present system at various locations. Required chilled water flow to proposed buildings located above North Campus Drive, west of East Campus Drive and south of the Central Plant cannot be accomplished using the present piping network. It will necessitate larger pipelines and interconnection with the present piping system to insure that adequate pressure and flow are provided to each building.

Table 3.2 presents the chronological growth of Campus chilled water demand and required chilled water supply. This is clearly defined in the 2002-2005 time period where the future growth is more certain. Using each future building's chilled water demand, a total for each time period of the Central Plant and satellite plant diversified chilled water demand is calculated. New electrical centrifugal chillers are added when needed to keep the chilled water supply greater than the diversified chilled water demand.

It is recommended that a bypass line for CH-3 be installed. The existing 14" return line will be replaced. This will allow CH-3, 4 & 5 to be run in parallel and increases the total chiller maximum rated capacity to 5870 tons for the existing Central Plant.

It is also recommended that chiller CH-1, 1050tons installed in 1983, be replaced with a new chiller sized at 1240 tons. This would increase the plant capacity by 190 tons bringing the total capacity of the existing Central Plant to 6060 tons.

The proposed Satellite Plant has a maximum capacity of 4000 tons. The combined capacity of the existing Central Plant and the Satellite Plant would be 10,060 tons.

Based on a 75% diversity the cooling capacity of the Central Plant is 80% of Campus demand. The installation of the TES system and Satellite Plant will provide an additional 4000 tons of chilled water supply for peak demand periods. As illustrated in Table 3.2, the added peak chilled water capacity from this project will satisfy the need for additional chillers until 2010. Two 2000-ton electrical centrifugal chillers will be installed in the satellite plant in 2010. This will increase the Campus chiller capacity to 14,060 tons. This coupled with the additional storage capacity of the TES tanks (TES-1, 2 and 3) will satisfy the projected future infrastructure growth through 2015.

3.4 Infrastructure Projects, 2002-2005 (outlined on page 3-8)

Table 3.3 (shown on page 3-8) gives a summary of the proposed chilled water projects for the 2002-2005 time period. The chilled water projects consist of piping installed to service new buildings, piping installed to improve system hydraulics and chiller replacement at the Central Plant. Chilled water project cost estimates are included in Appendix A.

Each chilled water project is identified with a unique project identification number. This project identification number can be used to cross reference Table 3.3 and drawing CH-10 (located at the end of this section).

A total of six chilled water projects were recommended with a total current value of $2,277,000.

3.5 Infrastructure Projects, 2006-2010 (outlined on page 3-9)

Table 3.3 (shown on page 3-9) gives a summary of the proposed chilled water projects for the 2006-2010 time period. The chilled water projects consist of piping installed to service new buildings, piping installed to improve system hydraulics and chiller additions at the satellite plant. Chilled water project cost estimates are included in Appendix A.

Each chilled water project is identified with a unique project identification number. This project identification number can be used to cross reference Table 3.3 and drawing CH-20 (located at the end of this section).

A total of three chilled water projects were recommended with a total current value of $8,225,000.

3.6 Infrastructure Projects, 2011-2015 (outlined on page 3-10)

Table 3.3 (shown on page 3-10) gives a summary of the proposed chilled water projects for the 2011-2015 time period. The chilled water projects consist of piping installed to service new buildings and piping installed to improve system hydraulics. Chilled water project cost estimates are included in Appendix A.

Each chilled water project is identified with a unique project identification number. This project identification number can be used to cross reference Table 3.3 and drawing CH-30 (located at the end of this section).

A total of four chilled water projects were recommended with a total current value of $1,249,000.

Table 3.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2002-2005	**24**	**Citrus Drive Chilled Water Line Upgrade**	**CH-11**	**Demolish and remove direct buried 6" mains from Central Plant. Replace with direct buried 10" mains and connect to existing 8" lines for building 24 and reconnect to existing 6" direct buried mains continuing south.**	**$ 220,000**
2002-2005	**17**	**Central Plant**	**CH-12**	**The installation of new primary pumps and a bypass line for chiller #3 that will allow for chillers #3, 4 and 5 to be run in parallel. Replace existing 14" return line.**	**$ 443,000**
2002-2005	17	Central Plant	**CH-12A**	Replace chiller #1 with 1240 Ton chiller	$ 905,000
2002-2005	**1 22 7A**	**Hinderacker Bachelor Humanities**	**CH-13**	**Repipe tertiary pumps**	$ 148,000
2002-2005	59	Alumni Visitor Center	**CH-14**	Connect to existing 20" direct buried chilled water piping with 20" mains. Extend West and North with 4" valved stubs for 59 and 20" capped connections.	$ 369,000
2002-2005	-	South of Stat. Comp.	**CH-15**	Connect to 24" mains down East Campus Drive North: 12" CHWS & CHWR connection from 24" mains West and connect to existing 12" mains in TV 8A with valved connections, 6" valved stubs for 67 and 8" valved stubs for 68. Provides additional connection to campus chilled water loop system.	$ 192,000
2002-2005	**Period Total**				**$ 2,277,000**

URGENT PROJECTS SHOWN IN RED - these projects are recommended to be completed as soon as possible, and chilled water projects are to be completed before the summer of 2002.

2002-2005 Reference Dwgs- Ch Water- CH-10

Table 3.3: Capital Projects Cost Estimates

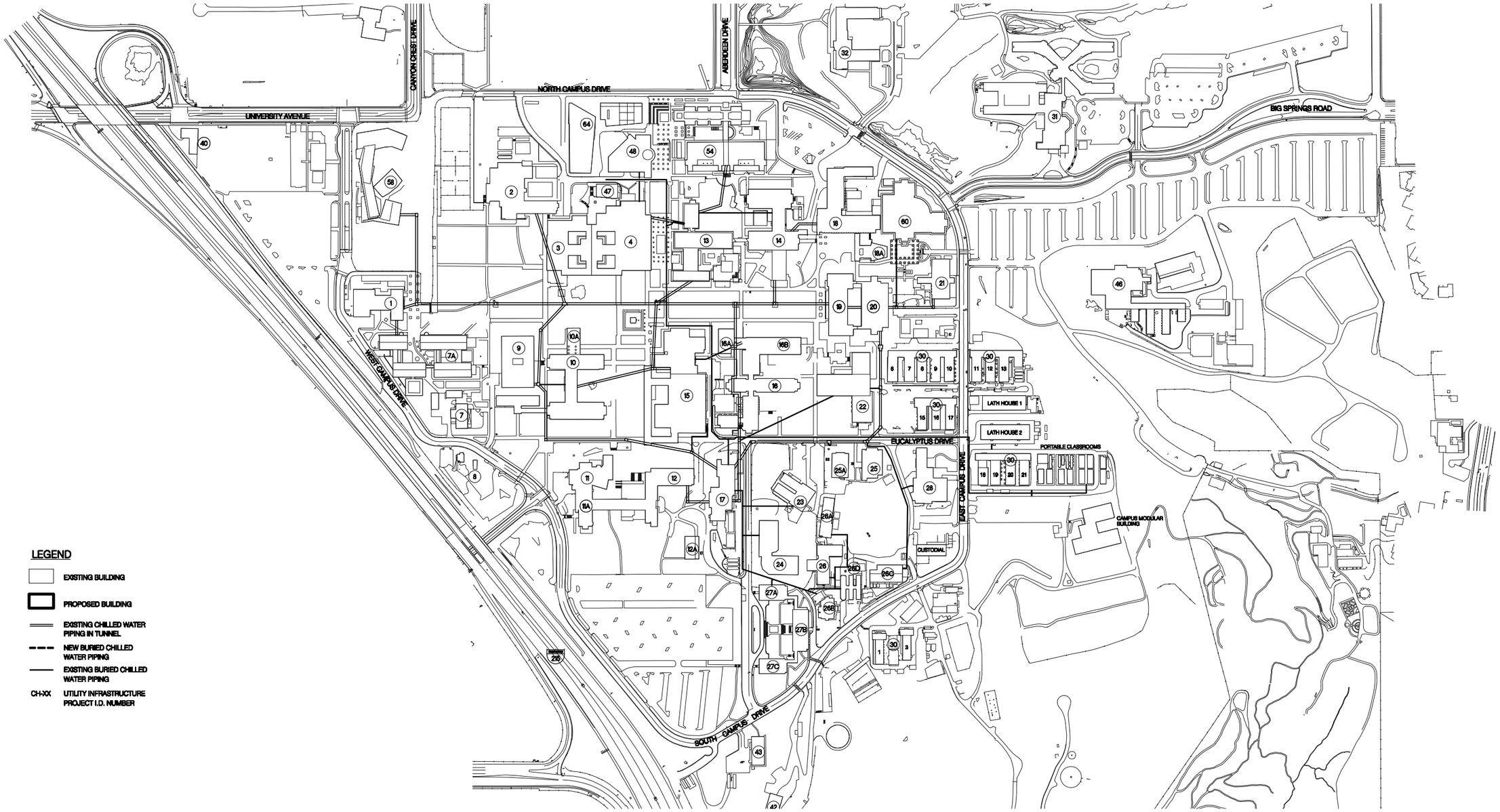
Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2006-2010	75 78	Engineering Unit #3 Performing Arts	**CH-21**	Extend 20" mains from 20" capped connections in **CH-12** North to North Campus Drive. Extend 24" mains from existing 24" capped connections to new 20" mains and connect to complete CHW loop. Include in new 24" mains, 6" valved stubs for 75. Continue piping West from new CHW loop connection with new 8" mains to 8" valved stubs for 78 and 6" capped connections.	$ 1,346,000
2006-2010	74	CHASS #2	**CH-22**	Demo and remove existing 6" mains in tunnel from central plant to TV-12. Replace with 12" mains, and extend mains South to 4" valved stubs for 74 and 10" capped connections.	$ 265,000
2006-2010	-	Satellite Plant	**CH-23**	Install (2) 2000 Ton chillers and TES Tank #3.	$ 6,614,000
2006-2010	**Period Total**				**$ 8,225,000**
2006-2010 Reference Dwgs- Ch Water- CH-20					
2002-2010	**Cum. Total**				**$ 10,502,000**

Table 3.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	95 96	Physical Science #3 Science Building #11	**CH-31**	Install direct buried 8" mains East from 24" mains in East Campus Drive with 8" valved stubs for 95. Continue East with 6" valved stubs for 96.	$ 305,000
2011-2015	82 83	Student Admin. #1 Student Admin. #2	**CH-32**	Install direct buried 6" mains west from capped mains in CH-21 with 4" valved stubs for 83. Continue piping West with 4" valved stubs for 82.	$ 276,000
2011-2015	97 98 99 100 101 102	lot 6 Devlpmnt #1 lot 6 Devlpmnt #2 lot 6 Devlpmnt #3 lot 6 Devlpmnt #4 lot 6 Devlpmnt #5 lot 6 Devlpmnt #6	**CH-33**	Install direct buried 10" mains from capped 10" mains in **CH-22** West and South with 6" valved stubs for 97 & 98. Continue 10" mains South with 4" valved stubs for 99. Continue 8" mains South with 4" valved stubs for 100. Continue 8" mains South with 6" valved stubs for 101. Continue piping South and East with 4" valved stubs for 102.	$ 603,000
2011-2015	89 94	Science Building #4 Science Building #9	**CH-34**	Connect to 24" mains in East Campus Drive with 8" direct buried mains. Extend mains South with 8" valved stubs for 94 and 6" valved stubs for 89.	$ 65,000
2011-2015	**Period Total**				**$ 1,249,000**
2011-2015 Reference Dwgs- Ch Water- CH-30					
2002-2015	**Grand Total**				**$ 11,751,000**

- Buildings denoted in bold type are high priority projects

- Project costs do not include curb to curb roadway replacements. Costs do include repair of any roadway, sidewalk, or landscaped area in the immediate vicinity of the excavated area.



LEGEND

- EXISTING BUILDING
- PROPOSED BUILDING
- EXISTING CHILLED WATER PIPING IN TUNNEL
- NEW BURIED CHILLED WATER PIPING
- EXISTING BURIED CHILLED WATER PIPING
- CH-XX UTILITY INFRASTRUCTURE PROJECT I.D. NUMBER

NORTH

0 50' 100' 200' 400' 600'

1"=200'-0"

UCR

UNIVERSITY OF CALIFORNIA RIVERSIDE

MECHANICAL - CHILLED WATER - EXISTING

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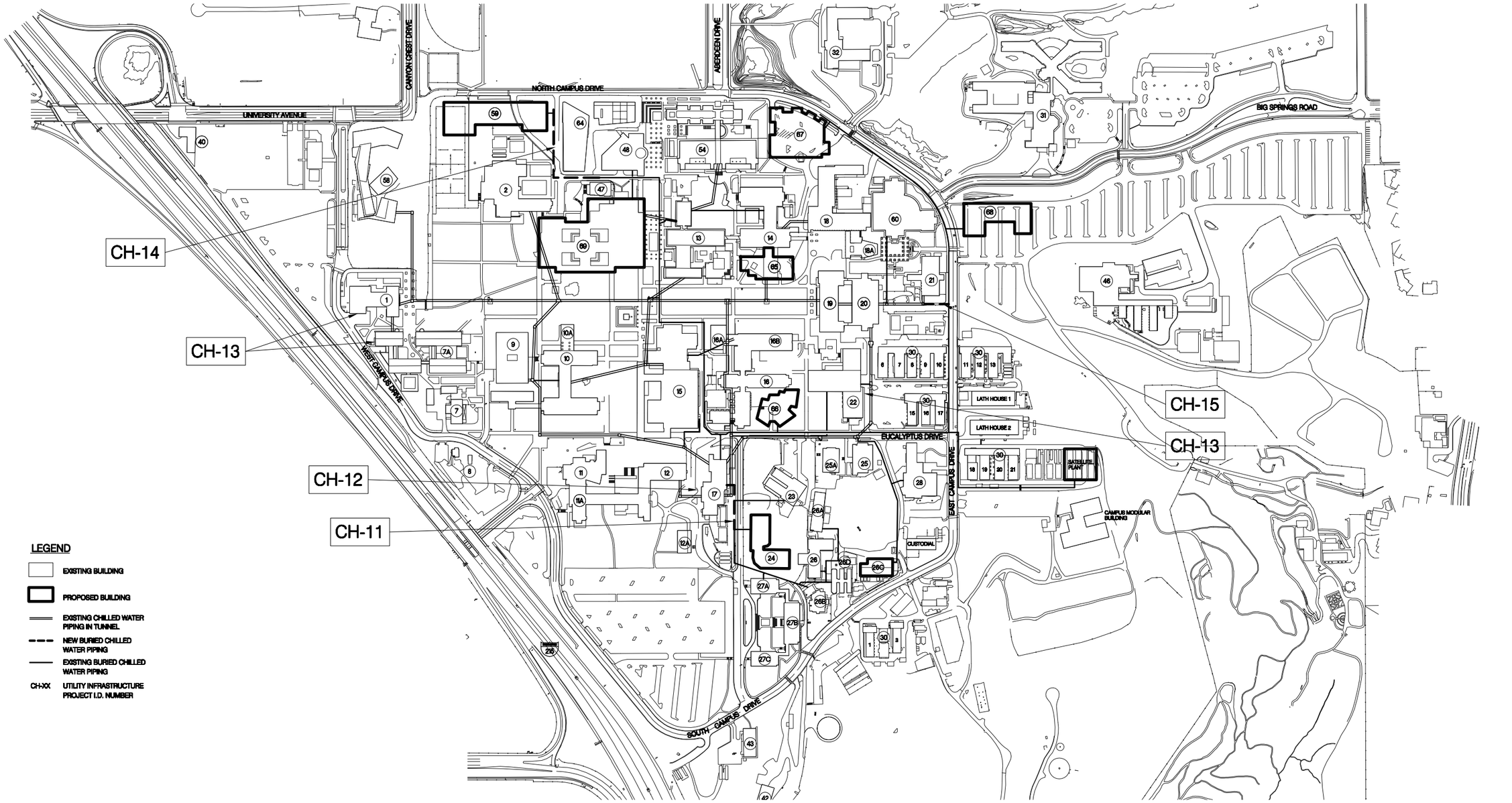
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: CH-00



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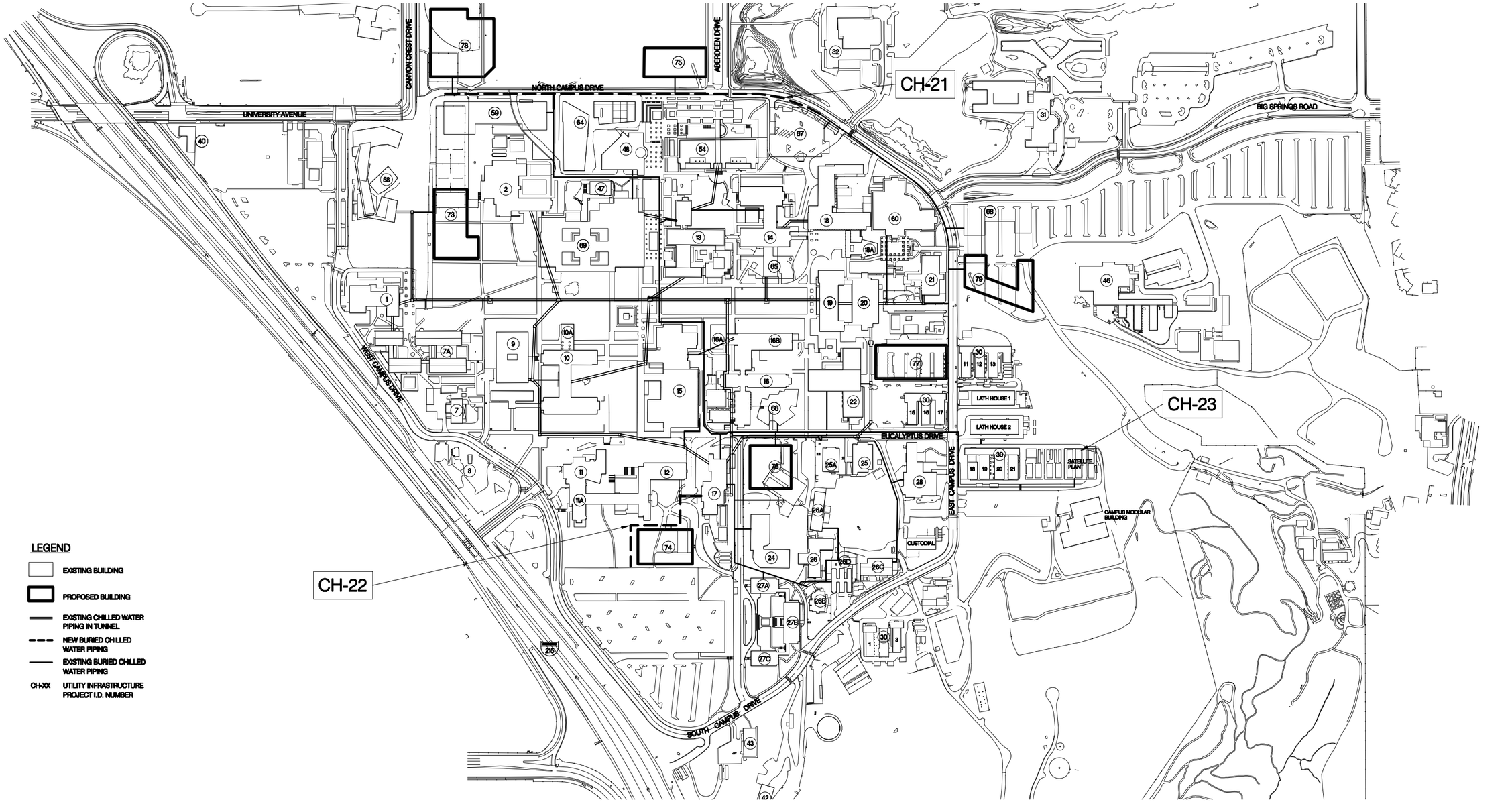
DATE: 01/28/01

SHEET NO: CH-10



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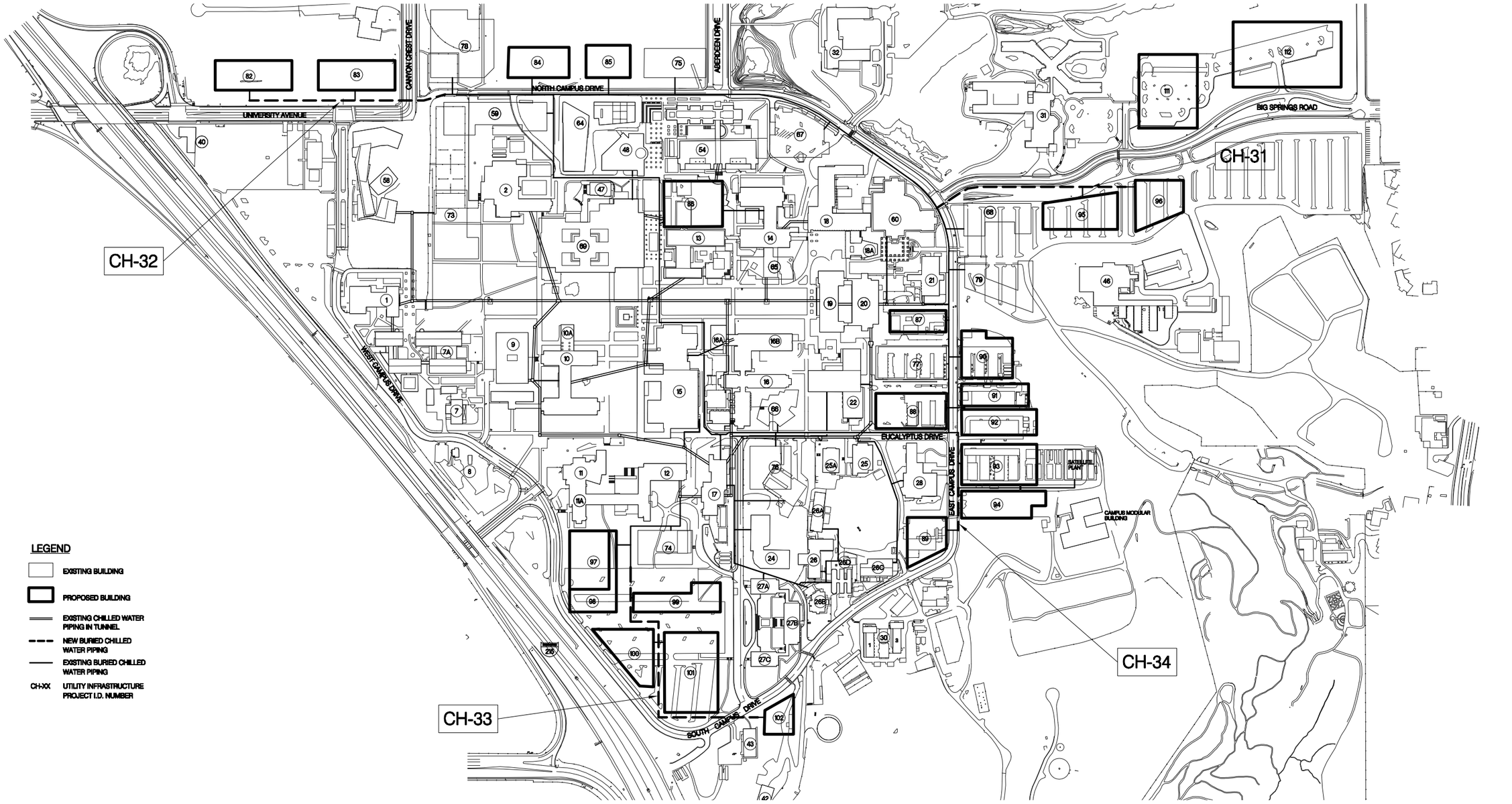
DATE: 01/28/01

SHEET NO: CH-20



LEGEND

- EXISTING BUILDING
- PROPOSED BUILDING
- EXISTING CHILLED WATER PIPING IN TUNNEL
- NEW BURIED CHILLED WATER PIPING
- EXISTING BURIED CHILLED WATER PIPING
- CH-XX UTILITY INFRASTRUCTURE PROJECT I.D. NUMBER

NORTH

0 50' 100' 200' 400' 600'

1"=200'-0"

UCR

UNIVERSITY OF CALIFORNIA RIVERSIDE

MECHANICAL - CHILLED WATER - 2011 - 2015

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PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: CH-30

SECTION 4.0

STEAM SUPPLY AND CONDENSATE RETURN SYSTEMS

4.1 Existing System

The existing steam supply and condensate return systems at the University of California, Riverside Campus consists of equipment located at the Central Plant and dedicated building condensate return systems. These systems serve the heating, domestic hot water, cooking and sterilization needs for the majority of the buildings in the central Campus. The Campus residence buildings are served by dedicated boilers and several other buildings on Campus have self-contained heating systems. The majority of the systems piping is located in underground utility tunnels, with the southeast portions of the piping systems and 4" steam in Eucalyptus Drive being direct buried.

The Central Plant presently contains four boilers; #1 rated at 29,000 lb/hr (installed in 1958), #2 rated at 29,000 lb/hr (installed in 1962), #3 rated at 29,000 lb/hr (installed in 1965) and #4 rated at 45,000 lb/hr (installed in 1968) for a total capacity of 132,000 lb/hr.

The Central Plant current peak steam demand is approximately 60,000 lb/hr. The steam system operates at a pressure of 100 psig and steam pressure as required at the buildings if needed. The steam pressure to the Science Hill buildings (including the Entomology buildings, Chapman/Anderson, and Boyden Lab) is reduced at the Central Plant and distributed at 40 psig. Water chemistry for the boilers is well monitored. No tubes have been replaced or plugged in the boilers.

The existing steam piping consists of pipe diameters from 1-1/2" to 8". The piping utilizes welded steel construction with expansion joints. The exception to this is the piping between tunnel vaults TV-14 and TV-18. This section of steam piping utilizes ball joints for thermal expansion. These joints leak and have broken from water hammer. The steam and condensate return piping expansion joints in the utility tunnel between Pierce Lab and Commons are in bad condition and are welded in place. There are bellows type expansion joints in the old utility tunnel. These joints have experienced failure approximately every 2 years.

A walk through of the existing steam system in the utility tunnels was made. Small steam leaks, missing sections of insulation, and faulty steam traps were observed. The overall integrity of the steam piping system appeared in good condition.

UCR staff indicated problems with the condensate return system in the Central Plant. The Central Plant's ability to generate steam is limited by the size of the make-up water feed for the steam system. It has been reduced from the original 6" to 2" due to connection size limitation to the softening system tanks. Recently, this 2" makeup line was replaced with a 4" line. However, the boiler feed water line from the deareator is also 2" and should be increased to a 4" line along with the installation of larger boiler feed water pumps.

The condensate return system consists of an 8,000-lb/hr condensate receiver in the Central Plant, and distribution piping with dedicated condensate receiver/pump sets in the buildings. The exception is Fawcett Lab which gravity feeds back to the Central Plant. Some of the building's older condensate return systems have been replaced by steam powered pumps that utilize steam pressure to operate. The following system deficiencies are included in this study for record purposes only. They are maintenance issues. The costs to correct same are not a part of this infrastructure study. The condensate pumps at Olmstead are not functioning and need replacement. The following building condensate receiver/pump sets are in need of replacement; Pierce Lab, Commons, Physics (2), Watkins Hall, Rivera Library and Life Sciences. TV-3 needs a condensate receiver/pump set as explained below.

The condensate return average back to the Central Plant is 80%, Campus wide. The northeast corner of the Campus has experienced condensate return problems due to low elevation (lower than the Central Plant and condensate is pumped uphill). The condensate return system in TV-3 has failed twice in the last five years due to lack of a condensate system and flash tank. This point in the system is the main trap collection for the high-pressure steam.

Drawings ST-00 and CR-00 (located at the end of this section) show the extent of the existing steam supply and condensate return piping systems both inside the utility tunnels and direct buried.

4.2 Analysis Assumptions and Methodology

Table 4.1 (shown on page 4-4) presents the calculated steam demand of each of the present buildings. An average steam usage per square foot was calculated using the current peak steam demand of 60,000 lb/hr and the cumulative building area connected to the Central Plant steam system. Actual heating area (AHSF) was determined to be 85% of the gross square feet (GSF). Steam demand was calculated by converting the cooling load for each building from btuh to lb/hr multiplied by a heat factor of 0.54. The heat factor was calculated by dividing the total Central Plant steam demand by the total AHSF. The steam loads of the buildings were calculated by this method to be consistent with the chilled water demand methodology. The heating base load is derived from the peak summer load of 14,000 lb/hr divided by the building AHSF multiplied by the base heat factor of 0.0053. The base heat factor was calculated by dividing the total base load demand by the total AHSF. Exceptions to this methodology were the Commons and Physical Education, due to increased steam usage for cooking and swimming pool.

The inherent line loss in the steam system piping network was considered constant for the purpose of the calculations.

Table 4.1 also presents the calculated condensate return from each present building. The calculation is based on taking 80% of the steam lb/hr to the building and converting the flow to gallons per minute using a condensate temperature of 180 degrees Fahrenheit.

Table 4.2 (shown on pages 4-5, 6) provides steam and condensate flow rate calculations for future buildings by time line. The buildings are listed in order of their estimated completion date. This is clearly defined in the 2002-2005 time line where the future growth is more certain. The estimated steam and condensate return demand for each future building is given, along with a total calculated for each time line. As the campus demand for steam increases in the future, boiler capacity is added accordingly. This decision to increase boiler capacity is driven by the point in time at which standby capacity begins to diminish.

A piping network plan was developed for each time line to determine pipe sizes and impact of new piping connections to the present distribution system. The plan was based on steam and condensate return demands taken from Table 4.1 and 4.2 and future piping systems to all the proposed buildings. The piping network was structured according to the proposed building construction sequence and existing system tie-in points.

New steam piping was sized so that a minimum building pressure of 50 psig would be available. Proposed pipe routings were sized for 200 ft/second for steam and 6 ft/second for condensate return.

Drawings ST-10, CR-10, ST-20, CR-20, ST-30, and CR-30 (located at the end of this section) show the future proposed piping network to serve all the buildings connected to the Central Plant steam/ condensate return system through 2015.

Table 4.1: Existing Building Steam and Condensate Return Loads

BUILDING	No.	Date	AHSF	Total Load (lbs/hr)	Base Laod (lbs/hr)	Btu/ sf	Cond Ret. (Gpm)
Administration - Hinderaker Hall	1	1,960	39,517	728	209	18	1.5
Anderson Hall	27B&C	1,917	See 27A				See 27A
Batchelor Hall (North & South)	22	1,965	97,631	2,161	517	22	4.5
Bookstore	48	1,991	28,390	524	150	18	1.1
Bourns Hall	54	1,995	123,513	3,722	655	30	7.7
Boyce Hall	20	1,974	93,442	4,374	990	47	9.0
Boyden Lab Building	26A	1,961	5,437	299	58	55	0.6
Chapman Hall-Soils, Plant Nutrition	27A	1,931	44,150	977	234	22	2.0
Chemical Sciences	13A	1,990	See 13				See 13
Commons	4	1,965	73,103	2,777	1,550	38	5.7
Computer Statistics	21	1,974	35,782	843	190	24	1.7
Costo	3	1,965	See 4				See 4
Custodial		1,965	6,329	204	34	32	0.4
Entomology	26	1,932	27,577	1,418	292	51	2.9
Entomology Annex	23	1,948	14,164	727	150	51	1.5
Fawcett Lab	28	1,965	17,847	1,028	189	58	2.1
Fine Arts	58	2,001	85,315	1,941	452	23	4.0
Geology	14	1,952	87,631	4,269	929	49	8.8
Greenhouse 11-13A	30	1,955	14,875	803		54	1.7
Greenhouse 1-3	30	1,988	12,750	689		54	1.4
Greenhouse 15-17	30	1,956	12,750	689		54	1.4
Greenhouse 18-21	30	1,965	17,000	918		54	1.9
Greenhouse 6-10	30	1,952	21,250	1,148		54	2.4
Humanities-1	7A	1,996	94,503	2,182	501	23	4.5
Humanities-2	11A	1,963	See 12				See 12
Insectory	26D	1,959	7,466	345	79	46	0.7
Life Sciences	16	1,948	128,345	2,882	680	22	6.0
Life Sciences	16A	1,969	See 16				See 16
Olmstead Hall (Humanities-2)	12	1,963	119,892	2,898	635	24	6.0
Physical Education	2	1,953	55,544	2,009	1,178	36	4.2
Physics	18	1,965	80,587	1,989	427	25	4.1
Physics 2000	18A		See 18				See 18
Pierce Hall (North & South)	13	1,966	118,925	5,831	1,261	49	12.0
Rivera Library	15	1,960	195,511	4,585	1,036	23	9.5
Science Library	60	1,998	142,254	2,820	754	20	5.8
Speith Hall -Life Sciences	16B	1,958	See 16				See 16
Sproul Hall	9	1,965	67,040	1,612	355	24	3.3
Theatre	11	1,996	See12				See 12
Watkins Hall	10	1,953	54,326	1,220	288	22	2.5
Webber Hall	19	1,953	43,181	1,710	229	40	3.5
SUBTOTAL			**1,966,026**	**60,321**	**14,023**	**31**	**124.6**

Table 4.2: Future Building Steam and Condensate Return Loads

BUILDING	No.	Date	AHSF	Total Load (lbs/hr)	Base Laod (lbs/hr)	Btu/ sf	Cond Ret. (Gpm)
2002 - 2005							
Alumni/ Visitor Center	59	2,005	22,007	441	117	20	0.9
Biological Science	66	2,005	46,810	2,578	496	55	5.3
Commons Expansion	69	2,005	158,103	5,640	3,352	36	11.7
Demo Commons	4	2,005	(73,103)	(2,777)	(1,550)	38	(5.7)
Engineering Unit #2	67	2,005	129,209	3,558	685	28	7.4
Entomology Seismic Replacement	24	2,002	57,068	2,925	605	51	6.0
Insectory & Quarantine	26C	2,002	26,795	1,645	284	61	3.4
Physical Science #1	68	2,005	110,004	6,058	1,166	55	12.5
Satellite Central Plant			5,950				
Science Lab #1	65	2,003	37,517	2,066	398	55	4.3
SUBTOTAL			**520,360**	**22,134**	**5,552**	**43**	**45.7**
CUMULATIVE TOTAL			**2,486,386**	**82,455**	**19,575**	**33**	**170.4**
2006 -2010							
CHASS Bldg 1	73	2,010	97,750	1,960	518	20	4.0
CHASS Bldg 2	74	2,010	72,250	1,511	383	21	3.1
Engineering Unit #3	75	2,010	127,500	3,511	676	28	7.3
Entomology #2	76	2,010	85,000	4,681	901	55	9.7
Demo Entomology Annex	23	2,010	(14,164)	(727)	(150)	51	(1.5)
Genomics	77	2,010	102,000	2,809	541	28	5.8
Performing Arts	78	2,010	63,750	1,350	338	21	2.8
Physical Science #2	79	2,010	110,500	6,085	1,171	55	12.6
SUBTOTAL			**644,586**	**21,180**	**4,377**	**33**	**43.8**
CUMULATIVE TOTAL			**3,130,972**	**103,635**	**23,953**	**33**	**214.1**

Table 4.2: Future Building Steam and Condensate Return Loads

BUILDING	No.	Date	AHSF	Total Load (lbs/hr)	Base Laod (lbs/hr)	Btu/ sf	Cond Ret. (Gpm)
2011 -2015							
Student/ Administration Cluster:							
Building 1	82	2,015	85,000	1,511	451	18	3.1
Building 2	83	2,015	85,000	1,511	451	18	3.1
Building 3	84	2,015	102,000	1,813	541	18	3.7
Building 4	85	2,015	42,500	756	225	18	1.6
Science Cluster:							
Building 1 (lab)	86	2,015	85,000	4,681	901	55	9.7
Demo 20% of Pierce Hall	13	2,015	(23,785)	(1,166)	(252)	49	(2.4)
Building 2 (classroom)	87	2,015	85,000	2,341	451	28	4.8
Building 3 (lab)	88	2,015	85,000	4,681	901	55	9.7
Demo Greenhouse 15-17	30	2,015	(12,750)	(689)		54	(1.4)
Building 4 (classroom)	89	2,015	85,000	2,341	451	28	4.8
Demo Custodial		2,015	(6,329)	(204)	(34)	32	(0.4)
Demo Entemology	26	2,015	(27,577)	(1,418)	(292)	51	(2.9)
Demo Insectory	26D	2,015	(7,466)	(345)	(79)	46	(0.7)
Building 5 (lab)	90	2,015	85,000	4,681	901	55	9.7
Demo Greenhouse 11-13A	30	2,015	(14,875)	(803)		54	(1.7)
Building 6 (classroom)	91	2,015	85,000	2,341	451	28	4.8
Building 7 (lab)	92	2,015	85,000	4,681	901	55	9.7
Building 8 (classroom)	93	2,015	102,000	2,809	541	28	5.8
Demo Greenhouse 18-21	30	2,015	(17,000)	(918)		54	(1.9)
Building 9 (lab)	94	2,015	102,000	5,617	1,081	55	11.6
Physical Science #3	95	2,015	110,500	6,085	1,171	55	12.6
Building 11 (classroom)	96	2,015	85,000	2,341	451	28	4.8
Future Bldg Devlpmnt in Prkg Lot 6:							
Building 1	97	2,015	85,000	2,071	451	24	4.3
Building 2	98	2,015	42,500	1,035	225	24	2.1
Building 3	99	2,015	63,750	1,553	338	24	3.2
Building 4	100	2,015	42,500	1,035	225	24	2.1
Building 5	101	2,015	127,500	3,106	676	24	6.4
Building 6	102	2,015	63,750	1,553	338	24	3.2
SUBTOTAL			**1,624,218**	**52,997**	**11,461**	**33**	**109.5**
GRAND TOTAL			**4,755,190**	**156,632**	**35,414**	**33**	**323.6**

4.3 Growth Requirements

The new piping network systems require extending and interconnection with the present systems with new piping sized to maintain pressure and flow to each building. Table 4.2 (shown on pages 4-5, 6) presents the chronological growth of Campus steam and condensate return demand. A total demand for each time line was determined using each future building's steam and condensate return demand.

Credit for a back-up boiler was taken when calculating available steam supply. One of the 29,000-lb/hr boilers was assigned as a back-up boiler at the Central Plant. This resulted in the Central Plant running out of boiler capacity in 2007. There is space in the Central Plant available for one additional boiler. To accommodate the need for additional steam capacity, the University could; 1) install a new 50,000-lb/hr boiler in the available open space, or 2) remove the existing 29,000-lb/hr boiler and install a new 50,000-lb/hr boiler in its place. Either option will increase the Central Plant boiler total capacity to 153,000 lb/hr with 29,000 lb/hr used for back up.

Consideration must be made for the difficulty of removing and replacing boilers and complying with more stringent air pollution requirements.

As shown in Table 4.2, an additional 50,000-lb/hr boiler will be needed in 2013. This will necessitate the removal of existing 29,000-lb/hr boiler #2 and installing the new boiler in its place. This will increase the Central Plant boiler total capacity to 174,000 lb/hr with 29,000 lb/hr used for back up.

4.4 Infrastructure Projects, 2002-2005 (outlined on page 4-10 & 4-12)

Table 4.3 (shown on page 4-10) gives a summary of the proposed steam projects for the 2002-2005 time line. The steam projects consist of piping installed to service new buildings, piping installed to improve system flow and piping system replacement at the Central Plant. Steam project cost estimates are included in Appendix B.

Each steam project is identified with a unique project identification number. This project identification number can be used to cross reference Table 4.3 and drawing ST-10 (located at the end of this section).

A total of two steam projects were recommended with a total current value of $329,000.

Table 4.4 (shown on page 4-12) gives a summary of the proposed condensate return projects for the 2002-2005 time line. The condensate return projects consist of piping installed to service new buildings and piping installed to improve system flow. Condensate return project cost estimates are included in Appendix B.

Each condensate return project is identified with a unique project identification number. This project identification number can be used to cross reference Table 4.4 and drawing CR-10 (located at the end of this section).

A total of one condensate return project was recommended. The cost is included in the Building Capital Budget and is not included in the DPP.

4.5 Infrastructure Projects, 2006-2010 (outlined on page 4-10 & 4-12)

Table 4.3 (shown on page 4-10) gives a summary of the proposed steam projects for the 2006-2010 time line. The steam projects consist of piping installed to service new buildings, piping installed to improve system flow and boiler replacement at the Central Plant. Steam project cost estimates are included in Appendix B.

Each steam project is identified with a unique project identification number. This project identification number can be used to cross reference Table 4.3 and drawing ST-20 (located at the end of this section).

A total of four steam projects were recommended with a total current value of $3,896,000.

Table 4.4 (shown on page 4-12) gives a summary of the proposed condensate return projects for the 2006-2010 time line. The condensate return projects consist of piping installed to service new buildings and piping installed to improve system flow. Condensate return project cost estimates are included in Appendix B.

Each condensate return project is identified with a unique project identification number. This project identification number can be used to cross reference Table 4.4 and drawing CR-20 (located at the end of this section).

A total of two condensate return projects were recommended with a total current value of $149,000.

4.6 Infrastructure Projects, 2011-2015 (outlined on page 4-11 & 4-13)

Table 4.3 (shown on page 4-11) gives a summary of the proposed steam projects for the 2011-2015 time line. The steam projects consist of piping installed to service new buildings, piping installed to improve system flow and boiler replacement at the Central Plant. Steam project cost estimates are included in Appendix B.

Each steam project is identified with a unique project identification number. This project identification number can be used to cross reference Table 4.3 and drawing ST-30 (located at the end of this section).

A total of four steam projects were recommended with a total current value of $3,713,000.

Table 4.4 (shown on page 4-13) gives a summary of the proposed condensate return projects for the 2011-2015 time line. The condensate return projects consist of piping installed to service new buildings and piping installed to improve system flow. Condensate return project cost estimates are included in Appendix B.

Each condensate return project is identified with a unique project identification number. This project identification number can be used to cross reference Table 4.4 and drawing CR-30 (located at the end of this section).

A total of three condensate return projects were recommended with a total current value of $212,000.

Table 4.3: Capital Projects Cost Estimates

Time Period	Building Number	Building Name	Project ID Tag	Project Description	Present Cost ($)
2002-2005	68	Physical Science #1	**ST-11**	At West corner of the tunnel containing 8" HPS to 21 (Statistics-Computer Bldg), connect and run 6" from tunnel direct buried across East Campus Drive with 6" capped connection and North with 4" valved stub for 68. Cost Included in building project cost.	$ -
2002-2005	17	Central Plant	**ST-12**	Increase feedwater system capacity. Provide new feedwater pumps, associated piping and valves and electrical wiring.	$ 434,000
2002-2005	**Period Total**				**$ 434,000**
2002-2005 Reference Dwgs- Steam- ST-10					
2006-2010	75 78	Engineering Unit #3 Performing Arts	**ST-21**	At North corner of the tunnel containing 6" HPS to 58 (Fine Arts), connect new 6" steam to run from tunnel North and East with 4" valved stubs for 75 & 78	$ 631,000
2006-2010	74	CHASS Building #2	**ST-22**	At South corner of the TV-12 containing 6" HPS , connect and run 6" from tunnel direct buried steam service with 4" valved stub for 76 and 6" capped connection.	$ 86,000
2006-2010	17	Central Plant	**ST-23**	Demolish existing steam header system at Central Plant and install new larger capacity header and distribution from Plant to accommodate increasing loads	$ 656,000
2006-2010	17	Central Plant	**ST-24**	Replace existing 1958 30,000 Lb/hr steam boiler with new 50,000 Lb/hr steam boiler and associated accessories	$ 2,523,000
2006-2010	**Period Total**				**$ 3,896,000**
2006-2010 Reference Dwgs- Steam- ST-20					
2002-2010	**Cum. Total**				**$ 4,330,000**

Table 4.3: Capital Projects Cost Estimates

Time Period	Building Number	Building Name	Project ID Tag	Project Description	Present Cost ($)
2011-2015	82 83	Student Admin. #1 Student Admin. #2	**ST-31**	Extend direct buried 4" main West from 6" capped connection in **ST-21** to 4" valved stubs for 82 & 83	$ 243,000
2011-2015	95 96	Physical Science #3 Science Building #11	**ST-32**	Extend direct buried 4" main East from 6" capped connection in **ST-11** to 4" valved stub for 95 and 3" valved stub for 96.	$ 279,000
2011-2015	97 98 99 100 101 102	lot 6 devlpmnt #1 lot 6 devlpmnt #2 lot 6 devlpmnt #3 lot 6 devlpmnt #4 lot 6 devlpmnt #5 lot 6 devlpmnt #6	**ST-33**	Connect 6" direct buried main from 6" capped connection in **ST-22** West and South to 4" valved stub for 97 & 98. Continue South with 4" direct buried main to 3" valved stub for 99. Continue South with 4" direct buried main to 3" valved stub for 100. Continue South with 4" direct buried main to 4" valved stub for 101. Continue South and East with 3" direct buried main to 3" valved stub for 102.	$ 668,000
2011-2015	17	Central Plant	**ST-34**	Replace existing 1958 30,000 Lb/hr steam boiler with new 50,000 Lb/hr steam boiler and associated accessories	$ 2,523,000
2011-2015	**Period Total**				**$ 3,713,000**

2011-2015 Reference Dwgs- Steam- ST-30

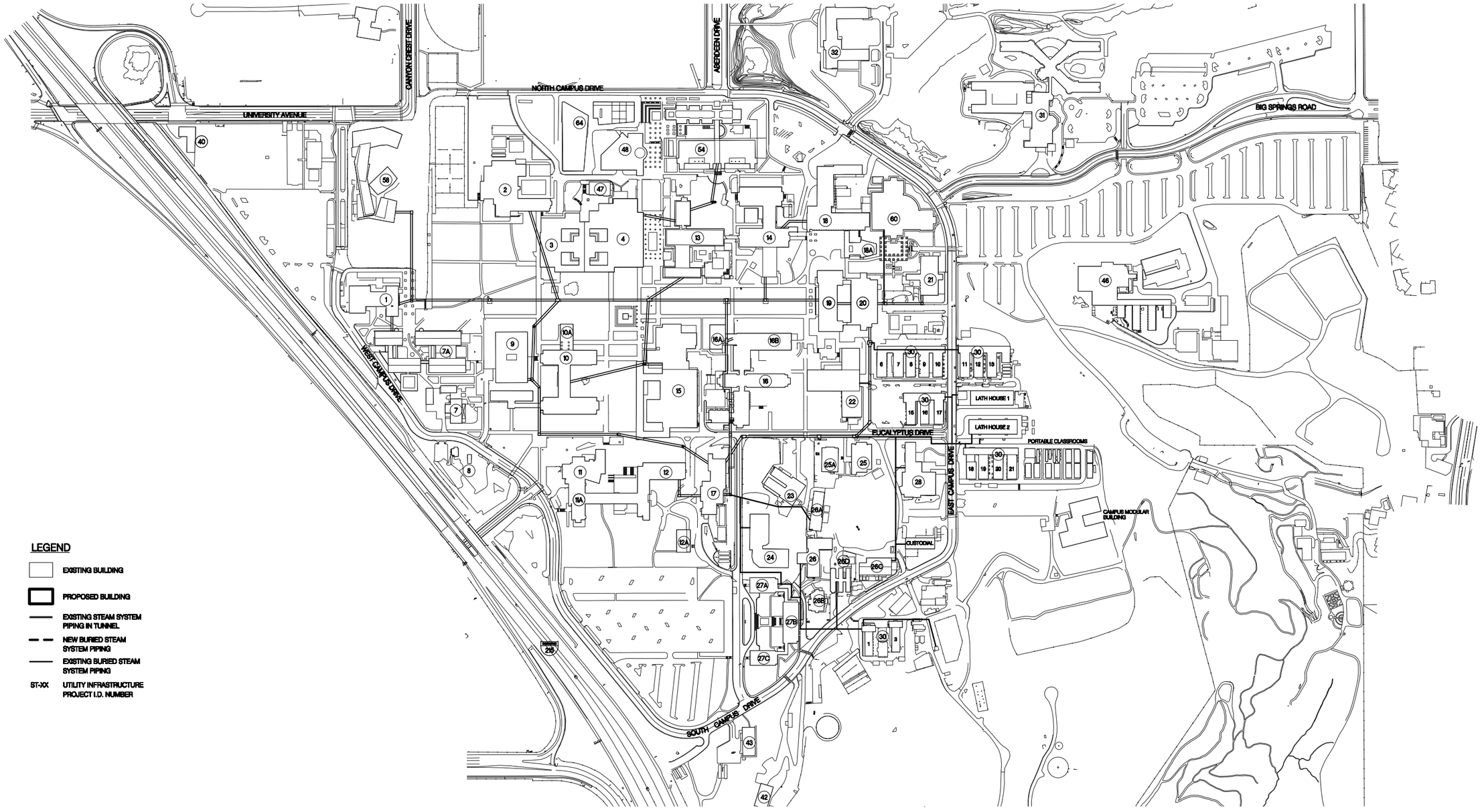
2002-2015	**Grand Total**				**$ 8,043,000**

Table 4.4: Capital Projects Cost Estimates

Time Period	Building Number	Building Name	Project ID Tag	Project Description	Present Cost ($)
2002-2005	68	Physical Science #1	**CR-11**	At West corner of the tunnel containing 4" condensate return from 21 (Statistics-Computer Bldg),connect to and run 3" from tunnel direct buried across East Campus Drive with 3" capped connection and North with 2" valved stub for 68	$ -
2002-2005	**Period Total**				**$ -**
2002-2005 Reference Dwgs- Steam- CR-10					
2006-2010	75 78	Engineering Unit #3 Performing Arts	**CR-21**	At North corner of the tunnel containing 3" condensate return from 58 (Fine Arts),connect new 3" condensate return to run from tunnel near 59, with 1-1/2" valved stub for 59 and 3"capped connectionExtend direct buried 2" condensate return North and East from 3" capped connection in CR-11 to 2" valved stubs for 75 & 78	$ 130,000
2006-2010	74	CHASS Building #2	**CR-22**	At South corner of the TV-12 containing 4" condensate return, connect and run 3" from tunnel direct buried condensate return to 2" valved stub for 76 and 3" capped connection	$ 19,000
2006-2010	**Period Total**				**$ 149,000**
2006-2010 Reference Dwgs- Steam- CR-20					
2002-2010	**Cum. Total**				**$ 149,000**

Table 4.4: Capital Projects Cost Estimates

Time Period	Building Number	Building Name	Project ID Tag	Project Description	Present Cost ($)
2011-2015	82 83	Student Admin. #1 Student Admin. #2	**CR-31**	Extend direct buried 2" condensate return West from 3" capped connection in **CR-21** to 2" valved stubs for 82 & 83.	$ 44,000
2011-2015	95 96	Physical Science #3 Science Building #11	**CR-32**	Extend direct buried 2" condensate return East from 3" capped connection in **CR-11** to 2" valved stub for 95 and 1-1/2" valved stub for 96.	$ 49,000
2011-2015	97 98 99 100 101 102	Lot 6 devlpmnt #1 Lot 6 devlpmnt #2 Lot 6 devlpmnt #3 Lot 6 devlpmnt #4 Lot 6 devlpmnt #5 Lot 6 devlpmnt #6	**CR-33**	Install 3" direct buried condensate return main from 3" capped connection in **CR-22** West and South to 2" valved stub for 97 & 98. Continue South with 2" direct buried main to 1-1/2" valved stub for 99. Continue South with 2" direct buried main to 1-1/2" valved stub for 100. Continue South with 2" direct buried main to 2" valved stub for 101. Continue South and East with 1-1/2" direct buried main to 1-1/2" valved stub for 102.	$ 119,000
2011-2015	**Period Total**				**$ 212,000**
2011-2015 Reference Dwgs- Steam- CR-30					
2002-2015	**Grand Total**				**$ 361,000**



LEGEND

- EXISTING BUILDING
- PROPOSED BUILDING
- EXISTING STEAM SYSTEM PIPING IN TUNNEL
- NEW BURIED STEAM SYSTEM PIPING
- EXISTING BURIED STEAM SYSTEM PIPING
- ST-XX UTILITY INFRASTRUCTURE PROJECT I.D. NUMBER

NORTH

0 50' 100' 200' 400' 600'

1"=200'-0"

UCR

UNIVERSITY OF CALIFORNIA RIVERSIDE

MECHANICAL - STEAM - EXISTING

Bechard Long &Associates, Inc.

MECHANICAL AND ELECTRICAL CONSULTING ENGINEERS

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FAX (858) 578-8865
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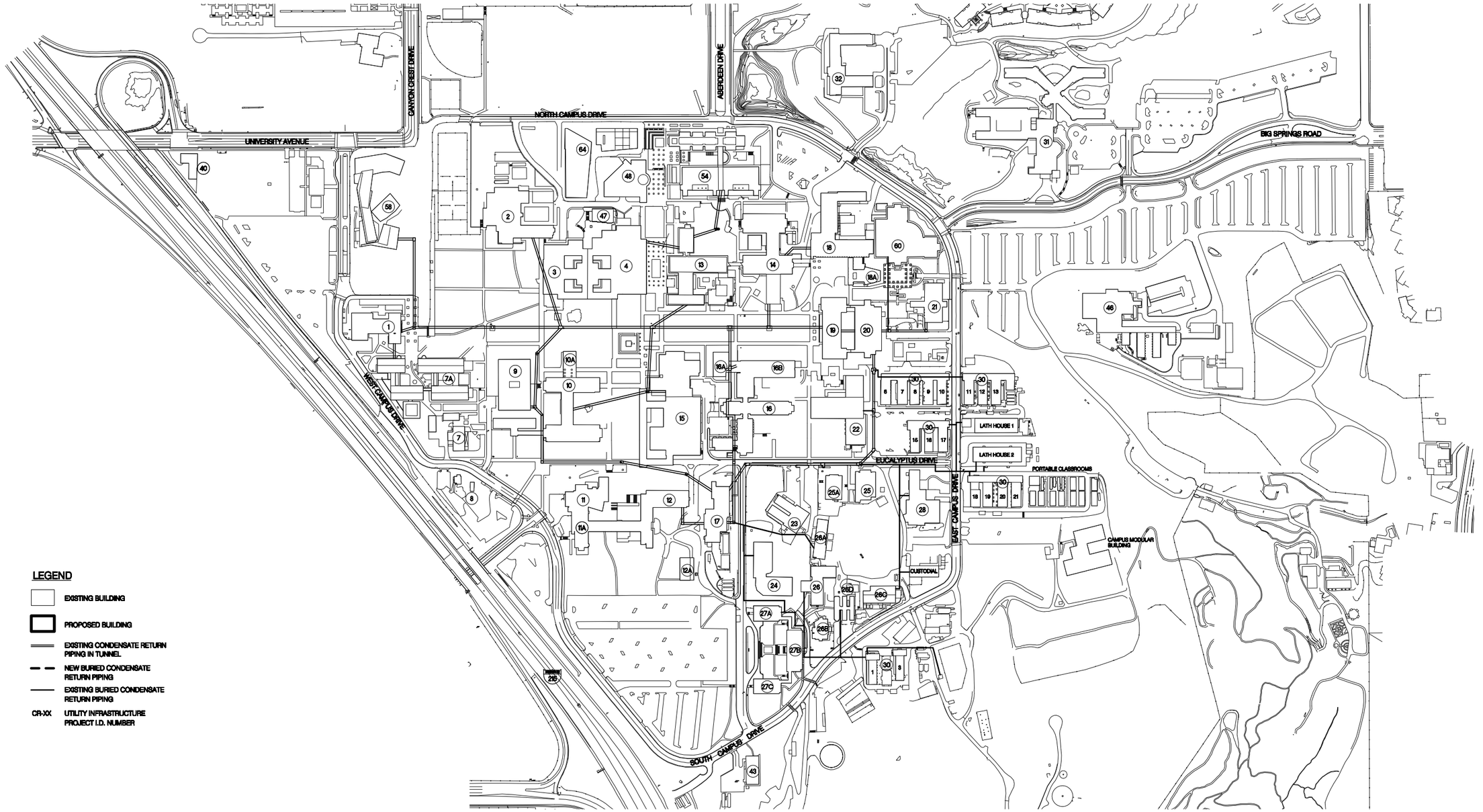
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: ST-00



LEGEND

- EXISTING BUILDING
- PROPOSED BUILDING
- EXISTING CONDENSATE RETURN PIPING IN TUNNEL
- NEW BURIED CONDENSATE RETURN PIPING
- EXISTING BURIED CONDENSATE RETURN PIPING
- CR-XX UTILITY INFRASTRUCTURE PROJECT I.D. NUMBER

NORTH

0 50'100' 200' 400' 600'
1"=200'-0"

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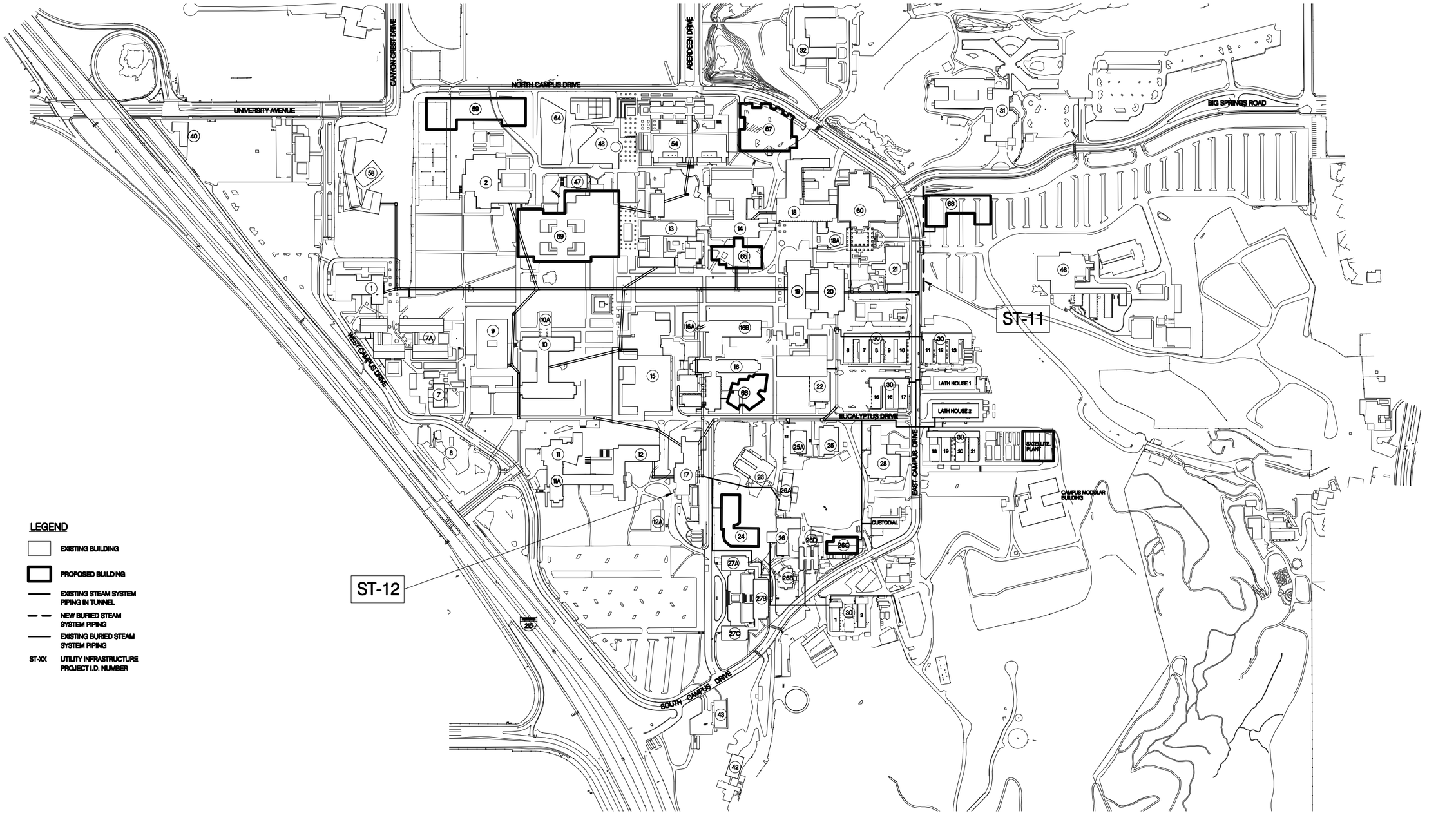
DATE: 01/28/01

SHEET NO: CR-00



LEGEND

- EXISTING BUILDING
- PROPOSED BUILDING
- EXISTING STEAM SYSTEM PIPING IN TUNNEL
- NEW BURIED STEAM SYSTEM PIPING
- EXISTING BURIED STEAM SYSTEM PIPING
- ST-XX UTILITY INFRASTRUCTURE PROJECT I.D. NUMBER

NORTH

0 50'100' 200' 400' 600'

1"=200'-0"

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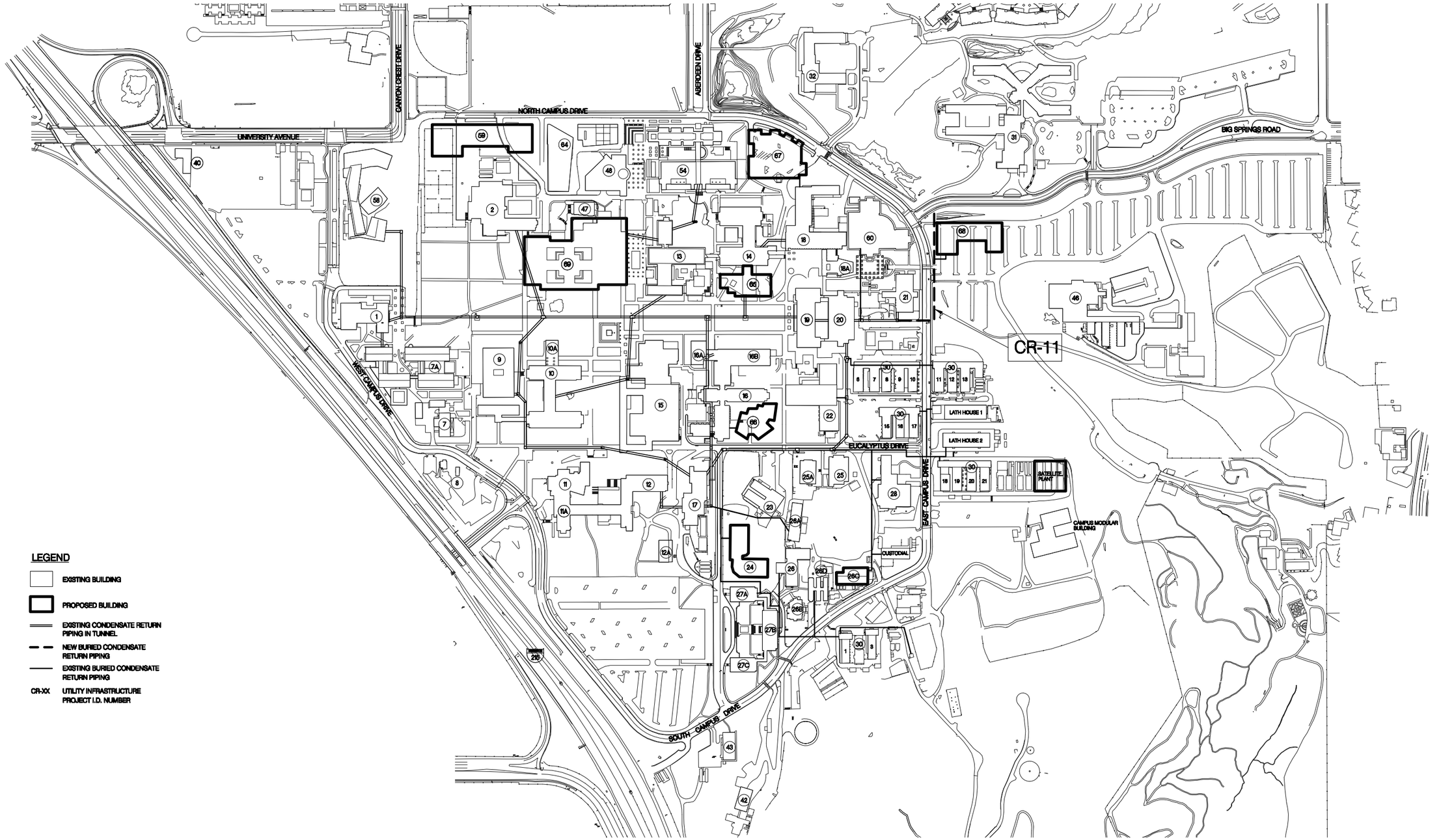

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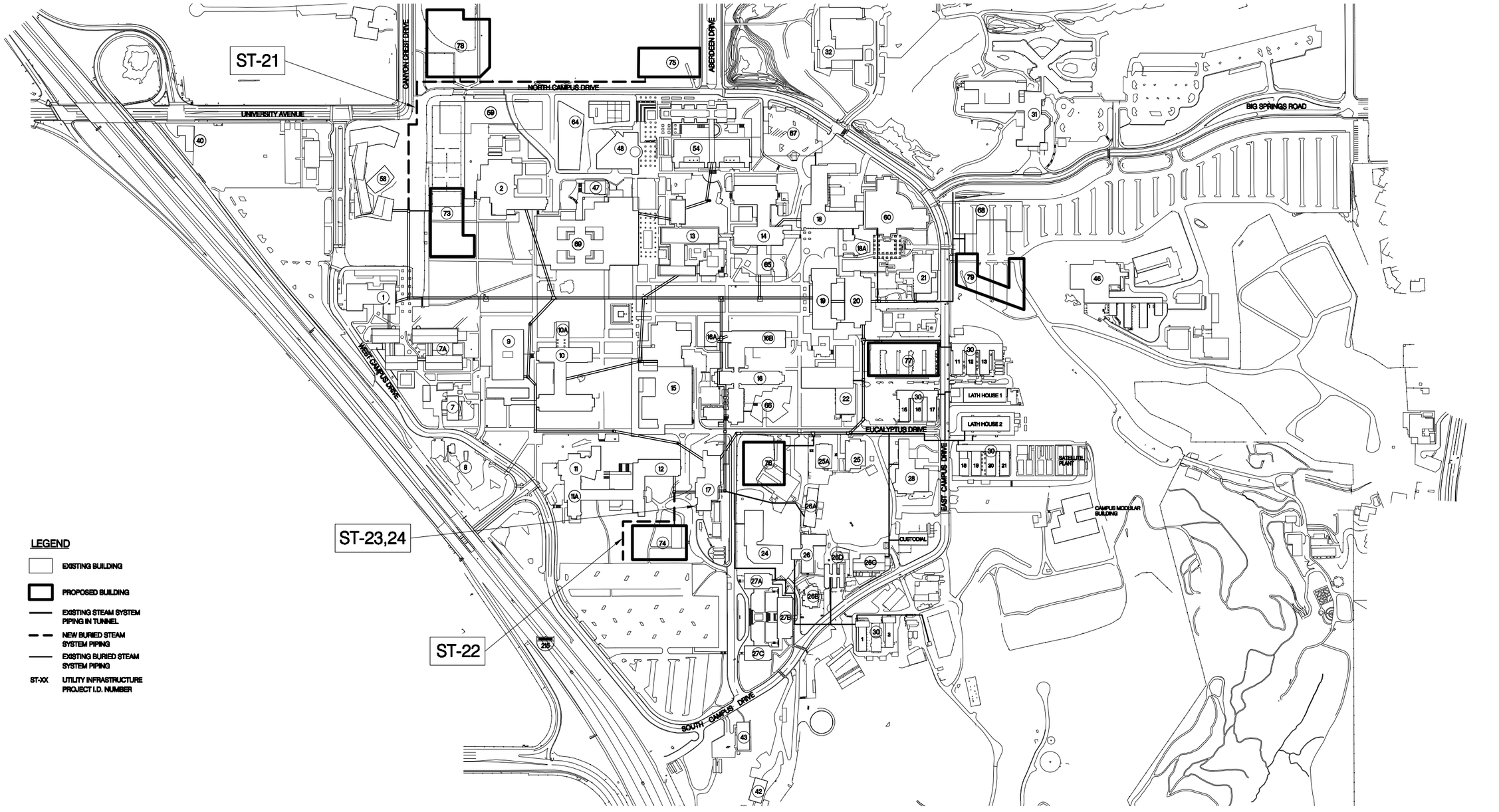
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: CR-10



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MECHANICAL - STEAM - 2006 - 2010

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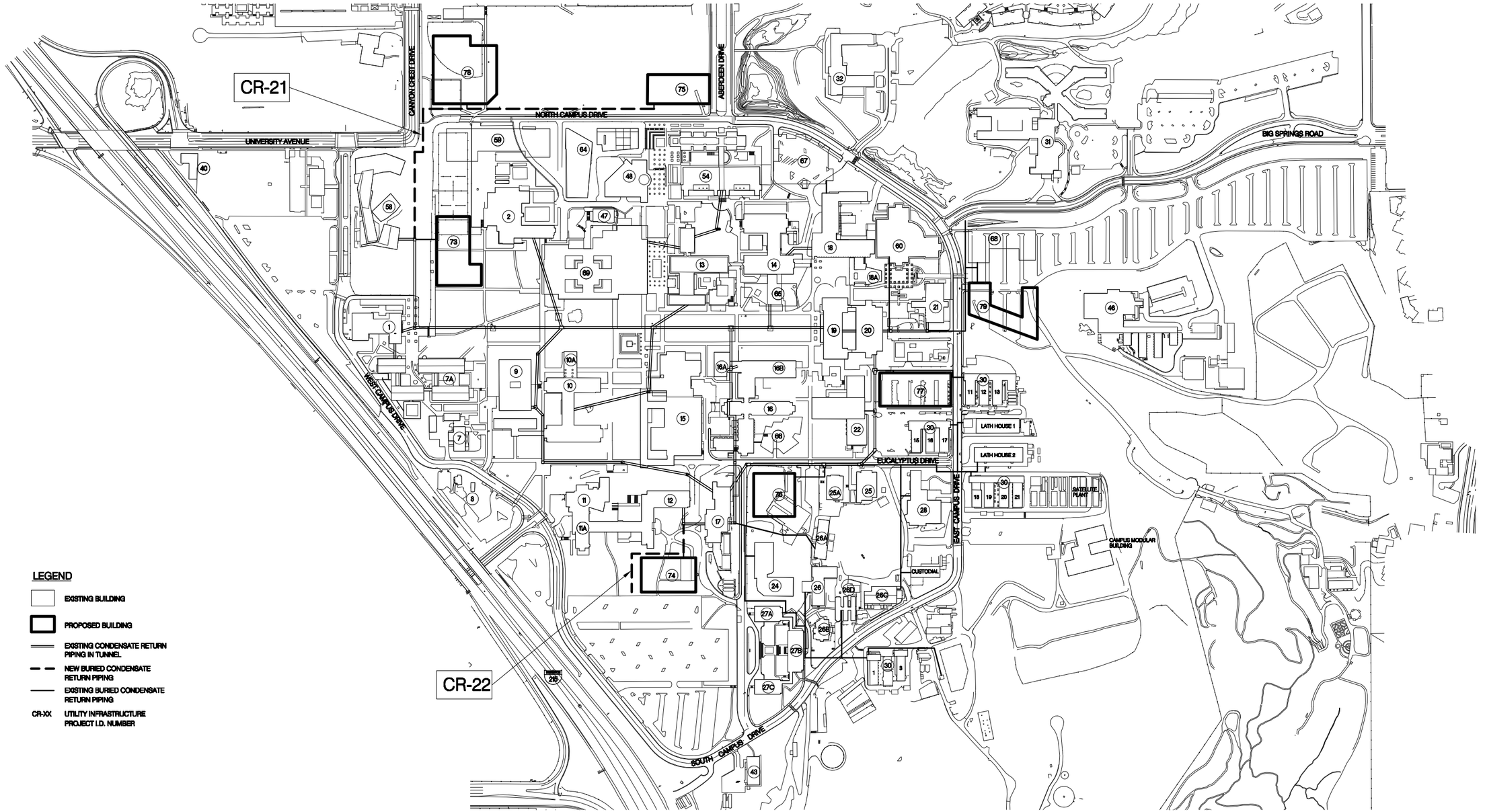
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: ST-20



UCR
UNIVERSITY OF CALIFORNIA RIVERSIDE

MECHANICAL - CONDENSATE RETURN - 2006 - 2010

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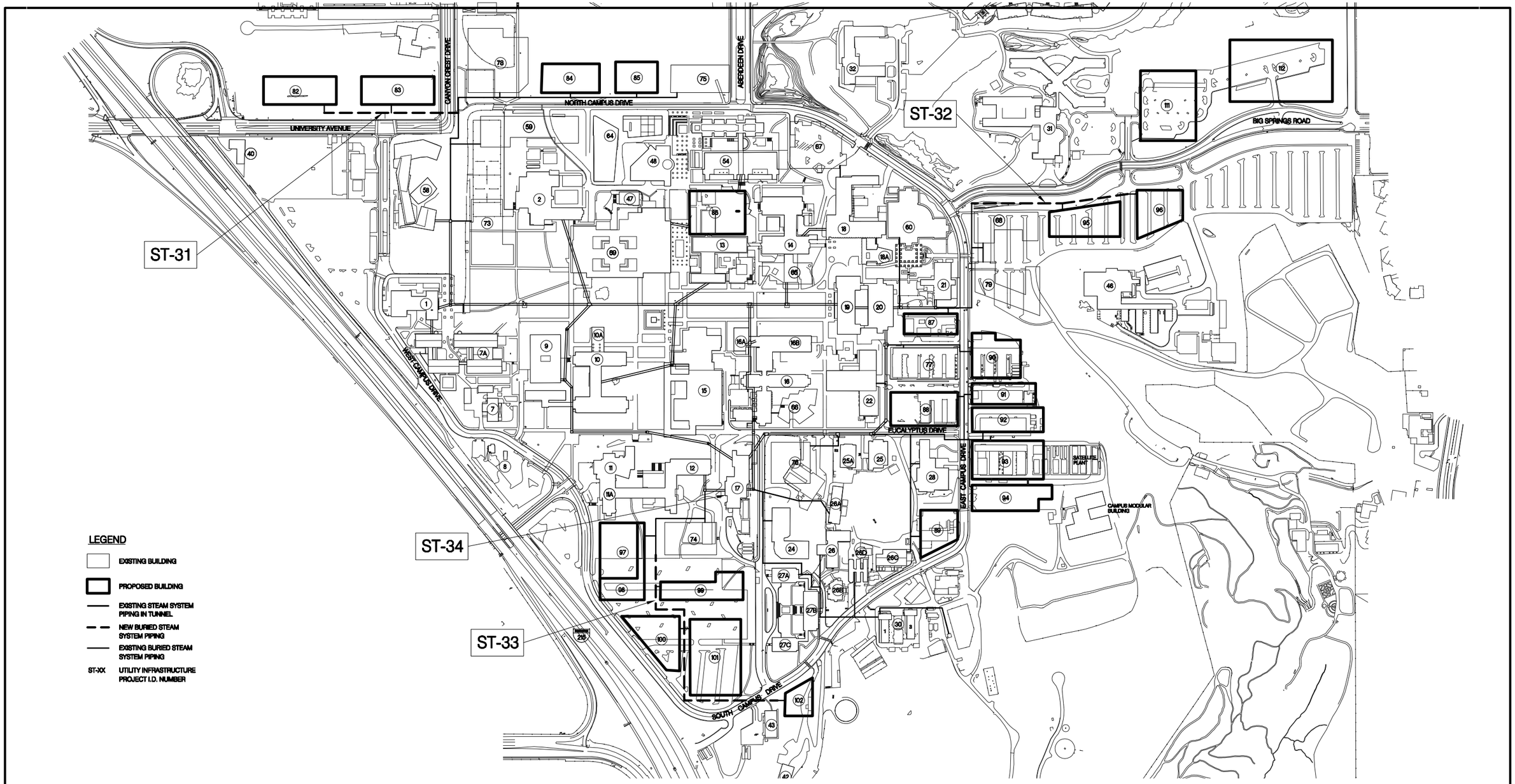
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: CR-200



LEGEND

- EXISTING BUILDING
- PROPOSED BUILDING
- EXISTING STEAM SYSTEM PIPING IN TUNNEL
- NEW BURIED STEAM SYSTEM PIPING
- EXISTING BURIED STEAM SYSTEM PIPING
- ST-XX UTILITY INFRASTRUCTURE PROJECT I.D. NUMBER

NORTH

0 50' 100' 200' 400' 600'

1"=200'-0"

UCR

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MECHANICAL - STEAM - 2011 - 2015

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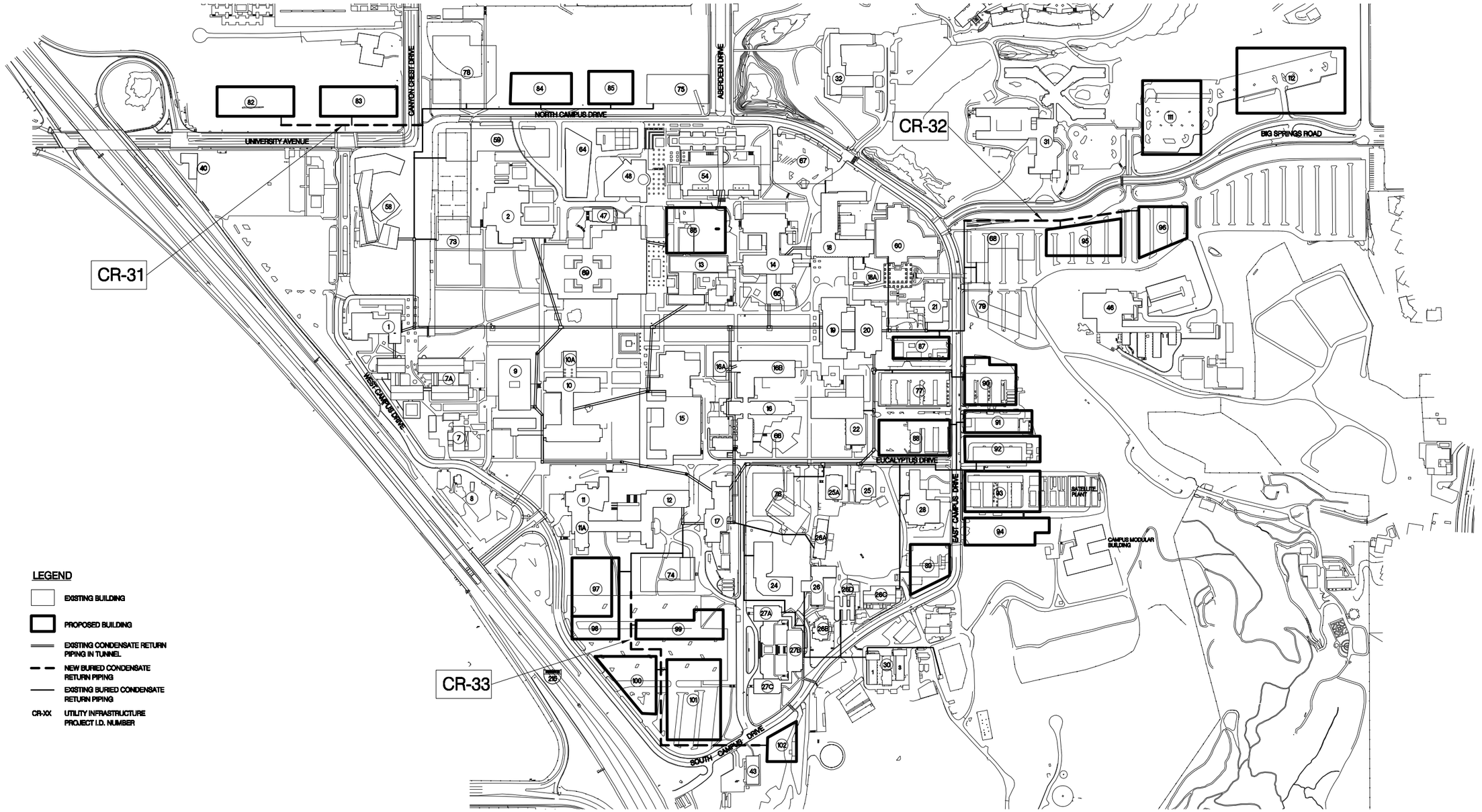
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: ST-30



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MECHANICAL - CONDENSATE RETURN - 2011 - 2015

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PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: CR-300

SECTION 5.0

DOMESTIC WATER SYSTEM

5.1 Existing System

The UCR campus has a direct buried water system that serves the campus domestic, irrigation, and fire water needs. All of the UCR domestic water is supplied to the campus from a buried 5,000,000-gallon City reservoir located just south of University Avenue and East of Interstate 215/60. A 15" buried concrete pipe transfers this treated water from the reservoir to the campus domestic water pumping station, located east of the intersection of University Avenue and Canyon Crest Drive. This pumping station consists of the main city water meter, (2) reduced backflow preventers, and (4) 100 HP pumps, capable of a total capacity of about 4,000 GPM at approximately 315 ft. of head (or 136 psi). Currently, a maximum of (3) pumps are operated simultaneously to feed the campus' water needs, with a discharge pressure set point of 125-135 psi.

The campus has (2) domestic water storage tanks, with capacities of 1,000,000 gallons and 50,000 gallons, both located at an elevation of 1287.58 feet. The lowest building elevation on campus is 1030 feet, and the top floor of the building closest to the tank is at 1163 feet. This translates to a maximum building water pressure of 112 psi, and minimum pressure of 54 psi. The main supply line to the tanks from the pump station is the same line used for water distribution from the tanks to the campus. This 12" line is mostly transite (concrete with asbestos) composition, and has experienced many leaks. When the storage tanks are full, the pumps in the pump station shut off, and the campus water system is gravity fed from the tanks. When the water level in the large tank drops below a pre-determined level, the pumps come on and fill the tanks as well as supplying water to the campus.

The campus distribution system is made up of mostly 8" and 6" direct buried ductile iron pipe, with the exception of the above mentioned 12" transite main. Irrigation water use is generally separated from the domestic water consumption by a backflow preventer. Valves are generally buried, with access provided by valve boxes.

A separate direct buried 12" city water main and meter, located at the corner of Florida Street and Linden Street, serves as a back up supply to the campus. This 12" main is interconnected to the campus distribution system south of Linden via an 8" direct buried pipe. This connection is normally closed, but can be opened to supplement the campus distribution system. University personnel claim the 12" city main was used to supply the entire campus in an emergency situation, but the 12" line pressure had to be increased by the city in order to provide adequate pressure to all buildings.

The fire protection water is also provided by the domestic water system. Fire hydrants located around the campus are connected to the water mains.

See drawings W-00S and W-00N (located at the end of this section) for the UCR existing domestic water system.

5.2 Analysis Assumptions and Methodology

Historical data for the main campus water meter was obtained (see Appendix C) detailing the total annual and monthly water use for the years 1990 – 2001. From this data, the average daily water demand per month was calculated. A 60%/40% split between irrigation and domestic water, respectively, (based on information from UCR personnel) was used to determine domestic water use. The peak monthly average flow was determined to be 870 gpm for all campus buildings. The water demand for dorms was based on water meter data from Aberdeen Hall; peak water demand was calculated to be 5.47 beds/gpm, or 880 gsf/gpm. Water demand for greenhouses and lathhouses was estimated as 300 gsf/gpm.

To determine campus-wide hourly peak domestic water consumption, the assumption was made that the sanitary sewer flow is 90% of the domestic water consumption, with the exception of make-up water used for cooling towers and/or boilers at the central plant, and water used in the greenhouses. From an MRC Tech sewer study, a peak hourly sanitary sewer flow for the entire campus of 2065 gpm was determined. This gives a peak hourly domestic water demand of 2294 gpm for all buildings, plus an additional 133 gpm for central plant make-up water and 279 gpm for the greenhouses and lathhouses, for a total campus peak hour building domestic water demand of 2706 gpm. Based on this total, the water demand for typical buildings was determined as 1,622 gsf/gpm. These three separate gsf/gpm rates (greenhouse, dormitory, and typical building) were then applied to future building type and square footage to get future building peak domestic water demand.

Based on these individual building demands, piping network calculations were completed to determine current areas of inadequate capacity. Future building demands were then added to these calculations to determine any new infrastructure projects that would need to be completed to support future building construction.

The last complete year of data available for this analysis was the year 2000. It indicates an average use ranging from 985,000 gallons/day in March to 3,130,000 gallons/day in July. This maximum daily average translates to a rate of almost 2,200 GPM every hour, for the entire month of July. Facilities personnel indicate that up to three (3) pumps are run at a time. This means that the storage tank is filled at a rate of 800 gpm, which would take about a day to fill. The storage tanks cannot discharge when the pumps are running (due to system arrangement), so the storage tanks are only being utilized about every other day for the summer months (July, August, and September of 2000). A solution to this problem would be to at least change the pumping controls to allow all four (4) pumps at the pump station to run simultaneously. It is recommended in Project W-14 to immediately increase the capacity of the pumping station to 8,250 gpm.

Building fire flow was calculated per the 1998 California Fire Code, Appendix III-AA: Fire Flow Requirements for Buildings. It mandates that a Type II-N building (which pertains to all buildings on campus constructed before approximately 1980) with a square footage greater than 128,301 square feet will require the capacity of 8,000 GPM of fire flow for a 4-hour duration. This equates to a total of 1,920,000 gallons. The largest domestic water

storage tank is only 1,000,000 gallons, and the pump station only has capacity for a maximum of 4,000 GPM, with no emergency power (these pumps do not require emergency power because of the second city water supply at Florida and Linden). Therefore, the current domestic water system can realistically provide roughly half of the needed fire flow for any older building over 128,301 square feet. The 2000 *NFPA 24: Standard for the Installation of Private Fire Service Mains and Their Appurtenances* section 2-2.1 states that for needed fire flow, "One or more connections from a reliable public water system shall be acceptable. The capacity of the supply shall meet the needed fire flow as determined by the authority having jurisdiction." Water project W-14 (shown in Table 5.3 on page 5-11) increases the capacity of the pump station to 8,250 gpm, and should be completed as soon as possible.

Table 5.1 (shown on page 5-4) shows the peak domestic water demand and needed fire flow for existing buildings. Table 5.2 (shown on pages 5-5, 6 & 7) shows the peak domestic water demand and needed fire flow for future buildings.

Table 5.1: Existing Building Water Demand

Building	No.	G.S.F.	Date	Peak GPM	Fire GPM	# of Hydrants
Aberdeen Hall	33	133,435		149.9	7,750	8
Administration - Hinderaker Hall	1	46,490	1960	28.7	4,500	5
Anderson Hall	27B & C	See 27A	1917	See 27A		
Art Annex	12A	2,645	1973	1.6	1,500	1
Barn Group	7	5,600		3.5	1,500	1
Batchelor Hall (North & South)	22	114,860	1965	70.8	7,250	7
Bookstore	48	33,400	1991	20.6	2,000	2
Bourns Hall	54	145,309	1995	89.6	4,750	5
Boyce Hall	20	109,932	1974	67.8	7,000	7
Boyden Lab Building	26A	6,396	1961	3.9	1,750	1
Campus Modular Building		21,960	2000	13.5	1,500	1
Canyon Crest Student Family Housing	62	197,266		121.6	8,000	8
Carillon Tower	5	4,774	1966	2.9	1,500	1
Central Power Plant	17	19,437	1953	145.0	3,000	3
Chapman Hall -Soils & Plant Nutrition	27A	51,941	1931	32.0	4,750	5
Chemical Sciences	13A	See 13	1990	See 13		
Child Development Center	51	12,000	1996	7.4	1,500	1
College Building North & South	42	17,944	1963	11.1	2,750	3
Commons	4	86,004	1965	53.0	6,250	6
Computer Statistics	21	42,096	1974	26.0	4,250	4
Corporation Yard	34	45,000	1959	27.7	4,500	5
Costo	3	See 4	1965	See 4		
Custodial		7,446	1965	4.6	1,750	1
Entomology	26	32,444	1932	20.0	3,750	4
Entomology Annex	23	16,664	1948	10.3	2,750	3
Entomology Research Museum	26B	8,988	1993	5.5	1,500	2
Environmental Health and Safety	43	6,334	1989	3.9	1,500	2
Fawcett Lab	28	20,997	1965	12.9	3,000	3
Fine Arts	58	100,371	2001	61.9	3,500	4
Geology	14	103,095	1952	63.6	6,750	7
Greenhouse 11-13A	30	17,500	1955	58.3	2,750	3
Greenhouse 1-3	30	15,000	1988	50.0	2,500	3
Greenhouse 15-17	30	15,000	1956	50.0	2,500	3
Greenhouse 18-21	30	20,000	1965	66.7	3,000	3
Greenhouse 6-10	30	25,000	1952	83.3	3,250	3
Humanities-1	7A	111,180	1996	68.5	3,500	4
Humanities-2	11A	See 12	1963	See 12		
Insectary	26D	8,783	1959	5.4	2,000	2
Lath House #1		5,000		16.7		
Lath House #2		5,000		16.7		
Life Sciences	16	150,994	1948	93.1	8,000	8
Life Sciences	16A	See 16	1969	See 16		
Lothian Hall	31	163,250		188.3	8,000	8
Mobile Trailer Facilities	29	15,691	1971	9.7	2,750	3
Olmstead Hall (Humanities-2)	12	141,049	1963	87.0	8,000	8

Table 5.1: Existing Building Water Demand

Building	No.	G.S.F.	Date	Peak GPM	Fire GPM	# of Hydrants
Parking Services	53	5,612	1993	3.5	1,500	1
Pentland Hills	61	134,544	2000	152.9	4,000	4
Physical Education	2	65,346	1953	40.3	5,250	5
Physics	18	94,808	1965	58.5	6,500	7
Physics 2000	18A	See 18		See 18		
Pierce Hall (North & South)	13	139,912	1966	86.3	8,000	8
Police Facility	36	9,320	1998	5.7	1,500	1
Rivera Library	15	230,013	1960	141.8	8,000	8
Science Library	60	167,358	1998	103.2	4,500	5
Speith Hall -Life Sciences	16B	See 16	1958	See 16		
Sproul Hall	9	78,870	1965	48.6	6,000	6
Student Recreation Center	55	80,000	1994	49.3	3,000	3
Surge Building	64	84,375	2001	52.0	3,250	3
Sweeney Art Gallery	39A	720	1984	0.4	1,500	1
Telephone Building	40	2,584	1965	1.6	1,500	1
Terrace Conference	47	4,880	1991	3.0	1,500	1
Theatre	11	See 12	1996	See 12		
University Cottage	8	1,025	1916	0.6	1,500	1
University Lab	25A	11,803	1994	7.3	1,500	1
University Offices	25	19,650	1991	12.1	1,500	1
USDA Salinity Lab	46					
Veitch Student Center	32	24,180	1961	14.9	3,250	3
Watkins Hall	10	63,913	1953	39.4	5,250	5
Webber Hall	19	50,801	1953	31.3	4,750	5
SUBTOTAL		**3,355,989**		**2,705.9**		

Table 5.2: Future Building Water Demand

Building	No.	G.S.F.	Date	Peak GPM	Fire GPM	# of Hydrants
2002 - 2005						
Alumni/ Visitor Center	59	25,890	2005	16.0	1,500	1
Biological Science	66	55,071	2005	34.0	2,500	3
Boiler Plant (additional load)			2005			
Commons Expansion	69	186,004	2005	114.7	4,750	5
Demo Commons	4	(86,004)		(53.0)		
Engineering Unit #2	67	152,010	2005	93.7	4,250	4
Entomology	24	67,139	2002	41.4	2,750	3
Insectory & Quarantine	26C	31,523	2002	19.4	2,000	2
Physical Science #1	68	129,417	2005	79.8	4,000	4
Satellite Central Plant		7,000	2005	115.0	1,500	1
Science Lab #1	65	44,138	2001	27.2	2,250	2
Pentland Hills #2	70	67,500	2002	76.7	2,750	3
Housing Unit #2	71	60,000	2003	68.2	2,750	3
Housing Unit #3	72	60,000	2005	68.2	2,750	3
SUBTOTAL		**799,688**		**701.2**		
CUMULATIVE TOTAL		**4,155,677**		**3,407.1**		
2006 -2010						
CHASS Bldg 1	73	115,000	2010	70.9	3,750	4
CHASS Bldg 2	74	85,000	2010	52.4	3,250	3
Boiler Plant (additional load)			2010			
Demo Art Annex	12A	(2,645)		(1.6)		
Engineering Unit #3	75	150,000	2010	92.5	4,250	4
Entomology #2	76	100,000	2010	61.7	3,500	4
Demo Entomology Annex	23	(16,664)		(10.3)		
Genomics	77	120,000	2010	74.0	3,750	4
Performing Arts	78	75,000	2010	46.2	3,000	3
Physical Science #2	79	130,000	2010	80.2	4,000	4
Satellite Plant Expansion		0	2008	115.0		
Housing Unit #4	80	93,750	2007	106.5	3,250	3
Housing Unit #5	81	93,750	2010	106.5	3,250	3
SUBTOTAL		**943,191**		**794.0**		
CUMULATIVE TOTAL		**5,098,868**		**4,201.1**		
2011 -2015						
Student/ Administration Cluster:						
Boiler Plant (additional load)			2015			
Building 1	82	100,000	2015	61.7	3,500	4
Building 2	83	100,000	2015	61.7	3,500	4
Building 3	84	120,000	2015	74.0	3,750	4
Building 4	85	50,000	2015	30.8	2,500	3
Science Cluster:						
Building 1 (lab)	86	100,000	2015	61.7	3,500	4
Demo 20% of Pierce Hall	13	(27,982)		(17.3)		
Building 2 (classroom)	87	100,000	2015	61.7	3,500	4

Table 5.2: Future Building Water Demand

Building	No.	G.S.F.	Date	Peak GPM	Fire GPM	# of Hydrants
Science Bldg. (lab)	88	100,000	2015	61.7	3,500	4
Demo Greenhouse 15-17	30	(15,000)		(50.0)		
Building 4 (classroom)	89	100,000	2015	61.7	3,500	4
Demo Custodial		(7,446)		(4.6)		
Demo Entomology	26	(32,444)		(20.0)		
Demo Insectary	26D	(8,783)		(5.4)		
Building 5 (lab)	90	100,000	2015	61.7	3,500	4
Demo Greenhouse 11- 13A	30	(17,500)		(58.3)		
Building 6 (classroom)	91	100,000	2015	61.7	3,500	4
Demo Lath House #1		(5,000)		(16.7)		
Building 7 (lab)	92	100,000	2015	61.7	3,500	4
Demo Lath House #2		(5,000)		(16.7)		
Building 8 (classroom)	93	120,000	2015	74.0	3,750	4
Demo Greenhouse 18-21	30	(20,000)		(66.7)		
Building 9 (lab)	94	120,000	2015	74.0	3,750	4
Physical Science #3	95	130,000	2015	80.2	4,000	4
Building 11 (classroom)	96	100,000	2015	61.7	3,500	4
Future Bldg Devlpmnt in Prkg Lot 6:						
Building 1	97	100,000	2015	61.7	3,500	4
Building 2	98	50,000	2015	30.8	2,500	3
Building 3	99	75,000	2015	46.2	3,000	3
Building 4	100	50,000	2015	30.8	2,500	3
Building 5	101	150,000	2015	92.5	4,250	4
Building 6	102	75,000	2015	46.2	3,000	3
Housing Unit #6	103	112,500	2015	127.8	3,500	4
Housing Unit #7	104	112,500	2015	127.8	3,500	4
Housing Unit #8	105	112,500	2015	127.8	3,500	4
Housing Unit #9	106	112,500	2015	127.8	3,500	4
Housing Unit #10	107	112,500	2015	127.8	3,500	4
Housing Unit #11	108	112,500	2015	127.8	3,500	4
Housing Unit #12	109	112,500	2015	127.8	3,500	4
Housing Unit #13	110	112,500	2015	127.8	3,500	4
Housing Unit #14	111	112,500	2015	127.8	3,500	4
Housing Unit #15	112	112,500	2015	127.8	3,500	4
SUBTOTAL		**3,025,845**		**2,280.6**		
GRAND TOTAL		**8,124,713**		**6,481.7**		

5.3 Growth Requirements

The projected growth of the UCR campus will significantly impact the existing domestic water system. Domestic water demand will increase as enrollment increases, and as more buildings are added to the campus. To determine future demand, a schedule of future building construction and square footages was obtained from the office of Academic Planning and Budget. The peak demand factors (gpm/sf) determined for the existing buildings were applied to the proposed buildings. The result of this analysis shows that peak water demand will increase by 25% by 2005, 55% by 2010, and 140% by 2015. A corresponding increase in maximum average daily water use can also be expected, which equates to 3,912,500 gal/day in 2005, 4,851,500 gal/day in 2010, and 7,512,000 gal/day in 2015. Replace old water closets and urinals with low-flow fixtures.

To keep up with the increasing demand, and to have sufficient fire flow capacity, the central pumping station will have to be upgraded as soon as possible. Capacity should be increased to at least 8,000 gpm, with one additional pump as a back up. Because of space limitations, existing pumps should be replaced with pumps of higher capacity. Based on the current ratio of storage capacity to daily water usage, storage capacity needs to be increased to 3,000,000 gallons (with the addition of a 2,000,000 gallon tank), in the year 2010.

Based on the piping network calculations, the current piping distribution system is adequate to handle the small amount of growth inside the campus drive loop, with the addition of a few main line interconnections. In the year 2010, an additional artery from the new tank to the campus will need to be added. The majority of campus growth will be in areas that are not currently developed. This will require new mains to be run, expanding the current distribution system. Piping network calculations were used to determine the size and layout of future projects. A maximum velocity of 10 fps and maximum head loss of 6 ft/ 100 ft were used in project design. Needed fire flow for new buildings was also considered, in addition to expected peak demand. As new areas are developed, projects were designed to utilize an Arterial loop system, providing the option of supplying water from more than one direction to a given area.

5.4 Infrastructure Projects, 2002-2005 (outlined on page 5-11)

A total of four infrastructure projects are recommended for this time period. The proposed construction for this time period is mainly in or around the central Campus Drive loop. Infrastructure currently exists to serve these buildings, so water connection to these buildings should be incorporated into project budgeting. The addition of these buildings will, however, put a strain on the existing water distribution system.

As a result, three projects are recommended to complete various system loops, thereby increasing the capacity of the overall system. The fourth project, W-14, should be completed as soon as possible, and involves increasing the capacity of the pump station to meet California Fire Code recommended fire flow guidelines. Projects W-11 and W-12 should be completed by July 2003, because they will increase the system

capacity and ability to serve the Commons Expansion, Science Lab #1, and Biological Sciences buildings. Project W-13 completes the water distribution loop west down North Campus Drive to Canyon Crest, increasing system capacity, and should be completed during the construction of the Alumni/ Visitor Center.

The total cost for all projects during this period is $1,155,000. Project descriptions can be found in Table 5.3 (shown on page 5-11) at the end of this section, and project locations are shown on drawings W-10S and W-10N, immediately following Table 5.3. Detailed cost estimates for each project can be found in Appendix C.

5.5 Infrastructure Projects, 2006-2010 (outlined on page 5-12)

A total of three infrastructure projects are recommended for this time period. During this time period, most of the expansion will occur in undeveloped areas of the campus. The few buildings inside the central Campus Drive loop can be served by the existing infrastructure, and connection costs should be incorporated into building construction project budgeting.

The construction of four new housing buildings south of Linden Street and west of Valencia Hill Drive are the impetus for the new domestic water loop in project W-23. Project W-22 provides a cross connection for the above new buildings, and also provides capacity for the construction of two new buildings north of North Campus Drive. Project W-21 begins a domestic water loop that will be completed during the future development of the parking lot 6 area in the 2011-2015 timeframe.

The total cost for all projects during this period is $1,889,000. Project descriptions can be found in Table 5.3 (shown on page 5-12) at the end of this section, and project locations are shown on drawings W-20S and W-20N, immediately following Table 5.3. Detailed cost estimates for each project can be found in Appendix C.

5.6 Infrastructure Projects, 2011-2015 (outlined on page 5-13, 14)

A total of six infrastructure projects are recommended during this time period. This time period has the greatest amount of projected growth. As a result, some major infrastructure improvements must be undertaken to support this growth. During this time period, the projected peak daily water usage will increase to 7,512,000 gal/day. As a result, the existing 5,000,000-gallon City reservoir will not be sufficient to support the campus. The City of Riverside should be contacted in the year 2011 in order to make arrangements for a larger water supply.

Due to the sharp increase in construction and enrollment, the domestic water storage capacity must be increased to 3,000,000 gallons in project W-31 by installing an additional 2,000,000-gallon tank. Two new arteries need to be installed to support this new tank. Project W-32 involves the installation of a new main down East Campus Drive, to support the new Science cluster of buildings and interconnects to the existing infrastructure. Project W-33 provides a second new main from the storage tank down West Campus Drive, to support the future development of the parking lot 6 area and interconnects to the existing distribution system.

Four new buildings will be constructed along Big Springs Road, and project W-34 provides a domestic water loop to serve these buildings. The Canyon Crest family housing units are slated for replacement in this time period with seven new dormitory buildings. This will require substantial demolition of the existing water distribution system in this area. Project W-35 increases the size of the main along Linden Street, and provides lines to complete loops around the new housing buildings. Demolition of existing water piping was assumed to be included in building construction cost. The construction of two new buildings north of University Avenue will require domestic water service to be brought across Canyon Crest Drive. The new main for these buildings is included in Project W-36.

The total cost for all projects during this period is $5,109,000. Project descriptions can be found in Table 5.3 (shown on pages 5-13, 14) at the end of this section, and project locations are shown on drawings W-30S and W-30N, immediately following Table 5.3. Detailed cost estimates for each project can be found in Appendix C.

Table 5.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2002-2005	65 69	East Carillon Mall	**W-11**	Install direct buried 6" main south connecting the end of the existing north-south 6" main that runs between 19 (Webber) and 16B (Spieth) to the east-west 12" transite main that runs down Eucalyptus, east of 66 (Biological Sciences). Install direct buried 6" main west connecting the end of the existing 6" east-west main north of Greenhouses 6-10 to the new 6" main above.	$ 255,000
2002-2005	59	Alumni/ Visitor Center	**W-12**	Install direct buried 8" main west connecting the existing 8" main running along North Campus Drive to the existing 8" north-south main running on the west side of Canyon Crest. Install 2 fire hydrants equally spaced along North Campus Drive. New fire hydrant cost to be included in building cost.	$ 155,000
2002-2005	65 69	West Carillon Mall	**W-13**	Install direct buried 6" main west connecting the end of the existing east-west 6 " main running through Carillon Mall to the north-south 12" transite main, north of 7A (Humanities). Install direct buried 6" main north connecting the end of the existing 6" north-south main that runs between 10 and 7 (Barn Group) to the new 6" main above.	$ 231,000
2002-2005	-	Pump Station	**W-14**	Replace all 4 pumps w/ 4 new 300 HP, 2,750 GPM @ 315 FT head pumps, for a total pumping capacity to 8,250 GPM, plus an additional 2,750 GPM back-up pump. Install VFD on two pumps, one for back-up.	$ 514,000
2002-2005	**Period Total**				**$ 1,155,000**

2002-2005 Reference Dwgs- Water- W-10S & W-10N

Table 5.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2006-2010	74	CHASS Building #2	**W-21**	Install direct buried 6" main west from the end of the existing 6" east-west main south of 17 (Central Plant) to the western edge of 74. Install 2 fire hydrants, one at each end of the above new 6" main. New fire hydrant cost to be included in building cost.	$ 79,000
2006-2010	75 78 80 81	Engineering Unit #3 Performing Arts Housing Unit #4 Housing Unit #5	**W-22**	Install direct buried 8" main south connecting the end of the existing 6" north-south main on the east side of Aberdeen to the existing 8" east-west main at the corner of North Campus Drive and Aberdeen. Install direct buried 8" main east connecting the existing north-south main running along the east side of Canyon Crest to the intersection of the 8" mains in **W-11**, near 70. Interconnect the above 2 new 8" mains at their intersection, on the east side of Aberdeen. Install 2 fire hydrants, one on the east side of Canyon Crest, and one on the west side of Aberdeen.	$ 805,000
2006-2010	70 71 72	Pentland Hills #2 Housing Unit #2 Housing Unit #3	**W-23**	Install direct buried 8" main east between 70 and 61 (Pentland Hills) from existing north-south 8" main to the west side of Valencia Hill. Continue 8" main north up the west side of Valencia Hill to the south side Linden. Continue west down the south side of Linden with a 8" main connecting to the end of the existing Linden 8" main across from 53 (Parking Services). Install 5 fire hydrants equally spaced along Linden and Valencia Hill. New fire hydrant cost to be included in building cost.	$ 1,005,000
2006-2010	**Period Total**				**$ 1,889,000**
2006-2010 Reference Dwgs- Water- W-20S & W-20N					
2002-2010	**Cum. Total**				**$ 3,044,000**

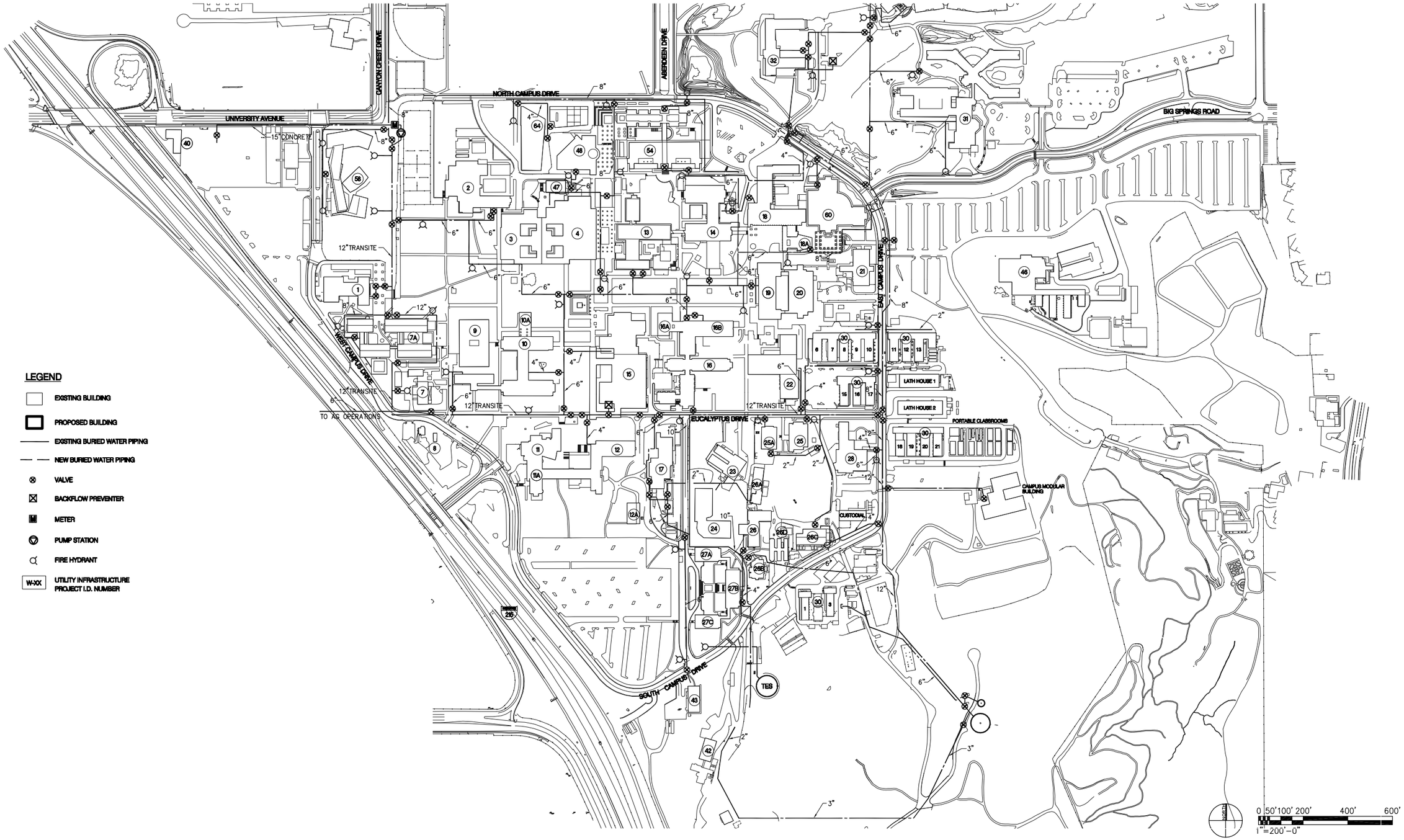
Table 5.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	-	N/A	**W-31**	Install new 2,000,000 gallon storage tank, and associated 12" piping to interconnect to existing tanks.	$ 1,137,000
2011-2015	87 88 89 90 91 92 93 94	Science Building #2 Science Building #3 Science Building #4 Science Building #5 Science Building #6 Science Building #7 Science Building #8 Science Building #9	**W-32**	Install a new 8" direct buried main originating at the new tank and connection piping in **W-31** to run parallel to the existing 8" main, down East Campus Drive, and connecting to the 8" line running down East Campus Drive in front of 87. Also interconnect this new 8" main to the 12" transite main at the corner of Eucalyptus and East Campus Drive. New fire hydrant cost to be included in building cost.	$ 533,000
2011-2015	97 98 99 100 101 102	Lot 6 Devlpmnt #1 Lot 6 Devlpmnt #2 Lot 6 Devlpmnt #3 Lot 6 Devlpmnt #4 Lot 6 Devlpmnt #5 Lot 6 Devlpmnt #6	**W-33**	Install a new 8" direct buried main originating at the new tank and connection piping in **W-31** to run parallel to the existing 6" main, down to South Campus Drive, south to West Campus Drive and north up West Campus Drive and connecting to the 12" transite main running down Eucalyptus in front of 10. Also interconnect this new 8" main to the 6" main from **W-21**. Install 5 new fire hydrants equally spaced along West Campus Drive. New fire hydrant cost to be included in building cost.	$ 987,000
2011-2015	95 96 111 112	Physical Science #3 Science Building #11 Housing Unit #14 Housing Unit #15	**W-34**	Install a new 8" direct buried main east on the north side of Big Springs, from the 8" main at the corner of East Campus Drive and Big Springs to the corner of Big Springs and Valencia Hill. Continue 8" main north along the west side of Valencia Hill, and connect to existing 8" from **W-11**. Install direct buried 8" main south crossing Big Springs in between 95 and 96 to serve 95 and 96. New fire hydrant cost to be included in building cost.	$ 789,000

Table 5.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	103 104 105 106 107 108 109	Housing Unit #6 Housing Unit #7 Housing Unit #8 Housing Unit #9 Housing Unit #10 Housing Unit #11 Housing Unit #12	**W-35**	Demolish and remove existing direct buried piping as needed for new building construction (cost to be included in new building site prep cost). Replace existing direct buried 6" east-west main along Linden with a new direct buried 8" main to be connected with 8" piping to existing meter and 12" city main. Install 2 new north-south direct buried mains from the above new 8" east-west main, one along the west side of Canyon Crest north to the existing 6" main along Blaine, and one along the western side of 107-109, north to the existing 6" main along Blaine. Extend the existing north-south direct buried 6" main along the eastern side of 104 and 105 with new 6" direct buried pipe north to the 6" main along Blaine, and south with new 6" direct buried pipe to the new 8" main above. New fire hydrant cost to be included in building cost.	$ 1,405,000
2011-2015	82 83	Student/ Admin. #1 Student/ Admin. #2	**W-36**	Install a new 8" direct buried main west from the existing 8" north-south main on the east side of Canyon Crest. Route piping across Canyon Crest, to run along the north side of University, terminating at the west side of 82. New fire hydrant cost to be included in building cost.	$ 258,000
2011-2015	**Period Total**				**$ 5,109,000**
2011-2015 Reference Dwgs- Water- W-30S & W-30N					
2002-2015	**Grand Total**				**$ 8,153,000**

- Project costs do not include curb to curb roadway replacements. Costs do include repair of any roadway, sidewalk, or landscaped area in the immediate vicinity of the excavated area.



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PLUMBING EXISTING SITE WATER SOUTH

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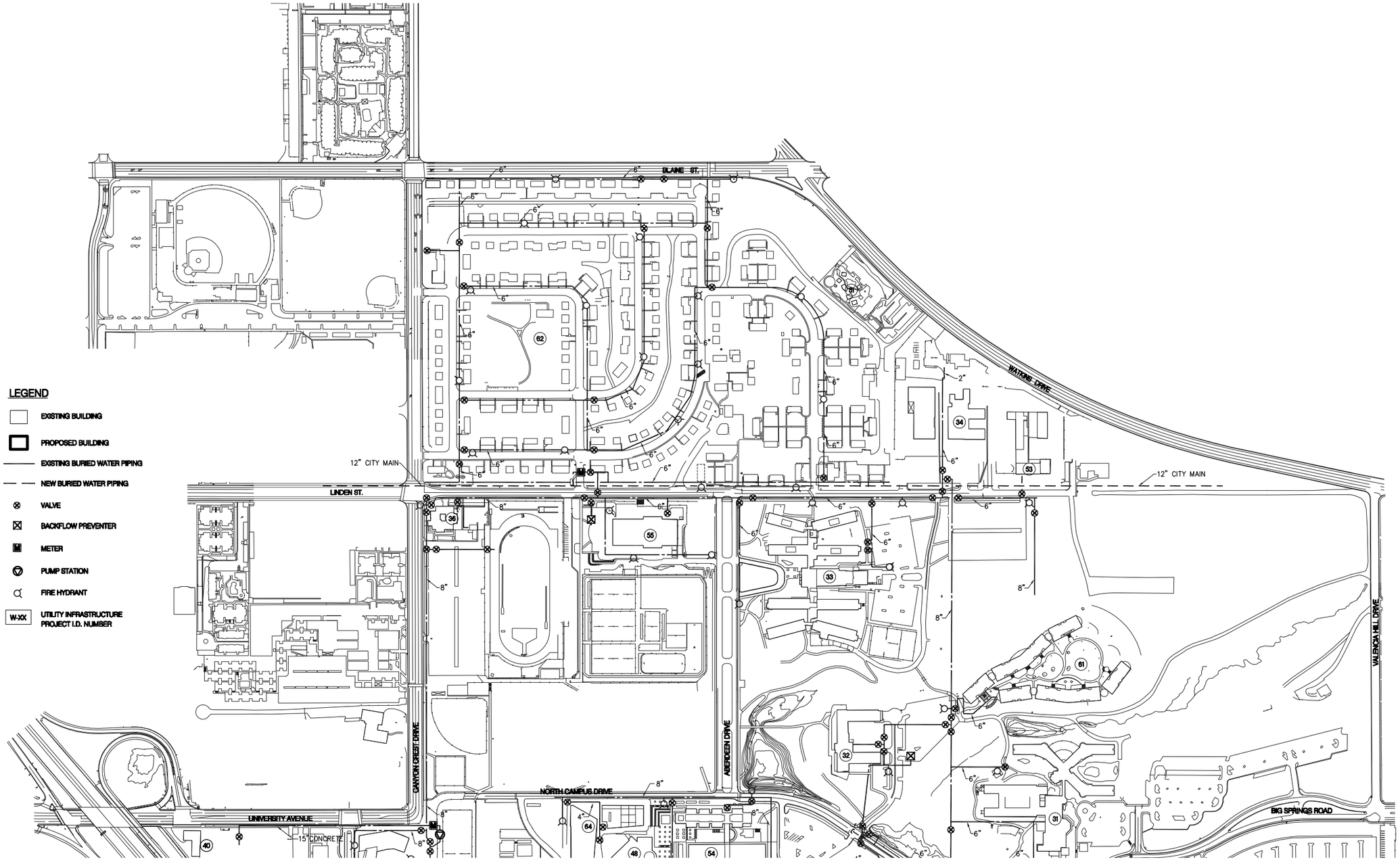
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: W-00S



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PLUMBING EXISTING SITE WATER NORTH

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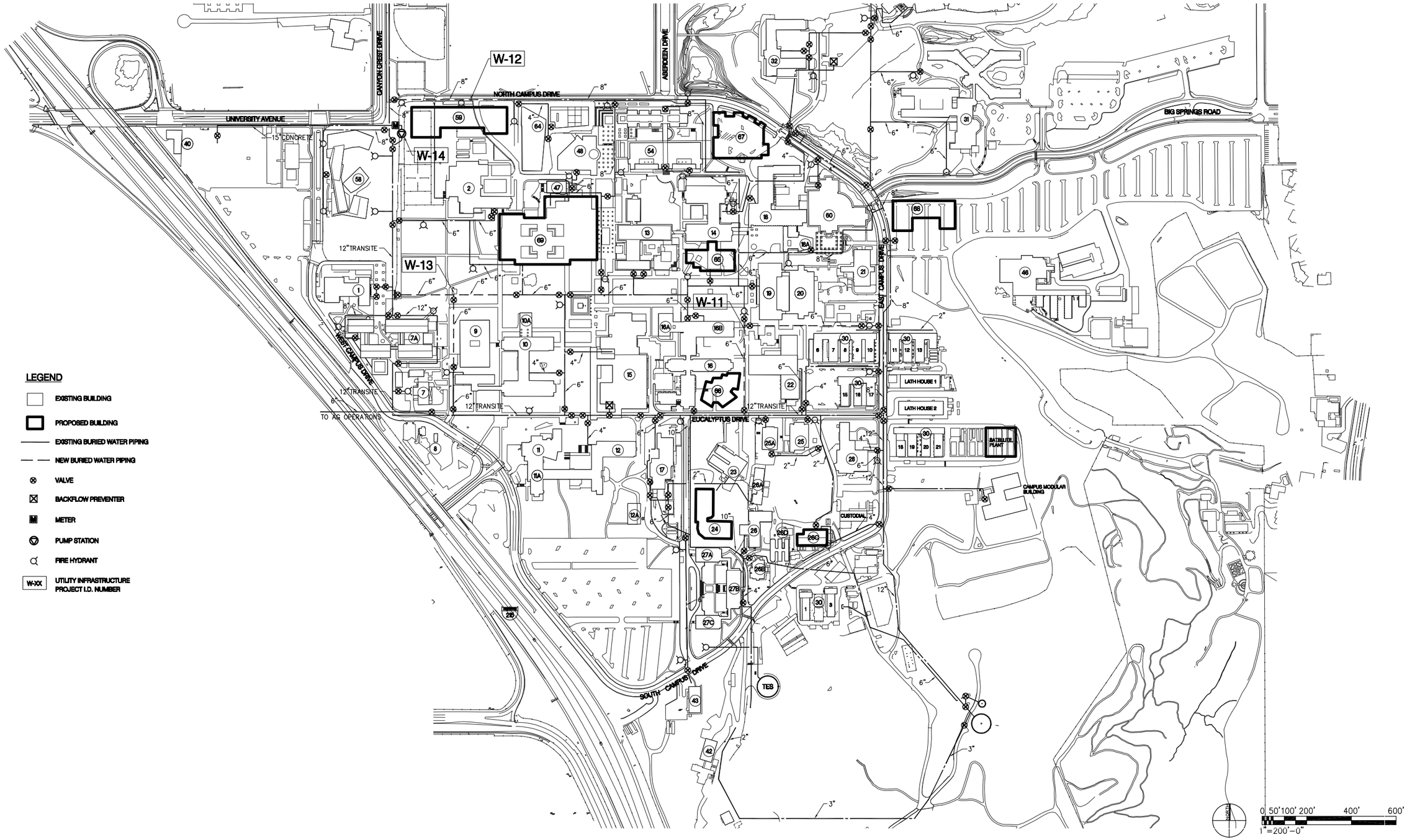
DATE: 01/28/01

SHEET NO: W-00N



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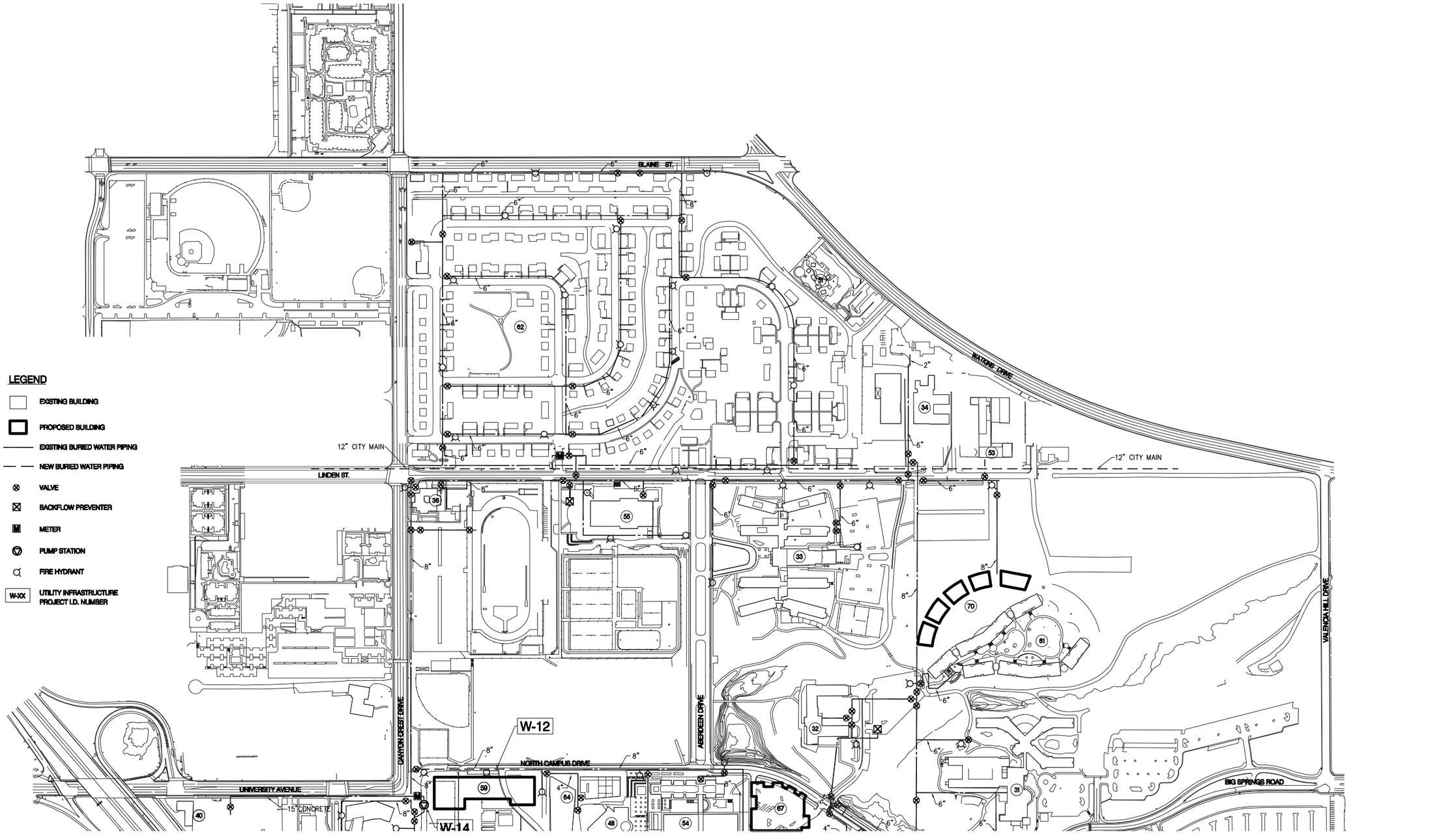

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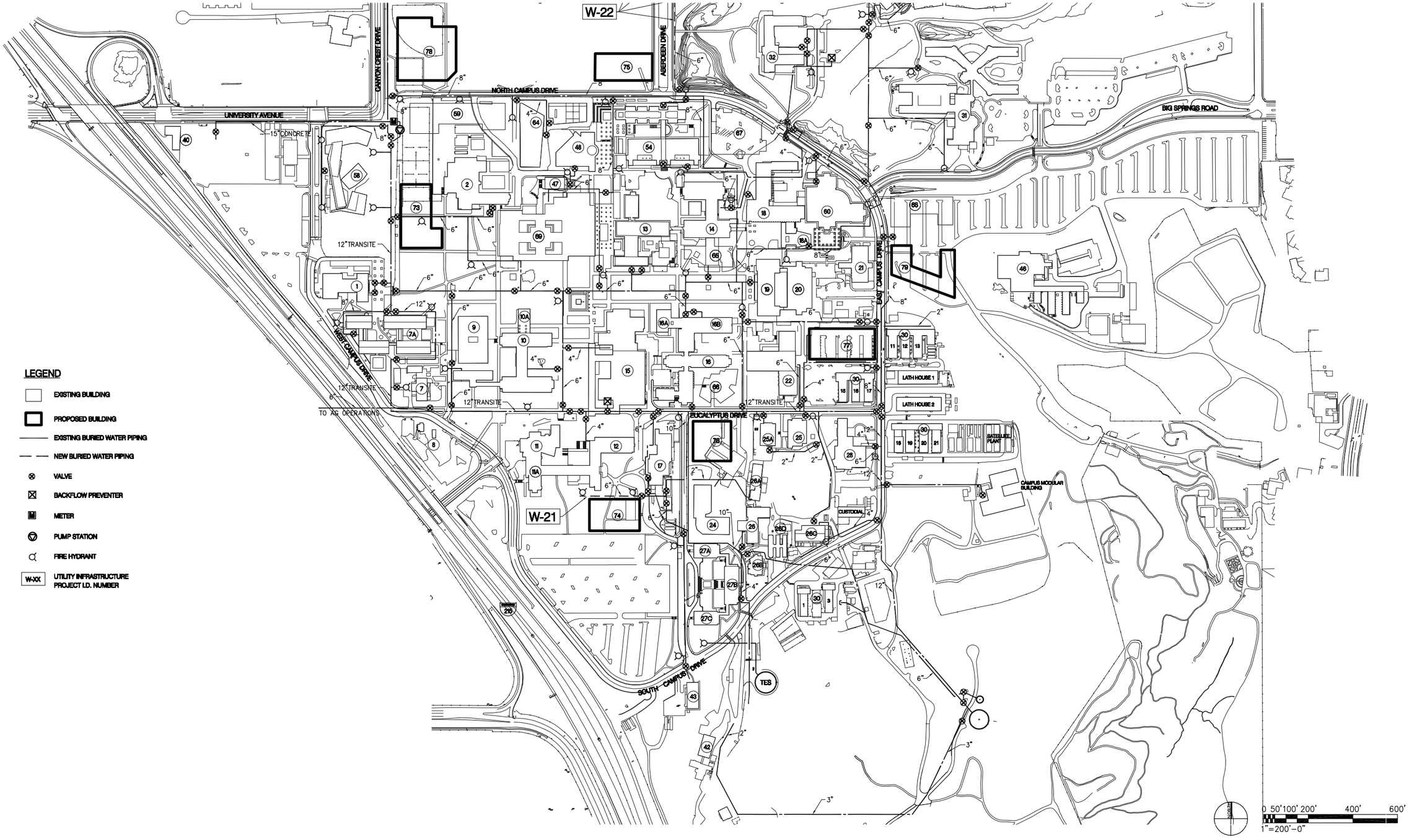

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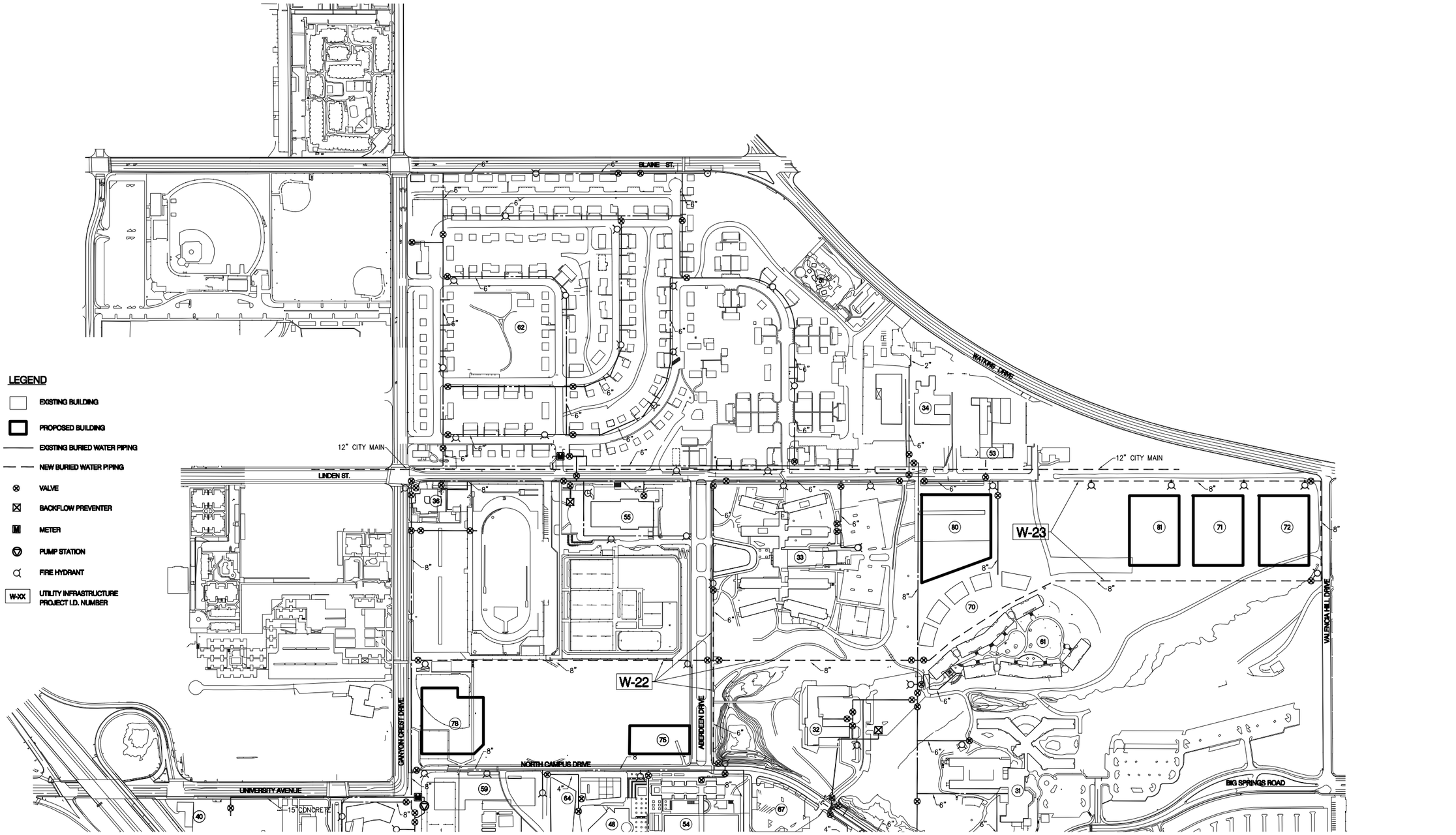

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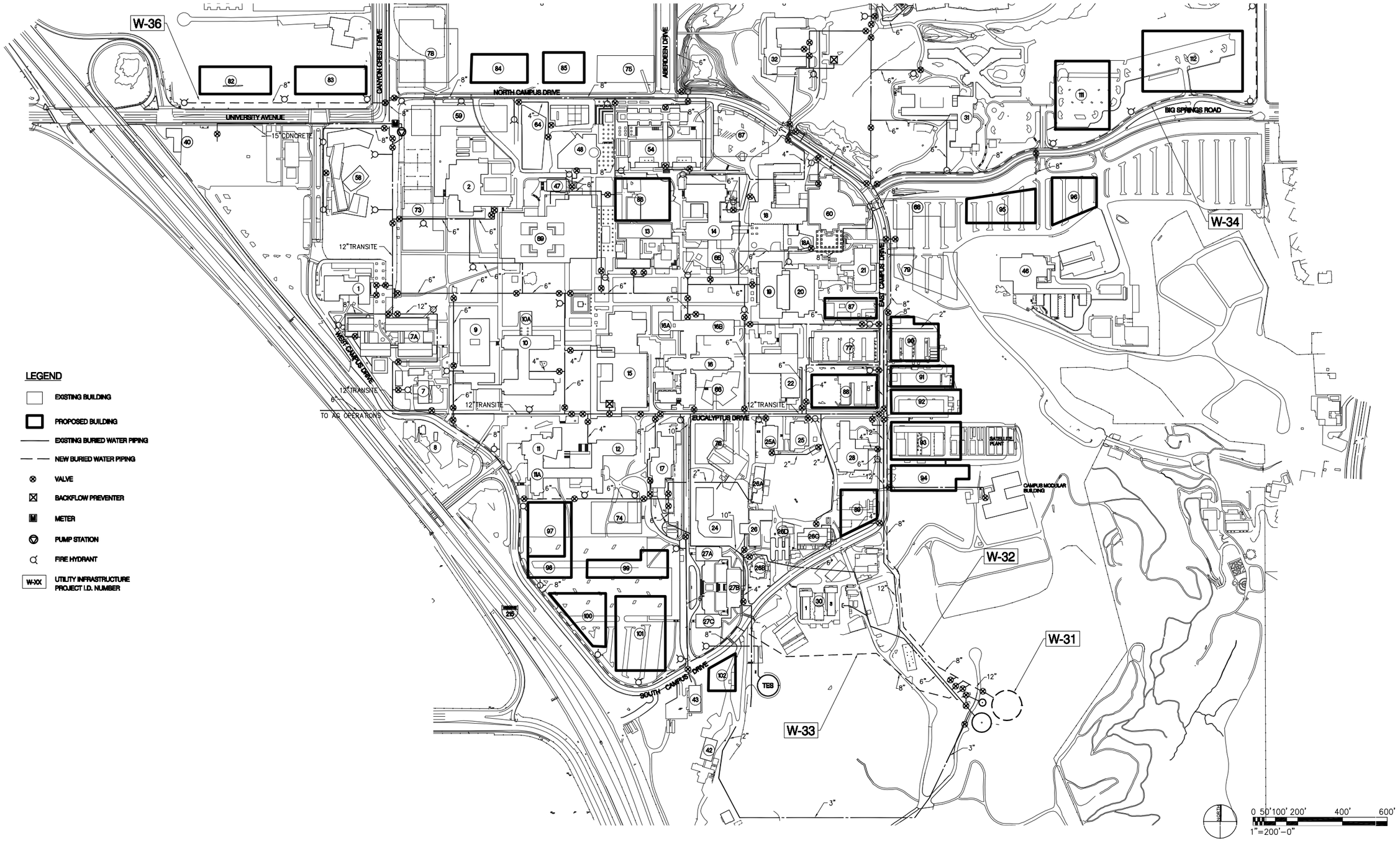

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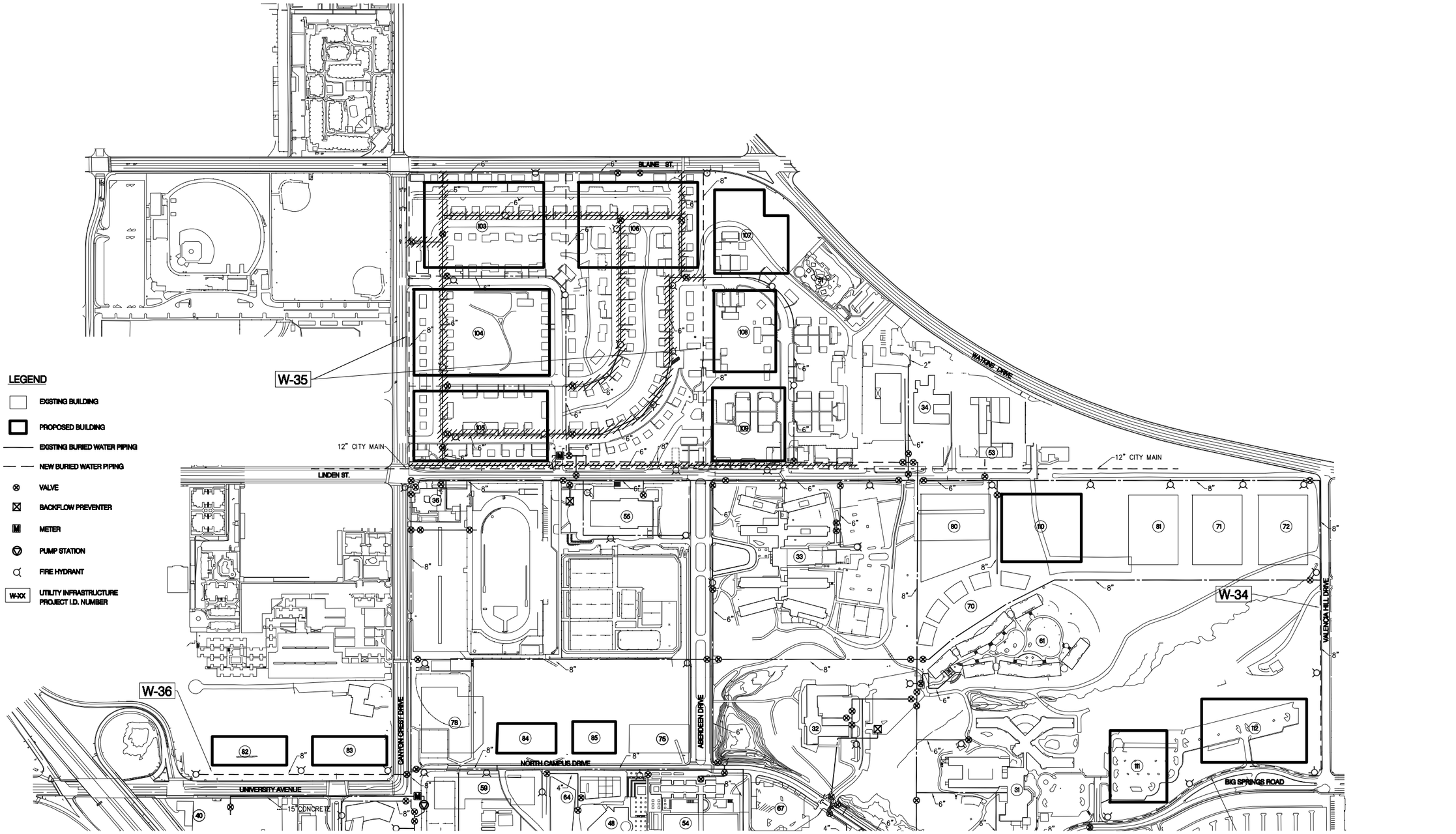

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SECTION 6.0

SANITARY SEWER SYSTEM

6.1 Existing System

The existing campus sanitary sewer system consists of three major arteries – one 8" diameter pipe serving the housing complexes to the north, one 15" diameter pipe running in North Campus Drive serving buildings to the south, and one 8" diameter pipe running in Eucalyptus Drive serving the heart of the campus. There is also an 8" that runs southeast in West Campus Drive and currently serves a limited number of buildings in that area. Tributaries branch out to the various buildings from the mains.

The main service to the north along Canyon Crest Road is owned and maintained by the City of Riverside. The 15" diameter pipe running west to east through University Avenue, North Campus Drive and due east paralleling Box Spring Drive to Valencia Hill Drive is also City owned. The majority of the remaining pipes serving the campus are owned and maintained by the University. See drawings SS-00S and SS-00N at the end of this section for existing site plans.

The City of Riverside and the University entered into an agreement in 1961 regarding the 15" line along North Campus Drive. This pipe runs in an easement along UCR property. The agreement states UCR is limited to discharge sewage into the 15" diameter pipe in the amount equal to an 8" diameter main. The City determined this to be 1.55 CFS peak flow. Any additional load beyond this amount is to be negotiated between the City and UCR. Estimated current flow into the 15" main is 1.9 CFS. Therefore, it is recommended discussions take place between the two parties.

Past history has indicated that several campus locations are experiencing frequent blockages. These blockages are primarily due to tree roots that find their way into the sanitary sewer piping (ABB Report, 1993 and facility staff). According to the staff, some of these locations do require regularly scheduled "roto-rooting" to maintain proper flow in the system. The most significant of the blockage occurs in the line running in the street of Eucalyptus Drive between manholes A8 and A12. Other areas include underground piping between manholes A13c and A13d, A13c2 and A13c3, A18 and A18a, D4 and D4a, D4c south, D6 and D6b, and A15i and A15k.

Throughout this report, the previously assigned alphanumeric tags currently used by the University Facility Staff will identify each campus manhole. A1 is identified as the most westerly manhole located at the intersection of University Avenue and Interstate 215/60. For the balance of the manholes and their tags, see drawings SS-00S and SS-00N.

Sewer mains have been tracked (Kennedy/Jenkins, April 1999) as to flow at various locations throughout the campus. Although flow was not measured at every manhole, the major intersections were consistent with expectations. The further away the manhole was from A1, the smaller the flow and the closer the manhole was to the A1 connection, the higher the flow. All flow ultimately is routed through to the campus

manhole A1 or the 15" City Main which then goes to the City of Riverside Regional Water Quality Control Plant for wastewater treatment. The invert elevations from the highest manhole A15 (at the south end of the campus) attached to the system is approximately 108 feet above manhole A1 flow line. This translates to an average slope in the longest run of less than ¼"/Ft. For optimum sewer line design, a slope of at least ¼"/Ft continuous is desired.

In a more recent study (MRC, 2001), a flow study was made and the results indicated that the 15" diameter service line into manhole D1 is 90% full during peak periods (currently calculated to be 2.5 CFS @ between 1/8"/FT and ¼"/FT slope). The other finding was that the 8" diameter line into manhole A1 is 100% full during the peak periods. Discussions with MRC revealed a very conservative approach to determining a full flow pipe. Bechard Long has determined that the 15" line is capable of 4.1 CFS and therefore would be considered 60% full (see City supplied pipe sizing graphs in Appendix D). The 8" line has its main blockages occurring upstream of A1 near A8 and A9. This is due to poor slope down Eucalyptus Drive (see drawing SS-00S at the end of this section).

The Manhole D1 serves the housing units north of University Avenue and the buildings due east or just south of North Campus Drive. Manhole A1 receives the load from the buildings at the southern and eastern portions of the campus. It is assumed that the 100% full line is that line that connects manhole A2 and A1. The 8" line from the "C" manholes would not have the load to fill the line unless the swimming pool is being drained. For this report, it is assumed that the draining of the pool does not occur at the time peak flow occurs in manhole A1.

6.2 Analysis Assumptions and Methodology

To determine peak hourly sewer flow, it was assumed that 90% of the domestic water demand would end up in the sanitary sewer system. Since the domestic water demand is partially based on the above mentioned MRC Technologies sewer study (see Appendix D), the calculated current peak hourly sewer flow for the entire campus is 2,065 gpm, corresponding to the results of the study. Individual building sewer load is based on 90% of the building peak domestic water demand, which gives a different average gpm/gsf amount per building type, i.e. dormitory, greenhouse, and typical. For future buildings, 90% of the calculated building peak domestic water demand was used to calculate anticipated sewer load. See Table 6.1 (shown on pages 6-3, 4) for calculated sewer load for existing buildings, and Table 6.2 (shown on pages 6-5, 6) for calculated sewer load for future buildings.

Based on these individual building demands, piping network calculations were completed to determine current areas of inadequate capacity. Future building demands were then added to these calculations to determine any new infrastructure projects that would need to be completed to support future building construction. In determining system capacity, charts were used that were obtained from the City of Riverside: "Design Capacities for Clay Pipe Sewers", which can be found in Appendix D. The roughness factor used was n=0.013, and the slopes were determined from manhole inverts taken from drawings provided by UCR. These charts were also used in sizing pipe for future infrastructure projects.

Table 6.1: Existing Building Sewer Load

BUILDING	No.	G.S.F.	Date	Peak GPM	Peak CFS
Aberdeen Hall	33	133,435		134.9	0.30
Administration - Hinderaker Hall	1	46,490	1960	25.8	0.06
Anderson Hall	27B & C	See 27A	1917	See 27A	
Art Annex	12A	2,645	1973	1.5	0.01
Barn Group	7	5,600		3.1	0.01
Batchelor Hall (North & South)	22	114,860	1965	63.8	0.14
Bookstore	48	33,400	1991	18.5	0.04
Bourns Hall	54	145,309	1995	80.7	0.18
Boyce Hall	20	109,932	1974	61.0	0.14
Boyden Lab Building	26A	6,396	1961	3.6	0.01
Campus Modular Building		21,960	2000	12.2	0.03
Canyon Crest Student Family Housing	62	197,266		109.5	0.24
Carillon Tower	5	4,774	1966	2.6	0.01
Central Power Plant	17	19,437	1953	10.8	0.02
Chapman Hall -Soils & Plant Nutrition	27A	51,941	1931	28.8	0.06
Chemical Sciences	13A	See 13	1990	See 13	
Child Development Center	51	12,000	1996	6.7	0.01
College Building North & South	42	17,944	1963	10.0	0.02
Commons	4	86,004	1965	47.7	0.11
Computer Statistics	21	42,096	1974	23.4	0.05
Corporation Yard	34	45,000	1959	25.0	0.06
Costo	3	See 4	1965	See 4	
Custodial		7,446	1965	4.1	0.01
Entomology	26	32,444	1932	18.0	0.04
Entomology Annex	23	16,664	1948	9.2	0.02
Entomology Research Museum	26B	8,988	1993	5.0	0.01
Environmental Health and Safety	43	6,334	1989	3.5	0.01
Fawcett Lab	28	20,997	1965	11.7	0.03
Fine Arts	58	100,371	2001	55.7	0.12
Geology	14	103,095	1952	57.2	0.13
Greenhouse 11-13A	30	17,500	1955	9.7	0.02
Greenhouse 1-3	30	15,000	1988	8.3	0.02
Greenhouse 15-17	30	15,000	1956	8.3	0.02
Greenhouse 18-21	30	20,000	1965	11.1	0.02
Greenhouse 6-10	30	25,000	1952	13.9	0.03
Humanities-1	7A	111,180	1996	61.7	0.14
Humanities-2	11A	See 12	1963	See 12	
Insectary	26D	8,783	1959	4.9	0.01
Lath House #1		5,000		2.8	0.01
Lath House #2		5,000		2.8	0.01
Life Sciences	16	150,994	1948	83.8	0.19
Life Sciences	16A	See 16	1969	See 16	
Lothian Hall	31	163,250		169.5	0.38
Mobile Trailer Facilities	29	15,691	1971	8.7	0.02
Olmstead Hall (Humanities-2)	12	141,049	1963	78.3	0.17

Table 6.1: Existing Building Sewer Load

BUILDING	No.	G.S.F.	Date	Peak GPM	Peak CFS
Parking Services	53	5,612	1993	3.1	0.01
Pentland Hills	61	134,544	2000	137.6	0.31
Physical Education	2	65,346	1953	36.3	0.08
Physics	18	94,808	1965	52.6	0.12
Physics 2000	18A	See 18		See 18	
Pierce Hall (North & South)	13	139,912	1966	77.7	0.17
Police Facility	36	9,320	1998	5.2	0.01
Rivera Library	15	230,013	1960	127.7	0.28
Science Library	60	167,358	1998	92.9	0.21
Speith Hall -Life Sciences	16B	See 16	1958	See 16	
Sproul Hall	9	78,870	1965	43.8	0.10
Student Recreation Center	55	80,000	1994	44.4	0.10
Surge Building	64	84,375	2001	46.8	0.10
Telephone Building	40	2,584	1965	1.4	0.01
Terrace Conference	47	4,880	1991	2.7	0.01
Theatre	11	See 12	1996	See 12	
University Cottage	8	1,025	1916	0.6	0.01
University Lab	25A	11,803	1994	6.6	0.01
University Offices	25	19,650	1991	10.9	0.02
USDA Salinity Lab	46				
Veitch Student Center	32	24,180	1961	13.4	0.03
Watkins Hall	10	63,913	1953	35.5	0.08
Webber Hall	19	50,801	1953	28.2	0.06
SUBTOTAL		**3,355,269**		**2,065.0**	**4.61**

Table 6.2: Future Building Sewer Load

BUILDING	No.	G.S.F.	Date	Peak GPM	Peak CFS
2002 - 2005					
Alumni/ Visitor Center	59	25,890	2005	14.4	0.03
Biological Science	66	55,071	2005	30.6	0.07
Boiler Plant (additional load)			2005		
Commons Expansion	69	186,004	2005	103.2	0.23
Demo Commons	4	(86,004)		(47.7)	(0.11)
Engineering Unit #2	67	152,010	2005	84.4	0.19
Entomology	24	67,139	2002	37.3	0.08
Insectory & Quarantine	26C	31,523	2002	17.5	0.04
Physical Science #1	68	129,417	2005	71.8	0.16
Satellite Central Plant		7,000	2005	3.9	0.01
Science Lab #1	65	44,138	2001	24.5	0.05
Pentland Hills #2	70	67,500	2002	69.0	0.15
SUBTOTAL		**679,688**		**408.8**	**0.91**
CUMULATIVE TOTAL		**4,034,957**		**2,473.8**	**5.52**
2006 -2010					
Housing Unit #2	71	60,000	2010	61.4	0.14
Housing Unit #3	72	60,000	2010	61.4	0.14
CHASS Bldg 1	73	115,000	2010	63.8	0.14
CHASS Bldg 2	74	85,000	2010	47.2	0.11
Boiler Plant (additional load)			2010		
Demo Art Annex	12A	(2,645)		(1.5)	(0.01)
Engineering Unit #3	75	150,000	2010	83.3	0.19
Entomology #2	76	100,000	2010	55.5	0.12
Demo Entomology Annex	23	(16,664)		(9.2)	(0.02)
Genomics	77	120,000	2010	66.6	0.15
Performing Arts	78	75,000	2010	41.6	0.09
Physical Science #2	79	130,000	2010	72.2	0.16
Satellite Plant Expansion		0	2008	0.0	0.01
Housing Unit #4	80	93,750	2007	95.9	0.21
Housing Unit #5	81	93,750	2010	95.9	0.21
SUBTOTAL		**1,063,191**		**733.9**	**1.64**
CUMULATIVE TOTAL		**5,098,148**		**3,207.7**	**7.16**
2011 -2015					
Student/ Administration Cluster:					
Boiler Plant (additional load)			2015		
Building 1	82	100,000	2015	55.5	0.12
Building 2	83	100,000	2015	55.5	0.12
Building 3	84	120,000	2015	66.6	0.15
Building 4	85	50,000	2015	27.8	0.06
Science Cluster:					
Building 1 (lab)	86	100,000	2015	55.5	0.12
Demo 20% of Pierce Hall	13	(27,982)		(15.5)	(0.03)
Building 2 (classroom)	87	100,000	2015	55.5	0.12

Table 6.2: Future Building Sewer Load

BUILDING	No.	G.S.F.	Date	Peak GPM	Peak CFS
Science Bldg. (lab)	88	100,000	2015	55.5	0.12
Demo Greenhouse 15-17	30	(15,000)		(8.3)	(0.02)
Building 4 (classroom)	89	100,000	2015	55.5	0.12
Demo Custodial		(7,446)		(4.1)	(0.01)
Demo Entomology	26	(32,444)		(18.0)	(0.04)
Demo Insectary	26D	(8,783)		(4.9)	(0.01)
Building 5 (lab)	90	100,000	2015	55.5	0.12
Demo Greenhouse 11- 13A	30	(17,500)		(9.7)	(0.02)
Building 6 (classroom)	91	100,000	2015	55.5	0.12
Demo Lath House #1		(5,000)		(2.8)	(0.01)
Building 7 (lab)	92	100,000	2015	55.5	0.12
Demo Lath House #2		(5,000)		(2.8)	(0.01)
Building 8 (classroom)	93	120,000	2015	66.6	0.15
Demo Greenhouse 18-21	30	(20,000)		(11.1)	(0.02)
Building 9 (lab)	94	120,000	2015	66.6	0.15
Physical Science #3	95	130,000	2015	72.2	0.16
Building 11 (classroom)	96	100,000	2015	55.5	0.12
Future Bldg Devlpmnt in Prkg Lot 6:					
Building 1	97	100,000	2015	55.5	0.12
Building 2	98	50,000	2015	27.8	0.06
Building 3	99	75,000	2015	41.6	0.09
Building 4	100	50,000	2015	27.8	0.06
Building 5	101	150,000	2015	83.3	0.19
Building 6	102	75,000	2015	41.6	0.09
Housing Unit #6	103	112,500	2015	115.1	0.26
Demo Canyon Crest	62	(197,266)		(109.5)	(0.24)
Housing Unit #7	104	112,500	2015	115.1	0.26
Housing Unit #8	105	112,500	2015	115.1	0.26
Housing Unit #9	106	112,500	2015	115.1	0.26
Housing Unit #10	107	112,500	2015	115.1	0.26
Housing Unit #11	108	112,500	2015	115.1	0.26
Housing Unit #12	109	112,500	2015	115.1	0.26
Housing Unit #13	110	112,500	2015	115.1	0.26
Housing Unit #14	111	112,500	2015	115.1	0.26
Housing Unit #15	112	112,500	2015	115.1	0.26
SUBTOTAL		**2,828,579**		**2,096.1**	**4.67**
GRAND TOTAL		**7,926,727**		**5,303.8**	**11.83**

6.3 Growth Requirements

The future campus growth will significantly impact the existing sanitary system. A review of the projected campus growth and capacity requirements is reflected in Table 6.2 (shown on pages 6-5, 6). Sewer capacity is expected to increase 50% during the next ten years and over 150% by 2015 to meet the projected growth of the campus. As a result, some major replacement projects upgrading sewer capacity will be needed. The City of Riverside will also have to be consulted in regard to the capacity of its lines in University Avenue and Canyon Crest Drive.

In the 1993 report by ABB, capacities of 8.2 CFS for a 15" diameter pipe, and 1.55 CFS for an 8" diameter line were given by the City of Riverside. These numbers were based on a slope of 5/8"/FT slopes. A review of the elevations given in the drawings provided by the campus indicate that the slope of the sewer lines generally range from less than 1/8"/FT to ¼"/FT. This significantly reduces the line capacity.

As mentioned in Section 6.1, the MRC study suggested a 90% full reading on the 15" line at D1. Bechard Long calculations determined the current peak flow in that line to be 2.5 CFS, and that the line had a maximum capacity of 4.1 CFS, thus 60% full. However, two eyewitness accounts (Jerry Higgins-UCR and Eric Keith-MRC) reported near full flow on two separate occasions. For this reason and the fact that Pentland Hills 2 will be coming on line this September, the replacement and upgrade of this line was originally recommended as an urgent project.

On February 25, 2001, a video scope was performed under the supervision of UCR physical plant members. Blockages in the form of sandbags, concrete chunks, and grease lining the sides of the pipe were found. These blockages are currently scheduled for removal and based on these findings, the project to replace and upgrade the 15" line was postponed to the time period 2006-2010.

6.4 Infrastructure Projects, 2002-2005 (outlined on page 6-11)

The current construction program calls for several of the new buildings to be constructed along North Campus Drive. These buildings would tie into the sewer line D. There are also several buildings to be constructed in the central and south parts of the campus and these buildings would be tied into the sewer main in Eucalyptus Street (sewer line A).

During this period, the recommendation is to replace the 8"diameter sewer line from manhole A12 down to the main manhole A1 with a new 12" diameter SDR 35 PVC line (project SS-11). The existing 8" line is undersized for the capacity and slope required. Even with a clean pipe, the root problem was not the cause for the various blockages. The slope from A12 to A8 is less than ¼"/Ft, but as the line turns the corner at A8, the line slope is reduced to 1/8"/FT. This will contribute to slowing down the flow and with the undersized line, backup of the system will occur at peak periods. During the replacement effort for the 12" diameter line, the "B" line could be used as a temporary by-pass line so the campus is not completely without waste disposal. Close

coordination will be required and work must occur during "off hours" in order to accomplish the cross over phasing of the work.

Along with changing out the line on West Campus Drive to Eucalyptus, various other blockages have occurred and should be addressed at this time. Projects SS-12 through SS-19 involve replacement of these blocked lines. The campus staff has identified each of the above referenced lines as blockage areas. Since these lines are relatively short in length (approximately 100 feet between manholes), the problem may be due to tree roots migrating into the pipes. Each of the lines should be replaced with PVC pipe (SDR-35) and sloped down at a minimum of ¼" per foot in the direction of flow. Replacement in these cases should not include mechanical fittings, but should utilize solvent cement joints. Expansion and contraction should not be a problem due the short length of run and the burial in a constant temperature environment (underground).

It was noted in an earlier report that the cleanout A13c2 is undersized for cleaning purposes. The cleanout is a 4" opening into a 6" line. In the 1988 report it was recommended that the cleanout be replaced with a sewer manhole. As part of the SS-14 project, a manhole has been included.

All sewer projects in this timeframe should be completed by July of 2003, due to the urgency of these problems, and the potential consequences if action is not taken.

The total cost for all projects during this period is $1,854,000. Project descriptions can be found in Table 6.3 (shown on page 6-11) at the end of this section, and project locations are shown on drawings SS-10S and SS-10N, immediately following Table 6.3. Detailed cost estimates for each project can be found in Appendix D.

Replacement of water and sewer mains were estimated using open cut, removal, replacement, backfill and restoration. These projects should be bid to allow "pipe-bursting" technology. This reduces the amount of excavation significantly, and provides a replacement pipe of high density polyethylene (HDPE). HDPE is fused together, providing a leak-free piping system. Depending on the specific requirements of the project, pipe bursting offers shorter construction scheduled, greatly reduced excavation and potentially lower cost.

6.5 Infrastructure Projects, 2006-2010 (outlined on page 6-12)

Due to the additional building construction in this time period, two major projects will have to be undertaken. A total of 11 buildings will be added, totaling approximately 1,060,000 square feet. This corresponds to a 35% increase in sewer load.

The additional buildings in the south campus area will increase the sewer load beyond the capacity of the current 15" artery in North Campus Drive. Project SS-21 involves the replacement of this main line with an 18" line. This is a City owned line and the University needs to negotiate fiscal responsibility for improvements to this line.

The addition of four dormitory buildings south of Linden Street and west of Valencia Hill Drive will require a substantial increase in the capacity of the sewer mains running down Linden Street. Currently, there are two mains running down Linden Street. The 8" "F" line is on the south side of Linden, and is in good condition. The 8" "G" line is on the north side of Linden, and is in very poor condition, but has adequate slope. Because of this, project SS-22 recommends that the "G" line be replaced with a 12" line, and then continued east to serve the new buildings.

Although it is not part of the University's responsibility, with the new additions during this period, it will be necessary for the City to address the existing 15" diameter street main in University Avenue, and the existing 8" main in Canyon Crest Drive. Replacement will depend on the slope of the mains in the street. If sizing is based on ¼" per foot, then an 18" diameter would be required between manhole D1 and the City main, and a 15" line would be required between manhole G1 and D1. However, it is not the intent of this report to address the capacity of the City's sewer system to accept the waste flow from the campus. A short 8" main also needs to be installed to serve the planned development of the existing parking lot 6 (project SS-23).

The total cost for all projects during this period is $2,888,000. Project descriptions can be found in Table 6.3 (shown on page 6-12) at the end of this section, and project locations are shown on drawings SS-20S and SS-20N, immediately following Table 6.3. Detailed cost estimates for each project can be found in Appendix D.

6.6 Infrastructure Projects, 2011-2015 (outlined on page 6-13)

The current plan adds the majority of the new buildings in the East Campus area from University Avenue south between 2010 and 2015. During this time period, 21 buildings are planned, totaling 2,020,000 GSF of new construction. At that time the student enrollment is expected to reach 25,000 students. To accommodate this growth, the campus would need to effectively double its sanitary waste capacity.

Two expansion projects to the sewer mains along East Campus Drive and West Campus Drive will be required in this period. Project SS-31 is a 1200-foot replacement of existing 6" and 8" diameter lines in East Campus Drive with a new 12 " line. Project SS-32 is a 600-foot extension of 8" diameter pipe from manhole B11 east to serve the new planned development of the existing parking lot 6. A new manhole (included) will be required at the end of the 8" diameter line in SS-32. In association with the SS-31 service, it would require that the existing 6" diameter pipe be abandoned after the new 12" diameter line is installed.

During the same period multiple housing units are planned for the northern portion of the campus. These units will connect directly to the 12" diameter main in Linden Street from project SS-22. The associated cost for connections to the buildings will be included in the project cost as they occur.

The total cost for all projects during this period is $909,000. Project descriptions can be found in Table 6.3 (shown on page 6-13) at the end of this section, and project

locations are shown on drawings SS-30S and SS-30N, immediately following Table 6.3. Detailed cost estimates for each project can be found in Appendix D.

Table 6.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2002-2005	-	**West Campus Drive, Eucalyptus Drive**	**SS-11**	**Replace existing 8" underground main in West Campus Drive and Eucalyptus between manholes A1 and A13 with 12" PVC pipe. Slope line at 1/8" per foot.**	$ 1,306,000
2002-2005	-	Eucalyptus Drive	**SS-12**	Replace existing 8" sewer line between manholes A15 and A17.	$ 78,000
2002-2005	16A	Life Sciences	**SS-13**	Replace existing 6" sewer line between manholes A13c and A13d.	$ 39,000
2002-2005	16, 16B	Life Sciences	**SS-14**	Replace existing 8" sewer line between manholes A13c2 and A13c3.	$ 53,000
2002-2005	26A	Boyden Lab Building	**SS-15**	Replace existing 8" sewer line between manholes A18 and A18a	$ 53,000
2002-2005	13, 69	West of Pierce Hall	**SS-16**	Replace existing 8" sewer branch between manholes D4 and D4a.	$ 78,000
2002-2005	13	Pierce Hall	**SS-17**	Replace existing 8" sewer from manhole D4c south to Pierce	$ 53,000
2002-2005	32	Student Service Center	**SS-18**	Replace existing 8" sewer line between manholes D6 and D6b	$ 78,000
2002-2005	43	Environmental Health and Safety	**SS-19**	Replace existing 4" sewer line between manholes A15i and A15k with new 6" line.	$ 116,000
2002-2005	**Period Total**				**$ 1,854,000**

2002-2005 Reference Dwgs- Sewer- SS-10S & SS-10N

Table 6.3: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2006-2010	-	North Campus Drive	**SS-21**	Notify the City of Riverside that the existing 15" city owned sewer main from D1 to D6 needs to be evaluated for increased sewer capacity. The City of Riverside and the University need to negotiate fiscal responsibility for improvements to this line. It is recommended a new 18" line parallel to the existing 15" underground main in North Campus Drive be installed.	$ 996,000
2006-2010	71 72 80 81	Housing Unit #2 Housing Unit #3 Housing Unit #4 Housing Unit #5	**SS-22**	Replace existing 8" sewer main down the north side of Linden Street with a 12" pipe. Extend 12" pipe east to Watkins Drive, to serve Building 72, Housing Unit #3. Slope line at 1/4" per foot. Reuse existing manholes and fill voids created by re-alignment. Cost of connection to building from main is to be included in the cost of the building.	$ 1,741,000
2006-2010	-	Canyon Crest Drive, University Avenue	-	Notify the City of Riverside that the existing 15" sewer main from D1 west down the north side of University Avenue needs to be evaluated for increased capacity. Notify the City of Riverside that the existing 8" sewer main from G1 to D1 needs to be evaluated for increased capacity.	$ -
2006-2010	74	CHASS #2	**SS-23**	Install new 8" underground sewer pipe from CHASS #2 west to existing B Line between manholes B9 and B10.	$ 151,000
2006-2010	**Period Total**				**$ 2,888,000**
2006-2010 Reference Dwgs- Sewer- SS-20S & SS-20N					
2002-2010	**Cum. Total**				**$ 4,742,000**

Table 6.3: Capital Projects Cost Estimates

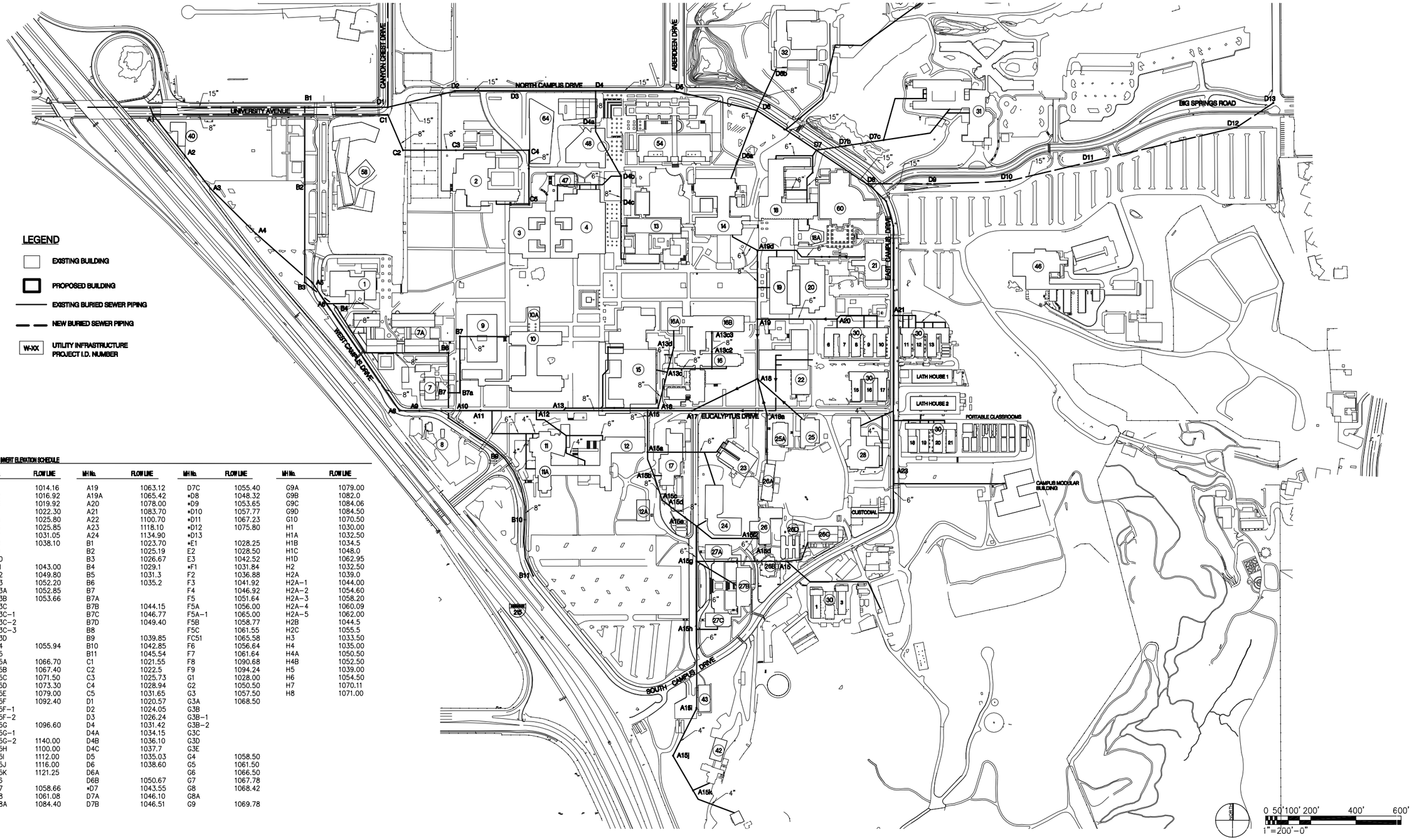
Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	87 88 89 90 91 92 93 94	Science Building #2 Science Building #3 Science Building #4 Science Building #5 Science Building #6 Science Building #7 Science Building #8 Science Building #9	**SS-31**	Replace existing 8" and 6" underground sewer main in East Campus Drive with 12" pipe from manhole D8 to Building 89. Cost of connection to building from main is to be included in the cost of the building.	$ 535,000
2011-2015	97 98 99 100 101	Lot 6 Devlpmnt #1 Lot 6 Devlpmnt #2 Lot 6 Devlpmnt #3 Lot 6 Devlpmnt #4 Lot 6 Devlpmnt #5	**SS-32**	Install new 8" underground sewer main from existing manhole B11 to Building 101 to serve new buildings listed. Cost of connection to building from main is to be included in the cost of the building.	$ 374,000
2011-2015	**Period Total**				**$ 909,000**

2011-2015 Reference Dwgs- Sewer- SS-30S & SS-30N

2002-2015	**Grand Total**				**$ 5,651,000**

- Buildings denoted in bold type are high priority projects

- Project costs do not include curb to curb roadway replacements. Costs do include repair of any roadway, sidewalk, or landscaped area in the immediate vicinity of the excavated area.



MANHOLE INVERT ELEVATION SCHEDULE

MH No.	FLOW LINE	MH No.	FLOW LINE	MH No.	FLOW LINE	MH No.	FLOW LINE
A1	1014.16	A19	1063.12	D7C	1055.40	G9A	1079.00
A2	1016.92	A19A	1065.42	*D8	1048.32	G9B	1082.0
A3	1019.92	A20	1078.00	*D9	1053.65	G9C	1084.06
A4	1022.30	A21	1083.70	*D10	1057.77	G9D	1084.50
A5	1025.80	A22	1100.70	*D11	1067.23	G10	1070.50
A6	1025.85	A23	1118.10	*D12	1075.80	H1	1030.00
A7	1031.05	A24	1134.90	*D13		H1A	1032.50
A8	1038.10	B1	1023.70	*E1	1028.25	H1B	1034.5
A9		B2	1025.19	E2	1028.50	H1C	1048.0
A10		B3	1026.67	E3	1042.52	H1D	1062.95
A11	1043.00	B4	1029.1	*F1	1031.84	H2	1032.50
A12	1049.80	B5	1031.3	F2	1036.88	H2A	1039.0
A13	1052.20	B6	1035.2	F3	1041.92	H2A–1	1044.00
A13A	1052.85	B7		F4	1046.92	H2A–2	1054.60
A13B	1053.66	B7A		F5	1051.64	H2A–3	1058.20
A13C		B7B	1044.15	F5A	1056.00	H2A–4	1060.09
A13C–1		B7C	1046.77	F5A–1	1065.00	H2A–5	1062.00
A13C–2		B7D	1049.40	F5B	1058.77	H2B	1044.5
A13C–3		B8		F5C	1061.55	H2C	1055.5
A13D		B9	1039.85	FC51	1065.58	H3	1033.50
A14	1055.94	B10	1042.85	F6	1056.64	H4	1035.00
A15		B11	1045.54	F7	1061.64	H4A	1050.50
A15A	1066.70	C1	1021.55	F8	1090.68	H4B	1052.50
A15B	1067.40	C2	1022.5	F9	1094.24	H5	1039.00
A15C	1071.50	C3	1025.73	G1	1028.00	H6	1054.50
A15D	1073.30	C4	1028.94	G2	1050.50	H7	1070.11
A15E	1079.00	C5	1031.65	G3	1057.50	H8	1071.00
A15F	1092.40	D1	1020.57	G3A	1068.50		
A15F–1		D2	1024.05	G3B			
A15F–2		D3	1026.24	G3B–1			
A15G	1096.60	D4	1031.42	G3B–2			
A15G–1		D4A	1034.15	G3C			
A15G–2	1140.00	D4B	1036.10	G3D			
A15H	1100.00	D4C	1037.7	G3E			
A15I	1112.00	D5	1035.03	G4	1058.50		
A15J	1116.00	D6	1038.60	G5	1061.50		
A15K	1121.25	D6A		G6	1066.50		
A16		D6B	1050.67	G7	1067.78		
A17	1058.66	*D7	1043.55	G8	1068.42		
A18	1061.08	D7A	1046.10	G8A			
A18A	1084.40	D7B	1046.51	G9	1069.78		

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PLUMBING EXISTING SITE SEWER SOUTH

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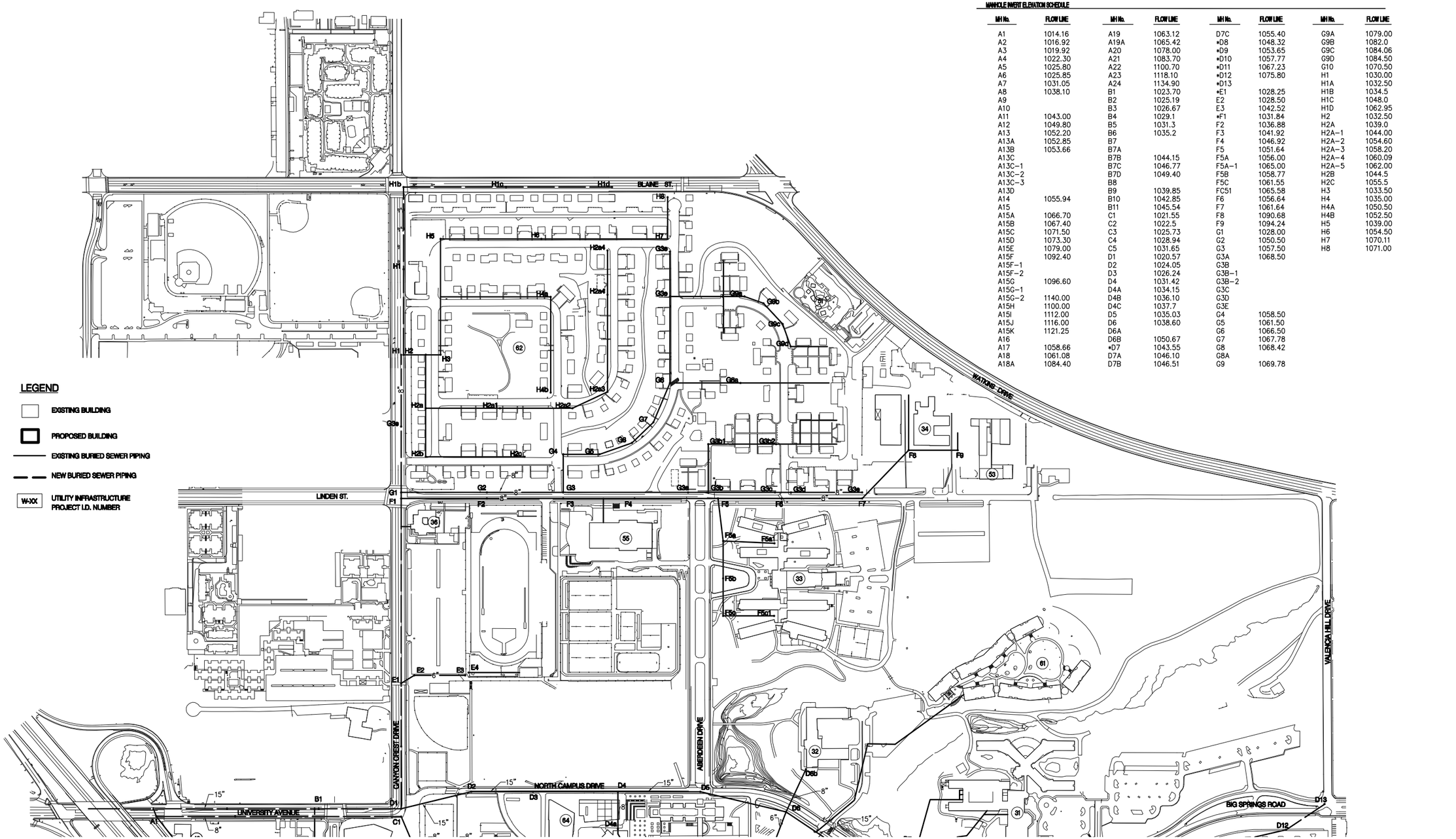
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: SS-00S



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MH No.	FLOW LINE	MH No.	FLOW LINE	MH No.	FLOW LINE	MH No.	FLOW LINE
A1	1014.16	A19	1063.12	D7C	1055.40	G9A	1079.00
A2	1016.92	A19A	1065.42	*D8	1048.32	G9B	1082.0
A3	1019.92	A20	1078.00	*D9	1053.65	G9C	1084.06
A4	1022.30	A21	1083.70	*D10	1057.77	G9D	1084.50
A5	1025.80	A22	1100.70	*D11	1067.23	G10	1070.50
A6	1025.85	A23	1118.10	*D12	1075.80	H1	1030.00
A7	1031.05	A24	1134.90	*D13		H1A	1032.50
A8	1038.10	B1	1023.70	*E1	1028.25	H1B	1034.5
A9		B2	1025.19	E2	1028.50	H1C	1048.0
A10		B3	1026.67	E3	1042.52	H1D	1062.95
A11	1043.00	B4	1029.1	*F1	1031.84	H2	1032.50
A12	1049.80	B5	1031.3	F2	1036.88	H2A	1039.0
A13	1052.20	B6	1035.2	F3	1041.92	H2A-1	1044.00
A13A	1052.85	B7		F4	1046.92	H2A-2	1054.60
A13B	1053.66	B7A		F5	1051.64	H2A-3	1058.20
A13C		B7B	1044.15	F5A	1056.00	H2A-4	1060.09
A13C-1		B7C	1046.77	F5A-1	1065.00	H2A-5	1062.00
A13C-2		B7D	1049.40	F5B	1058.77	H2B	1044.5
A13C-3		B8		F5C	1061.55	H2C	1055.5
A13D		B9	1039.85	FC51	1065.58	H3	1033.50
A14	1055.94	B10	1042.85	F6	1056.64	H4	1035.00
A15		B11	1045.54	F7	1061.64	H4A	1050.50
A15A	1066.70	C1	1021.55	F8	1090.68	H4B	1052.50
A15B	1067.40	C2	1022.5	F9	1094.24	H5	1039.00
A15C	1071.50	C3	1025.73	G1	1028.00	H6	1054.50
A15D	1073.30	C4	1028.94	G2	1050.50	H7	1070.11
A15E	1079.00	C5	1031.65	G3	1057.50	H8	1071.00
A15F	1092.40	D1	1020.57	G3A	1068.50		
A15F-1		D2	1024.05	G3B			
A15F-2		D3	1026.24	G3B-1			
A15G	1096.60	D4	1031.42	G3B-2			
A15G-1		D4A	1034.15	G3C			
A15G-2	1140.00	D4B	1036.10	G3D			
A15H	1100.00	D4C	1037.7	G3E			
A15I	1112.00	D5	1035.03	G4	1058.50		
A15J	1116.00	D6	1038.60	G5	1061.50		
A15K	1121.25	D6A		G6	1066.50		
A16		D6B	1050.67	G7	1067.78		
A17	1058.66	*D7	1043.55	G8	1068.42		
A18	1061.08	D7A	1046.10	G8A			
A18A	1084.40	D7B	1046.51	G9	1069.78		

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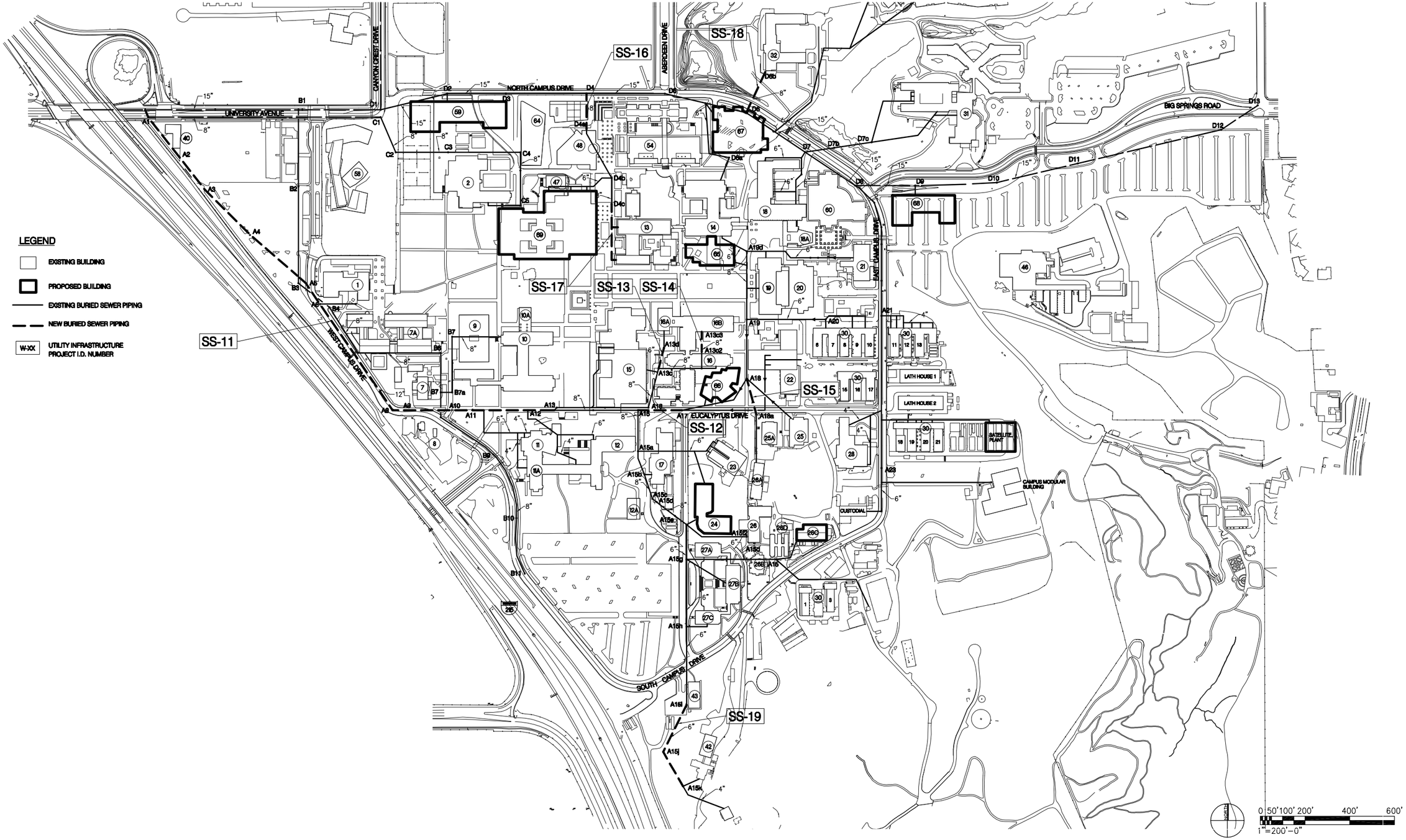

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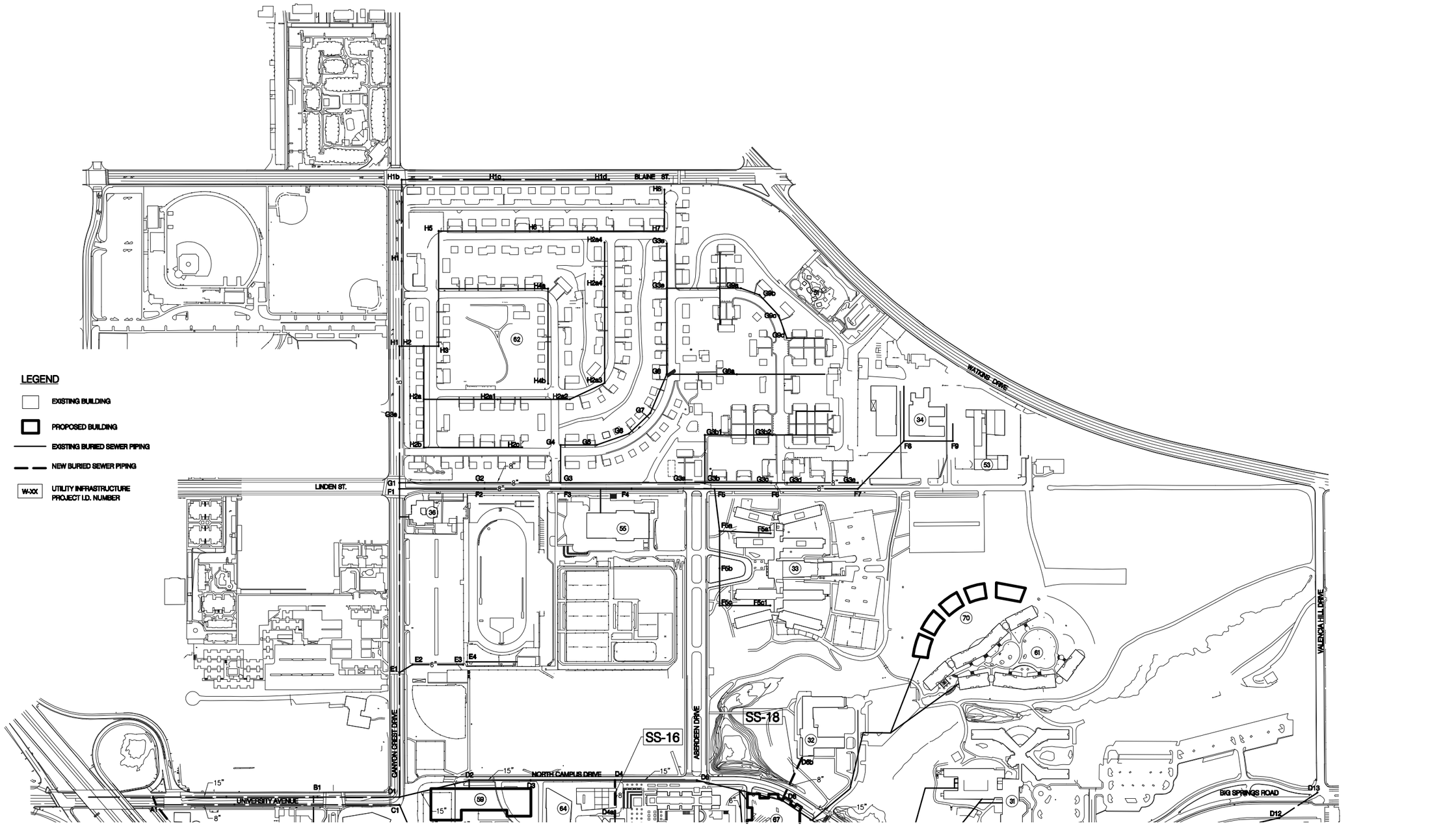

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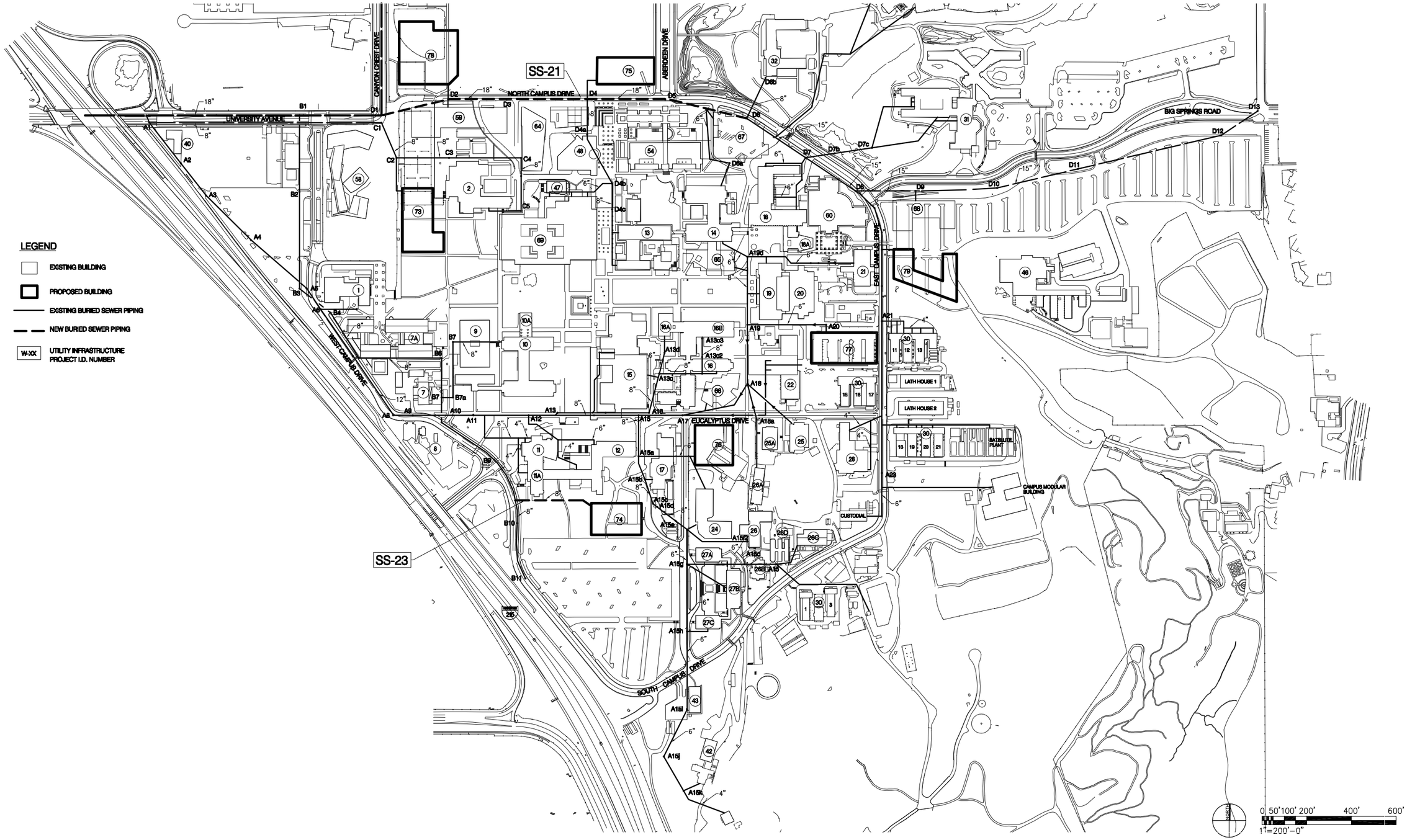

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PLUMBING SITE 2006-2010 SEWER SOUTH

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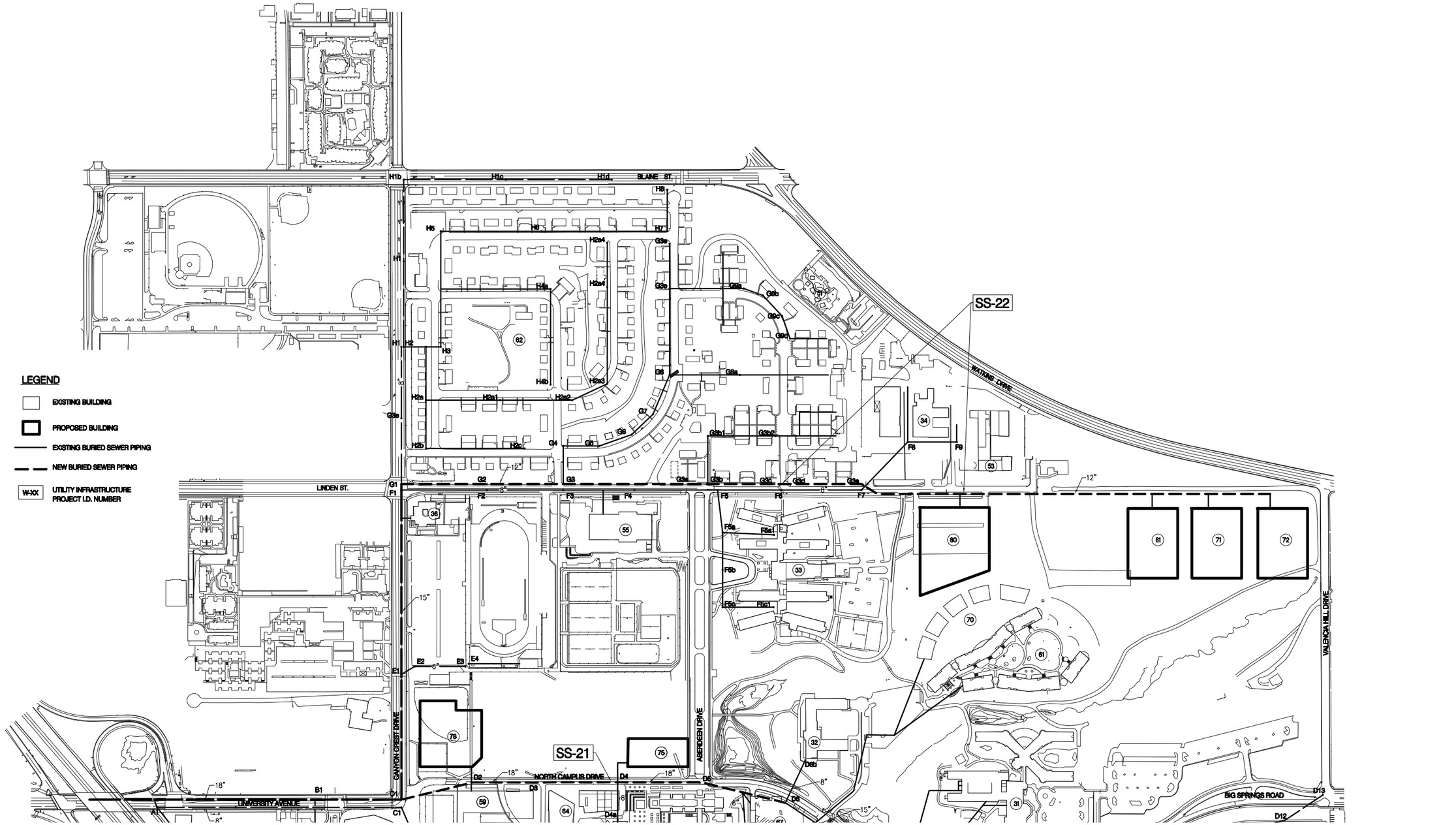
PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: SS-20S



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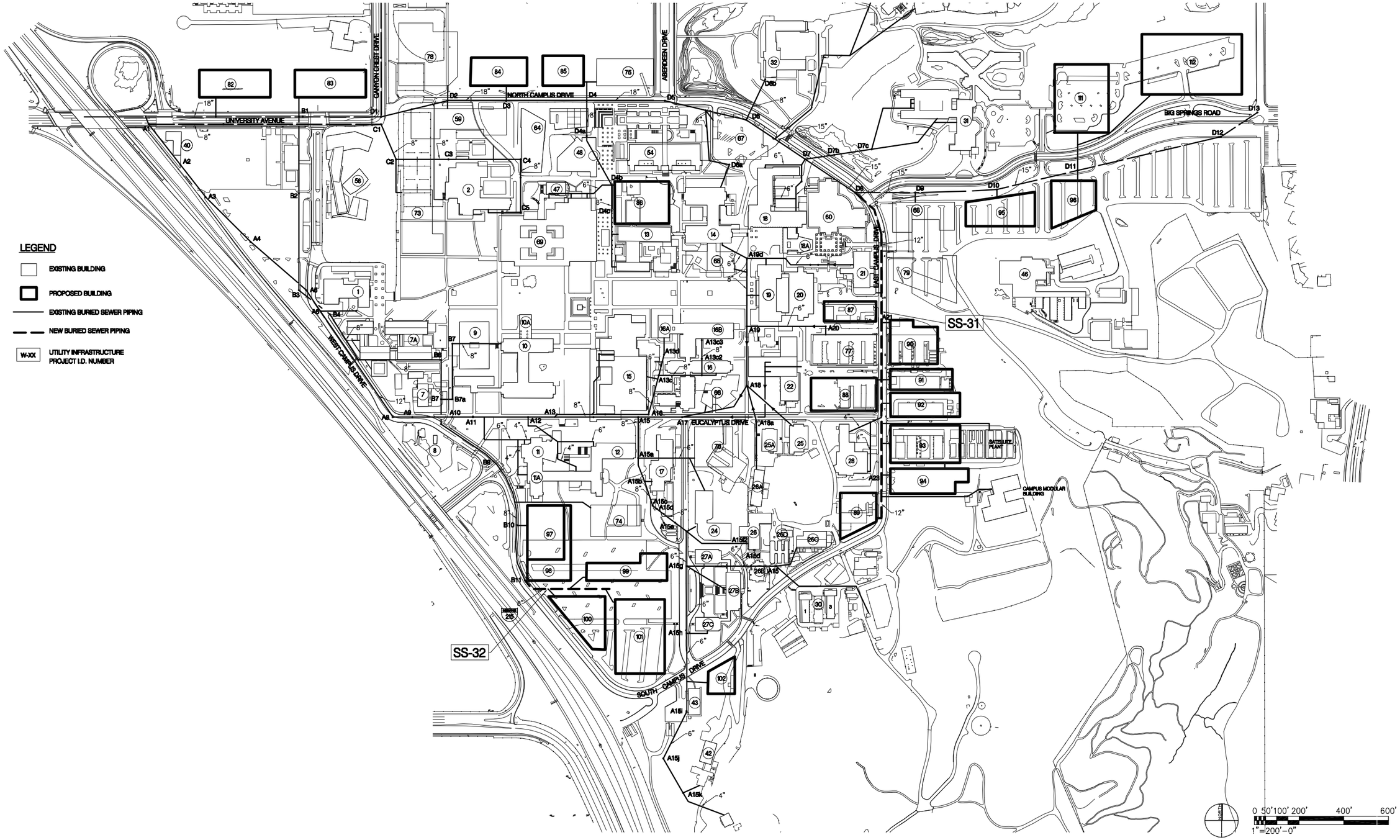

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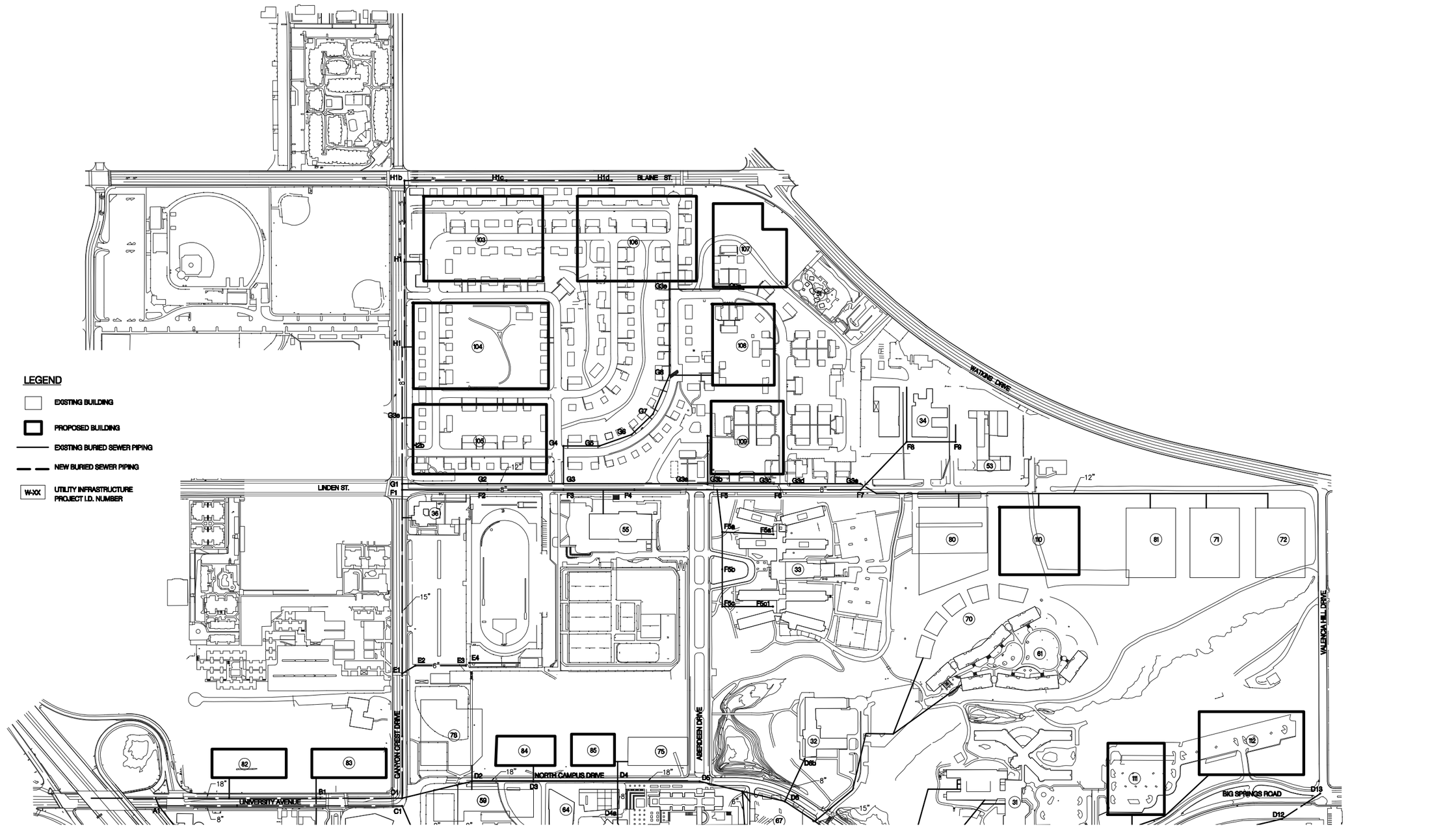

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SECTION 7.0

ELECTRICAL SUPPLY AND DISTRIBUTION SYSTEM

7.1 Existing System

7.1.1 System Description

The campus electrical distribution consists of a 4.16 and 12kV system. The City of Riverside has two 69kV feeders (Hunter and La Colina) to the main substation located at the West Side of Interstate 215. The City then transforms and delivers 4.16 and 12kV to the campus. The Campus has four major points of delivery for power, two each at 4.16kV and 12kV. The City of Riverside totalizes all points of delivery for consumption and demand for billing.

The 4.16kV is delivered via two 5.25 MVA, 69kV - 4.16kV transformers each feeding a 5kV switchgear lineup which are connected via a tie breaker. A total of six radial feeder circuits the University at 4.16kV. The city dedicates all of the 4.16kV transformer capacity to serve the University. The University owns and operates the 5kV switchgear and the 4.16kV feeders.

The 12kV is delivered via two 24 MVA, 69kV – 12.47kV transformers feeding a double ended 15kV switchgear lineup connected by a tie breaker. A total of six feeders (three primary selective circuits, 1AB, 2AB, and 3AB) and two spare (4 AB) serves the University at 12kV. The 15kV switchgear is jointly owned and operated by the University and the City. The 12kV transformer capacity is shared by the University with four 12kV feeders the City owns to serve other loads west of Interstate 215. The University owns the 12kV feeders serving the campus loads. The spare circuit (4 AB) will be used to serve the new campus satellite chilled water plant. See drawings E-00S and E-00N at the end of this section for the existing campus electric distribution system layout.

7.1.2 System Condition

Portions of the 4.16kV distribution system are approximately 50 years old and are deteriorating. In addition, a report prepared by Sampson, Randall, & Press Inc. in 1986 concluded that the projected load growth would exceed the capacity of the 4.16kV system. Thus, to reduce the liability of the continued growth on the 4.16kV system, the University, in the early 1990's, constructed the present 12kV system.

In the recent years, the University has undertaken several projects to transfer some of the loads from the 4.16kV system to the 12kV system. The University has also undertaken projects to replace select equipment with dual rated transformers, 15kV switchgear, and 15kV cabling for an eventual connection to the 12kV system. General descriptions of some of aforementioned projects are as follows:

1. Transfer 4.16kV circuit 1 and 5 to a newly constructed 12kV-4.16kV substation at the Central Plant.

2. Transfer 4.16kV Spieth Hall and Life Sciences loads to the 12kV-4.16kV substation at the Central Plant.
3. Replace Commons substation and connect to 12kV circuits 3A and 3B.
4. Replace PE Building and Tennis Courts substations and connect to 12kV circuits 3A and 3B.
5. Replace Lothian Hall substations and connect to 12kV circuits 2A and 2B.
6. Replace Aberdeen and Inverness Hall substations and connect to 12kV circuits 2A and 2B.
7. Replace substations at the following locations for future connection to 12kV:

    a. Geology Building
    b. Insectory Pad
    c. Life Sciences
    d. Tomas Rivera Library
    e. Boyce Hall
    f. Computer Statistic Building
    g. Webber Hall
    h. Central Plant

7.2 Analysis Assumptions and Methodology

The campus peak demand for the combined services is 14MW. This information was obtained from utility billings. There is a lack of historical demand data for each building and for occupancy types since the buildings are not individually metered. Therefore, to estimate the electrical load growth of the campus from present through 2015, the 14 MW load was spread evenly among the existing east campus buildings to arrive at an estimated electrical demand per gross square foot (W/GSF). This W/GSF figure was then applied to future buildings. Further, an assumption is made that the percent demand (kW/kVA) on each existing transformer is equal. This assumption is required to calculate the load to include all transformers serving loads without an applicable GSF figure (pump stations, parking lots, ball fields, etc.)

The largest known electrical load on the campus is the chiller load at the Central Plant. The plant chilled water peak output is approximately 5,000 tons. Assuming one ton of cooling is equal to one kW of demand, the estimated electrical demand of the chiller load is 5,000kW. This leaves 9,000kW of demand for the remaining electrical loads in the campus.

Utilizing the figures above and the previously mentioned assumption, 9,000kW of demand is produced by the total campus transformer capacity (KVA) minus the Central Plant transformer (KVA) for the chillers (53,418 – 8,000). The average demand calculates to .20 (9,000kW/45,418kVA). Applying this figure to the known transformer capacity at each existing transformer location calculates the estimated demand for each load (please refer to Table 7.1 below).

The calculated average demand load density for future buildings is estimated at 4.2W/GSF (14MW/3.355M GSF). Applying this figure to the estimated GSF of future

buildings calculates the estimated demand for each load (please refer to Table 7.1 below).

The load demand is estimated to grow as follows:

Existing	14	MW
2002-2005	22.2	MW
2006-2010	31.3	MW
2011-2015	49.6	MW

7.3 Growth Requirements

To support the present projected growth in the campus, the University must extend the existing 12kV system infrastructure to serve the electrical needs of the proposed buildings. Construction of concrete ductbanks and manholes with the extension of the primary selective system is recommended to maintain the flexibility the system offers in switching options. The eventual phasing out of all of the 5kV system is highly recommended. In future years, further investigation and discussion with the City of Riverside is recommended to evaluate the effects of the load growth and the reserve capacity at the 12kV main substation.

7.1 Existing Building Loads

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Aberdeen and Inverness Hall	33	133,435			12KV	2250	450	Yes	E	Existing 12kV Service
Administration - Hinderaker Hall	1	46,490	26,876	1960	5KV	500	100	No	U	Upgrade to 12KV Service
Barn, University Cottage	7, 8	6,625	4,864	1916	5KV	75	15	No	U	Upgrade to 12KV Service
Batchelor Hall (North & South)	22	114,860	60,876	1965	5KV	1300	260	Yes	U	Upgrade to 12KV Service
Bookstore	48	33,400	19,372	1991	5KV	300	60	No	U	Upgrade to 12KV Service
Bourns Hall	54	145,309	113,598	1995	12KV	2000	400	No	E	Existing 12kV Service
Boyce Hall	20	109,932	62,661	1974	5KV	1750	350	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Computing and Communication Services		21,960	12,737	2000	12KV	300	60	No	E	Existing 12kV Service
Canyon Crest Student Family Housing	62	197,266					0			Serviced by City of Riverside
Carillon Tower	5	4,774	3,342	1966	5KV	75	15	No	U	Upgrade to 12KV Service
Central Power Plant	17	19,437		1953	5KV	2450	490	Yes	U	Upgrade to 12KV Service
					12KV	8000	5000	Yes	E	Existing 12kV Service
Chapman Hall/ Andersen Hall (Graduate School of Management)	27A, B, C	51,941	27,528	1931	5KV	800	160	Yes	U	Upgrade to 12KV Service
Child Development Center	51	12,000		1996			0			Serviced by City of Riverside
College Building North & South	42	17,944	10,408	1963	5KV	310	62	Yes	U	Upgrade to 12KV Service
Commons (Costo, Terrace Conference)	4, 47	90,884	66,623	1965, 1991	5KV	800	160	Yes	U	Upgrade to 12KV Service
Computer Statistics	21	42,096	24,208	1974	5KV	1000	200	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Corporation Yard	34	45,000	33,300	1959	5KV	300	60	No	U	Upgrade to 12KV Service
Custodial		7,446	5,510	1965	5KV	75	15	No	U	Upgrade to 12KV Service
Entomology, Boyden Lab Building	26, 26A	38,840	25,332	1932, 1961	5KV	300	60	No	U	Upgrade to 12KV Service
Entomology Annex	23	16,664	10,685	1948	5KV	300	60	No	U	Upgrade to 12KV Service
Entomology Research Museum	26B	8,988	6,292	1993	5KV	75	15	No	U	Upgrade to 12KV Service
Environmental Health and Safety	43	6,334	4,687	1989	5KV	5	1	No	U	Upgrade to 12KV Service
Fawcett Lab	28	20,997	15,538	1965	5KV	750	150	No	U	Upgrade to 12KV Service
Fine Arts	58	100,371	55,150	2001	12KV	1000	200	No	E	Existing 12kV Service
Geology	14	103,095	61,857	1952	5KV	1500	300	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Geology Addition (Science Laboratories)					12KV	1500	300	No	E	Existing 12kV Service
Greenhouse 11-13A	30	17,500		1955	5KV	337.5	68	Yes	U	Upgrade to 12KV Service
Greenhouse 1-5	30	15,000		1988	5KV	300	60	No	U	Upgrade to 12KV Service
Greenhouse 15-17, Lath House 1 & 2	30	25,000		1956	5KV	225	45	No	U	Upgrade to 12KV Service
Greenhouse 18-21 (West Glasshouse)	30	20,000		1965	5KV	300	60	No	U	Upgrade to 12KV Service
Greenhouse 6-10	30	25,000		1952	5KV	150	30	No	U	Upgrade to 12KV Service
Humanities-1	7A	111,180	62,261	1996	12KV	1000	200	No	E	Existing 12kV Service

7.1 Existing Building Loads

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Insectary	26D	8,783	4,919	1959	5KV	150	30	No	S	Dual rated primary transformer, upgrade to 12KV Service
KUCR Radio	35	300					0			Serviced by City of Riverside
Life Sciences, Speith Hall	16, 16A, 16B	150,994	81,535	1948, 1969, 1958	5KV	1850	370	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Lothian Hall	31	163,250			12KV	3250	650	Yes	E	Existing 12kV Service
Mobile Trailer Facilities (East Glasshouse)	29	15,691	8,944	1971	5KV	225	45	No	U	Upgrade to 12KV Service
Olmstead Hall, Humanities-2, Theater, Art Annex	12, 11A, 11, 12A	143,694	85,738	1963, 1963, 1996, 1973	5KV	1112.5	223	Yes	U	Upgrade to 12KV Service
Parking Services	53	5,612	3,142	1993	12KV	150	30	No	E	Existing 12kV Service
Pentland Hills I (Undergraduate Student Housing)	61	134,544			12KV	1500	300	No	E	Existing 12kV Service
Physical Education	2	65,346	43,128	1953	12KV	300	60	Yes	E	Existing 12kV Service
Physics	18, 18A	94,808	57,833	1965	5KV	2150	430	No	U	Upgrade to 12KV Service
Pierce Hall (North & South)	13	139,912	84,634	1966	5KV	2750	550	Yes	U	Upgrade to 12KV Service
Pierce Hall Addition (Chemical Sciences)	13A			1990	12KV	500	100	No	E	Existing 12kV Service
Police Facility	36	9,320	5,405	1998			0			Serviced by City of Riverside
Tomas Rivera Library	15	230,013	184,010	1960	5KV	1975	395	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Science Library	60	167,358	107,109	1998	12KV	1500	300	No	E	Existing 12kV Service
Sproul Hall	9	78,870	46,533	1965	5KV	500	100	No	U	Upgrade to 12KV Service
Student Recreation Center	55	80,000	52,800	1994	12KV	1000	200	No	E	Existing 12kV Service
Surge Building	64	84,375	48,938	2001	12KV	750	150	No	E	Existing 12kV Service
Sweeney Art Gallery	39A	720	420	1984			0			Serviced by City of Riverside
Telephone Building	40	2,584	1,550	1965			0			Serviced by City of Riverside
University Lab	25A	11,803	7,082	1994	12KV	150	30	No	E	Existing 12kV Service
University Office Building	25	19,650	11,397	1991	5KV	500	100	No	S	Dual rated primary transformer, upgrade to 12KV Service
USDA Salinity Lab	46						0			Serviced by City of Riverside
Veitch Student Center (Student Health)	32	24,180	17,893	1961	5KV	225	45	No	U	Upgrade to 12KV Service
Watkins Hall	10	63,913	34,513	1953	5KV	300	60	No	U	Upgrade to 12KV Service
Webber Hall	19	50,801	27,432	1953	5KV	412.5	83	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Tennis Courts					12KV	225	45	No	E	Existing 12kV Service
Pumping Station					5KV	525	105	Yes	U	Upgrade to 12KV Service
Play Field					5KV	500	100	No	U	Upgrade to 12KV Service
Underpass Sub					5KV	75	15	No	U	Upgrade to 12KV Service
Air Pollution/Engineering Pad					5KV	500	100	No	U	Upgrade to 12KV Service
Multipurpose Building, Snake Pit, Head House					5KV	45	9	Yes	U	Upgrade to 12KV Service

7.1 Existing Building Loads

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Storage					5KV	225	45	No	U	Upgrade to 12KV Service
Lysimeter Tanks					5KV	45	9	No	U	Upgrade to 12KV Service
SUBTOTAL						**53,418**	**14,085**			
2002 - 2005										
Alumni/Visitor Center	59	25,890	16,829	2005	12KV		109			
Biological Science	66	55,071	38,550	2005	12KV		231			
Commons Expansion	69	186,004	118,643	2005	12KV		781			
Demo Commons	4	(86,004)	(63,643)				-361			
Engineering Unit #2	67	152,010	106,400	2005	12KV		638			
Entomology	24	67,139	42,969	2002	12KV	1000	282			
Insectory & Quarantine	26C	31,523	25,200	2002	12KV	1000	132			
Physical Science #1	68	129,417	90,592	2005	12KV		544			
Satellite Central Plant		7,000	7,000	2005	12KV	8750	5000			
Science Lab #1	65	44,138	30,897	2001	12KV		185			
Pentland Hills #2	70	67,500		2002	12KV	2000	621			
SUBTOTAL							**8,162**			
CUMULATIVE TOTAL							**22,247**			
2006 -2010										
Housing Unit #2	71	60,000		2003	12KV		552			
Housing Unit #3	72	60,000		2005	12KV		552			
CHASS Bldg 1	73	115,000	74,750	2010	12KV		483			
CHASS Bldg 2	74	85,000	58,500	2010	12KV		357			
Engineering Unit #3	75	150,000	105,000	2010	12KV		630			
Entomology #2	76	100,000	70,000	2010	12KV		420			
Demo Entomology Annex	23	(16,664)	(10,685)				-70			
Genomics	77	120,000	84,000	2010	12KV		504			
Performing Arts	78	75,000	52,500	2010	12KV		315			
Physical Science #2	79	130,000	91,000	2010	12KV		546			
Satellite Central Plant (Additional Equipment)		7,000	7,000	2005	12KV		3000			
Housing Unit #4	80	93,750		2007	12KV		863			
Housing Unit #5	81	93,750		2010	12KV		863			
SUBTOTAL							**9,015**			
CUMULATIVE TOTAL							**31,262**			

2011 - 2015

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Student/ Administration Cluster:										
Building 1	82	100,000	55,000	2015	12KV		420			
Building 2	83	100,000	55,000	2015	12KV		420			
Building 3	84	120,000	66,000	2015	12KV		504			
Building 4	85	50,000	27,500	2015	12KV		210			
Science Cluster:										
Building 1 (lab)	86	100,000	70,000	2015	12KV		420			
Demo 20% of Pierce Hall	13	(27,982)	(16,927)				-118			
Building 2 (classroom)	87	100,000	70,000	2015	12KV		420			
Science Bldg. (lab)	88	100,000	70,000	2015	12KV		420			
Demo Greenhouse 15-17	30	(15,000)					-63			
Building 4 (classroom)	89	100,000	70,000	2015	12KV		420			
Demo Custodial		(7,446)	(5,510)				-31			
Demo Entomology	26	(32,444)	(20,855)				-136			
Demo Insectary	26D	(8,783)	(4,919)				-37			
Building 5 (lab)	90	100,000	70,000	2015	12KV		420			
Demo Greenhouse 11- 13A	30	(17,500)					-74			
Building 6 (classroom)	91	100,000	70,000	2015	12KV		420			
Building 7 (lab)	92	100,000	70,000	2015	12KV		420			
Building 8 (classroom)	93	120,000	84,000	2015	12KV		504			
Demo Greenhouse 18-21	30	(20,000)					-84			
Building 9 (lab)	94	120,000	84,000	2015	12KV		504			
Physical Science #3	95	130,000	91,000	2015	12KV		546			
Building 11 (classroom)	96	100,000	70,000	2015	12KV		420			
Future Bldg Devlpmnt in Prkg Lot 6:										
Building 1	97	100,000	60,000	2015	12KV		420			
Building 2	98	50,000	30,000	2015	12KV		210			
Building 3	99	75,000	45,000	2015	12KV		315			
Building 4	100	50,000	30,000	2015	12KV		210			
Building 5	101	150,000	90,000	2015	12KV		630			
Building 6	102	75,000	45,000	2015	12KV		315			
Housing Unit #6	103	112,500		2015	12KV		1035			
Housing Unit #7	104	112,500		2015	12KV		1035			
Housing Unit #8	105	112,500		2015	12KV		1035			
Housing Unit #9	106	112,500		2015	12KV		1035			
Housing Unit #10	107	112,500		2015	12KV		1035			
Housing Unit #11	108	112,500		2015	12KV		1035			
Housing Unit #12	109	112,500		2015	12KV		1035			
Housing Unit #13	110	112,500		2015	12KV		1035			
Housing Unit #14	111	112,500		2015	12KV		1035			
Housing Unit #15	112	112,500		2015	12KV		1035			
SUBTOTAL							**18,375**			
GRAND TOTAL							**49,637**			

7.4 Infrastructure Projects, 2002-2005 (outlined on page 7-13)

The following is a summary of the proposed electrical distribution projects for the calendar years 2002-2005. The total cost of the recommended projects for this period is $1,275,000. See Table 7.2 (shown on page 7-13) for a summary of all infrastructure projects. See drawings E-10S and E-10N at the end of this section for project layout. For detailed cost estimates for each project, see Appendix E.

7.4.1 EL-11

Current Situation: The campus requires construction of a new engineering building to accommodate the expected increase in enrollment. The new building, Engineering Unit #2, will be constructed adjacent to the existing Engineering Building (Bourns Hall). However, to accommodate the new building, the existing 5kV electrical infrastructure must be located out of the proposed building footprint, or refeed the existing loads from the 12kV system. The 5kV infrastructure affected by the new building is circuit number 4. The buildings affected are Veitch Student Center (Student Health) and the Corporate Yard.

The 5kV infrastructure is old and deteriorating with portions of the system approximately 50 years old. Investment of funds in the 5kV system is not recommended. The 12kV system is reliable and currently available at both locations. However, existing substations at both locations must be replaced to accept service at 12kV.

Description of proposed construction: At the Veitch Student Center, extend 12kV circuits 2A-B from Vault V-24 to a new transformer pad located adjacent to the building. Provide cable in concrete encased ducts. Construct transformer pad and cut over the existing loads. Demolish existing substation serving the building.

At the Corporate Yard, extend 12kV circuits 2A-B from Vault V-24 to a new transformer pad located adjacent to the existing substation. Provide cable in concrete encased ducts. Construct transformer pad and cut over the existing loads. Demolish existing substation serving the Corporate Yard.

Disconnect and remove 5kV circuit number 4. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon demolition of substations at the Veitch Student Center and the Corporate Yard.

Projected Cost: $717,000

7.4.2 EL-12

Current Situation: Webber Hall has experienced low voltage problems, which is attributed to the increase in the use of computers. It is expected that the use of computers will continue to increase.

In general, low voltage problems are addressed either by isolating the load and increasing the size of the wire, or by adjusting the voltage taps on the transformer.

Increasing the size of the wire would reduce the resistance (and voltage drop) but is cost prohibitive when the low voltage problem is widespread. The existing transformer is dual rated which is capable of being supplied at either 4,160 volts or 12,000 volts. However, at the present 4,160 volt setting, there are no taps available, whereas at the 12,000 volt setting, taps are available. This is an industry wide manufacturing standard.

Description of proposed construction: Extend existing 12kV circuit 2A-B from Vault V-13 (East Campus Drive) west to Webber Hall. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide 12kV connections to Computer/Statistics and Boyce Hall for service at 12kV. At each building, utilize existing load interrupter switches and convert existing dual rated transformers for use at 12kV. Disconnect and remove 5kV service for Webber Hall, Computer/Statistics, and Boyce Hall. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.

Projected Cost: $374,000

7.4.3 EL-13

Current Situation: 12kV does not exist in the area of the proposed CHASS 2 building.

Description of proposed construction: Extend existing 12kV circuit 1A-B, and 2A-B from Vault V-8 (north of the Central Plant) south along Citrus Drive. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.

Projected Cost: $184,000

7.5 Infrastructure Projects, 2006-2010 (outlined on page 7-14)

The following is a summary of the proposed electrical distribution projects for the calendar years 2006-2010. The total cost of the recommended projects for this period is $2,044,000. See Table 7.2 (shown on page 7-14) for a summary of all infrastructure projects. See drawings E-20S and E-20N at the end of this section for project layout. For detailed cost estimates for each project, see Appendix E.

7.5.1 EL-21

Current Situation: 12kV does not exist in the area of the proposed Genomics and Science buildings, east of Bachelor Hall.

Description of proposed construction: Extend existing 12kV circuit 2A-B from Vault V-10 along the east side of Bachelor Hall. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pads at Bachelor Hall for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.

Projected Cost: $571,000

7.5.2 EL-22

Current Situation: 12kV does not exist in the area of the proposed Housing Units #2 and 3.

Description of proposed construction: Extend existing 12kV circuit 2A-B from Vault V-25 east along Linden Street. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.

Projected Cost: $303,000

7.5.3 EL-23

Current Situation: The 12kV circuit 3A-B runs under the proposed location for CHASS Building 1. The existing 12kV infrastructure must be relocated outside of the building footprint. Also, 12kV does not exist in the area of the proposed Alumni Center, Engineering Unit #3, Performing Arts, and the Student/Administration cluster, along North Campus Drive.

Description of proposed construction: Extend existing 12kV circuit 3A-B from Vault V-4C north to North Campus Drive. Reroute circuit along the north side of CHASS Building 1 to refeed Vault 4E. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pad at the Underground Pump Station and Field House for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.

Projected Cost: $1,170,000

7.6 Infrastructure Projects, 2011-2015 (outlined on page 7-15, 16)

The following is a summary of the proposed electrical distribution projects for the calendar years 2011-2015. The total cost of the recommended projects for this period is $12,263,000. See Table 7.2 (shown on pages 7-15, 16) for a summary of all infrastructure projects. See drawings E-30S and E-30N at the end of this section for project layout. For detailed cost estimates for each project, see Appendix E.

7.6.1 EL-31

Current Situation: 12kV does not exist in the area of the proposed Humanities/Law cluster, south of the existing Humanities 2 building.

Description of proposed construction: Extend existing 12kV circuit 3A-B from Vault V-4 southeast along West Campus Drive. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pads at the Humanities 2 building for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.

Projected Cost: $1,297,000

7.6.2 EL-32

Current Situation: The 12kV circuit 2A-B runs under the proposed location for Science Cluster Building 1. The existing 12kV infrastructure must be relocated outside of the building footprint.

Description of proposed construction: Reroute circuit outside of building footprint. Provide cable in concrete encased ducts. Provide transformer pads at Pierce Hall for 12kV service. At the Geology Building, utilize existing load interrupter switches and convert existing dual rated transformers for use at 12kV. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.

Projected Cost: $683,000

7.6.3 EL-33

Current Situation: 12kV does not exist in the area of the proposed Student/Admin #1 and 2.

Description of proposed construction: Extend existing 12kV circuit 3A-B from Alumni Center west along University Ave. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.

Projected Cost: $184,000

7.6.4 EL-34

Current Situation: 12kV does not exist in the area of the proposed Housing Units #14 &15, and Physical Science #3.

Description of proposed construction: Extend existing 12kV circuit 2A-B from Vault V-15 east along Big Springs Road. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.

Projected Cost: $487,000

7.6.5 EL-35

Current Situation: 12kV does not exist in the area of the proposed Housing Units #6 through 12.

Description of proposed construction: Extend existing 12kV circuit 2A-B from Vault V-27 north to the Housing Units #6 through 12 site. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.

Projected Cost: $671,000

7.6.6 EL-36

Current Situation: Portions of the 5kV system are approximately 50 years old. Investment of funds in the 5kV system is not recommended. The 12kV system is reliable and currently available at various locations.

Description of proposed construction: Replace 5kV System Phase I - Demolish 4.16kV distribution system originating from the main substation located west of Interstate 215. Upgrade buildings/loads to receive primary service at 12kV. Replace all transformers and switchgear rated at 5kV with equipment rated for use at 12kV. Extend substructure and existing circuits 2A, 2B, 3A, & 3B. At selected locations, combine loads to reduce the number of substations/transformers, especially at buildings with multiple services.

Projected Cost: $5,449,000

7.6.7 EL-37

Current Situation: Portions of the 5kV system are approximately 50 years old. Investment of funds in the 5kV system is not recommended. The 12kV system is reliable and currently available at various locations.

Description of proposed construction: Replace 5kV System Phase II - Demolish 4.16kV distribution system originating from the Central Power Plant. Upgrade buildings/loads to receive primary service at 12kV. Replace all transformers and switchgear rated at 5kV with equipment rated for use at 12kV. Extend substructure and existing circuits 1A, & 1B. At selected locations, combine loads to reduce the number of substations/transformers, especially at buildings with multiple services.

Projected Cost: $3,492,000

Table 7.2: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2002-2005	32,34	Veitch Student Center, Corporation Yard	EL-11	At the Veitch Student Center, extend 12kV circuits 2A-B from Vault V-24 to a new transformer pad located adjacent to the building. Provide cable in concrete encased ducts. Construct transformer pad and cut over the existing loads. Demolish existing substation serving the building. At the Corporate Yard, extend 12kV circuits 2A-B from Vault V-23 to a new transformer pad located adjacent to the existing substation. Provide cable in concrete encased ducts. Construct transformer pad and cut over the existing loads. Demolish existing substation serving the Corporate Yard. Disconnect and remove 5kV circuit number 4. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon demolition of substations at the Veitch Student Center and the Corporate Yard.	$ 717,000
2002-2005	19,20,21	Webber Hall, Boyce Hall, Computer/Statistics	EL-12	Extend existing 12kV circuit 2A-B from Vault V-13 (East Campus Drive) west to Webber Hall. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide 12kV connections to Computer/Statistics and Boyce Hall for service at 12kV. At each building, utilize existing load interrupter switches and convert existing dual rated transformers for use at 12kV. Disconnect and remove 5kV service for Webber Hall, Computer/Statistics, and Boyce Hall. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 374,000
2002-2005	74	CHASS 2	EL-13	Extend existing 12kV circuit 1A-B, and 2A-B from Vault V-8 (north of the Central Plant) south along Citrus Drive. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 184,000
2002-2005	**Period Total**				**$ 1,275,000**

URGENT PROJ SHOWN IN RED - these proj are recommended to be completed as soon as possible & 2002-2005 Ref Dwgs- El- E-10N,S

Table 7.2: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2006-2010	22,77	Batchelor Hall, Genomics	**EL-21**	Extend existing 12kV circuit 2A-B from Vault V-10 along the east side of Batchelor Hall. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pads at Batchelor Hall for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 571,000
2006-2010	71,72,80, 81,110	Housing Units #2, 3, 4, 5, 13	**EL-22**	Extend existing 12kV circuit 2A-B from Vault V-25 east along Linden Street. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 303,000
2006-2010	59,73, 75,78,84, 85	Alumni Center, CHASS 1,Engineering Unit #3, Performing Arts, Student/Admin #3 & 4, Play Field, Pump Station	**EL-23**	Extend existing 12kV circuit 3A-B from Vault V-4C north to North Campus Drive. Reroute circuit along the north side of CHASS Building 1 to refeed Vault 4E. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pad at the Underground Pump Station and Field House for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 1,170,000
2006-2010	**Period Total**				**$ 2,044,000**
2006-2010 Reference Dwgs- Elec- E-20N & E-20S					
2002-2010	**Cum. Total**				**$ 3,319,000**

Table 7.2: Capital Projects Cost Estimates

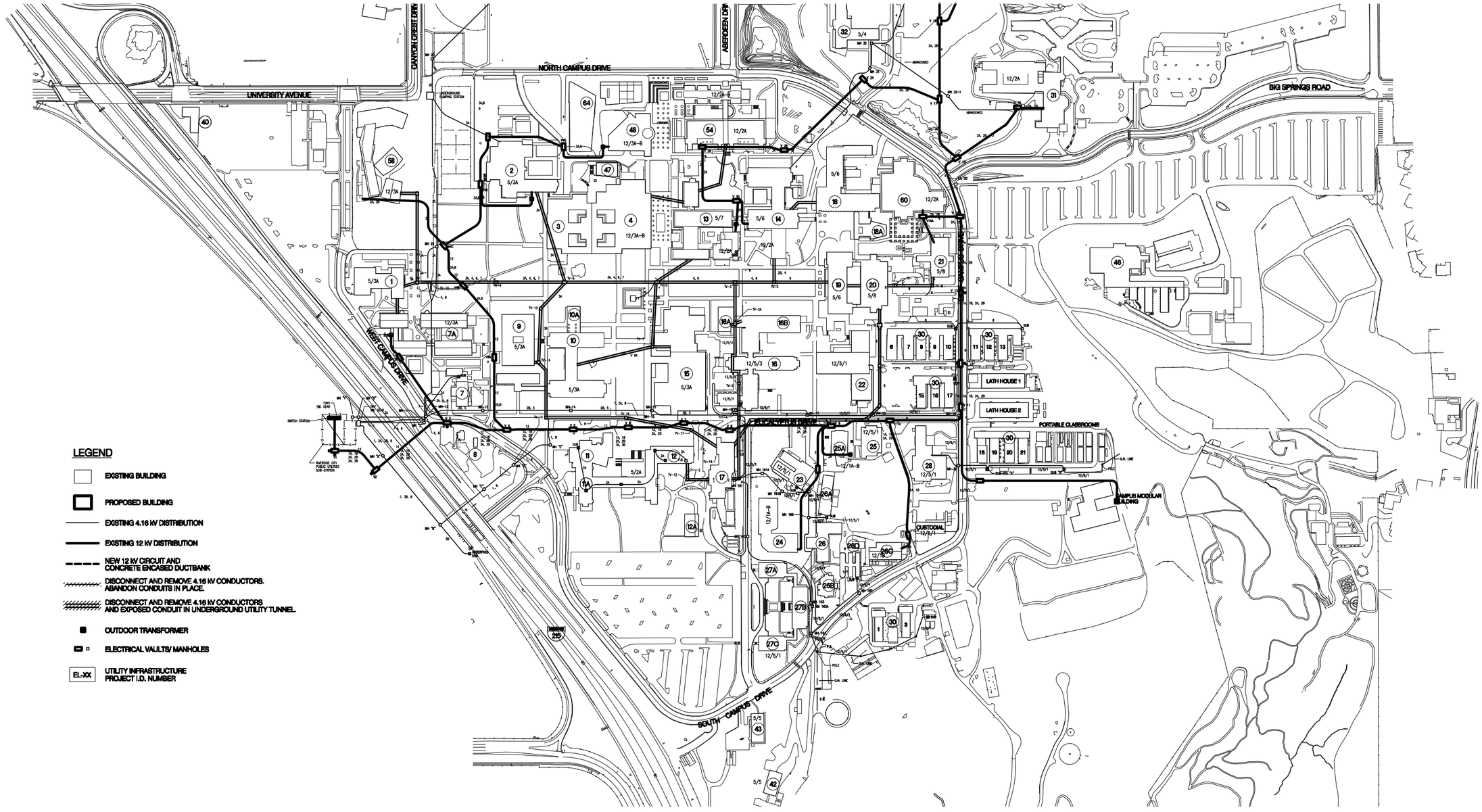
Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015	11, 11A, 12, 97, 98, 99, 100, 101, 102	Olmstead Hall, Humanities-2, Theater, Art Annex, Lot 6 Devlpmnt #1, 2, 3, 4, 5, 6	**EL-31**	Extend existing 12kV circuit 3A-B from Vault V-4 southeast along West Campus Drive. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals. Provide transformer pads at the Humanities 2 building for 12kV service. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 1,297,000
2011-2015	14, 86	Geology, Science Cluster Building #1	**EL-32**	Reroute circuit outside of building footprint. Provide cable in concrete encased ducts. Provide transformer pads at Pierce Hall for 12kV service. At the Geology Building, utilize existing load interrupter switches and convert existing dual rated transformers for use at 12kV. Disconnect and remove 5kV feeder. Demolish all cabling, exposed conduits in utility tunnels, and all associated switches upon cut over to 12kV.	$ 683,000
2011-2015	82, 83	Student/Admin #1 &2	**EL-33**	Extend existing 12kV circuit 3A-B from Alumni Center west along University Ave. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 184,000
2011-2015	95, 96, 111, 112	Physical Science #3, Classroom Building #11, Housing Units #14 &15	**EL-34**	Extend existing 12kV circuit 2A-B from Vault V-15 east along Big Springs Road. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 487,000
2011-2015	103, 104, 105, 106, 107, 108, 109	Housing Units #6, 7, 8, 9, 10, 11, 12	**EL-35**	Extend existing 12kV circuit 2A-B from Vault V-27 north to the Housing Units #6 through 12 site. Provide cable in concrete encased ducts, and manholes at approximately 300' intervals.	$ 671,000

Table 7.2: Capital Projects Cost Estimates

Time Period	Building Number	Campus Location	Project ID Tag	Project Description	Present Cost ($)
2011-2015		Various	**EL-36**	Repair 5kV System Phase I - Demolish 4.16kV distribution system originating from the main substation located west of Interstate 215. Upgrade buildings/loads to receive primary service at 12kV. Replace all transformers and switchgear rated at 5kV with equipment rated for use at 12kV. Extend substructure and existing circuits 2A, 2B, 3A, & 3B. At selected locations, combine loads to reduce the number of substations/transformers, specially at buildings with multiple services.	$ 5,449,000
2011-2015		Various	**EL-37**	Repair 5kV System Phase II - Demolish 4.16kV distribution system originating from the Central Power Plant. Upgrade buildings/loads to receive primary service at 12kV. Replace all transformers and switchgear rated at 5kV with equipment rated for use at 12kV. Extend substructure and existing circuits 1A, & 1B. At selected locations, combine loads to reduce the number of substations/transformers, specially at buildings with multiple services.	$ 3,492,000
2011-2015	**Period Total**				**$ 12,263,000**
2011-2015 Reference Dwgs- Elec- E-30N & E-30S					
2002-2015	**Grand Total**				**$ 15,582,000**

- Buildings denoted in bold type are high priority projects

- Project costs do not include curb to curb roadway replacements. Costs do include repair of any roadway, sidewalk, or landscaped area in the immediate vicinity of the excavated area.



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ELECTRICAL EXISTING SITE SOUTH

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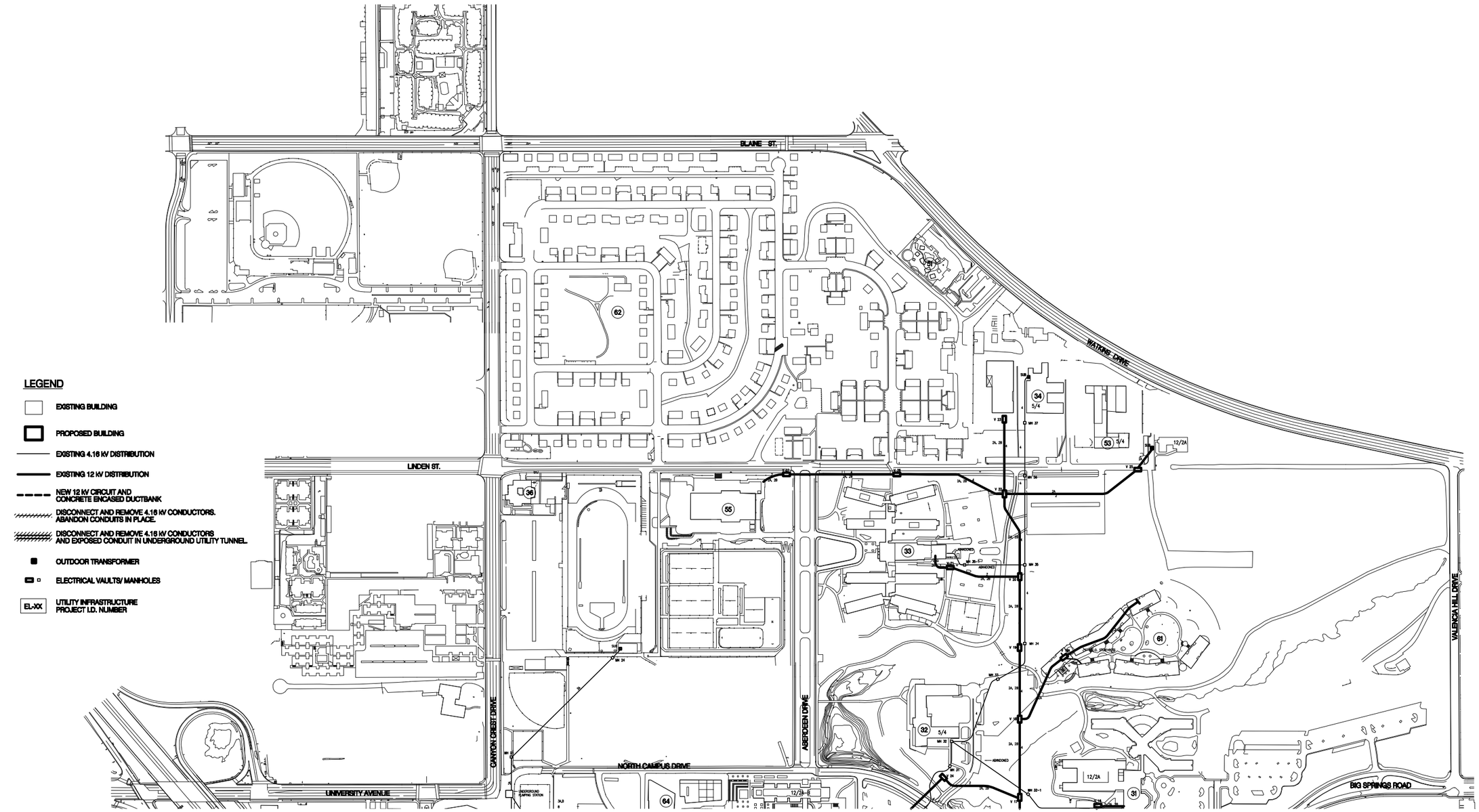
PROJECT NO: 01897
DATE: 01/28/01
SHEET NO: E-00S



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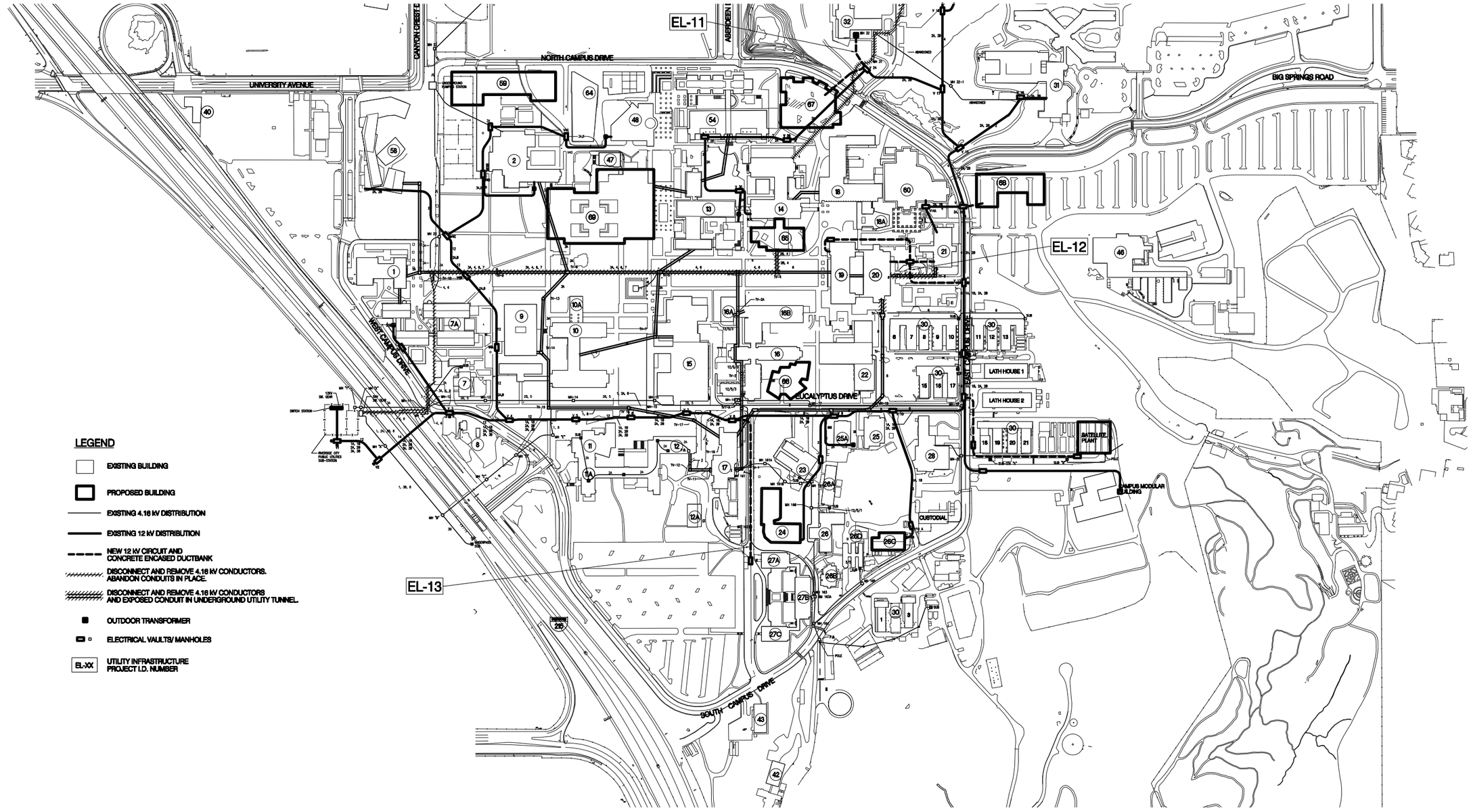

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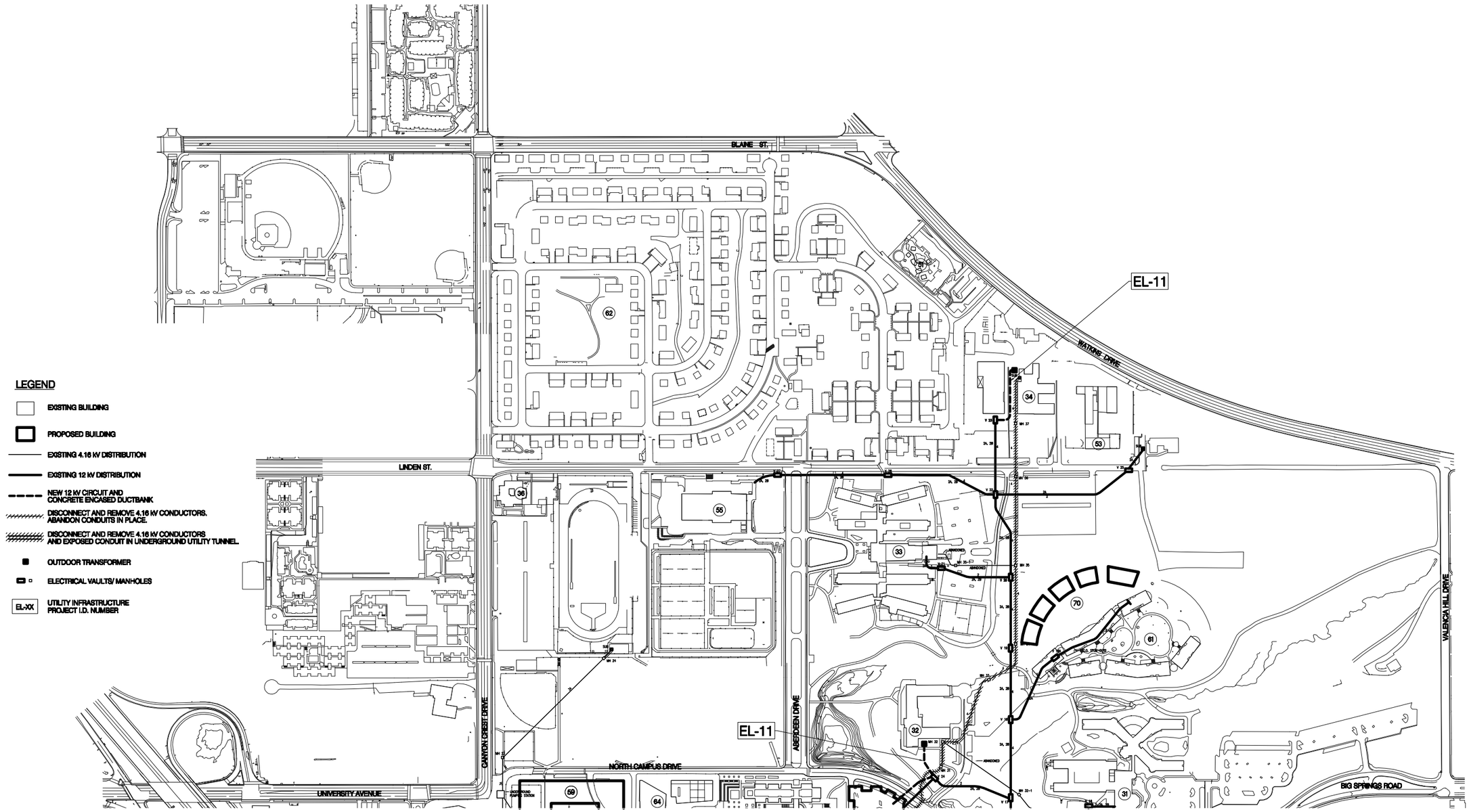

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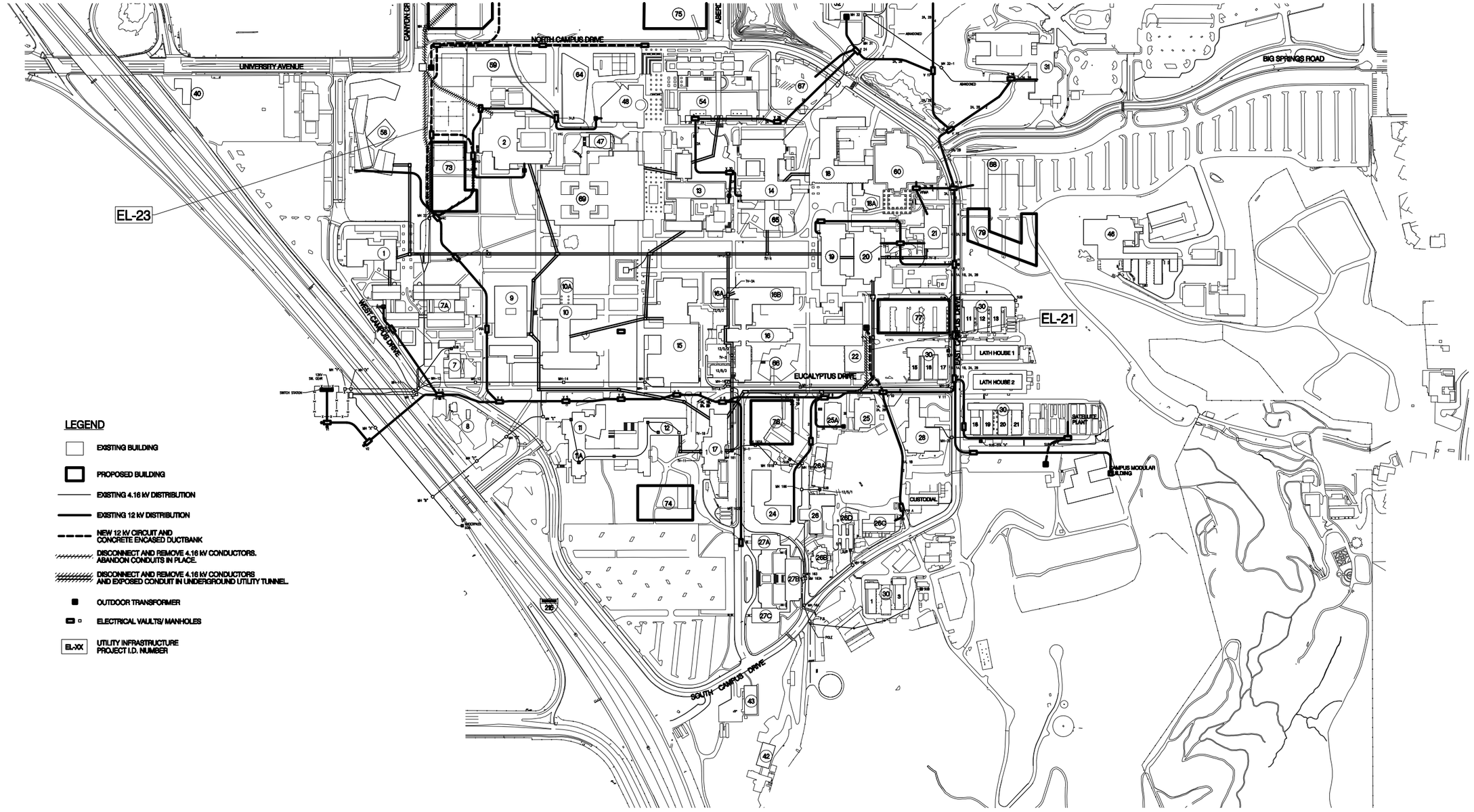

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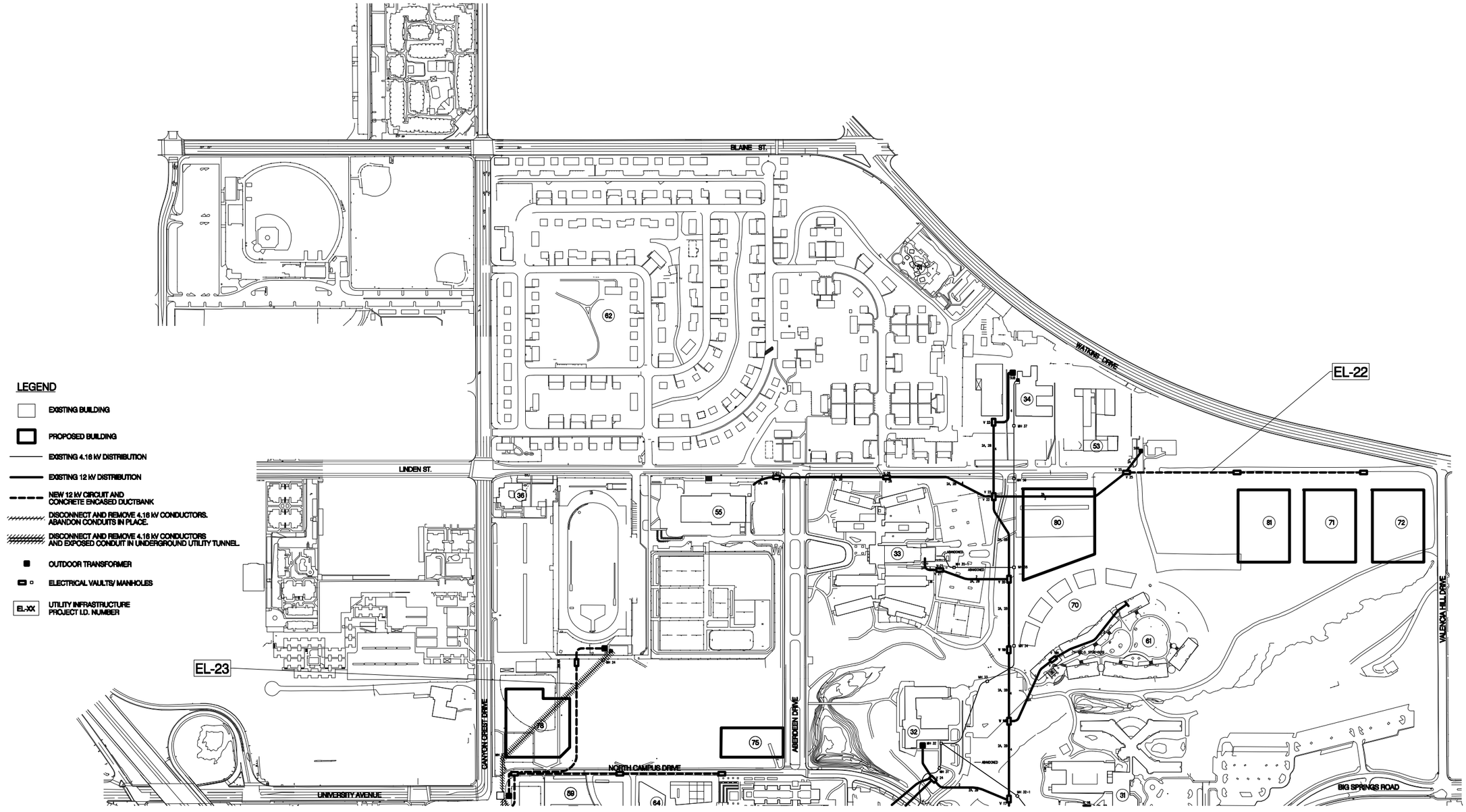

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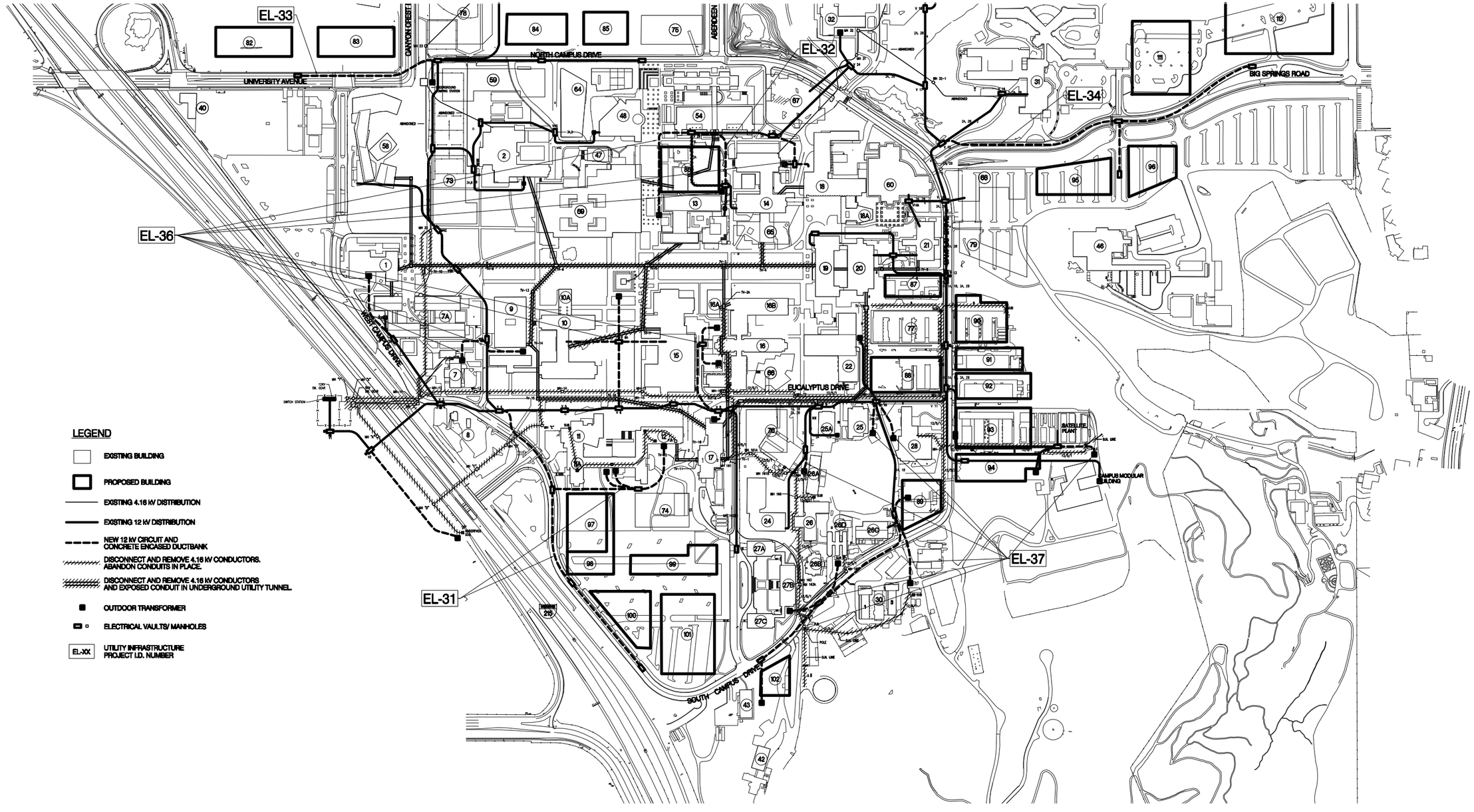

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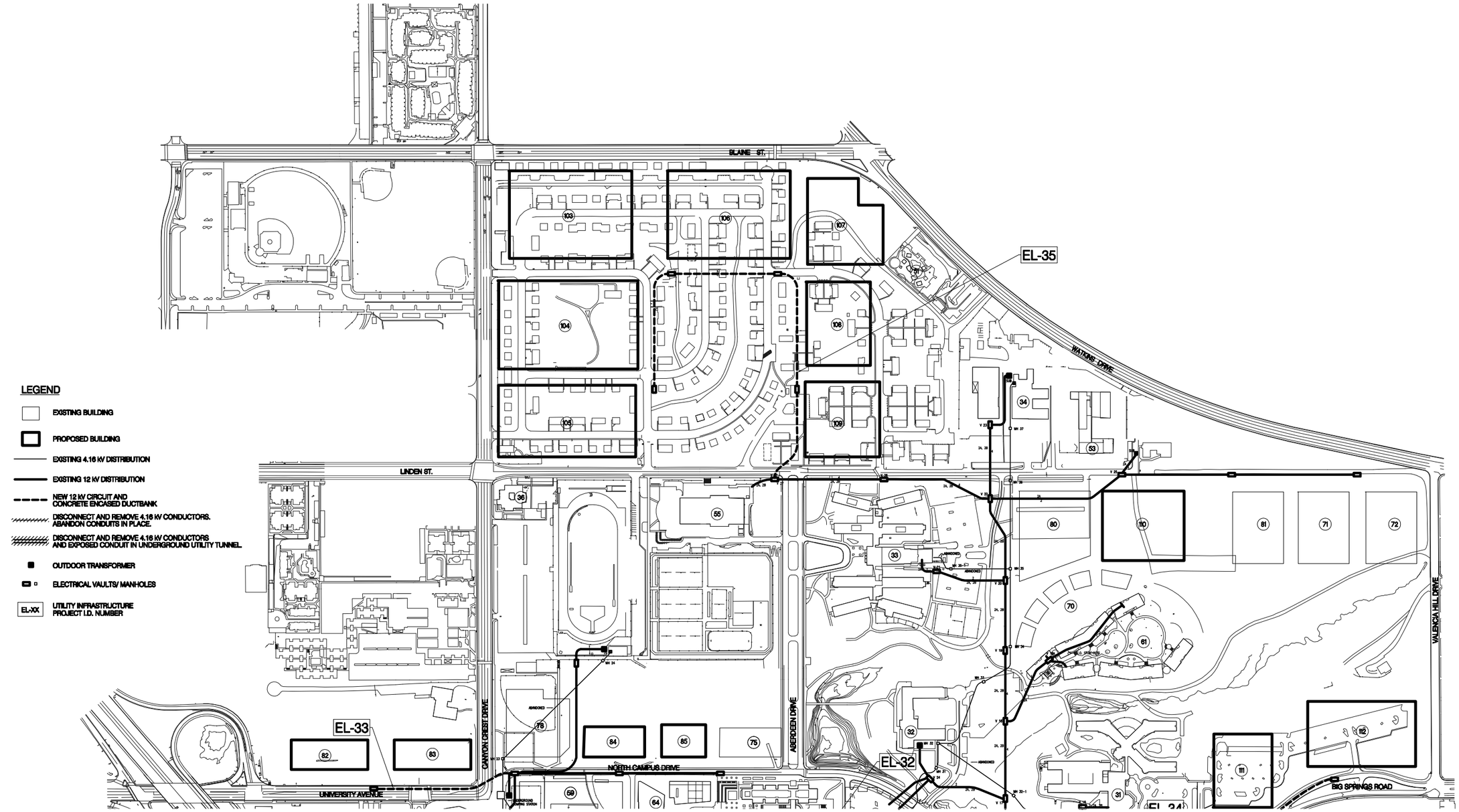

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DATE: 01/28/01

SHEET NO: E-30N

SECTION 8.0

NATURAL GAS SUPPLY AND DISTRIBUTION SYSTEM

8.1 Existing System

The Southern California Gas Company (SCG) supplies natural gas for the campus. The primary feed for the East Campus is at the central plant. SCG delivers medium pressure natural gas at 25 psi through a 4" line that enters the campus property via the southwest border. Inside the central plant, there is one master meter. The service then splits in two, serving the boilers with one line and the campus distribution system with the other. The campus distribution system is reduced to 5 psi.

The campus distribution system feeds the East Campus buildings. It does not serve any housing buildings or any buildings north of North Campus Drive (except for the Veitch Student Center). Three (3) 4" gas lines leave the central plant. The gas service then distributes to all the buildings. There are a few buildings (the Commons for example) that contain a University owned meter read by university staff. The distribution is a mix of buried pipe and pipe inside the tunnel network.

The north side (north of North Campus Drive) of the East Campus is fed from two locations. SCG delivers gas via a 4" 25 psi service that runs down University Avenue, and a 4" 25 psi service that runs down Blaine Street. These serve campus housing buildings. A meeting on January 8, 2002 with SCG revealed that loss of pressure in these north lines is a concern. A large housing community is planned east of this area. SCG requested that the University provide load information to assist in their future planning. See drawings G-00S and G-00N for a layout of the existing campus natural gas distribution system.

8.2 Growth Requirements

The campus is projected to grow significantly over the next 13 years. Today, as buildings are added to the East Campus, gas service is tied into the existing 5-psi distribution system. There were no planning documents or growth study available for review at the time of this infrastructure study. It is recommended that an analysis be performed to determine the capability of the existing lines to accommodate the added capacity.

LEGEND

-SCG-	SO. CAL. GAS LINE
- - -	UCR GAS LINE
	GAS LINE IN TUNNEL

NORTH

0 50'100' 200' 400' 600'

1"=200'-0"

UCR

UNIVERSITY OF CALIFORNIA RIVERSIDE

PLUMBING EXISTING SITE GAS SOUTH

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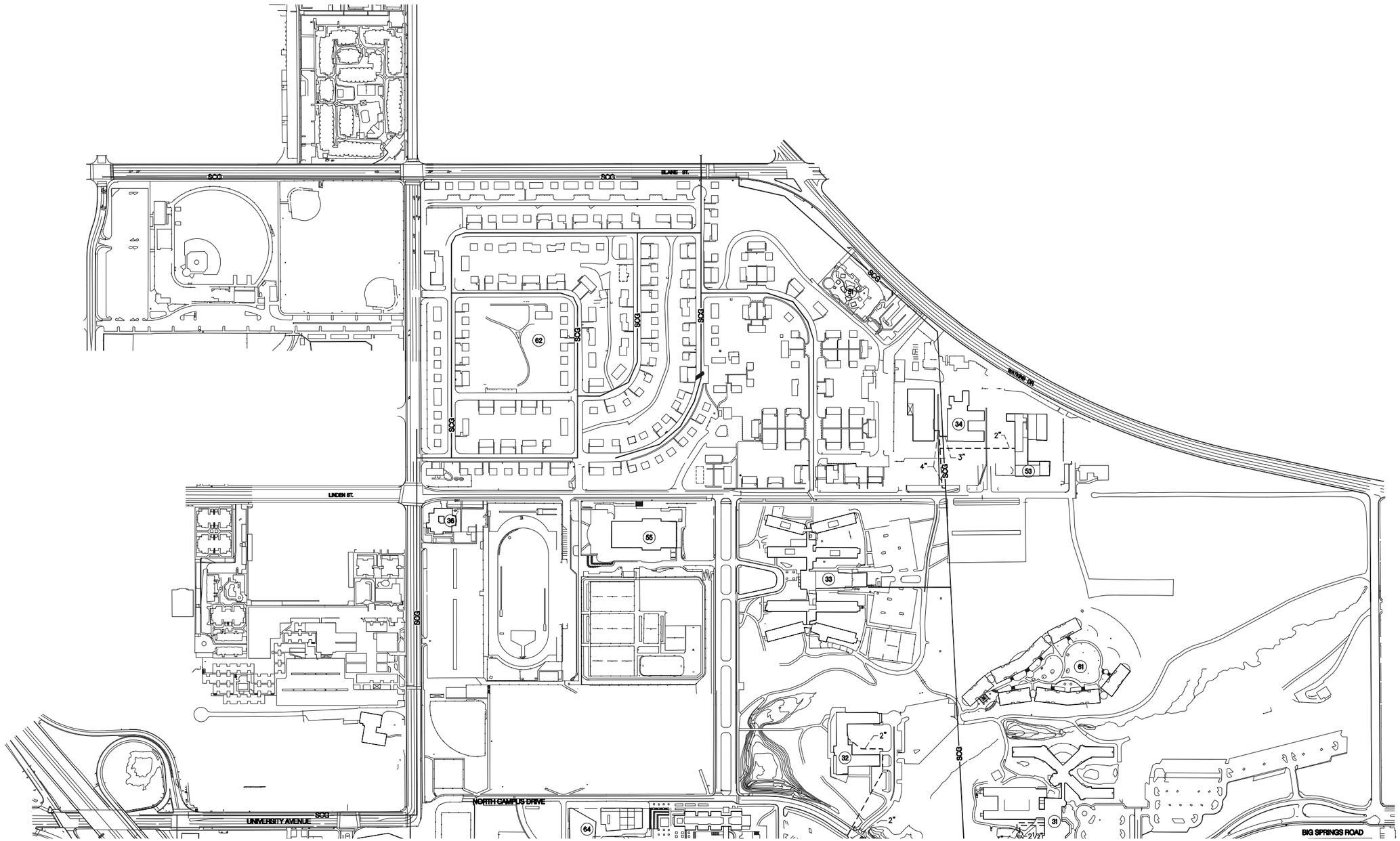

LEGEND	
-SCG-	SO. CAL. GAS LINE
- - -	UCR GAS LINE
⊂⊃	GAS LINE IN TUNNEL

NORTH

0 50'100' 200' 400' 600'

1"=200'-0"

UCR

UNIVERSITY OF CALIFORNIA RIVERSIDE

PLUMBING EXISTING SITE GAS NORTH

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PROJECT NO: 01897

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SHEET NO: G-00N

SECTION 9.0

STORM DRAIN SYSTEM

9.1 Existing System

The UCR campus is located at the mouth of the University Arroyo watershed, which has an area of approximately 2,300 acres. The UCR campus is actually only a small part of this watershed, which includes all areas east to the Box Springs Mountains, south to Interstate 215, and north to Blaine Street. The lowest elevation of the campus is approximately 1,000 feet, at the Gage detention basin near Interstate 215/60. East of the campus, the elevation rises above 2,800 feet, into the Box Springs Mountains. Because of the campus location, the storm drain system at UCR must be able to handle the discharge from the entire 2,300-acre watershed. The campus storm drain system is composed primarily of buried RCP (reinforced concrete pipe), open channels, and two detention basins. Existing manhole locations, invert elevations, and system layout and pipe size are shown on drawings SD-00S and SD-00N.

The campus system has two points where drainage can exit. The main campus discharge is through the Gage detention basin, located north of University Avenue and west of Canyon Crest Drive. This basin feeds west into a City of Riverside open channel through two 60" x 54" box culverts. The Gage detention basin receives discharge from two campus mains. The second point drainage to exit is at Linden Street and Canyon Crest Drive, into a 24" City of Riverside main.

The first main that feeds into the Gage detention basin is a 72" buried RCP that runs parallel to North Campus Drive and Big Springs Road, terminating at the corner of Big Springs Road and Valencia Hill Drive. An inlet structure is located at the termination of this 72" main that serves as the intake for all discharge flowing down Big Springs Road. Big Springs Road is fed from Islander Park, which in turn is fed by two streams containing discharge from the northeast area of the watershed. A 48" buried RCP ("F" line) feeds into the 72" main at a junction structure at the corner of North Campus Drive and Big Springs Road. This 48" line terminates at an inlet structure near parking lot 13, across the street from the Computer Statistics building, and receives runoff from the southeast area of the watershed, including the Botanical Garden tributary. A 24" buried RCP ("B" line) feeds into the 72" main at the corner of North Campus Drive and Canyon Crest Drive. This 24" line runs south along West Campus Drive, and then east under Eucalyptus Drive. It serves the western and southern areas of the UCR campus. An 18" buried RCP ("A" line) feeds into the 72" main just west of the "B" line connection. This 18" line serves the tennis courts across from Fine Arts, and areas west of the SURGE building.

The second main that feeds into the Gage detention basin is a 39" buried RCP that runs parallel to North Campus Drive, terminating at the Campus Glade detention basin, located just east of Aberdeen and north of North Campus Drive. The Campus Glade detention basin receives runoff from the area bordered by Linden Street, Aberdeen Drive, Big Springs Road, and Valencia Hill (which includes all dormitory housing buildings served by the "G" and "H" lines), as well as discharge from a 48" RCP that serves an area east of Valencia Hill Drive and discharge from an open channel that runs parallel

to Big Springs Road. A 15" buried RCP ("E" line) feeds into the 39" main on the west side of Aberdeen Drive and serves the north and eastern areas of the UCR campus. A 21" buried RCP ("D" line) feeds into the 39" main across from the SURGE building and serves the northern and central areas of the campus. A 27" buried RCP ("C" line) feeds into the 39" main at Canyon Crest Drive and terminates at an inlet structure near the tennis courts and the track. The "C" line serves the area bordered by North Campus Drive, Canyon Crest Drive, Aberdeen Drive, and Linden Street, which includes all the athletic fields.

The second point of discharge for the UCR campus is through a 24" buried City of Riverside storm drain RCP, beginning at the corner of Linden Street and Canyon Crest Drive running west. An 18" buried RCP ("J" line) feeds into this 24" main and runs parallel to Linden Street. The "J" line serves the area bordered by Linden Street, Blaine Street, Canyon Crest Drive, and Watkins Drive, which includes the Canyon Crest Student Family Housing. An 8" buried RCP feeds into the 24" main serving the small area west of Canyon Crest Drive and north of the Gage detention basin, which includes the University offices buildings.

9.2 Analysis Assumptions and Methodology

A hydrologic study on the University Arroyo was completed by Philip Williams and Associates (PWA) in October of 2001. The purpose of the study was to determine the overall ability of the storm drain system to handle the 3-hour, 6-hour, and 24-hour duration of a 100-year storm. This study found that the existing storm drain system is not sufficient, recognized the system deficiencies, and provided several regional and on-campus alternatives to solve these problems.

Of the four regional alternatives analyzed, representatives from UCR and PWA selected alternative A as the preferred regional alternative. Alternative A involves the construction of two new detention ponds in the Islander Park area east of the UCR campus, a new 1,600 foot 48" RCP along Big Springs road to convey flow from these ponds, a new on-campus detention pond downstream of the Botanical Gardens, and restoration of the 1,300 foot open channel parallel to Big Springs Road.

Of the three on-campus alternatives analyzed, representatives from UCR and PWA selected alternative G as the preferred on-campus alternative. Alternative G involves the construction of a new on-campus channel that will capture flow from Big Springs Drive, and divert it to a new 7 feet by 7 feet box culvert that runs parallel to North Campus Drive from the junction of the 72" and 48" lines to the Gage detention basin. The Campus Glade detention basin will be re-graded for additional capacity, and a new detention basin downstream of the Botanical Gardens will be constructed.

Although alternative G is the less expensive of the two recommended options, alternative A is favorable because it requires no on-campus construction and thereby avoids disruption to the UCR campus. At this time the University is still in the process of making a final decision as to which alternative will be implemented.

To verify individual building storm drain line capacity, peak building roof discharge flow was calculated. The existing building roof area was calculated from campus site plans provided by the University. The rainfall intensity was obtained from the RCFC & WCD Hydrology Manual. The five-minute duration of the 100-year storm was used, for the area of Riverside. The resulting rainfall intensity is 3.92 inches/hour. The coefficient of runoff used was 0.90, which assumes that building roof construction is that of a non-permeable surface. The resulting calculated existing building roof drainage can be seen in Table 9.1 below.

To determine future building roof drainage, an average roof area per building square foot was determined. This factor was applied to future building gross square footage to determine future building roof area while also taking into consideration the building function and anticipated number of floors. This calculated roof area was then used in calculations with the above mentioned rainfall intensity and coefficient of runoff to determine future building roof discharge. The results of these calculations can be seen in Table 9.2 below.

Table 9.1: Existing Building Roof Drainage

100 yr (in/hr)=

BUILDING	No.	G.S.F.	Date	Roof Area	Pk Flow (Gpm)
Aberdeen Hall	33	133,435		89,000	3,262
Administration - Hinderaker Hall	1	46,490	1960	21,000	770
Anderson Hall	27B & C	See 27A	1917	18,500	678
Art Annex	12A	2,645	1973	2,700	99
Barn Group	7	5,600		5,000	183
Batchelor Hall (North & South)	22	114,860	1965	35,000	1,283
Bookstore	48	33,400	1991	24,000	880
Bourns Hall	54	145,309	1995	51,900	1,902
Boyce Hall	20	109,932	1974	26,000	953
Boyden Lab Building	26A	6,396	1961	6,400	235
Campus Modular Building		21,960	2000	15,000	550
Canyon Crest Family Housing	62	197,266		150,000	5,498
Carillon Tower	5	4,774	1966	500	18
Central Power Plant	17	19,437	1953	18,500	678
Chapman Hall Soils, Plant Nutrition	27A	51,941	1931	8,300	304
Chemical Sciences	13A	See 13	1990	see 13	
Child Development Center	51	12,000	1996	6,000	220
College Building North & South	42	17,944	1963	5,200	191
Commons	4	86,004	1965	64,500	2,364
Computer Statistics	21	42,096	1974	14,100	517
Corporation Yard	34	45,000	1959	21,000	770
Costo	3	See 4	1965	18,300	671
Custodial		7,446	1965	6,000	220
Entomology	26	32,444	1932	12,600	462
Entomology Annex	23	16,664	1948	12,600	462
Entomology Research Museum	26B	8,988	1993	5,000	183
Environmental Health and Safety	43	6,334	1989	5,200	191
Fawcett Lab	28	20,997	1965	21,000	770
Fine Arts	58	100,371	2001	42,800	1,569
Geology	14	103,095	1952	33,000	1,210
Greenhouse 11-13A	30	17,500	1955	17,500	641
Greenhouse 1-3	30	15,000	1988	15,000	550
Greenhouse 15-17	30	15,000	1956	15,000	550
Greenhouse 18-21	30	20,000	1965	20,000	733
Greenhouse 6-10	30	25,000	1952	25,000	916
Humanities-1	7A	111,180	1996	25,000	916
Humanities-2	11A	See 12	1963	11,700	429
Insectary	26D	8,783	1959	6,500	238
Lath House #1		5,000		5,000	183
Lath House #2		5,000		5,000	183
Life Sciences	16	150,994	1948	33,000	1,210
Life Sciences	16A	See 16	1969	7,500	275
Lothian Hall	31	163,250		82,500	3,024
Mobile Trailer Facilities	29	15,691	1971	9,000	330
Olmstead Hall (Humanities-2)	12	141,049	1963	27,200	997

Table 9.1: Existing Building Roof Drainage

100 yr (in/hr)=

BUILDING	No.	G.S.F.	Date	Roof Area	Pk Flow (Gpm)
Parking Services	53	5,612	1993	5,600	205
Pentland Hills	61	134,544	2000	56,000	2,053
Physical Education	2	65,346	1953	38,000	1,393
Physics	18	94,808	1965	37,800	1,385
Physics 2000	18A	See 18		8,700	319
Pierce Hall (North & South)	13	139,912	1966	24,000	880
Police Facility	36	9,320	1998	9,300	341
Rivera Library	15	230,013	1960	84,500	3,097
Science Library	60	167,358	1998	41,500	1,521
Speith Hall -Life Sciences	16B	See 16	1958	22,000	806
Sproul Hall	9	78,870	1965	28,000	1,026
Student Recreation Center	55	80,000	1994	30,500	1,118
Surge Building	64	84,375	2001	26,000	953
Telephone Building	40	2,584	1965	2,500	92
Terrace Conference	47	4,880	1991	5,000	183
Theatre	11	See 12	1996	19,800	726
University Cottage	8	1,025	1916	1,025	38
University Lab	25A	11,803	1994	6,900	253
University Offices	25	19,650	1991	10,200	374
USDA Salinity Lab	46			28,800	1,056
Veitch Student Center	32	24,180	1961	24,200	887
Watkins Hall	10	63,913	1953	52,000	1,906
Webber Hall	19	50,801	1953	23,000	843
SUBTOTAL		**3,355,269**		**1,629,325**	**59,718**

Table 9.2: Future Building Roof Drainage

100 yr (in/hr)= 3.92

BUILDING	No.	G.S.F.	Date	Roof Area	Pk Flow (Gpm)	Pk Flow (Cfs)
2002 - 2005						
Alumni/ Visitor Center	59	25,890	2005	9,800	359	0.80
Biological Science	66	55,071	2005	16,500	605	1.35
Boiler Plant (additional load)			2005			
Commons Expansion	69	186,004	2005	70,680	2,591	5.77
Demo Commons	4	(86,004)		(64,500)	(2,364)	(5.27)
Engineering Unit #2	67	152,010	2005	45,600	1,671	3.72
Entomology	24	67,139	2002	20,100	737	1.64
Insectory & Quarantine	26C	31,523	2002	9,000	330	0.74
Physical Science #1	68	129,417	2005	38,800	1,422	3.17
Satellite Central Plant		7,000	2005	7,000	257	0.57
Science Lab #1	65	44,138	2001	13,200	484	1.08
Pentland Hills #2	70	67,500	2002	33,750	1,237	2.76
SUBTOTAL		**679,688**		**199,930**	**7,328**	**16.33**
CUMULATIVE TOTAL		**4,034,957**		**1,829,255**	**67,046**	**149.39**
2006 -2010						
Housing Unit #2	71	60,000	2010	30,000	1,100	2.45
Housing Unit #3	72	60,000	2010	30,000	1,100	2.45
CHASS Bldg 1	73	115,000	2010	46,000	1,686	3.76
CHASS Bldg 2	74	85,000	2010	34,000	1,246	2.78
Boiler Plant (additional load)			2010			
Demo Art Annex	12A	(2,645)		(2,700)	(99)	(0.22)
Engineering Unit #3	75	150,000	2010	45,000	1,649	3.68
Entomology #2	76	100,000	2010	30,000	1,100	2.45
Demo Entomology Annex	23	(16,664)		(12,600)	(462)	(1.03)
Genomics	77	120,000	2010	36,000	1,319	2.94
Performing Arts	78	75,000	2010	30,000	1,100	2.45
Physical Science #2	79	130,000	2010	39,000	1,429	3.19
Satellite Plant Expansion			2010			
Housing Unit #4	80	93,750	2010	46,875	1,718	3.83
Housing Unit #5	81	93,750	2010	46,875	1,718	3.83
SUBTOTAL		**1,063,191**		**398,450**	**14,604**	**32.54**
CUMULATIVE TOTAL		**5,098,148**		**2,227,705**	**81,650**	**181.93**
2011 -2015						
Student/ Administration Cluster:						
Boiler Plant (additional load)			2015			
Building 1	82	100,000	2015	40,000	1,466	3.27
Building 2	83	100,000	2015	40,000	1,466	3.27
Building 3	84	120,000	2015	48,000	1,759	3.92
Building 4	85	50,000	2015	20,000	733	1.63
Science Cluster:						
Building 1 (lab)	86	100,000	2015	30,000	1,100	2.45
Demo 20% of Pierce Hall	13	(27,982)		(4,800)	(176)	(0.39)
Building 2 (classroom)	87	100,000	2015	30,000	1,100	2.45

Table 9.2: Future Building Roof Drainage

100 yr (in/hr)= 3.92

BUILDING	No.	G.S.F.	Date	Roof Area	Pk Flow (Gpm)	Pk Flow (Cfs)
Science Bldg. (lab)	88	100,000	2015	30,000	1,100	2.45
Demo Greenhouse 15-17	30	(15,000)		(15,000)	(550)	(1.23)
Building 4 (classroom)	89	100,000	2015	30,000	1,100	2.45
Demo Custodial		(7,446)		(6,000)	(220)	(0.49)
Demo Entomology	26	(32,444)		(12,600)	(462)	(1.03)
Demo Insectary	26D	(8,783)		(6,500)	(238)	(0.53)
Building 5 (lab)	90	100,000	2015	30,000	1,100	2.45
Demo Greenhouse 11- 13A	30	(17,500)		(17,500)	(641)	(1.43)
Building 6 (classroom)	91	100,000	2015	30,000	1,100	2.45
Demo Lath House #1		(5,000)		(5,000)	(183)	(0.41)
Building 7 (lab)	92	100,000	2015	30,000	1,100	2.45
Demo Lath House #2		(5,000)		(5,000)	(183)	(0.41)
Building 8 (classroom)	93	120,000	2015	36,000	1,319	2.94
Demo Greenhouse 18-21	30	(20,000)		(20,000)	(733)	(1.63)
Building 9 (lab)	94	120,000	2015	36,000	1,319	2.94
Physical Science #3	95	130,000	2015	39,000	1,429	3.19
Building 11 (classroom)	96	100,000	2015	30,000	1,100	2.45
Future Bldg Devlpmnt in Prkg Lot 6:						
Building 1	97	100,000	2015	40,000	1,466	3.27
Building 2	98	50,000	2015	20,000	733	1.63
Building 3	99	75,000	2015	30,000	1,100	2.45
Building 4	100	50,000	2015	20,000	733	1.63
Building 5	101	150,000	2015	60,000	2,199	4.90
Building 6	102	75,000	2015	30,000	1,100	2.45
Housing Unit #6	103	112,500	2015	56,250	2,062	4.59
Demo Canyon Crest	62	(197,266)		(150,000)	(5,498)	(12.25)
Housing Unit #7	104	112,500	2015	56,250	2,062	4.59
Housing Unit #8	105	112,500	2015	56,250	2,062	4.59
Housing Unit #9	106	112,500	2015	56,250	2,062	4.59
Housing Unit #10	107	112,500	2015	56,250	2,062	4.59
Housing Unit #11	108	112,500	2015	56,250	2,062	4.59
Housing Unit #12	109	112,500	2015	56,250	2,062	4.59
Housing Unit #13	110	112,500	2015	56,250	2,062	4.59
Housing Unit #14	111	112,500	2015	56,250	2,062	4.59
Housing Unit #15	112	112,500	2015	56,250	2,062	4.59
SUBTOTAL		**2,828,579**		**871,100**	**37,352**	**83.23**
GRAND TOTAL		**7,926,727**		**3,098,805**	**119,002**	**265.16**

9.3 Growth Requirements

The projected increase in the campus enrollment will not present a significant increase in the necessary storm drain system capacity. Storm drain load is a function of anticipated rainfall intensity, watershed area, and watershed characteristics such as soil type, amount and type of vegetation, and permeability of surfaces. Anticipated rainfall and watershed area will remain unchanged. Construction of new buildings in previously undeveloped areas, however, will change the watershed characteristics slightly, causing a small increase in the amount of storm water discharge. New building construction will convert undeveloped areas, which were previously semi-permeable and retained some rainfall,- to hardscape and/ or building roof area that is impermeable and absorbs or retains almost no rainfall, causing more discharge per square foot. If one of the alternatives recommended by the PWA report is implemented, the new storm drain system capacity should be sufficient to handle the increase in storm drain load due to new building construction. Future building storm drain connections should be sized for five-minute duration of the 100-year storm.

MANHOLE INVERT ELEVATION SCHEDULE

MH No.	FLOW LINE	MH No.	FLOW LINE
A	1026.18	D6B	1052.50
B	1062.35	D7	1047.80
A1	1021.12	D8	1049.51
B1	1026.75	D9	1052.64
B2	1031.60	D9A	1055.61
B3	1032.53	D10	1054.37
B4	1035.50	D10A	1065.70
B5	1036.52	D10B	1065.35
B5A	1067.08	D11	1055.17
B6	1037.20	E1	1042.90
B6A	1039.30	E1A	1050.75
B7	1048.50	E1B	1052.78
B8	1060.00	E2	1045.30
B9	1061.99	E3	1057.65
B10	1072.98	E4	1059.00
B11	1089.62	E5	1061.00
C1	1014.21	E5A	1069.00
C2	1031.00	E6	1067.64
C1	1029.00	E7	1088.09
D2	1032.45	F1	1072.80
D2A	1035.80	G1	1087.00
D3	1033.80	H1	1072.00
D4	1035.86	H2	1068.60
*	1034.38	H3	1072.65
D5	1045.23	H4	1071.25
D5A	1046.50	H5	1070.39
D5B	1047.50	J1	1040.85
D5C	1050.60	J2	1055.02
D5D	1063.60	J3	1066.27
D6	1046.22	J4	1082.50
D6A	1051.22		

UCR
UNIVERSITY OF CALIFORNIA RIVERSIDE

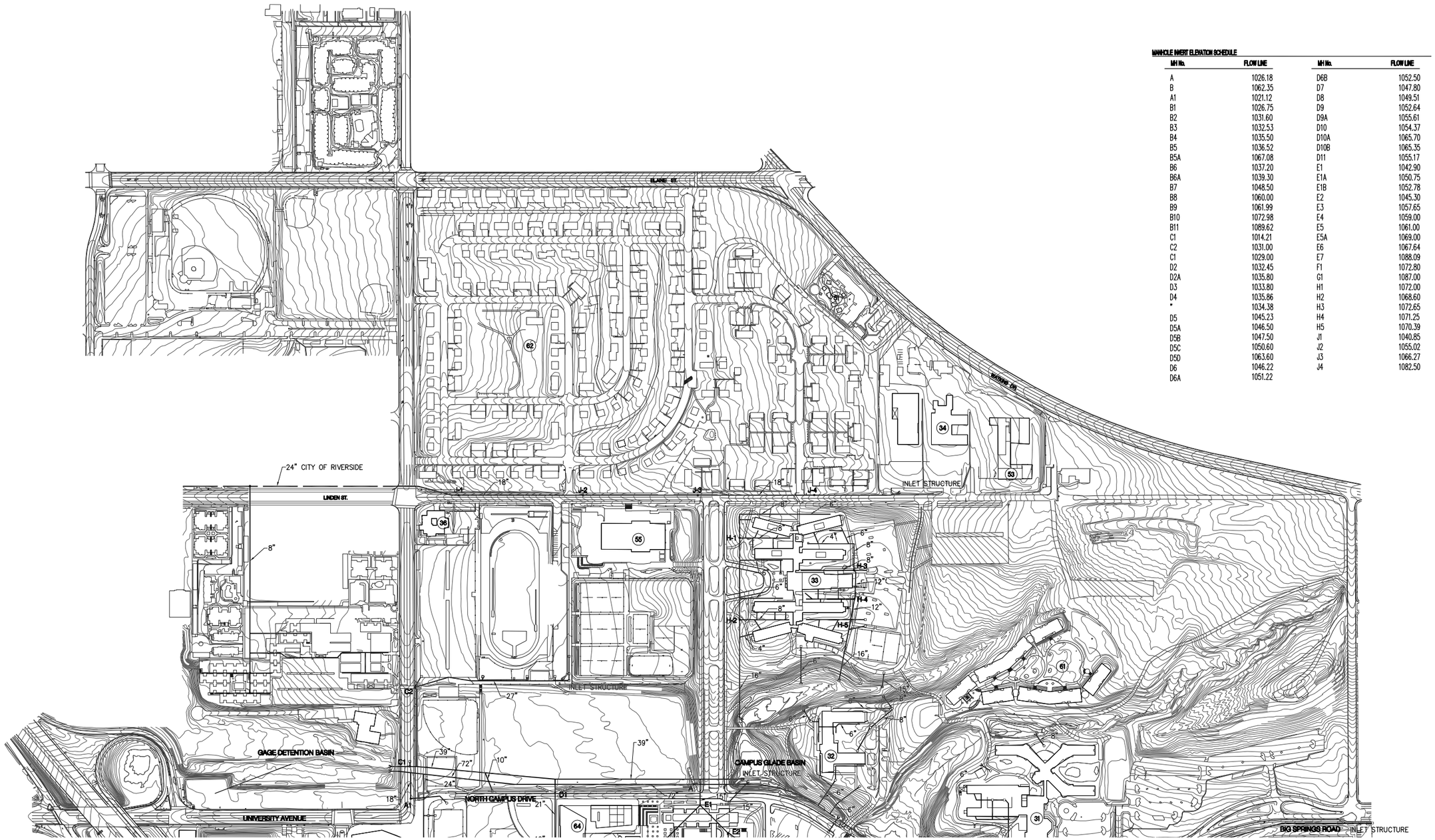
PLUMBING EXISTING SITE STORM DRAIN SOUTH

Bechard Long &Associates, Inc.
MECHANICAL AND ELECTRICAL CONSULTING ENGINEERS
10670 Treena Street
Suite 208
San Diego
CA 92131-2437
(858) 578-8661
FAX (858) 578-8865
E-MAIL sd@bech.com

PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: SD-00S



MANHOLE INVERT ELEVATION SCHEDULE

MH No.	FLOW LINE	MH No.	FLOW LINE
A	1026.18	D6B	1052.50
B	1062.35	D7	1047.80
A1	1021.12	D8	1049.51
B1	1026.75	D9	1052.64
B2	1031.60	D9A	1055.61
B3	1032.53	D10	1054.37
B4	1035.50	D10A	1065.70
B5	1036.52	D10B	1065.35
B5A	1067.08	D11	1055.17
B6	1037.20	E1	1042.90
B6A	1039.30	E1A	1050.75
B7	1048.50	E1B	1052.78
B8	1060.00	E2	1045.30
B9	1061.99	E3	1057.65
B10	1072.98	E4	1059.00
B11	1089.62	E5	1061.00
C1	1014.21	E5A	1069.00
C2	1031.00	E6	1067.64
C1	1029.00	E7	1088.09
D2	1032.45	F1	1072.80
D2A	1035.80	G1	1087.00
D3	1033.80	H1	1072.00
D4	1035.86	H2	1068.60
"	1034.38	H3	1072.65
D5	1045.23	H4	1071.25
D5A	1046.50	H5	1070.39
D5B	1047.50	J1	1040.85
D5C	1050.60	J2	1055.02
D5D	1063.60	J3	1066.27
D6	1046.22	J4	1082.50
D6A	1051.22		

NORTH

0 50'100' 200' 400' 600'
1"=200'-0"

UCR
UNIVERSITY OF CALIFORNIA RIVERSIDE

PLUMBING EXISTING SITE STORM DRAIN NORTH

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E-MAIL sd@bech.com

PROJECT NO: 01897

DATE: 01/28/01

SHEET NO: SD-00N

APPENDIX A

	BUILDING	No.	G.S.F.	A.S.F	On-Line Date	CHILLED WATER											STEAM								COND RETURN			
						dT (deg F)= 16 Diversity= 75%											Heating Factor= 0.54 Base Factor= 0.0053								Ret %= 100%			
						Service (Inches)	Data Source	Est. Tons	Est. sf/ton	Est GPM	Pk (UCR) Tons	s.f./ Pk Ton	Peak (Gpm)	Diversified (Tons) (7)	Diversified (Gpm) (7)	Condition	Remarks	Service (Inches)	AHSF	Total Load (lbs/hr)	Base Load (lbs/hr)	Btu/sf	Condition	Remarks	Service (Inches)	Load (Gpm)	Condition	Remarks
1	Aberdeen Hall *	33	133,435			N/A											N/A						10-17#	N/A			
2	Administration - Hinderaker Hall	1	46,490	26,876	1,960	8"	U (L)	77	350	115	146	184	219	110	164	F	2-CHWP (3)	4"	39,517	728	209	18	F		1-1/2"	1.5	F	
3	Anderson Hall	27B & C	See 27A		1,917						See 27A							See 27A							1-1/2"	See 27A	F	
4	Art Annex**	12A	2,645	1,950	1,973	N/A											N/A							N/A			
5	Barn Group	7	5,600	4,144		N/A											N/A							N/A			
6	Batchelor Hall (North & South)	22	114,860	60,876	1,965	8", 4"	U (M)	244	250	365	375	162	563	281	422	F	5-CHWP	4"	97,631	2,161	517	22	G	100-10#	2"	4.5	G	
7	Bookstore	48	33,400	19,372	1,991	4"	F (L)	55	350	83	71	273	107	53	80	G	1-CHWP	N/A	28,390	524	150	18			N/A	1.1		
8	Bourns Hall	54	145,309	113,598	1,995	8"	U (M)	454	250	682	716	159	1,074	537	806	G	2-CHWP	6"	123,513	3,722	655	30	G	105-12#	2"	7.7	G	
9	Boyce Hall	20	109,932	62,661	1,974	8", 3"	U (H)	501	125	752	688	91	1,032	516	774	F	4-CHWP	3"	93,442	4,374	990	47	F		1-1/2"	9.0	F	
10	Boyden Lab Building	26A	6,396	4,477	1,961	3"	U (H)	36	125	54	25	179	38	19	28	P	1-CHWP	2-1/2"	5,437	299	58	55	F		1"	0.6	F	
11	Campus Modular Building		21,960	12,737	2,000	N/A											N/A							N/A			
12	Canyon Crest Student Family Housing *	62	197,266			N/A											N/A							N/A			
13	Carillon Tower	5	4,774	3,342	1,966	N/A											N/A							N/A			
14	Central Power Plant	17	19,437		1,953																						
15	Chapman Hall -Soils & Plant Nutrition	27A	51,941	27,528	1,931	4"	U (M)	110	250	165	250	110	375	188	281	F	4-CHWP	4"	44,150	977	234	22	G		1-1/2"	2.0	G	
16	Chemical Sciences	13A	See 13		1,990						See 13								See 13							See 13		
17	Child Development Center *	51	12,000		1,996	N/A											N/A							N/A			
18	College Building North & South	42	17,944	10,408	1,963	N/A											N/A							N/A			
19	Commons**	4	86,004	63,643	1,965	6"	U (L)	182	350	273	146	436	219	110	164	G	5-CHWP	3"	73,103	2,777	1,550	38	F	100-15#	1-1/2"	5.7	F	
20	Computer Statistics	21	42,096	24,208	1,974	6"	U (M)	97	250	145	125	194	188	94	141	F	2-CHWP	3"	35,782	843	190	24	F	100-10#	1"	1.7	F	
21	Corporation Yard	34	45,000	33,300	1,959	N/A											N/A							N/A			
22	Costo	3	See 4		1,965						See 4								See 4							See 4		
23	Custodial**		7,446	5,510	1,965	N/A	M		250									1-1/2"	6,329	204	34	32	F	10# Stm	1"	0.4	F	
24	Entomology**	26	32,444	20,855	1,932	4"	U (H)	167	125	250	150	139	225	113	169	F	4-CHWP	5"	27,577	1,418	292	51	F		1-1/2"	2.9	F	
25	Entomology Annex**	23	16,664	10,685	1,948	3"	U (H)	85	125	128	91	117	137	68	102	P	1-CHWP	6"	14,164	727	150	51	F		2-1/2"	1.5	F	
26	Entomology Research Museum	26B	8,988	6,292	1,993	N/A												N/A							N/A			
27	Environmental Health and Safety	43	6,334	4,687	1,989	N/A												N/A							N/A			
28	Fawcett Lab	28	20,997	15,538	1,965	4"	U (H)	124	125	186	63	247	95	47	71	G	1-CHWP	3"	17,847	1,028	189	58	F	105#	1-1/2"	2.1	F	
29	Fine Arts	58	100,371	55,150	2,001	6"	U (M)	221	250	331	294	188	441	221	331	N	2-CHWP	3"	85,315	1,941	452	23	N	100-10#	1-1/2"	4.0	N	
30	Geology	14	103,095	61,857	1,952	8"	U (H)	495	125	742	490	126	735	368	551	F	3-CHWP	4"	87,631	4,269	929	49	F	100-10#	2"	8.8	F	
31	Greenhouse 11-13A**	30	17,500		1,955	N/A	H		125									4"	14,875	803		54	G		2"	1.7	G	
32	Greenhouse 1-3	30	15,000		1,988	N/A	H		125									1-1/2"	12,750	689		54	F	36#	1"	1.4	F	
33	Greenhouse 15-17**	30	15,000		1,956	N/A	H		125									2"	12,750	689		54	F		1"	1.4	F	
34	Greenhouse 18-21**	30	20,000		1,965	N/A	H		125									6"	17,000	918		54	F		1-1/4"	1.9	F	
35	Greenhouse 6-10	30	25,000		1,952	N/A	H		125										21,250	1,148		54				2.4		
	Humanities-1	7A	111,180	62,261	1,996	6"	U (M)	249	250	374	354	176	531	266	398	G	2-CHWP	4"	94,503	2,182	501	23	G	100-12#	2"	4.5	G	
37	Humanities-2 (1)	11A	See 12		1,963						See 12								See 12							See 12		
38	Insectory**	26D	8,783	4,919	1,959	3"	U (H)	39	125	59	47	105	71	35	53	F	1-CHWP	2-1/2"	7,466	345	79	46	F	40-6#	1-1/4"	0.7	F	
39	Lath House #1**		5,000			N/A												N/A							N/A			
40	Lath House #2**		5,000			N/A												N/A							N/A			
41	Life Sciences	16	150,994	81,535	1,948	6"	U (M)	326	250	489	665	123	998	499	748	G	1-CHWP (3)	6", 2"	128,345	2,882	680	22	F	100-8#	(2) 1-1/2"	6.0	F	
42	Life Sciences	16A	See 16		1,969	4"					See 16					F	1-CHWP		See 16							See 16		
43	Lothian Hall *	31	163,250			N/A												N/A						10-12#	N/A			
44	Mobile Trailer Facilities	29	15,691	8,944	1,971	N/A												N/A							N/A			
45	Olmstead Hall (Humanities-2) (1)	12	141,049	83,788	1,963	6"	U (M)	335	250	503	313	268	470	235	352	F	1-CHWP (6)		119,892	2,898	635	24	F			6.0	F	
46	Parking Services	53	5,612	3,142	1,993	N/A												N/A							N/A			
47	Pentland Hills *	61	134,544		2,000	N/A												N/A							N/A			
48	Physical Education	2	65,346	43,128	1,953	6"	U (L)	123	350	185	104	415	156	78	117	G	2-CHWP	4"	55,544	2,009	1,178	36	F	100-10#	2-1/2"	4.2	F	
49	Physics	18	94,808	57,833	1,965	8"	U (M)	231	250	347	375	154	563	281	422	P	7-CHWP	4"	80,587	1,989	427	25	F	100-26#	2-1/2"	4.1	F	
50	Physics 2000	18A	See 18								See 18								See 18							See 18		
51	Pierce Hall (North & South)**	13	139,912	84,634	1,966	5", 8"	U (H)	677	125	1,016	755	112	1,133	566	849	G	4-CHWP	(2) 4"	118,925	5,831	1,261	49	F	100-8#	(2) 1-1/2"	12.0	F	
52	Police Facility	36	9,320	5,405	1,998	N/A												N/A							N/A			
53	Rivera Library	15	230,013	184,010	1,960	4", 6", 6"	U (L)	526	350	789	563	327	845	422	633	F	4-CHWP	(4) 4"	195,511	4,585	1,036	23	P	105-10#	(4) 2"	9.5	P	
54	Science Library	60	167,358	107,109	1,998	6", 6"	U (L)	306	350	459	583	184	875	437	656	G	4-CHWP		142,254	2,820	754	20	G	100-12#		5.8	G	
55	Speith Hall -Life Sciences (1)	16B	See 16		1,958	4", 6"					See 16					F	See 16		See 16							See 16		
56	Sproul Hall (1)	9	78,870	46,533	1,965	5", 5"	U (M)	186	250	279	188	248	282	141	212	F	2-CHWP	2", 4"	67,040	1,612	355	24	G	50 Psi	3/4", 2-1/2"	3.3	G	(4)
57	Student Recreation Center	55	80,000	52,800	1,994	N/A											(Not accessible)	N/A							N/A			
58	Surge Building	64	84,375	48,938	2,001	N/A												N/A							N/A			
59	Sweeney Art Gallery	39A	720	420	1,984	N/A												N/A							N/A			
60	Telephone Building	40	2,584	1,550	1,965	N/A												N/A							N/A			
61	Terrace Conference	47	4,880	2,980	1,991	N/A												N/A							N/A			
62	Theatre (1)	11	See 12		1,996						See 12								See12							See 12		
63	University Cottage	8	1,025	720	1,916	N/A												N/A							N/A			
64	University Lab	25A	11,803	7,082	1,994	N/A												N/A							N/A			
65	University Offices	25	19,650	11,397	1,991	N/A												N/A							N/A			
66	USDA Salinity Lab	46																										
67	Veitch Student Center	32	24,180	17,893	1,961	N/A												N/A							N/A			
68	Watkins Hall (1)	10	63,913	34,513	1,953	5"	U (M)	138	250	207	125	276	188	94	141	F	4-CHWP	4"	54,326	1,220	288	22	F	100-10#	3"	2.5	F	
69	Webber Hall (1)	19	50,801	27,432	1,953	6"	U (H)	219	125	329	208	132	312	156	234	G	2-CHWP	5"	43,181	1,710	229	40	G		?	3.5		U.C.
	SUBTOTAL		**3,355,989**	**1,628,660**							**7,910**		**11,865**	**5,933**	**8,899**				**1,966,026**	**60,321**	**14,023**	**31**				**124.6**		
			Chilled Water A.S.F.	**1,385,019**																								

	BUILDING	No.	G.S.F.	A.S.F	On-Line Date	CHILLED WATER dT (deg F)= 16 Diversity= 75% Service (Inches)	Data Source	Est. Tons	Est. sf/ton	Est GPM	Pk (UCR) Tons	s.f./ Pk Ton	Peak (Gpm)	Diversified (Tons) (7)	Diversified (Gpm) (7)	Condition	Remarks	STEAM Heating Factor= 0.54 Base Factor= 0.0053 Service (Inches)	AHSF	Total Load (lbs/hr)	Base Load (lbs/hr)	Btu/sf	Condition	Remarks	COND RETURN Ret %= 100% Service (Inches)	Load (Gpm)	Condition	Remarks
	2002 - 2005																											
70	Alumni/ Visitor Center	59	25,890	16,829	2,005		L	48	350	72				36	54				22,007	441	117	20				0.9		
71	Biological Science	66	55,071	38,550	2,005		H	308	125	463				231	347				46,810	2,578	496	55				5.3		
72	Commons Expansion (2)	69	186,004	118,643	2,005		L	339	350	508				254	381				158,103	5,640	3,352	36				11.7		
73	Demo Commons	4	(86,004)	(63,643)	2,005		U (L)	(182)	350	(273)	(146)	436	(219)	(110)	(164)				(73,103)	(2,777)	(1,550)	38				(5.7)		
74	Engineering Unit #2	67	152,010	106,400	2,005		M	426	250	638				319	479				129,209	3,558	685	28				7.4		
75	Entomology Seismic Replacement Bldg	24	67,139	42,969	2,002	8" ?	H	344	125	516	890	48	1,335	258	387	N	18 deg dT	4"	57,068	2,925	605	51	N		2"	6.0	N	
76	Insectory & Quarantine	26C	31,523	25,200	2,002	8"	U (H)	202	125	302	686	37	1,029	151	227	N	2-CHWP	6"	26,795	1,645	284	61	N	110#	3"	3.4	N	
77	Physical Science #1	68	129,417	90,592	2,005		H	725	125	1,087				544	815				110,004	6,058	1,166	55				12.5		
78	Satellite Central Plant		7,000																5,950									
79	Science Lab #1	65	44,138	30,897	2,003		H	247	125	371	617	50	926	185	278				37,517	2,066	398	55				4.3		
	SUBTOTAL		**612,188**	**406,437**				**2,456**		**3,685**				**1,869**	**2,804**				**520,360**	**22,134**	**5,552**	**43**				**45.7**		
	CUMULATIVE TOTAL		**3,968,177**	**2,035,097**										**7,802**	**11,703**				**2,486,386**	**82,455**	**19,575**	**33**				**170.4**		
	2006 -2010																											
80	Housing*	70-72	187,500		2,005	N/A												N/A							N/A			
81	CHASS Bldg 1	73	115,000	74,750	2,010		L	214	350	320				160	240				97,750	1,960	518	20				4.0		
82	CHASS Bldg 2	74	85,000	58,500	2,010		L	167	350	251				125	188				72,250	1,511	383	21				3.1		
83	Demo Art Annex	12A	(2,645)	(1,950)	2,010	N/A												N/A							N/A			
84	Engineering Unit #3	75	150,000	105,000	2,010		M	420	250	630				315	473				127,500	3,511	676	28				7.3		
85	Entomology #2	76	100,000	70,000	2,010		H	560	125	840				420	630				85,000	4,681	901	55				9.7		
86	Demo Entomology Annex	23	(16,664)	(10,685)	2,010		U (H)	(85)	125	(128)	(91)	117	(137)	(68)	(102)				(14,164)	(727)	(150)	51				(1.5)		
87	Genomics	77	120,000	84,000	2,010		M	336	250	504				252	378				102,000	2,809	541	28				5.8		
88	Performing Arts	78	75,000	52,500	2,010		L	150	350	225				113	169				63,750	1,350	338	21				2.8		
89	Physical Science #2	79	130,000	91,000	2,010		H	728	125	1,092				546	819				110,500	6,085	1,171	55				12.6		
90	Housing*	80-81	187,500		2,010	N/A												N/A							N/A			
	SUBTOTAL		**1,130,691**	**523,115**				**2,489**		**3,734**				**1,863**	**2,794**				**644,586**	**21,180**	**4,377**	**33**				**43.8**		
	CUMULATIVE TOTAL		**5,098,868**	**2,558,212**										**9,665**	**14,497**				**3,130,972**	**103,635**	**23,953**	**33**				**214.1**		
	2011 -2015																											
	Student/ Administration Cluster:																											
91	Building 1	82	100,000	55,000	2,015		L	157	350	236				118	177				85,000	1,511	451	18				3.1		
92	Building 2	83	100,000	55,000	2,015		L	157	350	236				118	177				85,000	1,511	451	18				3.1		
93	Building 3	84	120,000	66,000	2,015		L	189	350	283				141	212				102,000	1,813	541	18				3.7		
	Building 4	85	50,000	27,500	2,015		L	79	350	118				59	88				42,500	756	225	18				1.6		
	Science Cluster:									0																		
95	Building 1 (lab)	86	100,000	70,000	2,015		H	560	125	840				420	630				85,000	4,681	901	55				9.7		
96	Demo 20% of Pierce Hall	13	(27,982)	(16,927)	2,015		U (H)	(135)	125	(203)	(151)	112	(227)	(113)	(170)				(23,785)	(1,166)	(252)	49				(2.4)		
97	Building 2 (classroom)	87	100,000	70,000	2,015		M	280	250	420				210	315				85,000	2,341	451	28				4.8		
98	Building 3 (lab)	88	100,000	70,000	2,015		H	560	125	840				420	630				85,000	4,681	901	55				9.7		
99	Demo Greenhouse 15-17	30	(15,000)		2,015	N/A	H		125										(12,750)	(689)		54				(1.4)		
100	Building 4 (classroom)	89	100,000	70,000	2,015		M	280	250	420				210	315				85,000	2,341	451	28				4.8		
101	Demo Custodial		(7,446)	(5,510)	2,015	N/A	M		250										(6,329)	(204)	(34)	32				(0.4)		
102	Demo Entemology	26	(32,444)	(20,855)	2,015		U (H)	(167)	125	(250)	(150)	139	(225)	(113)	(169)				(27,577)	(1,418)	(292)	51				(2.9)		
103	Demo Insectory	26D	(8,783)	(4,919)	2,015		U (H)	(39)	125	(59)	(47)	105	(71)	(35)	(53)				(7,466)	(345)	(79)	46				(0.7)		
104	Building 5 (lab)	90	100,000	70,000	2,015		H	560	125	840				420	630				85,000	4,681	901	55				9.7		
105	Demo Greenhouse 11-13A	30	(17,500)		2,015	N/A	H		125										(14,875)	(803)		54				(1.7)		
106	Building 6 (classroom)	91	100,000	70,000	2,015		M	280	250	420				210	315				85,000	2,341	451	28				4.8		
107	Demo Lath House #1		(5,000)		2,015	N/A												N/A							N/A			
108	Building 7 (lab)	92	100,000	70,000	2,015		H	560	125	840				420	630				85,000	4,681	901	55				9.7		
109	Demo Lath House #2		(5,000)		2,015	N/A												N/A							N/A			
110	Building 8 (classroom)	93	120,000	84,000	2,015		M	336	250	504				252	378				102,000	2,809	541	28				5.8		
111	Demo Greenhouse 18-21	30	(20,000)		2,015	N/A	H		125										(17,000)	(918)		54				(1.9)		
112	Building 9 (lab)	94	120,000	84,000	2,015		H	672	125	1,008				504	756				102,000	5,617	1,081	55				11.6		
113	Physical Science #3	95	130,000	91,000	2,015		H	728	125	1,092				546	819				110,500	6,085	1,171	55				12.6		
114	Building 11 (classroom)	96	100,000	70,000	2,015		M	280	250	420				210	315				85,000	2,341	451	28				4.8		
	~~Humanities/ Law Cluster:~~																											
115	Building 1	97	100,000	60,000	2,015		M	240	250	360				180	270				85,000	2,071	451	24				4.3		
116	Building 2 Parking Lot	98	50,000	30,000	2,015		M	120	250	180				90	135				42,500	1,035	225	24				2.1		
117	Building 3	99	75,000	45,000	2,015		M	180	250	270				135	203				63,750	1,553	338	24				3.2		
118	Building 4 6 Developments	100	50,000	30,000	2,015		M	120	250	180				90	135				42,500	1,035	225	24				2.1		
119	Building 5	101	150,000	90,000	2,015		M	360	250	540				270	405				127,500	3,106	676	24				6.4		
120	Building 6	102	75,000	45,000	2,015		M	180	250	270				135	203				63,750	1,553	338	24				3.2		
121	Housing*	103-112	1,125,000		2,015	N/A												N/A							N/A			
	SUBTOTAL		**3,025,845**	**1,274,289**				**6,536**		**9,804**				**4,897**	**7,346**				**1,624,218**	**52,997**	**11,461**	**33**				**109.5**		
	GRAND TOTAL		**8,124,713**	**3,832,501**										**14,562**	**21,842**				**4,755,190**	**156,632**	**35,414**	**33**				**323.6**		

** Buildings to be Demolished
* Building maintained by Housing
(1) HVAC Replacement Project
(2) Will replace existing Commons
(3) New chilled water pump installed
(4) New condensate pump
(5) New domestic hot water heater
(6) Pump not operating (High pressure)
(7) For existing buildings, diversified GPM & Tons are based on peak tons & GPM. For future buildings, diversified GPM and tons are based on estimated tons and GPM

LEGEND
U University furnished data
F Field data
H 125 S.F./ Ton
M 250 S.F./ Ton
L 350 S.F./ Ton

NOTES
1. Actual heating area (AHSF) is assumed to 85% of overall gross square ft.
2. Condensate return flows were calculated using 180 deg F condensate.

	BUILDING	No.	G.S.F.	A.S.F.	On-Line Date	DOMESTIC WATER gh sf/gpm 300		:l sf/gpm: 1,622		dm sf/gpm: 880		SANITARY SEWER % of DW= 90%					GAS					STORM 100 yr (in/hr)= 3.92				
						Service (Inches)	Peak (Gpm)	Fire GPM	# of hydrant	Condition	Remarks	Service (Inches)	Peak (Gpm)	Peak (cfs)	Condition	Remarks	Lo P Srvc (Inches)	Hi P Srvc (Inches)	Peak (CFH)	Condition	Remarks	Service (Inches)	Roof Area	Pk Flow (Gpm)	Pk Flow (Cfs)	Remarks
1	Aberdeen Hall *	33	133,435			4"	149.9	7,750	8	F	40-65#	(2) 6" dwg	134.9	0.30	F		4"	4"	17,791	F			89,000	3,262	7.27	
2	Administration - Hinderaker Hall	1	46,490	26,876	1960	4"	28.7	4,500	5	F			25.8	0.06	F			1-1/2"	297	F		6"	21,000	770	1.72	
3	Anderson Hall	27B & C	See 27A		1917	3"	See 27A					4"	See 27A		F		2-1/2"		0				18,500	678	1.51	
4	Art Annex	12A	2,645	1,950	1973	3/4"	1.6	1,500	1	F	120-70#		1.5	0.01	F			1"	22	F			2,700	99	0.22	
5	Barn Group	7	5,600	4,144		2"	3.5	1,500	1	F	4" spkr		3.1	0.01	F			1"	46	F			5,000	183	0.41	
6	Batchelor Hall (North & South)	22	114,860	60,876	1965	4"	70.8	7,250	7	F	105#	6"	63.8	0.14	F		2"		672	F			35,000	1,283	2.86	
7	Bookstore	48	33,400	19,372	1991	2"	20.6	2,000	2	G		4"	18.5	0.04	G		N/A						24,000	880	1.96	
8	Bourns Hall	54	145,309	113,598	1995	3"	89.6	4,750	5	G	115-68#	8"	80.7	0.18	G		2"		1254	G			51,900	1,902	4.24	
9	Boyce Hall	20	109,932	62,661	1974	4"	67.8	7,000	7	G			61.0	0.14	G		1-1/2"		692	F			26,000	953	2.12	
10	Boyden Lab Building	26A	6,396	4,477	1961	2"	3.9	1,750	1	F		6"	3.6	0.01	F			1"	49	F			6,400	235	0.52	
11	Campus Modular Building		21,960	12,737	2000	2"	13.5	1,500	1	G	4" spkr	6"	12.2	0.03	G		2"		141	G		8"	15,000	550	1.23	
12	Canyon Crest Student Family Housing	62	197,266			6" & (2) 4"	121.7	8,000	8	G	3/4" per unit ?		109.5	0.24	G			3/4" per unit	0	F					
13	Carillon Tower	5	4,774	3,342	1966	1-1/4"	2.9	1,500	1	G		N/A	2.6	0.01			N/A					4"	500	18	0.04	
14	Central Power Plant	17	19,437		1953		145.0	3,000	3	F			10.8	0.02	F				86,173	F			18,500	678	1.51	
15	Chapman Hall -Soils & Plant Nutrition	27A	51,941	27,528	1931	4"	32.0	4,750	5	G			28.8	0.06	G		3"		See 27B	G			8,300	304	0.68	
16	Chemical Sciences	13A	See 13		1990		See 13						See 13						See 13				see 13			
17	Child Development Center *	51	12,000		1996	(2) 2"	7.4	1,500	1	G	2-1/2" dwg	6" dwg	6.7	0.01	G		3"	3/4"	0	G			6,000	220	0.49	
18	College Building North & South	42	17,944	10,408	1963	2" (North)	11.1	2,750	3	G			10.0	0.02	G		1-1/4", 1-1/2"		115	G			5,200	191	0.42	
19	Commons	4	86,004	63,643	1965	4"	53.0	6,250	6	G	65#	(3) - 6"	47.7	0.11	G			1-1/2"	702	G		(2) - 8"	64,500	2,364	5.27	
20	Computer Statistics	21	42,096	24,208	1974	4"	26.0	4,250	4	F	110-60#		23.4	0.05	F		4"	1"	267	F			14,100	517	1.15	
21	Corporation Yard	34	45,000	33,300	1959	6"	27.8	4,500	5	F	2, 2, 2, 3/4		25.0	0.06	"B"-3", Garage-4", Vol.Stor.-3"		4"		368	F	A-4", B-3", C-2"	"A"-5", Garage-4"	21,000	770	1.72	
22	Costo	3	See 4		1965		See 4						See 4						See 4				18,300	671	1.49	
23	Custodial		7,446	5,510	1965	2-1/2"	4.6	1,750	1	F		4"	4.1	0.01	F			1"	61	F		4"	6,000	220	0.49	
24	Entomology	26	32,444	20,855	1932	3"	20.0	3,750	4	F	85#	4"	18.0	0.04	F		3"		230	F			12,600	462	1.03	
25	Entomology Annex	23	16,664	10,685	1948	2"	10.3	2,750	3	F	A, B, & C 2" Ea	6"	9.2	0.02	F		3"	2"	118	F		8"	12,600	462	1.03	
26	Entomology Research Museum	26B	8,988	6,292	1993	3"	5.5	1,500	2	G	17#?		5.0	0.01	G			1-1/2"	69	G			5,000	183	0.41	
27	Environmental Health and Safety	43	6,334	4,687	1989	1-1/2"	3.9	1,500	2	G		4"	3.5	0.01	G			1-1/4"	52	G	M.P.	6"	5,200	191	0.42	
28	Fawcett Lab	28	20,997	15,538	1965	3"	12.9	3,000	3	F		4"	11.7	0.03	F		2"		172	F			21,000	770	1.72	
29	Fine Arts	58	100,371	55,150	2001	(2) - 4"	61.9	3,500	4	N	4" spkr	8" dwg	55.7	0.12	N			2" dwg	609	N		24" dwg	42,800	1,569	3.50	
30	Geology	14	103,095	61,857	1952	(2) - 4"	63.6	6,750	7	F	105-65#	6", 4"	57.2	0.13	F		2"		683	F		12", 8"	33,000	1,210	2.70	
31	Greenhouse 11-13A	30	17,500		1955	2"	58.3	2,750	3	G		6"	9.7	0.02	G			1"	181			6"				
32	Greenhouse 1-3	30	15,000		1988	1-1/4"	50.0	2,500	3	F			8.3	0.02	F			3/4"	155	F						
33	Greenhouse 15-17	30	15,000		1956	2"	50.0	2,500	3	F			8.3	0.02	F			1"	155	F						
34	Greenhouse 18-21	30	20,000		1965	3"	66.7	3,000	3	F		6"	11.1	0.02	F		2"	1-1/4"	207	F						
35	Greenhouse 6-10	30	25,000		1952	2"	83.3	3,250	3	G		6"	13.9	0.03	G		2"	1-1/4"	259	G		6"				
36	Humanities-1	7A	111,180	62,261	1996	4"	68.6	3,500	4	G	125-75#		61.7	0.14	G			3/4"	687	G			25,000	916	2.04	
37	Humanities-2 (1)	11A	See 12		1963	4"	See 12					(2) - 6"	See 12				1"	1"	See 12	F			11,700	429	0.96	
38	Insectary	26D	8,783	4,919	1959	1-3/4"	5.4	2,000	2	G		6"	4.9	0.01	G		2"		54	F			6,500	238	0.53	
39	Lath House #1		5,000			1-1/2"	16.7			G			2.8	0.01	G			1"	55	G						
40	Lath House #2		5,000			1-1/2"	16.7			G			2.8	0.01	G		N/A		55							
41	Life Sciences	16	150,994	81,535	1948	(2) - 4"	93.1	8,000	8	F	110-80#	8"	83.8	0.19	F		(2) 2"		1416	F			33,000	1,210	2.70	
42	Life Sciences	16A	See 16		1969		See 16						See 16						See 16				7,500	275	0.61	
43	Lothian Hall *	31	163,250			(2) 4"	188.3	8,000	8	F	80-100#		169.5	0.38	F		2" dwg	(2) 3"	21,767	F			82,500	3,024	6.74	
44	Mobile Trailer Facilities	29	15,691	8,944	1971	6"	9.7	2,750	3	F		6"	8.7	0.02	F		2"		173	F			9,000	330	0.74	
45	Olmstead Hall (Humanities-2) (1)	12	141,049	83,788	1963		87.0	8,000	8	F			78.3	0.17	F				See 11				27,200	997	2.22	
46	Parking Services	53	5,612	3,142	1993	2"	3.5	1,500	1	G	1-1/2" irr	4" dwg	3.1	0.01	G		1-1/2" dwg	1"	35	G			5,600	205	0.46	
47	Pentland Hills *	61	134,544		2000	6"	152.9	4,000	4	G		8" dwg	137.6	0.31	G		2, 2-1/2" dwg	4"	17,939	G			56,000	2,053	4.57	
48	Physical Education	2	65,346	43,128	1953	4"	40.3	5,250	5	F	110-70#	8" dwg	36.3	0.08	F			2-1/2"	476	G			38,000	1,393	3.10	
49	Physics	18	94,808	57,833	1965	4"	58.5	6,500	7	F	120-90#	6"	52.6	0.12	F		2"		638	P			37,800	1,385	3.09	
50	Physics 2000	18A	See 18				See 18						See 18						See 18				8,700	319	0.71	
51	Pierce Hall (North & South)	13	139,912	84,634	1966	4", 3"	86.3	8,000	8	P	110-75#	8"	77.7	0.17	P		(2) 2-1/2"		934	F			24,000	880	1.96	
52	Police Facility	36	9,320	5,405	1998	2"	5.7	1,500	1	G	6" spkr	4" dwg	5.2	0.01	G		2" dwg	1"	60	G		4" dwg	9,300	341	0.76	
53	Rivera Library	15	230,013	184,010	1960	4", 3"	141.9	8,000	8	F	120-78#		127.7	0.28	F			1"	2031	F			84,500	3,097	6.90	
54	Science Library	60	167,358	107,109	1998	3"	103.2	4,500	5	G	70-60#	6"	92.9	0.21	G		N/A						41,500	1,521	3.39	
55	Speith Hall -Life Sciences (1)	16B	See 16		1958		See 16						See 16						See 16				22,000	806	1.80	
56	Sproul Hall (1)	9	78,870	46,533	1965	3"	48.6	6,000	6	G	100-110# (5)		43.8	0.10	G			1"	514	G			28,000	1,026	2.29	
57	Student Recreation Center	55	80,000	52,800	1994	6"	49.3	3,000	3	G		6" dwg	44.4	0.10	G			1"	583	G		12" dwg	30,500	1,118	2.49	
58	Surge Building	64	84,375	48,938	2001	4"	52.0	3,250	3	N		8"	46.8	0.10	N		6"		540	N			26,000	953	2.12	
60	Telephone Building	40	2,584	1,550	1965	1-1/4"	1.6	1,500	1	F	2" dwg	4" dwg	1.4	0.01	F		2"		17	F	no meter or reg		2,500	92	0.20	
61	Terrace Conference	47	4,880	2,980	1991	See 4	3.0	1,500	1	F			2.7	0.01	F								5,000	183	0.41	
62	Theatre (1)	11	See 12		1996		See 12						See 12						0	F			19,800	726	1.62	
63	University Cottage	8	1,025	720	1916	3/4"	0.6	1,500	1	F	1-1/2" dwg		0.6	0.01	F		1" dwg	3/4"	8	F			1,025	38	0.08	
64	University Lab	25A	11,803	7,082	1994	2"	7.3	1,500	1	G			6.6	0.01	G		4"	1-3/4"	78	G			6,900	253	0.56	
65	University Offices	25	19,650	11,397	1991	2"	12.1	1,500	1	G			10.9	0.02	G		1-1/2"		126	F			10,200	374	0.83	
66	USDA Salinity Lab	46																					28,800	1,056	2.35	
67	Veitch Student Center	32	24,180	17,893	1961	3"	14.9	3,250	3	F	70#	6" dwg	13.4	0.03	F			2"	197	F		8" dwg	24,200	887	1.98	
68	Watkins Hall (1)	10	63,913	34,513	1953	4"	39.4	5,250	5	G	130-70#	8"	35.5	0.08	G			1-1/2"	381	F	not used		52,000	1,906	4.25	
69	Webber Hall (1)	19	50,801	27,432	1953	4"	31.3	4,750	5	P		(2) - 6"	28.2	0.06	P		2-1/2"		303	F		6"	23,000	843	1.88	
	SUBTOTAL		3,355,269	1,628,240			2,705.8						2,065.0	4.61					160,606				1,376,825	50,463	112.44	

	BUILDING	No.	G.S.F.	A.S.F.	On-Line Date	DOMESTIC WATER gh sf/gpm 300		il sf/gpm: 1,622		dm sf/gpm: 880		SANITARY SEWER % of DW= 90%					GAS					STORM 100 yr (in/hr)= 3.92				
						Service (Inches)	Peak (Gpm)	Fire GPM	# of hydrant	Condition	Remarks	Service (Inches)	Peak (Gpm)	Peak (cfs)	Condition	Remarks	Lo P Srvc (Inches)	Hi P Srvc (Inches)	Peak (CFH)	Condition	Remarks	Service (Inches)	Roof Area	Pk Flow (Gpm)	Pk Flow (Cfs)	Remarks
	2002 - 2005																									
70	Alumni/ Visitor Center	59	25,890	16,829	2005		16.0	1,500	1				14.4	0.03					186				9,800	359	0.80	
71	Biological Science	66	55,071	38,550	2005		34.0	2,500	3				30.6	0.07					425				16,500	605	1.35	
72	Boiler Plant (additional load)				2005														31619							
73	Commons Expansion (2)	69	186,004	118,643	2005		114.7	4,750	5				103.2	0.23					1310				70,680	2,591	5.77	
74	Demo Commons	4	(86,004)	(63,643)			(53.0)						(47.7)	(0.11)					(702)				(64,500)	(2,364)	(5.27)	
75	Engineering Unit #2	67	152,010	106,400	2005		93.7	4,250	4				84.4	0.19					1174				45,600	1,671	3.72	
76	Entomology	24	67,139	42,969	2002	6"	41.4	2,750	3	N		10"	37.3	0.08	N		2"		474	N		12"	20,100	737	1.64	
77	Insectory & Quarantine	26C	31,523	25,200	2002	4"	19.4	2,000	2	N			17.5	0.04	N			1-1/2"	278	N			9,000	330	0.74	
78	Physical Science #1	68	129,417	90,592	2005		79.8	4,000	4				71.8	0.16					1000				38,800	1,422	3.17	
79	Satellite Central Plant		7,000	7,000	2005	6"	115.0	1,500	1				3.9	0.01					77				7,000	257	0.57	
80	Science Lab #1	65	44,138	30,897	2001		27.2	2,250	2				24.5	0.05					341				13,200	484	1.08	
81	Pentland Hills #2	70	67,500		2002		76.7	2,750	3				69.0	0.15					9,000				33,750	1,237	2.76	
	SUBTOTAL		**679,688**	**413,437**			**564.9**						**408.8**	**0.91**					**45,183**				**199,930**	**7,328**	**16.33**	
	CUMULATIVE TOTAL		**4,034,957**	**2,041,677**			**3,270.8**						**2,473.8**	**5.52**					**205,789**				**1,576,755**	**57,791**	**128.77**	
	2006 -2010																									
82	Housing Unit #2	71	60,000		2010		68.2	2,750	3				61.4	0.14					8,000				30,000	1,100	2.45	
83	Housing Unit #3	72	60,000		2010		68.2	2,750	3				61.4	0.14					8,000				30,000	1,100	2.45	
84	CHASS Bldg 1	73	115,000	74,750	2010		70.9	3,750	4				63.8	0.14					825				46,000	1,686	3.76	
85	CHASS Bldg 2	74	85,000	58,500	2010		52.4	3,250	3				47.2	0.11					646				34,000	1,246	2.78	
86	Boiler Plant (additional load)				2010														30257							
87	Demo Art Annex	12A	(2,645)	(1,950)			(1.6)						(1.5)	(0.01)					(22)				(2,700)	(99)	(0.22)	
88	Engineering Unit #3	75	150,000	105,000	2010		92.5	4,250	4				83.3	0.19					1159				45,000	1,649	3.68	
89	Entomology #2	76	100,000	70,000	2010		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
90	Demo Entomology Annex	23	(16,664)	(10,685)			(10.3)						(9.2)	(0.02)					(118)				(12,600)	(462)	(1.03)	
91	Genomics	77	120,000	84,000	2010		74.0	3,750	4				66.6	0.15					927				36,000	1,319	2.94	
92	Performing Arts	78	75,000	52,500	2010		46.3	3,000	3				41.6	0.09					579				30,000	1,100	2.45	
93	Physical Science #2	79	130,000	91,000	2010		80.2	4,000	4				72.2	0.16					1004				39,000	1,429	3.19	
94	Satellite Plant Expansion		0		2008		115.0						0.0	0.01					0				0	0	0.00	
95	Housing Unit #4	80	93,750		2007		106.5	3,250	3				95.9	0.21					12,500				46,875	1,718	3.83	
96	Housing Unit #5	81	93,750		2010		106.5	3,250	3				95.9	0.21					12,500				46,875	1,718	3.83	
	SUBTOTAL		**1,063,191**	**523,115**			**930.5**						**733.9**	**1.64**					**77,031**				**398,450**	**14,604**	**32.54**	
	CUMULATIVE TOTAL		**5,098,148**	**2,564,792**			**4,201.3**						**3,207.7**	**7.16**					**282,820**				**1,975,205**	**72,395**	**161.31**	
	2011 -2015																									
	Student/ Administration Cluster:																									
	Boiler Plant (additional load)				2015														75711							
97	Building 1	82	100,000	55,000	2015		61.7	3,500	4				55.5	0.12					607				40,000	1,466	3.27	
98	Building 2	83	100,000	55,000	2015		61.7	3,500	4				55.5	0.12					607				40,000	1,466	3.27	
99	Building 3	84	120,000	66,000	2015		74.0	3,750	4				66.6	0.15					728				48,000	1,759	3.92	
100	Building 4	85	50,000	27,500	2015		30.8	2,500	3				27.8	0.06					304				20,000	733	1.63	
	Science Cluster:																									
101	Building 1 (lab)	86	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
102	Demo 20% of Pierce Hall	13	(27,982)	(16,927)			(17.3)						(15.5)	(0.03)					(187)				(4,800)	(176)	(0.39)	
103	Building 2 (classroom)	87	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
104	Science Bldg. (lab)	88	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
105	Demo Greenhouse 15-17	30	(15,000)				(50.0)						(8.3)	(0.02)					(155)							
106	Building 4 (classroom)	89	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
107	Demo Custodial		(7,446)	(5,510)			(4.6)						(4.1)	(0.01)					(61)				(6,000)	(220)	(0.49)	
108	Demo Entomology	26	(32,444)	(20,855)			(20.0)						(18.0)	(0.04)					(230)				(12,600)	(462)	(1.03)	
109	Demo Insectary	26D	(8,783)	(4,919)			(5.4)						(4.9)	(0.01)					(54)				(6,500)	(238)	(0.53)	
110	Building 5 (lab)	90	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
111	Demo Greenhouse 11- 13A	30	(17,500)				(58.3)						(9.7)	(0.02)					(181)							
112	Building 6 (classroom)	91	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
113	Demo Lath House #1		(5,000)				(16.7)						(2.8)	(0.01)					(55)					0		
114	Building 7 (lab)	92	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
115	Demo Lath House #2		(5,000)				(16.7)						(2.8)	(0.01)					(55)							
116	Building 8 (classroom)	93	120,000	84,000	2015		74.0	3,750	4				66.6	0.15					927				36,000	1,319	2.94	
117	Demo Greenhouse 18-21	30	(20,000)				(66.7)						(11.1)	(0.02)					(207)							
118	Building 9 (lab)	94	120,000	84,000	2015		74.0	3,750	4				66.6	0.15					927				36,000	1,319	2.94	
119	Physical Science #3	95	130,000	91,000	2015		80.2	4,000	4				72.2	0.16					1004				39,000	1,429	3.19	
120	Building 11 (classroom)	96	100,000	70,000	2015		61.7	3,500	4				55.5	0.12					773				30,000	1,100	2.45	
	Humanities/ Law Cluster:																									
121	Building 1	97	100,000	60,000	2015		61.7	3,500	4				55.5	0.12					662				40,000	1,466	3.27	
122	Building 2	98	50,000	30,000	2015		30.8	2,500	3				27.8	0.06					331				20,000	733	1.63	
123	Building 3	99	75,000	45,000	2015		46.3	3,000	3				41.6	0.09					497				30,000	1,100	2.45	
124	Building 4	100	50,000	30,000	2015		30.8	2,500	3				27.8	0.06					331				20,000	733	1.63	
125	Building 5	101	150,000	90,000	2015		92.5	4,250	4				83.3	0.19					993				60,000	2,199	4.90	
126	Building 6	102	75,000	45,000	2015		46.3	3,000	3				41.6	0.09					497				30,000	1,100	2.45	
127	Housing Unit #6	103	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
	Demo Canyon Crest	62	(197,266)				(121.7)						(109.5)	(0.24)					0							
128	Housing Unit #7	104	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
129	Housing Unit #8	105	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
130	Housing Unit #9	106	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
131	Housing Unit #10	107	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
132	Housing Unit #11	108	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
133	Housing Unit #12	109	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
134	Housing Unit #13	110	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
135	Housing Unit #14	111	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
136	Housing Unit #15	112	112,500		2015		127.8	3,500	4				115.1	0.26					15,000				56,250	2,062	4.59	
	SUBTOTAL		**2,828,579**	**1,274,289**			**2,159.2**						**2,096.1**	**4.67**					**239,123**				**1,083,600**	**45,141**	**100.58**	
	GRAND TOTAL		**7,926,727**	**3,839,081**			**6,360.5**						**5,303.8**	**11.83**					**521,942**				**3,058,805**	**117,536**	**261.89**	

* Building maintained by Housing
(1) HVAC Replacement Project
(2) Will replace existing Commons

Storm peak flow is based on roof area and a coefficient of runoff of 0.9

7.1 Existing Building Loads

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Aberdeen and Inverness Hall	33	133,435			12KV	2250	450	Yes	E	Existing 12kV Service
Administration - Hinderaker Hall	1	46,490	26,876	1960	5KV	500	100	No	U	Upgrade to 12KV Service
Barn, University Cottage	7, 8	6,625	4,864	1916	5KV	75	15	No	U	Upgrade to 12KV Service
Batchelor Hall (North & South)	22	114,860	60,876	1965	5KV	1300	260	Yes	U	Upgrade to 12KV Service
Bookstore	48	33,400	19,372	1991	5KV	300	60	No	U	Upgrade to 12KV Service
Bourns Hall	54	145,309	113,598	1995	12KV	2000	400	No	E	Existing 12kV Service
Boyce Hall	20	109,932	62,661	1974	5KV	1750	350	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Computing and Communication Services		21,960	12,737	2000	12KV	300	60	No	E	Existing 12kV Service
Canyon Crest Student Family Housing	62	197,266					0			Serviced by City of Riverside
Carillon Tower	5	4,774	3,342	1966	5KV	75	15	No	U	Upgrade to 12KV Service
Central Power Plant	17	19,437		1953	5KV	2450	490	Yes	U	Upgrade to 12KV Service
					12KV	8000	5000	Yes	E	Existing 12kV Service
Chapman Hall/ Andersen Hall (Graduate School of Management)	27A, B, C	51,941	27,528	1931	5KV	800	160	Yes	U	Upgrade to 12KV Service
Child Development Center	51	12,000		1996			0			Serviced by City of Riverside
College Building North & South	42	17,944	10,408	1963	5KV	310	62	Yes	U	Upgrade to 12KV Service
Commons (Costo, Terrace Conference)	4, 47	90,884	66,623	1965, 1991	5KV	800	160	Yes	U	Upgrade to 12KV Service
Computer Statistics	21	42,096	24,208	1974	5KV	1000	200	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Corporation Yard	34	45,000	33,300	1959	5KV	300	60	No	U	Upgrade to 12KV Service
Custodial		7,446	5,510	1965	5KV	75	15	No	U	Upgrade to 12KV Service
Entomology, Boyden Lab Building	26, 26A	38,840	25,332	1932, 1961	5KV	300	60	No	U	Upgrade to 12KV Service
Entomology Annex	23	16,664	10,685	1948	5KV	300	60	No	U	Upgrade to 12KV Service
Entomology Research Museum	26B	8,988	6,292	1993	5KV	75	15	No	U	Upgrade to 12KV Service
Environmental Health and Safety	43	6,334	4,687	1989	5KV	5	1	No	U	Upgrade to 12KV Service
Fawcett Lab	28	20,997	15,538	1965	5KV	750	150	No	U	Upgrade to 12KV Service
Fine Arts	58	100,371	55,150	2001	12KV	1000	200	No	E	Existing 12kV Service
Geology	14	103,095	61,857	1952	5KV	1500	300	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Geology Addition (Science Laboratories)					12KV	1500	300	No	E	Existing 12kV Service
Greenhouse 11-13A	30	17,500		1955	5KV	337.5	68	Yes	U	Upgrade to 12KV Service
Greenhouse 1-5	30	15,000		1988	5KV	300	60	No	U	Upgrade to 12KV Service
Greenhouse 15-17, Lath House 1 & 2	30	25,000		1956	5KV	225	45	No	U	Upgrade to 12KV Service
Greenhouse 18-21 (West Glasshouse)	30	20,000		1965	5KV	300	60	No	U	Upgrade to 12KV Service
Greenhouse 6-10	30	25,000		1952	5KV	150	30	No	U	Upgrade to 12KV Service
Humanities-1	7A	111,180	62,261	1996	12KV	1000	200	No	E	Existing 12kV Service

7.1 Existing Building Loads

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Insectary	26D	8,783	4,919	1959	5KV	150	30	No	S	Dual rated primary transformer, upgrade to 12KV Service
KUCR Radio	35	300					0			Serviced by City of Riverside
Life Sciences, Speith Hall	16, 16A, 16B	150,994	81,535	1948, 1969, 1958	5KV	1850	370	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Lothian Hall	31	163,250			12KV	3250	650	Yes	E	Existing 12kV Service
Mobile Trailer Facilities (East Glasshouse)	29	15,691	8,944	1971	5KV	225	45	No	U	Upgrade to 12KV Service
Olmstead Hall, Humanities-2, Theater, Art Annex	12, 11A, 11, 12A	143,694	85,738	1963, 1963, 1996, 1973	5KV	1112.5	223	Yes	U	Upgrade to 12KV Service
Parking Services	53	5,612	3,142	1993	12KV	150	30	No	E	Existing 12kV Service
Pentland Hills I (Undergraduate Student Housing)	61	134,544			12KV	1500	300	No	E	Existing 12kV Service
Physical Education	2	65,346	43,128	1953	12KV	300	60	Yes	E	Existing 12kV Service
Physics	18, 18A	94,808	57,833	1965	5KV	2150	430	No	U	Upgrade to 12KV Service
Pierce Hall (North & South)	13	139,912	84,634	1966	5KV	2750	550	Yes	U	Upgrade to 12KV Service
Pierce Hall Addition (Chemical Sciences)	13A			1990	12KV	500	100	No	E	Existing 12kV Service
Police Facility	36	9,320	5,405	1998			0			Serviced by City of Riverside
Tomas Rivera Library	15	230,013	184,010	1960	5KV	1975	395	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Science Library	60	167,358	107,109	1998	12KV	1500	300	No	E	Existing 12kV Service
Sproul Hall	9	78,870	46,533	1965	5KV	500	100	No	U	Upgrade to 12KV Service
Student Recreation Center	55	80,000	52,800	1994	12KV	1000	200	No	E	Existing 12kV Service
Surge Building	64	84,375	48,938	2001	12KV	750	150	No	E	Existing 12kV Service
Sweeney Art Gallery	39A	720	420	1984			0			Serviced by City of Riverside
Telephone Building	40	2,584	1,550	1965			0			Serviced by City of Riverside
University Lab	25A	11,803	7,082	1994	12KV	150	30	No	E	Existing 12kV Service
University Office Building	25	19,650	11,397	1991	5KV	500	100	No	S	Dual rated primary transformer, upgrade to 12KV Service
USDA Salinity Lab	46						0			Serviced by City of Riverside
Veitch Student Center (Student Health)	32	24,180	17,893	1961	5KV	225	45	No	U	Upgrade to 12KV Service
Watkins Hall	10	63,913	34,513	1953	5KV	300	60	No	U	Upgrade to 12KV Service
Webber Hall	19	50,801	27,432	1953	5KV	412.5	83	Yes	S	Dual rated primary transformer, upgrade to 12KV Service
Tennis Courts					12KV	225	45	No	E	Existing 12kV Service
Pumping Station					5KV	525	105	Yes	U	Upgrade to 12KV Service
Play Field					5KV	500	100	No	U	Upgrade to 12KV Service
Underpass Sub					5KV	75	15	No	U	Upgrade to 12KV Service
Air Pollution/Engineering Pad					5KV	500	100	No	U	Upgrade to 12KV Service
Multipurpose Building, Snake Pit, Head House					5KV	45	9	Yes	U	Upgrade to 12KV Service

7.1 Existing Building Loads

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Storage					5KV	225	45	No	U	Upgrade to 12KV Service
Lysimeter Tanks					5KV	45	9	No	U	Upgrade to 12KV Service
SUBTOTAL						**53,418**	**14,085**			
2002 - 2005										
Alumni/Visitor Center	59	25,890	16,829	2005	12KV		109			
Biological Science	66	55,071	38,550	2005	12KV		231			
Commons Expansion	69	186,004	118,643	2005	12KV		781			
Demo Commons	4	(86,004)	(63,643)				-361			
Engineering Unit #2	67	152,010	106,400	2005	12KV		638			
Entomology	24	67,139	42,969	2002	12KV	1000	282			
Insectory & Quarantine	26C	31,523	25,200	2002	12KV	1000	132			
Physical Science #1	68	129,417	90,592	2005	12KV		544			
Satellite Central Plant		7,000	7,000	2005	12KV	8750	5000			
Science Lab #1	65	44,138	30,897	2001	12KV		185			
Pentland Hills #2	70	67,500		2002	12KV	2000	621			
SUBTOTAL							**8,162**			
CUMULATIVE TOTAL							**22,247**			
2006 -2010										
Housing Unit #2	71	60,000		2003	12KV		552			
Housing Unit #3	72	60,000		2005	12KV		552			
CHASS Bldg 1	73	115,000	74,750	2010	12KV		483			
CHASS Bldg 2	74	85,000	58,500	2010	12KV		357			
Engineering Unit #3	75	150,000	105,000	2010	12KV		630			
Entomology #2	76	100,000	70,000	2010	12KV		420			
Demo Entomology Annex	23	(16,664)	(10,685)				-70			
Genomics	77	120,000	84,000	2010	12KV		504			
Performing Arts	78	75,000	52,500	2010	12KV		315			
Physical Science #2	79	130,000	91,000	2010	12KV		546			
Satellite Central Plant (Additional Equipment)		7,000	7,000	2005	12KV		3000			
Housing Unit #4	80	93,750		2007	12KV		863			
Housing Unit #5	81	93,750		2010	12KV		863			
SUBTOTAL							**9,015**			
CUMULATIVE TOTAL							**31,262**			

2011 - 2015

Building Name	Building Number	G.S.F.	A.S.F.	On-Line Date	ELECTRIC					
					Service Voltage	Capacity (KVA)	Est Demand (KW)	Multiple Service	Condition	Remarks
Student/ Administration Cluster:										
Building 1	82	100,000	55,000	2015	12KV		420			
Building 2	83	100,000	55,000	2015	12KV		420			
Building 3	84	120,000	66,000	2015	12KV		504			
Building 4	85	50,000	27,500	2015	12KV		210			
Science Cluster:										
Building 1 (lab)	86	100,000	70,000	2015	12KV		420			
Demo 20% of Pierce Hall	13	(27,982)	(16,927)				-118			
Building 2 (classroom)	87	100,000	70,000	2015	12KV		420			
Science Bldg. (lab)	88	100,000	70,000	2015	12KV		420			
Demo Greenhouse 15-17	30	(15,000)					-63			
Building 4 (classroom)	89	100,000	70,000	2015	12KV		420			
Demo Custodial		(7,446)	(5,510)				-31			
Demo Entomology	26	(32,444)	(20,855)				-136			
Demo Insectary	26D	(8,783)	(4,919)				-37			
Building 5 (lab)	90	100,000	70,000	2015	12KV		420			
Demo Greenhouse 11- 13A	30	(17,500)					-74			
Building 6 (classroom)	91	100,000	70,000	2015	12KV		420			
Building 7 (lab)	92	100,000	70,000	2015	12KV		420			
Building 8 (classroom)	93	120,000	84,000	2015	12KV		504			
Demo Greenhouse 18-21	30	(20,000)					-84			
Building 9 (lab)	94	120,000	84,000	2015	12KV		504			
Physical Science #3	95	130,000	91,000	2015	12KV		546			
Building 11 (classroom)	96	100,000	70,000	2015	12KV		420			
Future Bldg Devlpmnt in Prkg Lot 6:										
Building 1	97	100,000	60,000	2015	12KV		420			
Building 2	98	50,000	30,000	2015	12KV		210			
Building 3	99	75,000	45,000	2015	12KV		315			
Building 4	100	50,000	30,000	2015	12KV		210			
Building 5	101	150,000	90,000	2015	12KV		630			
Building 6	102	75,000	45,000	2015	12KV		315			
Housing Unit #6	103	112,500		2015	12KV		1035			
Housing Unit #7	104	112,500		2015	12KV		1035			
Housing Unit #8	105	112,500		2015	12KV		1035			
Housing Unit #9	106	112,500		2015	12KV		1035			
Housing Unit #10	107	112,500		2015	12KV		1035			
Housing Unit #11	108	112,500		2015	12KV		1035			
Housing Unit #12	109	112,500		2015	12KV		1035			
Housing Unit #13	110	112,500		2015	12KV		1035			
Housing Unit #14	111	112,500		2015	12KV		1035			
Housing Unit #15	112	112,500		2015	12KV		1035			
SUBTOTAL							**18,375**			
GRAND TOTAL							**49,637**			

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-11			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 24		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
DEMOLITION	300.00	LF			$ 100.00	$ 30,000	$ 100.00	$ 30,000
TRENCHING	310.0	LF	$ -	$ -	$ 97.40	$ 30,194	$ 97.40	$ 30,194
TOTAL DIVISION 2				**$ -**		**$ 60,194**		**$ 60,194**
DIVISION 15 - MECHANICAL								
10" CHILLED WATER PIPING	500.0	LF	$ 68.21	$ 34,105	$ 40.17	$ 20,085	$ 108.38	$ 54,190
10" ELBOW	4.0	EA	$ 145.01	$ 580	$ 266.73	$ 1,067	$ 411.74	$ 1,647
8" CHILLED WATER PIPING	120.0	LF	$ 40.41	$ 4,849	$ 33.22	$ 3,986	$ 73.63	$ 8,836
8" BUTTERFLY VALVE	2.0	EA	$ 370.00	$ 740	$ 171.00	$ 342	$ 541.00	$ 1,082
8" ELBOW	4.0	EA	$ 82.11	$ 328	$ 202.12	$ 808	$ 284.23	$ 1,137
TOTAL DIVISION 15				**$ 40,603**		**$ 26,289**		**$ 66,891**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 127,085
TAXES (ON MATERIAL)	7.5%							$ 3,045
ESCALATION	2.0%							$ 2,603
OVERHEAD AND PROFIT	20.0%							$ 26,547
CONTINGENCY	15.0%							$ 23,892
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 183,172**
SOFT COSTS	20.0%							$ 36,634
GRAND TOTAL								**$ 219,806**

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-12			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 17		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Misc Cleanup and Dumpsters	1.0	EA	$ 10,000	$10,000	$ -	$ -	$ 10,000	$ 10,000
TOTAL DIVISION 2				**$ 10,000**		**$ -**		**$ 10,000**
DIVISION 15 - MECHANICAL								
Demolish Chilled and Condenser Water Piping	1	LS	$2,000	$2,000	$4,000	$4,000	$6,000	$6,000
Chilled Water Pipe - Insulated:								
14"	20	LF	$91	$1,820	$67	$1,340	$158	$3,160
12"	30	LF	$73	$2,190	$55	$1,650	$128	$3,840
10"	20	LF	$61	$1,220	$44	$880	$105	$2,100
Demolish Misc sections of Chilled Water Piping	1	LS	$1,500	$1,500	$2,200	$2,200	$3,700	$3,700
Chilled Water Pipe - Insulated:								
14" (ADDITIONAL PARALLEL RETURN LINE)	120	LF	$91	$10,920	$67	$8,040	$158	$18,960
Misc Valve, Fittings, Tie-ins - For Addl Parallel Ret Line	1	LS	$3,500	$3,500	$2,200	$2,200	$5,700	$5,700
14" (BYPASS LINE FOR CHILLER #3)	100	LF	$91	$9,100	$67	$6,700	$158	$15,800
Misc Valve, Fittings, Tie-ins - For Addl Parallel Ret Line	1	LS	$2,800	$2,800	$1,800	$1,800	$4,600	$4,600
Demolish and Rig-out old pumps	1	LS	$4,000	$4,000	$2,500	$2,500	$6,500	$6,500
75 HP Chilled Water Pumps	3	EA	$12,000	$36,000	$2,750	$8,250	$14,750	$44,250
Misc Valve, strainer, gages, etc. - For Pumps	3	EA	$6,000	$18,000	$2,200	$6,600	$8,200	$24,600
Concrete Pad and inertia blocks	30	CY	$259	$7,770	$0	$0	$259	$7,770
Rig in new Pumps	1	LS	$1,500	$1,500	$3,500	$3,500	$5,000	$5,000
Engr/Calibration/Start-up	1	LS	$6,000	$6,000	$0	$0	$6,000	$6,000
Controls	1	LS	$4,500	$4,500	$0	$0	$4,500	$4,500
Test Adjust and Balance	1	LS	$8,000	$8,000	$0	$0	$8,000	$8,000
TOTAL DIVISION 15				**$ 120,820**		**$ 49,660**		**$ 170,480**
DIVISION 16 - ELECTRICAL								
Modification of Existing Switchboard	1	LS	$6,000	$6,000	$3,500	$3,500	$9,500	$9,500
New Motor Control Center (Pumps)	3	EA	$8,500	$25,500	$1,500	$4,500	$10,000	$30,000
New Feeder for New MCC	1	LS	$6,500	$6,500	$3,000	$3,000	$9,500	$9,500
Pump Motor Work w/ Safety Disconnects	3	EA	$3,200	$9,600	$800	$2,400	$4,000	$12,000
Testing, Mobilization, etc.	1	LS	$7,500	$7,500	$0	$0	$7,500	$7,500
TOTAL DIVISION 16				**$ 49,100**		**$ 9,900**		**$ 68,500**
COST SUMMARY								
SUBTOTAL								$ 248,980
TAXES (ON MATERIAL)	7.5%							$ 13,494
ESCALATION	2.0%							$ 5,249
OVERHEAD AND PROFIT	20.0%							$ 53,545
CONTINGENCY	15.0%							$ 48,190
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 369,458**
SOFT COSTS	20.0%							$ 73,892
GRAND TOTAL								**$ 443,350**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-12a			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 17		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Remove Roof Sections for Rig	1	EA	$2,500	$2,500	$3,000	$3,000	$5,500	$5,500
Repair Roof Sections	1	EA	$8,000	$8,000	$4,000	$4,000	$12,000	$12,000
Misc Cleanup and Dumpsters	1.0	EA	$ 10,000	$10,000	$ -	$ -	$ 10,000	$ 10,000
TOTAL DIVISION 2				**$ 18,000**		**$ 7,000**		**$ 27,500**
DIVISION 15 - MECHANICAL								
Demolish and Rig-out old chiller	1	LS	$13,000	$13,000	$2,500	$2,500	$15,500	$15,500
Demolish Chilled and Condenser Water Piping	1	LS	$2,000	$2,000	$4,000	$4,000	$6,000	$6,000
Remove Wiring, conduit, and MCC for Chiller	1	LS	$6,000	$6,000	$6,500	$6,500	$12,500	$12,500
Water-cooled Centrifugal Chiller - 1240 Tons	1	EA	$310,000	$310,000	$48,000	$48,000	$358,000	$358,000
Concrete Pad and inertia blocks	40	CY	$259	$10,360	$0	$0	$259	$10,360
Chiller Valves, Gages, etc. - FOR NEW CHILLER	1	LS	$9,000	$9,000	$7,600	$7,600	$16,600	$16,600
Chilled Water Pipe - Insulated:								
14"	50	LF	$91	$4,550	$67	$3,350	$158	$7,900
12"	60	LF	$73	$4,380	$55	$3,300	$128	$7,680
10"	40	LF	$61	$2,440	$44	$1,760	$105	$4,200
Rig in new 1240 ton Chiller	1	LS	$15,000	$15,000	$12,500	$12,500	$27,500	$27,500
Demolish Misc sections of Chilled Water Piping	1	LS	$1,500	$1,500	$2,200	$2,200	$3,700	$3,700
Chilled Water Pipe - Insulated:								
14" (ADDITIONAL PARALLEL RETURN LINE)	120	LF	$91	$10,920	$67	$8,040	$158	$18,960
Misc Valve, Fittings, Tie-ins - For Addl Parallel Ret Line	1	LS	$3,500	$3,500	$2,200	$2,200	$5,700	$5,700
14" (BYPASS LINE FOR CHILLER #3)	100	LF	$91	$9,100	$67	$6,700	$158	$15,800
Misc Valve, Fittings, Tie-ins - For Addl Parallel Ret Line	1	LS	$2,800	$2,800	$1,800	$1,800	$4,600	$4,600
Demolish and Rig-out old pumps	1	LS	$4,000	$4,000	$2,500	$2,500	$6,500	$6,500
75 HP Chilled Water Pumps	3	EA	$12,000	$36,000	$2,750	$8,250	$14,750	$44,250
Misc Valve, strainer, gages, etc. - For Pumps	3	EA	$6,000	$18,000	$2,200	$6,600	$8,200	$24,600
Concrete Pad and inertia blocks	30	CY	$259	$7,770	$0	$0	$259	$7,770
Rig in new Pumps	1	LS	$1,500	$1,500	$3,500	$3,500	$5,000	$5,000
Engr/Calibration/Start-up	1	LS	$12,000	$12,000	$0	$0	$12,000	$12,000
Controls	1	LS	$9,000	$9,000	$0	$0	$9,000	$9,000
Test Adjust and Balance	1	LS	$16,000	$16,000	$0	$0	$16,000	$16,000
TOTAL DIVISION 15				**$ 508,820**		**$ 131,300**		**$ 640,120**
DIVISION 16 - ELECTRICAL								
Modification of Existing Switchboard	1	LS	$8,500	$8,500	$3,500	$3,500	$12,000	$12,000
Chiller Feeder Complete	1	LS	$7,500	$7,500	$3,250	$3,250	$10,750	$10,750
Chiller Control System Conduit and Wiring	1	LS	$3,500	$3,500	$2,100	$2,100	$5,600	$5,600
New Motor Control Center (Pumps)	3	EA	$8,500	$25,500	$1,500	$4,500	$10,000	$30,000
New Feeder for New MCC	1	LS	$6,500	$6,500	$3,000	$3,000	$9,500	$9,500
Pump Motor Work w/ Safety Disconnects	3	EA	$3,200	$9,600	$800	$2,400	$4,000	$12,000
Testing, Mobilization, etc.	1	LS	$7,500	$7,500	$0	$0	$7,500	$7,500
TOTAL DIVISION 16				**$ 52,600**		**$ 12,000**		**$ 87,350**
COST SUMMARY								
SUBTOTAL								$ 754,970
TAXES (ON MATERIAL)	7.5%							$ 43,457
ESCALATION	2.0%							$ 15,969
OVERHEAD AND PROFIT	20.0%							$ 162,879
CONTINGENCY	15.0%							$ 146,591
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 1,123,865**
SOFT COSTS	20.0%							$ 224,773

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-13			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	MULTIPLE BLDGS.		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Misc Cleanup and Dumpsters	1.0	LS	$ 2,500	$2,500	$ -	$ -	$ 2,500	$ 2,500
TOTAL DIVISION 2				**$ 2,500**		**$ -**		**$ 2,500**
DIVISION 15 - MECHANICAL								
Demolish Misc sections of Chilled Water Piping	3	EA	$250	$750	$260	$780	$510	$1,530
Chilled Water Pipe - Insulated:								
8" Pipe (Hinderaker and Batchelor)	40	LF	$41	$1,640	$37	$1,480	$78	$3,120
8" misc fittings	40	LF	$10	$400	$9	$360	$19	$760
8" Gate Valve	4	EA	$2,408	$9,632	$363	$1,452	$2,771	$11,084
8" Strainer	2	EA	$835	$1,670	$366	$732	$1,201	$2,402
8" Check Valve	2	EA	$2,434	$4,868	$363	$726	$2,797	$5,594
8" Flex Connector	4	EA	$308	$1,232	$82	$328	$390	$1,560
Pressure Gauge	4	EA	$31	$124	$10	$40	$41	$164
Temperature Sensor	2	EA	$500	$1,000	$250	$500	$750	$1,500
8" Flow Switch	2	EA	$315	$630	$173	$346	$488	$976
8" Shut off Valve	2	EA	$1,500	$3,000	$220	$440	$1,720	$3,440
8" Delta P Control Valve	2	EA	$3,500	$7,000	$350	$700	$3,850	$7,700
6" Pipe (Humanities)	20	LF	$30	$594	$30	$608	$60	$1,202
6" misc fittings	20	LF	$8	$150	$8	$150	$15	$300
6" Gate Valve	2	EA	$1,498	$2,996	$303	$606	$1,801	$3,602
6" Strainer	1	EA	$500	$500	$306	$306	$806	$806
6" Check Valve	1	EA	$1,471	$1,471	$303	$303	$1,774	$1,774
6" Flex Connector	2	EA	$174	$348	$66	$132	$240	$480
Pressure Gauge	2	EA	$31	$62	$10	$20	$41	$82
Temperature Sensor	1	EA	$500	$500	$250	$250	$750	$750
6" Flow Switch	1	EA	$221	$221	$92	$92	$313	$313
6" Shut off Valve	1	EA	$1,200	$1,200	$190	$190	$1,390	$1,390
6" Delta P Control Valve	1	EA	$3,100	$3,100	$310	$310	$3,410	$3,410
Controls	3	EA	$500	$1,500	$250	$750	$750	$2,250
Engr/Calibration/Start-up	3	EA	$2,200	$6,600	$0	$0	$2,200	$6,600
Test Adjust and Balance	3	EA	$2,500	$7,500	$0	$0	$2,500	$7,500
TOTAL DIVISION 15				**$ 58,688**		**$ 11,601**		**$ 70,289**
DIVISION 16 - ELECTRICAL								
Electric work for sensors,control valves, etc.	3	EA	$1,500	$4,500	$500	$1,500	$2,000	$6,000
Testing, Mobilization, etc.	3	EA	$1,000	$3,000	$250	$750	$1,250	$3,750
TOTAL DIVISION 16				**$ 3,000**		**$ 750**		**$ 9,750**
COST SUMMARY								
SUBTOTAL								$ 82,539
TAXES (ON MATERIAL)	7.5%							$ 4,814
ESCALATION	2.0%							$ 1,747
OVERHEAD AND PROFIT	20.0%							$ 17,820
CONTINGENCY	15.0%							$ 16,038
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 122,958**
SOFT COSTS	20.0%							$ 24,592
GRAND TOTAL								**$ 147,550**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-14			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 59		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	400.0	LF	$ -	$ -	$ 97.40	$ 38,960	$ 97.40	$ 38,960
TOTAL DIVISION 2				**$ -**		**$ 38,960**		**$ 38,960**
DIVISION 15 - MECHANICAL								
20" CHILLED WATER PIPING	750.0	LF	$ 118.91	$ 89,183	$ 97.06	$ 72,795	$ 215.97	$ 161,978
20" BUTTERFLY VALVE	2.0	EA	$ 1,775.00	$ 3,550	$ 770.00	$ 1,540	$ 2,545.00	$ 5,090
20" ELBOW	2.0	EA	$ 666.31	$ 1,333	$ 689.56	$ 1,379	$ 1,355.87	$ 2,712
4" CHILLED WATER PIPING	50.0	LF	$ 15.09	$ 755	$ 19.14	$ 957	$ 34.23	$ 1,712
4" BUTTERFLY VALVE	2.0	EA	$ 206.00	$ 412	$ 99.00	$ 198	$ 305.00	$ 610
4" ELBOW	4.0	EA	$ 25.10	$ 100	$ 109.69	$ 439	$ 134.79	$ 539
TOTAL DIVISION 15				**$ 95,332**		**$ 77,308**		**$ 172,640**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 211,600
TAXES (ON MATERIAL)	7.5%							$ 7,150
ESCALATION	2.0%							$ 4,375
OVERHEAD AND PROFIT	20.0%							$ 44,625
CONTINGENCY	15.0%							$ 40,162
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 307,912**
SOFT COSTS	20.0%							$ 61,582
GRAND TOTAL								**$ 369,495**

ENGINEERING COST ESTIMATE

PROJECT		ESTIMATED BY	DATE PREPARED
CHILLED WATER PROJECT CH-15		BECHARD LONG & ASSOCIATES, INC.	20-Jan-02
LOCATION	AREA	STATUS OF DESIGN	JOB NUMBER
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 67& 68	_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )	001897

	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	310.0	LF	$ -	$ -	$ 97.40	$ 30,194	$ 97.40	$ 30,194
TOTAL DIVISION 2				**$ -**		**$ 30,194**		**$ 30,194**
DIVISION 15 - MECHANICAL								
12" CHILLED WATER PIPING	220.0	LF	$ 83.61	$ 18,394	$ 47.96	$ 10,551	$ 131.57	$ 28,945
12" BUTTERFLY VALVE	2.0	EA	$ 690.00	$ 1,380	$ 257.00	$ 514	$ 947.00	$ 1,894
12" ELBOW	4.0	EA	$ 204.41	$ 818	$ 319.31	$ 1,277	$ 523.72	$ 2,095
8" CHILLED WATER PIPING	200.0	LF	$ 40.41	$ 8,082	$ 33.22	$ 6,644	$ 73.63	$ 14,726
8" BUTTERFLY VALVE	10.0	EA	$ 370.00	$ 3,700	$ 171.00	$ 1,710	$ 541.00	$ 5,410
8" ELBOW	20.0	EA	$ 82.11	$ 1,642	$ 202.12	$ 4,042	$ 284.23	$ 5,685
6" CHILLED WATER PIPING	200.0	LF	$ 28.10	$ 5,620	$ 27.67	$ 5,534	$ 55.77	$ 11,154
6" BUTTERFLY VALVE	12.0	EA	$ 284.00	$ 3,408	$ 154.00	$ 1,848	$ 438.00	$ 5,256
6" ELBOW	24.0	EA	$ 49.58	$ 1,190	$ 162.12	$ 3,891	$ 211.70	$ 5,081
TOTAL DIVISION 15				**$ 44,234**		**$ 36,012**		**$ 80,246**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 110,440
TAXES (ON MATERIAL)	7.5%							$ 3,318
ESCALATION	2.0%							$ 2,275
OVERHEAD AND PROFIT	20.0%							$ 23,206
CONTINGENCY	15.0%							$ 20,886
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 160,125**
SOFT COSTS	20.0%							$ 32,025
GRAND TOTAL								**$ 192,150**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-21			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 75, 78		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	1,630.0	LF	$ -	$ -	$ 97.40	$ 158,762	$ 97.40	$ 158,762
TOTAL DIVISION 2				**$ -**		**$ 158,762**		**$ 158,762**
DIVISION 15 - MECHANICAL								
24" CHILLED WATER PIPING	2,000.0	LF	$ 134.41	$ 268,820	$ 110.36	$ 220,720	$ 244.77	$ 489,540
24" ELBOW	4.0	EA	$ 958.00	$ 3,832	$ 756.00	$ 3,024	$ 1,714.00	$ 6,856
20" CHILLED WATER PIPING	150.0	LF	$ 118.91	$ 17,837	$ 97.06	$ 14,559	$ 215.97	$ 32,396
8" CHILLED WATER PIPING	920.0	LF	$ 40.41	$ 37,177	$ 33.22	$ 30,562	$ 73.63	$ 67,740
6" CHILLED WATER PIPING	120.0	LF	$ 28.10	$ 3,372	$ 27.67	$ 3,320	$ 55.77	$ 6,692
6" BUTTERFLY VALVE	4.0	EA	$ 284.00	$ 1,136	$ 154.00	$ 616	$ 438.00	$ 1,752
6" ELBOW	8.0	EA	$ 49.58	$ 397	$ 162.12	$ 1,297	$ 211.70	$ 1,694
4" CHILLED WATER PIPING	120.0	LF	$ 15.09	$ 1,811	$ 19.14	$ 2,297	$ 34.23	$ 4,108
4" BUTTERFLY VALVE	4.0	EA	$ 206.00	$ 824	$ 99.00	$ 396	$ 305.00	$ 1,220
4" ELBOW	8.0	EA	$ 25.10	$ 201	$ 109.69	$ 878	$ 134.79	$ 1,078
TOTAL DIVISION 15				**$ 335,406**		**$ 277,669**		**$ 613,075**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 771,837
TAXES (ON MATERIAL)	7.5%							$ 25,155
ESCALATION	2.0%							$ 15,940
OVERHEAD AND PROFIT	20.0%							$ 162,586
CONTINGENCY	15.0%							$ 146,328
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 1,121,847**
SOFT COSTS	20.0%							$ 224,369
GRAND TOTAL								**$ 1,346,216**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-22			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 74		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
DEMOLITION	400				$ 100.00	$ 40,000	$ 100.00	$ 40,000
TRENCHING	200.0	LF	$ -	$ -	$ 97.40	$ 19,480	$ 97.40	$ 19,480
TOTAL DIVISION 2				**$ -**		**$ 59,480**		**$ 59,480**
DIVISION 15 - MECHANICAL								
12" CHILLED WATER PIPING	600.0	LF	$ 83.61	$ 50,166	$ 47.96	$ 28,776	$ 131.57	$ 78,942
12" ELBOW	6.0	EA	$ 204.41	$ 1,226	$ 319.31	$ 1,916	$ 523.72	$ 3,142
10" CHILLED WATER PIPING	50.0	LF	$ 68.21	$ 3,411	$ 40.17	$ 2,009	$ 108.38	$ 5,419
10" BUTTERFLY VALVE	2.0	EA	$ 475.00	$ 950	$ 193.00	$ 386	$ 668.00	$ 1,336
10" ELBOW	4.0	EA	$ 145.01	$ 580	$ 266.73	$ 1,067	$ 411.74	$ 1,647
4" CHILLED WATER PIPING	50.0	LF	$ 15.09	$ 755	$ 19.14	$ 957	$ 34.23	$ 1,712
4" BUTTERFLY VALVE	2.0	LF	$ 206.00	$ 412	$ 99.00	$ 198	$ 305.00	$ 610
4" ELBOW	4.0	EA	$ 25.10	$ 100	$ 109.69	$ 439	$ 134.79	$ 539
TOTAL DIVISION 15				**$ 57,600**		**$ 35,747**		**$ 93,347**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 152,827
TAXES (ON MATERIAL)	7.5%							$ 4,320
ESCALATION	2.0%							$ 3,143
OVERHEAD AND PROFIT	20.0%							$ 32,058
CONTINGENCY	15.0%							$ 28,852
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 221,200**
SOFT COSTS	20.0%							$ 44,240
GRAND TOTAL								**$ 265,440**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT: CH-23			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	SATELLITE PLANT		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE	0.0	LS	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
TES Tank	1.0	LS	$ 1,500,000.00	$ 1,500,000	$ 500,000.00	$ 500,000	$ 2,000,000.00	$ 2,000,000
CHW 14" pipe	200	LF	$ 60.00	$ 12,000	$ 58.00	$ 11,600	$ 118.00	$ 23,600
CHW 18" pipe	80	LF	$ 66.00	$ 5,280	$ 80.00	$ 6,400	$ 146.00	$ 11,680
CW 24" pipe below grade	30	LF	$ 92.00	$ 2,760	$ 120.00	$ 3,600	$ 212.00	$ 6,360
CW 24" pipe above grade	30	LF	$ 92.00	$ 2,760	$ 110.00	$ 3,300	$ 202.00	$ 6,060
CW 18" pipe	80	LF	$ 66.00	$ 5,280	$ 80.00	$ 6,400	$ 146.00	$ 11,680
Chillers 2,000 tons w/marine water boxes	2	EA	$ 556,000.00	$ 1,112,000	$ 45,000.00	$ 90,000	$ 601,000.00	$ 1,202,000
Primary pumps	2	EA	$ 8,000.00	$ 16,000	$ 3,500.00	$ 7,000	$ 11,500.00	$ 23,000
Secondary pumps	1	EA	$ 17,000.00	$ 17,000	$ 4,500.00	$ 4,500	$ 21,500.00	$ 21,500
TES Pumps	1	EA	$ 16,000.00	$ 16,000	$ 4,500.00	$ 4,500	$ 20,500.00	$ 20,500
Cooling towers fiberglass two cell	1	EA	$ 220,000.00	$ 220,000	$ 96,000.00	$ 96,000	$ 316,000.00	$ 316,000
CW pumps	1	EA	$ 21,000.00	$ 21,000	$ 5,800.00	$ 5,800	$ 26,800.00	$ 26,800
Engr/Calibration/Start-up	2	LS	$ 8,500.00	$ 17,000	$ -	$ -	$ 8,500.00	$ 17,000
Controls	2	LS	$ 9,000.00	$ 18,000	$ -	$ -	$ 9,000.00	$ 18,000
Test Adjust and Balance	2	LS	$ 12,000.00	$ 24,000	$ -	$ -	$ 12,000.00	$ 24,000
Testing, Mobilization, etc.	2	LS	$ 7,500.00	$ 15,000	$ -	$ -	$ 7,500.00	$ 15,000
TOTAL DIVISION 15				**$ 1,504,080**		**$ 239,100**		**$ 3,743,180**
DIVISION 16 - ELECTRICAL								
Modification of Existing Switchboard	2	LS	$ 8,500.00	$ 17,000	$ 3,500.00	$ 7,000	$ 12,000.00	$ 24,000
Chiller Feeder Complete	2	LS	$ 7,500.00	$ 15,000	$ 3,250.00	$ 6,500	$ 10,750.00	$ 21,500
Chiller Control System Conduit and Wiring	2	LS	$ 3,500.00	$ 7,000	$ 2,100.00	$ 4,200	$ 5,600.00	$ 11,200
TOTAL DIVISION 16				**$ 39,000**		**$ 17,700**		**$ 56,700**
COST SUMMARY								
SUBTOTAL								$ 3,799,880
TAXES (ON MATERIAL)	7.5%							$ 115,731
ESCALATION	2.0%							$ 78,312
OVERHEAD AND PROFIT	20.0%							$ 798,785
CONTINGENCY	15.0%							$ 718,906
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 5,511,614**
SOFT COSTS	20.0%							$ 1,102,323
GRAND TOTAL								**$ 6,613,937**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-31			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 95, 96		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	750.0	LF	$ -	$ -	$ 97.40	$ 73,050	$ 97.40	$ 73,050
TOTAL DIVISION 2				**$ -**		**$ 73,050**		**$ 73,050**
DIVISION 15 - MECHANICAL								
8" CHILLED WATER PIPING	900.0	LF	$ 40.41	$ 36,369	$ 33.22	$ 29,898	$ 73.63	$ 66,267
8" BUTTERFLY VALVE	2.0	EA	$ 370.00	$ 740	$ 171.00	$ 342	$ 541.00	$ 1,082
8" ELBOW	4.0	EA	$ 82.11	$ 328	$ 202.10	$ 808	$ 284.21	$ 1,137
6" CHILLED WATER PIPING	600.0	LF	$ 28.10	$ 16,860	$ 27.67	$ 16,602	$ 55.77	$ 33,462
6" BUTTERFLY VALVE	2.0	EA	$ 284.00	$ 568	$ 154.00	$ 308	$ 438.00	$ 876
6" ELBOW	4.0	EA	$ 49.58	$ 198	$ 162.12	$ 648	$ 211.70	$ 847
TOTAL DIVISION 15				**$ 55,064**		**$ 48,607**		**$ 103,671**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 176,721
TAXES (ON MATERIAL)	7.5%							$ 4,130
ESCALATION	2.0%							$ 3,617
OVERHEAD AND PROFIT	20.0%							$ 36,893
CONTINGENCY	15.0%							$ 33,204
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 254,565**
SOFT COSTS	20.0%							$ 50,913
GRAND TOTAL								**$ 305,478**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-32			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 82, 83		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	850.0	LF	$ -	$ -	$ 97.40	$ 82,790	$ 97.40	$ 82,790
TOTAL DIVISION 2				**$ -**		**$ 82,790**		**$ 82,790**
DIVISION 15 - MECHANICAL								
6" CHILLED WATER PIPING	800.0	LF	$ 28.10	$ 22,480	$ 27.67	$ 22,136	$ 55.77	$ 44,616
4" CHILLED WATER PIPING	900.0	EA	$ 15.09	$ 13,581	$ 19.14	$ 17,226	$ 34.23	$ 30,807
4" BUTTERFLY VALVE	4.0	EA	$ 206.00	$ 824	$ 99.00	$ 396	$ 305.00	$ 1,220
4" ELBOW	8.0	EA	$ 25.10	$ 201	$ 109.69	$ 878	$ 134.79	$ 1,078
TOTAL DIVISION 15				**$ 37,086**		**$ 40,636**		**$ 77,721**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 160,511
TAXES (ON MATERIAL)	7.5%							$ 2,781
ESCALATION	2.0%							$ 3,266
OVERHEAD AND PROFIT	20.0%							$ 33,312
CONTINGENCY	15.0%							$ 29,981
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 229,851**
SOFT COSTS	20.0%							$ 45,970
GRAND TOTAL								**$ 275,821**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-33			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 97-102		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	1,500.0	LF	$ -	$ -	$ 97.40	$ 146,100	$ 97.40	$ 146,100
TOTAL DIVISION 2				**$ -**		**$ 146,100**		**$ 146,100**
DIVISION 15 - MECHANICAL								
10" CHILLED WATER PIPIPNG	750.0	LF	$ 68.21	$ 51,158	$ 40.17	$ 30,128	$ 108.38	$ 81,285
10" ELBOW	2.0	EA	$ 145.01	$ 290	$ 266.73	$ 533	$ 411.74	$ 823
8" CHILLED WATER PIPING	850.0	LF	$ 40.41	$ 34,349	$ 33.22	$ 28,237	$ 73.63	$ 62,586
8" ELBOW	2.0	EA	$ 82.11	$ 164	$ 202.12	$ 404	$ 284.23	$ 568
6" CHILLED WATER PIPING	100.0	LF	$ 28.10	$ 2,810	$ 27.67	$ 2,767	$ 55.77	$ 5,577
6" BUTTERFLY VALVE	4.0	EA	$ 284.00	$ 1,136	$ 154.00	$ 616	$ 438.00	$ 1,752
6" ELBOW	8.0	EA	$ 49.58	$ 397	$ 162.12	$ 1,297	$ 211.70	$ 1,694
4" CHILLED WATER PIPING	1,300.0	LF	$ 15.09	$ 19,617	$ 19.14	$ 24,882	$ 34.23	$ 44,499
4" BUTTERFLY VALVE	6.0	EA	$ 206.00	$ 1,236	$ 99.00	$ 594	$ 305.00	$ 1,830
4" ELBOW	14.0	EA	$ 25.10	$ 351	$ 109.69	$ 1,536	$ 134.79	$ 1,887
TOTAL DIVISION 15				**$ 111,507**		**$ 90,994**		**$ 202,501**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 348,601
TAXES (ON MATERIAL)	7.5%							$ 8,363
ESCALATION	2.0%							$ 7,139
OVERHEAD AND PROFIT	20.0%							$ 72,821
CONTINGENCY	15.0%							$ 65,539
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 502,463**
SOFT COSTS	20.0%							$ 100,493
GRAND TOTAL								**$ 602,955**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CHILLED WATER PROJECT CH-34			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 89, 94		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	200.0	LF	$ -	$ -	$ 97.40	$ 19,480	$ 97.40	$ 19,480
TOTAL DIVISION 2				**$ -**		**$ 19,480**		**$ 19,480**
DIVISION 15 - MECHANICAL								
6" CHILLED WATER PIPING	100.0	LF	$ 28.10	$ 2,810	$ 27.67	$ 2,767	$ 55.77	$ 5,577
4" CHILLED WATER PIPING	300.0	LF	$ 15.09	$ 4,527	$ 19.14	$ 5,742	$ 34.23	$ 10,269
4" BUTTERFLY VALVE	4.0	EA	$ 206.00	$ 824	$ 99.00	$ 396	$ 305.00	$ 1,220
4" ELBOW	8.0	EA	$ 25.10	$ 201	$ 109.69	$ 878	$ 134.79	$ 1,078
TOTAL DIVISION 15				**$ 8,362**		**$ 9,783**		**$ 18,144**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 37,624
TAXES (ON MATERIAL)	7.5%							$ 627
ESCALATION	2.0%							$ 765
OVERHEAD AND PROFIT	20.0%							$ 7,803
CONTINGENCY	15.0%							$ 7,023
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 53,843**
SOFT COSTS	20.0%							$ 10,769
GRAND TOTAL								**$ 64,611**

APPENDIX B

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-11			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 68		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	650.0	LF	$ -	$ -	$ 97.40	$ 63,310	$ 97.40	$ 63,310
TOTAL DIVISION 2				**$ -**		**$ 63,310**		**$ 63,310**
DIVISION 15 - MECHANICAL								
4" STEAM PIPING	50.0	LF	$ 19.99	$ 1,000	$ 21.24	$ 1,062	$ 41.23	$ 2,062
6" STEAM PIPING	650.0	LF	$ 49.38	$ 32,097	$ 33.67	$ 21,886	$ 83.05	$ 53,983
4" GATE VALVE	2.0	EA	$ 790.00	$ 1,580	$ 39.50	$ 79	$ 829.50	$ 1,659
6" GATE VALVE	1.0	EA	$ 570.00	$ 570	$ 257.00	$ 257	$ 827.00	$ 827
4" ELBOWS	4.0	EA	$ 25.10	$ 100	$ 109.69	$ 439	$ 134.79	$ 539
6" ELBOWS	2.0	EA	$ 49.58	$ 99	$ 162.12	$ 324	$ 211.70	$ 423
TOTAL DIVISION 15				**$ 35,446**		**$ 24,047**		**$ 59,493**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 122,803
TAXES (ON MATERIAL)	7.5%							$ 2,658
ESCALATION	2.0%							$ 2,509
OVERHEAD AND PROFIT	20.0%							$ 25,594
CONTINGENCY	15.0%							$ 23,035
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 176,599**
SOFT COSTS	20.0%							$ 35,320
GRAND TOTAL								**$ 211,919**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-12			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 17		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
DEMOLITION AND REMOVAL OF EXISTING	1.0	EA	$ -	$ -	$ 30,000.00	$ 30,000	$ 30,000.00	$ 30,000
FEEDWATER PUMPS AND ASSOCIATED PIPING								
TOTAL DIVISION 2				**$ -**		**$ 30,000**		**$ 30,000**
DIVISION 15 - MECHANICAL								
NEW FEEDWATER PUMPS	6.0	EA	$ 6,600.00	$ 39,600	$ 1,925.00	$ 11,550	$ 8,525.00	$ 51,150
6" PIPING	200.0	LF	$ 49.38	$ 9,876	$ 33.67	$ 6,734	$ 83.05	$ 16,610
4" PIPING	200.0	LF	$ 19.99	$ 3,998	$ 21.24	$ 4,248	$ 41.23	$ 8,246
6" ELBOWS	10.0	EA	$ 49.58	$ 496	$ 162.00	$ 1,620	$ 211.58	$ 2,116
4" ELBOWS	10.0	EA	$ 25.10	$ 251	$ 159.00	$ 1,590	$ 184.10	$ 1,841
6" GATE VALVES	4.0	EA	$ 790.00	$ 3,160	$ 79.00	$ 316	$ 869.00	$ 3,476
4" GATE VALVES	4.0	EA	$ 570.00	$ 2,280	$ 39.00	$ 156	$ 609.00	$ 2,436
TOTAL DIVISION 15				**$ 59,661**		**$ 26,214**		**$ 85,875**
DIVISION 16 - ELECTRICAL								
MODIFICATION OF EXISTING SWITCHBOARD	1.0	LS	$ 12,000.00	$ 12,000	$ 7,000.00	$ 7,000	$ 19,000.00	$ 19,000
NEW MOTOR CONTROL CENTER	6.0	EA	$ 8,500.00	$ 51,000	$ 1,500.00	$ 9,000	$ 10,000.00	$ 60,000
NEW FEEDER FOR NEW MCC	1.0	LS	$ 13,000.00	$ 13,000	$ 3,000.00	$ 3,000	$ 16,000.00	$ 16,000
PUMP MOTOR WORK W/ SAFETY DISCONNECTS	6.0	EA	$ 3,200.00	$ 19,200	$ 800.00	$ 4,800	$ 4,000.00	$ 24,000
TESTING, MOBILIZATION, ETC.	1.0	LS	$ 15,000.00	$ 15,000	$ -	$ -	$ 15,000.00	$ 15,000
TOTAL DIVISION 16				**$ 34,200**		**$ 4,800**		**$ 134,000**
COST SUMMARY								
SUBTOTAL								$ 249,875
TAXES (ON MATERIAL)	7.5%							$ 7,040
ESCALATION	2.0%							$ 5,138
OVERHEAD AND PROFIT	20.0%							$ 52,411
CONTINGENCY	15.0%							$ 47,169
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 361,633**
SOFT COSTS	20.0%							$ 72,327
GRAND TOTAL								**$ 433,959**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-21			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 75, 78		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	2,820.0	LF	$ -	$ -	$ 97.40	$ 274,668	$ 97.40	$ 274,668
TOTAL DIVISION 2				**$ -**		**$ 274,668**		**$ 274,668**
DIVISION 15 - MECHANICAL								
6" STEAM PIPING	600.0	LF	$ 49.38	$ 29,628	$ 33.67	$ 20,202	$ 83.05	$ 49,830
6" ELBOWS	2.0	EA	$ 49.58	$ 99	$ 162.12	$ 324	$ 211.70	$ 423
4" STEAM PIPING	2,220.0	LF	$ 19.99	$ 44,378	$ 21.24	$ 47,153	$ 41.23	$ 91,531
4" GATE VALVE	3.0	EA	$ 790.00	$ 2,370	$ 39.50	$ 119	$ 829.50	$ 2,489
4" ELBOWS	8.0	EA	$ 25.10	$ 201	$ 109.69	$ 878	$ 134.79	$ 1,078
TOTAL DIVISION 15				**$ 46,949**		**$ 48,149**		**$ 95,097**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 369,765
TAXES (ON MATERIAL)	7.5%							$ 3,521
ESCALATION	2.0%							$ 7,466
OVERHEAD AND PROFIT	20.0%							$ 76,150
CONTINGENCY	15.0%							$ 68,535
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 525,438**
SOFT COSTS	20.0%							$ 105,088
GRAND TOTAL								**$ 630,526**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-22			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 74		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	250.0	LF	$ -	$ -	$ 97.40	$ 24,350	$ 97.40	$ 24,350
TOTAL DIVISION 2				**$ -**		**$ 24,350**		**$ 24,350**
DIVISION 15 - MECHANICAL								
6" STEAM PIPING	250.0	LF	$ 49.38	$ 12,345	$ 33.67	$ 8,418	$ 83.05	$ 20,763
4" STEAM PIPING	50.0	LF	$ 19.99	$ 1,000	$ 21.24	$ 1,062	$ 41.23	$ 2,062
6" GATE VALVE	1.0	EA	$ 570.00	$ 570	$ 257.00	$ 257	$ 827.00	$ 827
4" GATE VALVE	1.0	EA	$ 790.00	$ 790	$ 39.50	$ 40	$ 829.50	$ 830
6" ELBOWS	2.0	LF	$ 49.58	$ 99	$ 162.12	$ 324	$ 211.70	$ 423
4" ELBOWS	2.0	LF	$ 25.10	$ 50	$ 109.69	$ 219	$ 134.79	$ 270
TOTAL DIVISION 15				**$ 14,854**		**$ 10,320**		**$ 25,173**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 49,523
TAXES (ON MATERIAL)	7.5%							$ 1,114
ESCALATION	2.0%							$ 1,013
OVERHEAD AND PROFIT	20.0%							$ 10,330
CONTINGENCY	15.0%							$ 9,297
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 71,277**
SOFT COSTS	20.0%							$ 14,255
GRAND TOTAL								**$ 85,533**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-23			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 17		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
DEMOLITION AND REMOVAL OF EXISTING	1.0	EA	$ -	$ -	$ 50,000.00	$ 50,000	$ 50,000.00	$ 50,000
STEAM HEADER								
TOTAL DIVISION 2				**$ -**		**$ 50,000**		**$ 50,000**
DIVISION 15 - MECHANICAL								
STEAM PIPING	180,000.0	LBS/HR	$ 1.75	$ 315,000			$ 1.75	$ 315,000
TOTAL DIVISION 15				**$ 315,000**		**$ -**		**$ 315,000**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 365,000
TAXES (ON MATERIAL)	7.5%							$ 23,625
ESCALATION	2.0%							$ 7,773
OVERHEAD AND PROFIT	20.0%							$ 79,280
CONTINGENCY	15.0%							$ 71,352
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 547,029**
SOFT COSTS	20.0%							$ 109,406
GRAND TOTAL								**$ 656,434**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-24			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 17		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
DEMOLITION AND REMOVAL OF EXISTING BOILER	1.0	EA			$ 50,000.00	$ 50,000	$ 50,000.00	$ 50,000
RIGGING & CENTRAL PLANT MODIFICATIONS	1.0	EA			$ 100,000.00	$ 100,000	$ 100,000.00	$ 100,000
TOTAL DIVISION 2				**$ -**		**$ 150,000**		**$ 150,000**
DIVISION 15 - MECHANICAL								
PACKAGE FIRE TUBE BOILER	50,000.0	LBS/HR	$ 25.00	$ 1,250,000			$ 25.00	$ 1,250,000
TOTAL DIVISION 15				**$ 1,250,000**		**$ -**		**$ 1,250,000**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 1,400,000
TAXES (ON MATERIAL)	7.5%							$ 93,750
ESCALATION	2.0%							$ 29,875
OVERHEAD AND PROFIT	20.0%							$ 304,725
CONTINGENCY	15.0%							$ 274,253
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 2,102,603**
SOFT COSTS	20.0%							$ 420,521
GRAND TOTAL								**$ 2,523,123**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-31			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 82, 83		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	1,010.0	LF	$ -	$ -	$ 97.40	$ 98,374	$ 97.40	$ 98,374
TOTAL DIVISION 2				**$ -**		**$ 98,374**		**$ 98,374**
DIVISION 15 - MECHANICAL								
4" STEAM PIPING	1,010.0	LF	$ 19.99	$ 20,190	$ 21.24	$ 21,452	$ 41.23	$ 41,642
4" GATE VALVE	2.0	EA	$ 790.00	$ 1,580	$ 39.50	$ 79	$ 829.50	$ 1,659
4" ELBOWS	4.0	LF	$ 25.10	$ 100	$ 109.69	$ 439	$ 134.79	$ 539
TOTAL DIVISION 15				**$ 21,870**		**$ 21,970**		**$ 43,840**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 142,214
TAXES (ON MATERIAL)	7.5%							$ 1,640
ESCALATION	2.0%							$ 2,877
OVERHEAD AND PROFIT	20.0%							$ 29,346
CONTINGENCY	15.0%							$ 26,412
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 202,490**
SOFT COSTS	20.0%							$ 40,498
GRAND TOTAL								**$ 242,988**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-32			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 95, 96		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	1,200.0	LF	$ -	$ -	$ 97.40	$ 116,880	$ 97.40	$ 116,880
TOTAL DIVISION 2				**$ -**		**$ 116,880**		**$ 116,880**
DIVISION 15 - MECHANICAL								
4" STEAM PIPING	650.0	LF	$ 19.99	$ 12,994	$ 21.24	$ 13,806	$ 41.23	$ 26,800
3" STEAM PIPING	550.0	LF	$ 14.50	$ 7,975	$ 18.55	$ 10,203	$ 33.05	$ 18,178
4" GATE VALVE	1.0	EA	$ 790.00	$ 790	$ 39.50	$ 40	$ 829.50	$ 830
3" GATE VALVE	1.0	EA	$ 490.00	$ 490	$ 30.50	$ 31	$ 520.50	$ 521
4" ELBOWS	2.0	EA	$ 25.10	$ 50	$ 109.69	$ 219	$ 134.79	$ 270
3" ELBOWS	2.0	EA	$ 15.62	$ 31	$ 79.60	$ 159	$ 95.22	$ 190
TOTAL DIVISION 15				**$ 22,330**		**$ 24,457**		**$ 46,787**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 163,667
TAXES (ON MATERIAL)	7.5%							$ 1,675
ESCALATION	2.0%							$ 3,307
OVERHEAD AND PROFIT	20.0%							$ 33,730
CONTINGENCY	15.0%							$ 30,357
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 232,735**
SOFT COSTS	20.0%							$ 46,547
GRAND TOTAL								**$ 279,282**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-33			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 97-102		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING	2,710.0	LF	$ -	$ -	$ 97.40	$ 263,954	$ 97.40	$ 263,954
TOTAL DIVISION 2				**$ -**		**$ 263,954**		**$ 263,954**
DIVISION 15 - MECHANICAL								
3" STEAM PIPING	1,105.0	LF	$ 14.50	$ 16,023	$ 18.55	$ 20,498	$ 33.05	$ 36,520
4" STEAM PIPING	1,140.0	LF	$ 19.99	$ 22,789	$ 21.24	$ 24,214	$ 41.23	$ 47,002
6" STEAM PIPING	465.0	LF	$ 49.38	$ 22,962	$ 33.67	$ 15,657	$ 83.05	$ 38,618
3" GATE VALVE	3.0	EA	$ 490.00	$ 1,470	$ 30.50	$ 92	$ 520.50	$ 1,562
4" GATE VALVE	2.0	EA	$ 790.00	$ 1,580	$ 39.50	$ 79	$ 829.50	$ 1,659
3" ELBOWS	6.0	EA	$ 15.62	$ 94	$ 79.60	$ 478	$ 95.22	$ 571
4" ELBOWS	4.0	EA	$ 25.10	$ 100	$ 109.69	$ 439	$ 134.79	$ 539
TOTAL DIVISION 15				**$ 65,017**		**$ 61,455**		**$ 126,472**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 390,426
TAXES (ON MATERIAL)	7.5%							$ 4,876
ESCALATION	2.0%							$ 7,906
OVERHEAD AND PROFIT	20.0%							$ 80,642
CONTINGENCY	15.0%							$ 72,577
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 556,427**
SOFT COSTS	20.0%							$ 111,285
GRAND TOTAL								**$ 667,712**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
STEAM SYSTEM PROJECT ST-34			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 17		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
DEMOLITION AND REMOVAL OF EXISTING BOILER	1.0	EA			$ 50,000.00	$ 50,000	$ 50,000.00	$ 50,000
RIGGING & CENTRAL PLANT MODIFICATIONS	1.0	EA			$ 100,000.00	$ 100,000	$ 100,000.00	$ 100,000
TOTAL DIVISION 2				**$ -**		**$ 150,000**		**$ 150,000**
DIVISION 15 - MECHANICAL								
PACKAGE FIRE TUBE BOILER	50,000.0	LBS/HR	$ 25.00	$ 1,250,000			$ 25.00	$ 1,250,000
TOTAL DIVISION 15				**$ 1,250,000**		**$ -**		**$ 1,250,000**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 1,400,000
TAXES (ON MATERIAL)	7.5%							$ 93,750
ESCALATION	2.0%							$ 29,875
OVERHEAD AND PROFIT	20.0%							$ 304,725
CONTINGENCY	15.0%							$ 274,253
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 2,102,603**
SOFT COSTS	20.0%							$ 420,521
GRAND TOTAL								**$ 2,523,123**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CONDENSATE RETURN PROJECT CR-11			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 68		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
2" CONDENSATE RETURN PIPING	50.0	LF	$ 9.23	$ 462	$ 14.25	$ 713	$ 23.48	$ 1,174
3" CONDENSATE RETURN PIPING	650.0	LF	$ 14.50	$ 9,425	$ 18.55	$ 12,058	$ 33.05	$ 21,483
2" GATE VALVE	2.0	EA	$ 475.00	$ 950	$ 25.00	$ 50	$ 500.00	$ 1,000
3" GATE VALVE	1.0	EA	$ 490.00	$ 490	$ 30.50	$ 31	$ 520.50	$ 521
2" ELBOWS	4.0	EA	$ 11.64	$ 47	$ 56.38	$ 226	$ 68.02	$ 272
3" ELBOWS	2.0	EA	$ 15.62	$ 31	$ 79.60	$ 159	$ 95.22	$ 190
TOTAL DIVISION 15				**$ 11,404**		**$ 13,235**		**$ 24,640**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 24,640
TAXES (ON MATERIAL)	7.5%							$ 855
ESCALATION	2.0%							$ 510
OVERHEAD AND PROFIT	20.0%							$ 5,201
CONTINGENCY	15.0%							$ 4,681
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 35,887**
SOFT COSTS	20.0%							$ 7,177
GRAND TOTAL								**$ 43,064**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CONDENSATE RETURN PROJECT CR-21			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 75, 78		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
3" CONDENSATE RETURN PIPING	600.0	LF	$ 14.50	$ 8,700	$ 18.55	$ 11,130	$ 33.05	$ 19,830
3" GATE VALVE	1.0	EA	$ 490.00	$ 490	$ 30.50	$ 31	$ 520.50	$ 521
3" ELBOWS	2.0	EA	$ 15.62	$ 31	$ 79.60	$ 159	$ 95.22	$ 190
2" CONDENSATE RETURN PIPING	2,220.0	LF	$ 9.23	$ 20,491	$ 14.25	$ 31,635	$ 23.48	$ 52,126
2" GATE VALVE	3.0	EA	$ 475.00	$ 1,425	$ 25.00	$ 75	$ 500.00	$ 1,500
2" ELBOWS	6.0	EA	$ 11.64	$ 70	$ 56.38	$ 338	$ 68.02	$ 408
TOTAL DIVISION 15				**$ 31,207**		**$ 43,368**		**$ 74,575**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 74,575
TAXES (ON MATERIAL)	7.5%							$ 2,341
ESCALATION	2.0%							$ 1,538
OVERHEAD AND PROFIT	20.0%							$ 15,691
CONTINGENCY	15.0%							$ 14,122
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 108,266**
SOFT COSTS	20.0%							$ 21,653
GRAND TOTAL								**$ 129,919**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CONDENSATE RETURN PROJECT CR-22			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 74		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
3" CONDENSATE RETURN PIPING	250.0	LF	$ 14.50	$ 3,625	$ 18.55	$ 4,638	$ 33.05	$ 8,263
2" CONDENSATE RETURN PIPING	50.0	LF	$ 9.23	$ 462	$ 14.25	$ 713	$ 23.48	$ 1,174
3" GATE VALVE	1.0	EA	$ 490.00	$ 490	$ 30.50	$ 31	$ 520.50	$ 521
2" GATE VALVE	1.0	EA	$ 475.00	$ 475	$ 25.00	$ 25	$ 500.00	$ 500
3" ELBOWS	2.0	EA	$ 15.62	$ 31	$ 79.60	$ 159	$ 95.22	$ 190
2" ELBOWS	2.0	EA	$ 11.64	$ 23	$ 56.38	$ 113	$ 68.02	$ 136
TOTAL DIVISION 15				**$ 5,106**		**$ 5,677**		**$ 10,783**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 10,783
TAXES (ON MATERIAL)	7.5%							$ 383
ESCALATION	2.0%							$ 223
OVERHEAD AND PROFIT	20.0%							$ 2,278
CONTINGENCY	15.0%							$ 2,050
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 15,718**
SOFT COSTS	20.0%							$ 3,144
GRAND TOTAL								**$ 18,861**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CONDENSATE RETURN PROJECT CR-31			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 82 ,83		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
2" CONDENSATE RETURN PIPING	1,010.0	LF	$ 9.23	$ 9,322	$ 14.25	$ 14,393	$ 23.48	$ 23,715
2" GATE VALVE	2.0	EA	$ 475.00	$ 950	$ 25.00	$ 50	$ 500.00	$ 1,000
2" ELBOWS	4.0	EA	$ 11.64	$ 47	$ 56.38	$ 226	$ 68.02	$ 272
TOTAL DIVISION 15				**$ 10,319**		**$ 14,668**		**$ 24,987**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 24,987
TAXES (ON MATERIAL)	7.5%							$ 774
ESCALATION	2.0%							$ 515
OVERHEAD AND PROFIT	20.0%							$ 5,255
CONTINGENCY	15.0%							$ 4,730
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 36,261**
SOFT COSTS	20.0%							$ 7,252
GRAND TOTAL								**$ 43,513**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CONDENSATE RETURN PROJECT CR-32			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 95, 96		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TOTAL DIVISION 2	0.0			**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
2" CONDENSATE RETURN PIPING	650.0	LF	$ 9.23	$ 6,000	$ 14.25	$ 9,263	$ 23.48	$ 15,262
1-1/2" CONDENSATE RETURN PIPING	550.0	LF	$ 7.45	$ 4,098	$ 13.51	$ 7,431	$ 20.96	$ 11,528
2" GATE VALVE	1.0	EA	$ 475.00	$ 475	$ 25.00	$ 25	$ 500.00	$ 500
1-1/2" GATE VALVE	1.0	EA	$ 465.00	$ 465	$ 21.00	$ 21	$ 486.00	$ 486
2" ELBOWS	2.0	EA	$ 11.64	$ 23	$ 56.38	$ 113	$ 68.02	$ 136
1-1/2" ELBOWS	2.0	EA	$ 11.64	$ 23	$ 56.38	$ 113	$ 68.02	$ 136
TOTAL DIVISION 15				**$ 11,084**		**$ 16,965**		**$ 28,048**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 28,048
TAXES (ON MATERIAL)	7.5%							$ 831
ESCALATION	2.0%							$ 577.59
OVERHEAD AND PROFIT	20.0%							$ 5,891
CONTINGENCY	15.0%							$ 5,302
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 40,651**
SOFT COSTS	20.0%							$ 8,130
GRAND TOTAL								**$ 48,781**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
CONDENSATE RETURN PROJECT CR-33			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BUILDING 97-102		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
1-1/2" CONDENSATE RETURN PIPING	1,105.0	LF	$ 7.45	$ 8,232	$ 13.51	$ 14,929	$ 20.96	$ 23,161
2" CONDENSATE RETURN PIPING	1,140.0	LF	$ 9.23	$ 10,522	$ 14.25	$ 16,245	$ 23.48	$ 26,767
3" CONDENSATE RETURN PIPING	465.0	LF	$ 14.50	$ 6,743	$ 18.55	$ 8,626	$ 33.05	$ 15,368
1-1/2" GATE VALVE	3.0	EA	$ 465.00	$ 1,395	$ 21.00	$ 63	$ 486.00	$ 1,458
2" GATE VALVE	2.0	EA	$ 475.00	$ 950	$ 25.00	$ 50	$ 500.00	$ 1,000
1-1/2" ELBOWS	6.0	EA	$ 11.64	$ 70	$ 56.38	$ 338	$ 68.02	$ 408
2" ELBOWS	4.0	EA	$ 11.64	$ 47	$ 56.38	$ 226	$ 68.02	$ 272
TOTAL DIVISION 15				**$ 27,958**		**$ 40,476**		**$ 68,434**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 68,434
TAXES (ON MATERIAL)	7.5%							$ 2,097
ESCALATION	2.0%							$ 1,411
OVERHEAD AND PROFIT	20.0%							$ 14,388
CONTINGENCY	15.0%							$ 12,950
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 99,280**
SOFT COSTS	20.0%							$ 19,856
GRAND TOTAL								**$ 119,136**

APPENDIX C

University of California Riverside - Metered Water Deliveries 1990 - 2001

Metered Deliveries - 100 cubic feet

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
January	34,372	40,778	28,570	22,814	47	30,970	30,152	59,726	58,675	40,256	76,905	45,261
February	28,586	32,915	29,839	22,053	32	23,154	30,965	41	22,872	30,601	66,766	75,053
March	6,260	64,718	24,932	22,789	63,516	26,580	24,958	44,879	18,925	31,148	40,828	37,630
April	34,936	22,937	26,220	-	56,641	26,591	34,568	106	28,549	32,393	68,040	82,925
May	47,671	45,813	47,691	-	43,171	45,519	47,509	132,884	40,514	52,047	74,242	71,892
June	56,366	48,696	56,313	140,782	55,416	45,226	47,449	71,475	44,221	57,498	94,310	62
July	65,435	63,287	63,817	62,369	61,936	50,231	63,026	62,197	69,896	74,849	129,793	249,630
August	-	64,360	65,014	67,210	25,187	66,817	80,046	72,076	73,809	48,608	122,567	
September	139,245	66,372	61,058	64,679	101,409	83,148	98,349	81,774	224	85,260	122,491	
October	56,792	63,803	64,858	59,214	104,237	198	55,566	61,201	136,418	95,989	102,196	
November	57,778	50,353	49,382	50,366	52,456	129,818	117	59,106	46,217	108,280	93,864	
December	-	40,593	42,677	41,159	37,724	45,507	43,560	59,098	33,801	76,223	44,186	
	527,441	**604,625**	**560,371**	**553,435**	**601,772**	**573,759**	**556,265**	**704,563**	**574,121**	**733,152**	**1,036,188**	

	2000 k-gallons/mo.	2000 ave gal/day	2000 40% gal/day	2000 ave gpm	2000 40% gpm
January	57,525	1,855,643	742,257	1,289	515
February	49,941	1,783,606	713,442	1,239	495
March	30,539	985,140	394,056	684	274
April	50,894	1,696,464	678,586	1,178	471
May	55,533	1,791,388	716,555	1,244	498
June	70,544	2,351,463	940,585	1,633	653
July	97,085	3,131,779	1,252,712	2,175	870
August	91,680	2,957,423	1,182,969	2,054	822
September	91,623	3,054,109	1,221,644	2,121	848
October	76,443	2,465,891	986,356	1,712	685
November	70,210	2,340,342	936,137	1,625	650
December	33,051	1,066,165	426,466	740	296
	775,069	**2,123,476**	**849,390**	**1,475**	**590**

max average daily building flow=	870 gpm
calculated hourly peak flow=	2706 gpm
peaking factor=	**3.1**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-11			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	EAST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	1,015.0	LF	$ -	$ -	$ 97.40	$ 98,861	$ 97.40	$ 98,861
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 98,861**		**$ 98,861**
DIVISION 15 - MECHANICAL								
6" Direct Buried Schedule 40 Pipe	1,015.0	LF	$ 23.52	$ 23,873	$ 24.29	$ 24,654	$ 47.81	$ 48,527
6" Butterfly Valve	4.0	EA	$ 284.00	$ 1,136	$ 154.00	$ 616	$ 438.00	$ 1,752
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 25,009**		**$ 25,270**		**$ 50,279**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 149,140
TAXES (ON MATERIAL)	7.5%							$ 1,876
ESCALATION	2.0%							$ 3,020
OVERHEAD AND PROFIT	20.0%							$ 30,807
CONTINGENCY	15.0%							$ 27,727
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 212,570**
SOFT COSTS	20.0%							$ 42,514
GRAND TOTAL								**$ 255,084**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-12			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS DRIVE		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	555.0	LF	$ -	$ -	$ 97.40	$ 54,057	$ 97.40	$ 54,057
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 54,057**		**$ 54,057**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	555.0	LF	$ 34.30	$ 19,037	$ 29.97	$ 16,633	$ 64.27	$ 35,670
8" Butterfly Valve	1.0	EA	$ 370.00	$ 370	$ 171.00	$ 171	$ 541.00	$ 541
Fire Hydrant	2.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 19,407**		**$ 16,804**		**$ 36,211**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 90,268
TAXES (ON MATERIAL)	7.5%							$ 1,455
ESCALATION	2.0%							$ 1,834
OVERHEAD AND PROFIT	20.0%							$ 18,712
CONTINGENCY	15.0%							$ 16,840
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 129,110**
SOFT COSTS	20.0%							$ 25,822
GRAND TOTAL								**$ 154,932**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-13			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	WEST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	920.0	LF	$ -	$ -	$ 97.40	$ 89,608	$ 97.40	$ 89,608
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 89,608**		**$ 89,608**
DIVISION 15 - MECHANICAL								
6" Direct Buried Schedule 40 Pipe	920.0	LF	$ 23.52	$ 21,638	$ 24.29	$ 22,347	$ 47.81	$ 43,985
6" Butterfly Valve	4.0	EA	$ 284.00	$ 1,136	$ 154.00	$ 616	$ 438.00	$ 1,752
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 22,774**		**$ 22,963**		**$ 45,737**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 135,345
TAXES (ON MATERIAL)	7.5%							$ 1,708
ESCALATION	2.0%							$ 2,741
OVERHEAD AND PROFIT	20.0%							$ 27,959
CONTINGENCY	15.0%							$ 25,163
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 192,916**
SOFT COSTS	20.0%							$ 38,583
GRAND TOTAL								**$ 231,499**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-14			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	PUMP STATION		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Concrete Pad and Site Prep	400.0	CY	$ 3.36	$ 1,344	$ 1.78	$ 712	$ 5.14	$ 2,056
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ 1,344**		**$ 712**		**$ 2,056**
DIVISION 15 - MECHANICAL								
300 HP, 2750 GPM @ 315 FT Head, Vertical Pump	4.0	EA	$ 35,000.00	$ 140,000	$ 2,000.00	$ 8,000	$ 37,000.00	$ 148,000
Additonal Controls	4.0	LS	$ 2,500.00	$ 10,000	$ 1,000.00	$ 4,000	$ 3,500.00	$ 14,000
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 150,000**		**$ 12,000**		**$ 162,000**
DIVISION 16 - ELECTRICAL								
Electric for Pump (Conduit, Wiring, Motor Control)	4.0	EA	$ 10,000.00	$ 40,000	$ 5,000.00	$ 20,000	$ 15,000.00	$ 60,000
300 HP VFD	2.0	EA	$ 30,000.00	$ 60,000	$ 3,000.00	$ 6,000	$ 33,000.00	$ 66,000
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ 40,000**		**$ 20,000**		**$ 126,000**
COST SUMMARY								
SUBTOTAL								$ 290,056
TAXES (ON MATERIAL)	7.5%							$ 14,351
ESCALATION	2.0%							$ 6,088
OVERHEAD AND PROFIT	20.0%							$ 62,099
CONTINGENCY	15.0%							$ 55,889
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 428,483**
SOFT COSTS	20.0%							$ 85,697
GRAND TOTAL								**$ 514,180**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-21			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	SOUTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	310.0	LF	$ -	$ -	$ 97.40	$ 30,194	$ 97.40	$ 30,194
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 30,194**		**$ 30,194**
DIVISION 15 - MECHANICAL								
6" Direct Buried Schedule 40 Pipe	310.0	LF	$ 23.52	$ 7,291	$ 24.29	$ 7,530	$ 47.81	$ 14,821
6" Butterfly Valve	2.0	EA	$ 284.00	$ 568	$ 154.00	$ 308	$ 438.00	$ 876
Fire Hydrant	2.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 7,859**		**$ 7,838**		**$ 15,697**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 45,891
TAXES (ON MATERIAL)	7.5%							$ 589
ESCALATION	2.0%							$ 930
OVERHEAD AND PROFIT	20.0%							$ 9,482
CONTINGENCY	15.0%							$ 8,534
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 65,426**
SOFT COSTS	20.0%							$ 13,085
GRAND TOTAL								**$ 78,511**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-22			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	2,950.0	LF	$ -	$ -	$ 97.40	$ 287,330	$ 97.40	$ 287,330
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 287,330**		**$ 287,330**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	2,170.0	LF	$ 34.30	$ 74,431	$ 29.97	$ 65,035	$ 64.27	$ 139,466
8" Butterfly Valve	4.0	EA	$ 370.00	$ 1,480	$ 171.00	$ 684	$ 541.00	$ 2,164
6" Direct Buried Schedule 40 Pipe	780.0	LF	$ 23.52	$ 18,346	$ 24.29	$ 18,946	$ 47.81	$ 37,292
6" Butterfly Valve	2.0	EA	$ 284.00	$ 568	$ 154.00	$ 308	$ 438.00	$ 876
Fire Hydrant	2.0	EA	$ 750.00	$ 1,500	$ 400.00	$ 800	$ 1,150.00	$ 2,300
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 96,325**		**$ 85,773**		**$ 182,098**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 469,428
TAXES (ON MATERIAL)	7.5%							$ 7,224
ESCALATION	2.0%							$ 9,533
OVERHEAD AND PROFIT	20.0%							$ 97,237
CONTINGENCY	15.0%							$ 87,513
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 670,935**
SOFT COSTS	20.0%							$ 134,187
GRAND TOTAL								**$ 805,123**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-23			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	LINDEN STREET		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	3,610.0	LF	$ -	$ -	$ 97.40	$ 351,614	$ 97.40	$ 351,614
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 351,614**		**$ 351,614**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	3,610.0	LF	$ 34.30	$ 123,823	$ 29.97	$ 108,192	$ 64.27	$ 232,015
8" Butterfly Valve	4.0	EA	$ 370.00	$ 1,480	$ 171.00	$ 684	$ 541.00	$ 2,164
Fire Hydrant	5.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 125,303**		**$ 108,876**		**$ 234,179**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 585,793
TAXES (ON MATERIAL)	7.5%							$ 9,398
ESCALATION	2.0%							$ 11,904
OVERHEAD AND PROFIT	20.0%							$ 121,419
CONTINGENCY	15.0%							$ 109,277
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 837,790**
SOFT COSTS	20.0%							$ 167,558
GRAND TOTAL								**$ 1,005,348**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-31			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	SOUTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Concrete Pad and Site Prep	10,000.0	CY	$ 1.68	$ 16,800	$ 0.89	$ 8,900	$ 2.57	$ 25,700
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ 16,800**		**$ 8,900**		**$ 25,700**
DIVISION 15 - MECHANICAL								
12" Schedule 40 Pipe	350.0	LF	$ 74.20	$ 25,970	$ 45.80	$ 16,030	$ 120.00	$ 42,000
12" Butterfly Valve	4.0	EA	$ 690.00	$ 2,760	$ 257.00	$ 1,028	$ 947.00	$ 3,788
2,000,000 Gallon Steel Tank	1.0	EA	$ 460,000.00	$ 460,000	$ 100,000.00	$ 100,000	$ 560,000.00	$ 560,000
Additonal Controls	1.0	LS	$ 2,500.00	$ 2,500	$ 1,000.00	$ 1,000	$ 3,500.00	$ 3,500
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 491,230**		**$ 118,058**		**$ 609,288**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 634,988
TAXES (ON MATERIAL)	7.5%							$ 38,102
ESCALATION	2.0%							$ 13,462
OVERHEAD AND PROFIT	20.0%							$ 137,310
CONTINGENCY	15.0%							$ 123,579
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 947,442**
SOFT COSTS	20.0%							$ 189,488
GRAND TOTAL								**$ 1,136,930**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-32			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	SOUTH/ EAST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	1,910.0	LF	$ -	$ -	$ 97.40	$ 186,034	$ 97.40	$ 186,034
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 186,034**		**$ 186,034**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	1,910.0	LF	$ 34.30	$ 65,513	$ 29.97	$ 57,243	$ 64.27	$ 122,756
8" Butterfly Valve	3.0	EA	$ 370.00	$ 1,110	$ 171.00	$ 513	$ 541.00	$ 1,623
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 66,623**		**$ 57,756**		**$ 124,379**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 310,413
TAXES (ON MATERIAL)	7.5%							$ 4,997
ESCALATION	2.0%							$ 6,308
OVERHEAD AND PROFIT	20.0%							$ 64,344
CONTINGENCY	15.0%							$ 57,909
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 443,970**
SOFT COSTS	20.0%							$ 88,794
GRAND TOTAL								**$ 532,764**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-33			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	SOUTH/ WEST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	3,580.0	LF	$ -	$ -	$ 97.40	$ 348,692	$ 97.40	$ 348,692
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 348,692**		**$ 348,692**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	3,260.0	LF	$ 34.30	$ 111,818	$ 29.97	$ 97,702	$ 64.27	$ 209,520
6" Direct Buried Schedule 40 Pipe	320.0	LF	$ 23.52	$ 7,526	$ 24.29	$ 7,773	$ 47.81	$ 15,299
8" Butterfly Valve	2.0	EA	$ 370.00	$ 740	$ 171.00	$ 342	$ 541.00	$ 1,082
6" Butterfly Valve	1.0	EA	$ 284.00	$ 284	$ 154.00	$ 154	$ 438.00	$ 438
Fire Hydrant	5.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 120,368**		**$ 105,971**		**$ 226,339**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 575,031
TAXES (ON MATERIAL)	7.5%							$ 9,028
ESCALATION	2.0%							$ 11,681
OVERHEAD AND PROFIT	20.0%							$ 119,148
CONTINGENCY	15.0%							$ 107,233
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 822,121**
SOFT COSTS	20.0%							$ 164,424
GRAND TOTAL								**$ 986,546**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-34			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH/ WEST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	2,830.0	LF	$ -	$ -	$ 97.40	$ 275,642	$ 97.40	$ 275,642
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 275,642**		**$ 275,642**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	2,830.0	LF	$ 34.30	$ 97,069	$ 29.97	$ 84,815	$ 64.27	$ 181,884
8" Butterfly Valve	4.0	EA	$ 370.00	$ 1,480	$ 171.00	$ 684	$ 541.00	$ 2,164
Fire Hydrant	4.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 98,549**		**$ 85,499**		**$ 184,048**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 459,690
TAXES (ON MATERIAL)	7.5%							$ 7,391
ESCALATION	2.0%							$ 9,342
OVERHEAD AND PROFIT	20.0%							$ 95,285
CONTINGENCY	15.0%							$ 85,756
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 657,464**
SOFT COSTS	20.0%							$ 131,493
GRAND TOTAL								**$ 788,956**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-35			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	5,060.0	LF	$ -	$ -	$ 97.40	$ 492,844	$ 97.40	$ 492,844
Remove 6" Pipe	1,650.0	LF	$ -	$ -	$ 6.95	$ 11,468	$ 6.95	$ 11,468
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 504,312**		**$ 504,312**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	4,130.0	LF	$ 34.30	$ 141,659	$ 29.97	$ 123,776	$ 64.27	$ 265,435
6" Direct Buried Schedule 40 Pipe	930.0	LF	$ 23.52	$ 21,874	$ 24.29	$ 22,590	$ 47.81	$ 44,463
8" Butterfly Valve	8.0	EA	$ 370.00	$ 2,960	$ 171.00	$ 1,368	$ 541.00	$ 4,328
6" Butterfly Valve	2.0	EA	$ 284.00	$ 568	$ 154.00	$ 308	$ 438.00	$ 876
Fire Hydrant	12.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 167,061**		**$ 148,042**		**$ 315,102**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 819,414
TAXES (ON MATERIAL)	7.5%							$ 12,530
ESCALATION	2.0%							$ 16,639
OVERHEAD AND PROFIT	20.0%							$ 169,716
CONTINGENCY	15.0%							$ 152,745
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 1,171,044**
SOFT COSTS	20.0%							$ 234,209
GRAND TOTAL								**$ 1,405,252**

ENGINEERING COST ESTIMATE

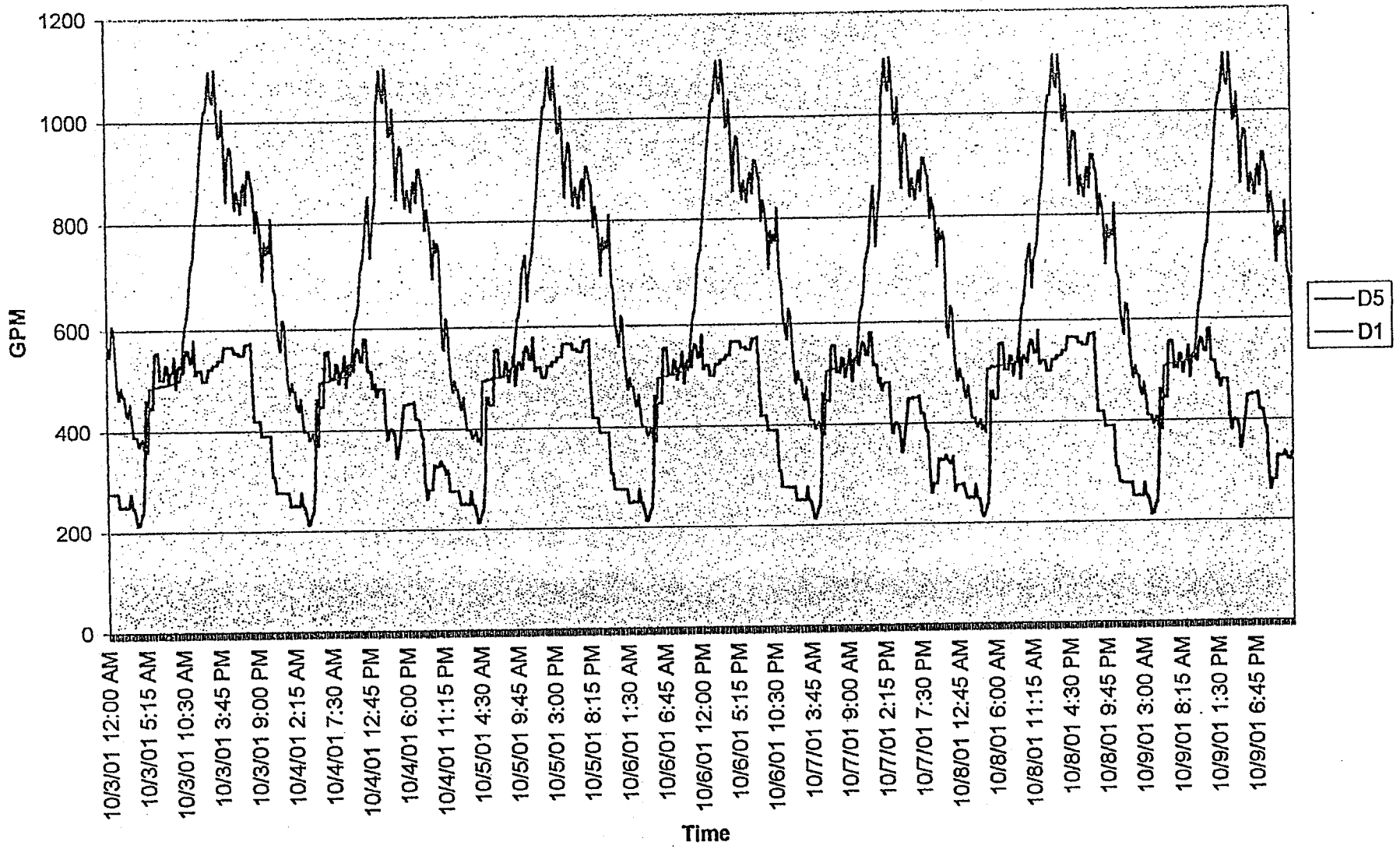
PROJECT			ESTIMATED BY				DATE PREPARED	
WATER PROJECT W-36			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	UNIVERSITY DRIVE		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
Trenching and Backfill	920.0	LF	$ -	$ -	$ 97.40	$ 89,608	$ 97.40	$ 89,608
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ 89,608**		**$ 89,608**
DIVISION 15 - MECHANICAL								
8" Direct Buried Schedule 40 Pipe	920.0	LF	$ 34.30	$ 31,556	$ 29.97	$ 27,572	$ 64.27	$ 59,128
8" Butterfly Valve	3.0	EA	$ 370.00	$ 1,110	$ 171.00	$ 513	$ 541.00	$ 1,623
Fire Hydrant	3.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
	0.0	EA	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ 32,666**		**$ 28,085**		**$ 60,751**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 150,359
TAXES (ON MATERIAL)	7.5%							$ 2,450
ESCALATION	2.0%							$ 3,056
OVERHEAD AND PROFIT	20.0%							$ 31,173
CONTINGENCY	15.0%							$ 28,056
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 215,094**
SOFT COSTS	20.0%							$ 43,019
GRAND TOTAL								**$ 258,113**

APPENDIX D

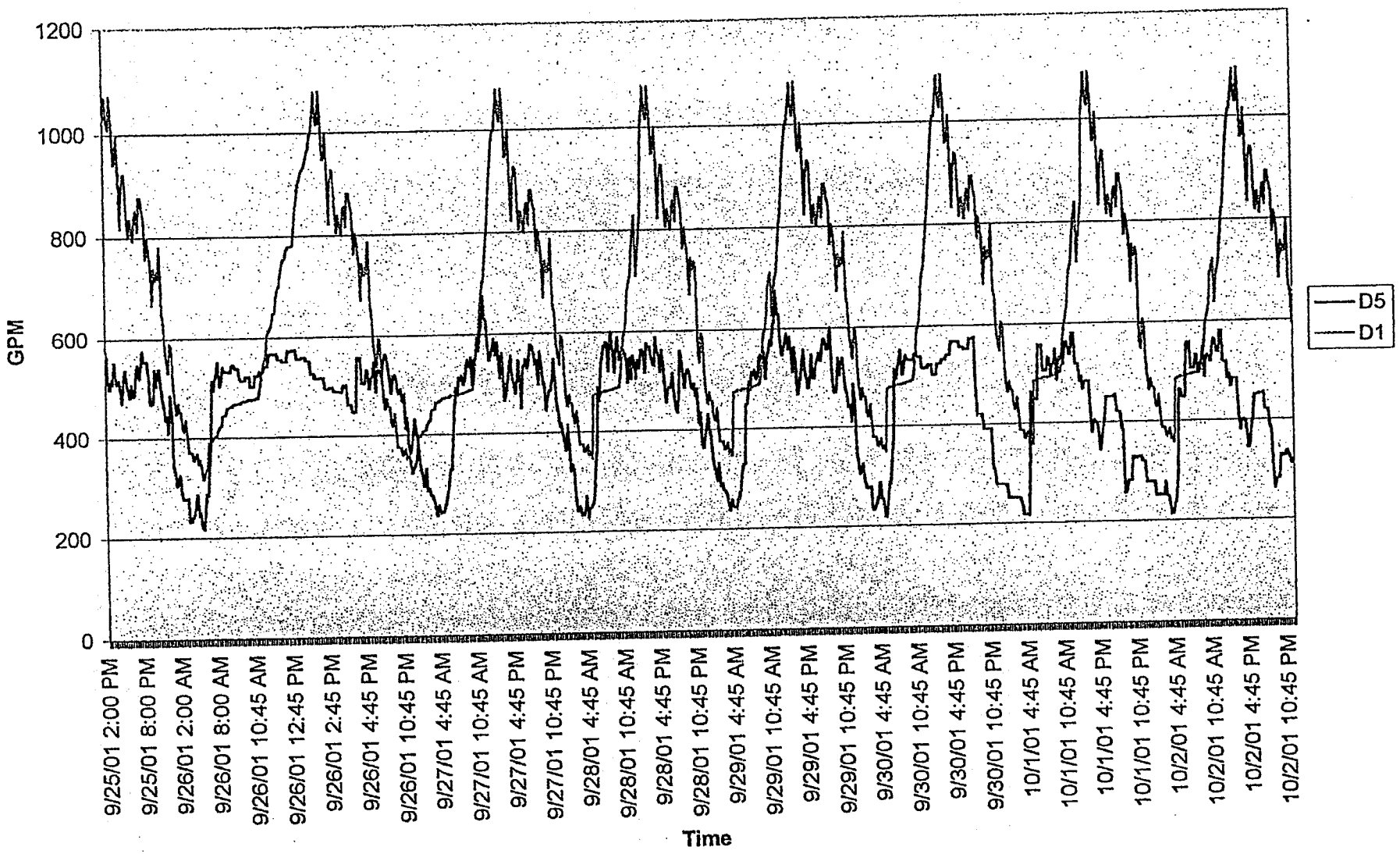
MRC Technologies Flow Graphs

Manholes A1, B1, C1, D1, D5, F1

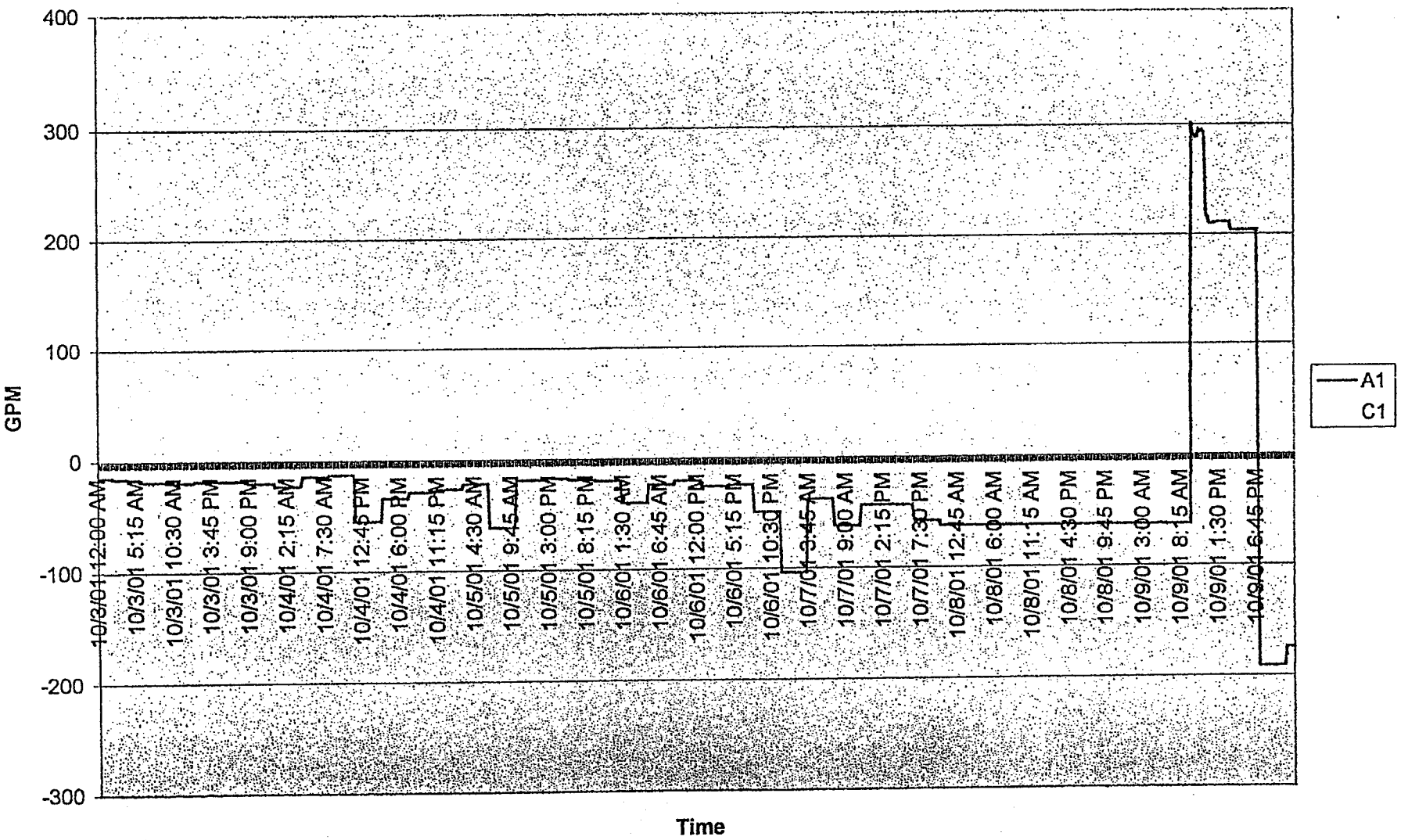
Sites D1 + D5: 15 inch



Sites D1 + D5: 15 inch

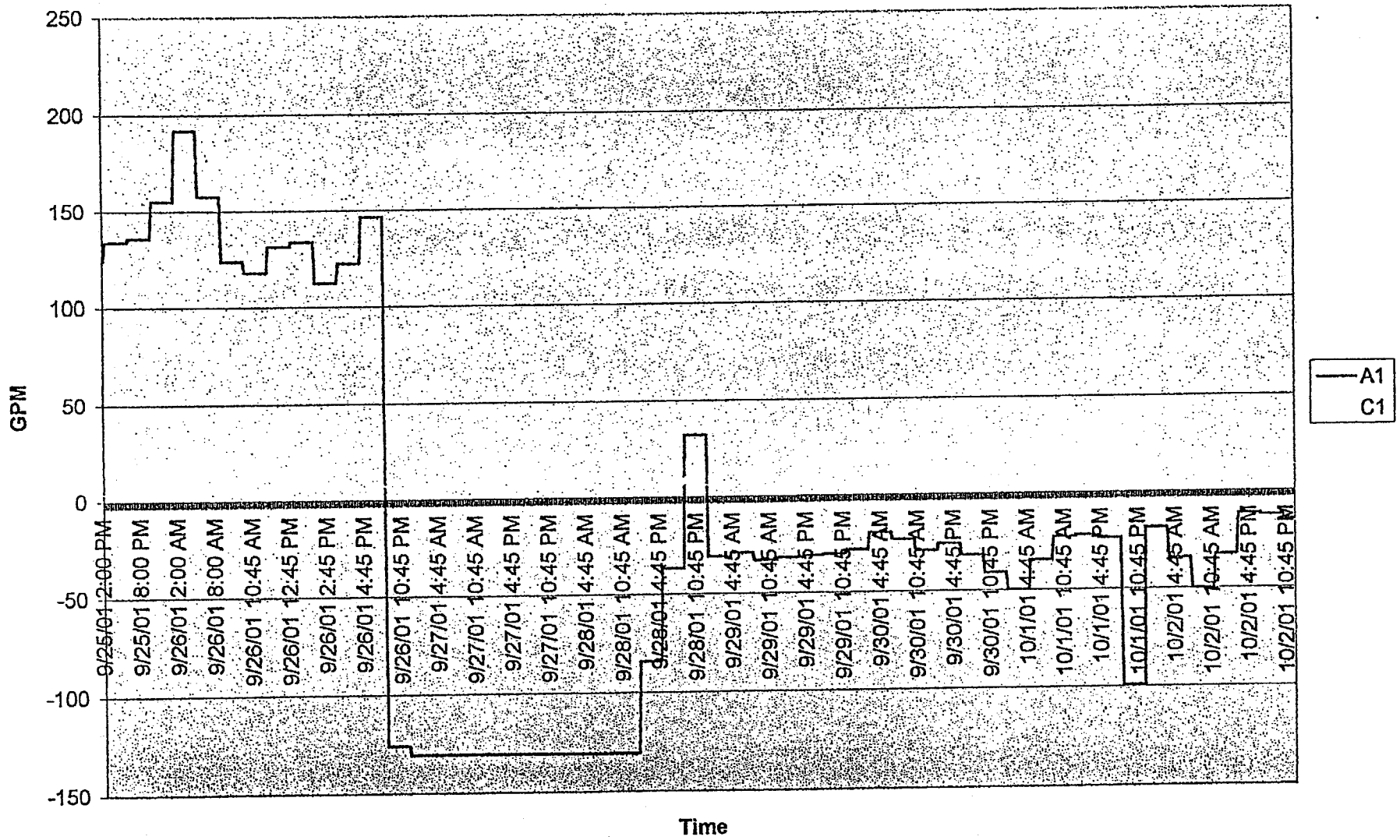


Sites A1 + C1: 8 inch

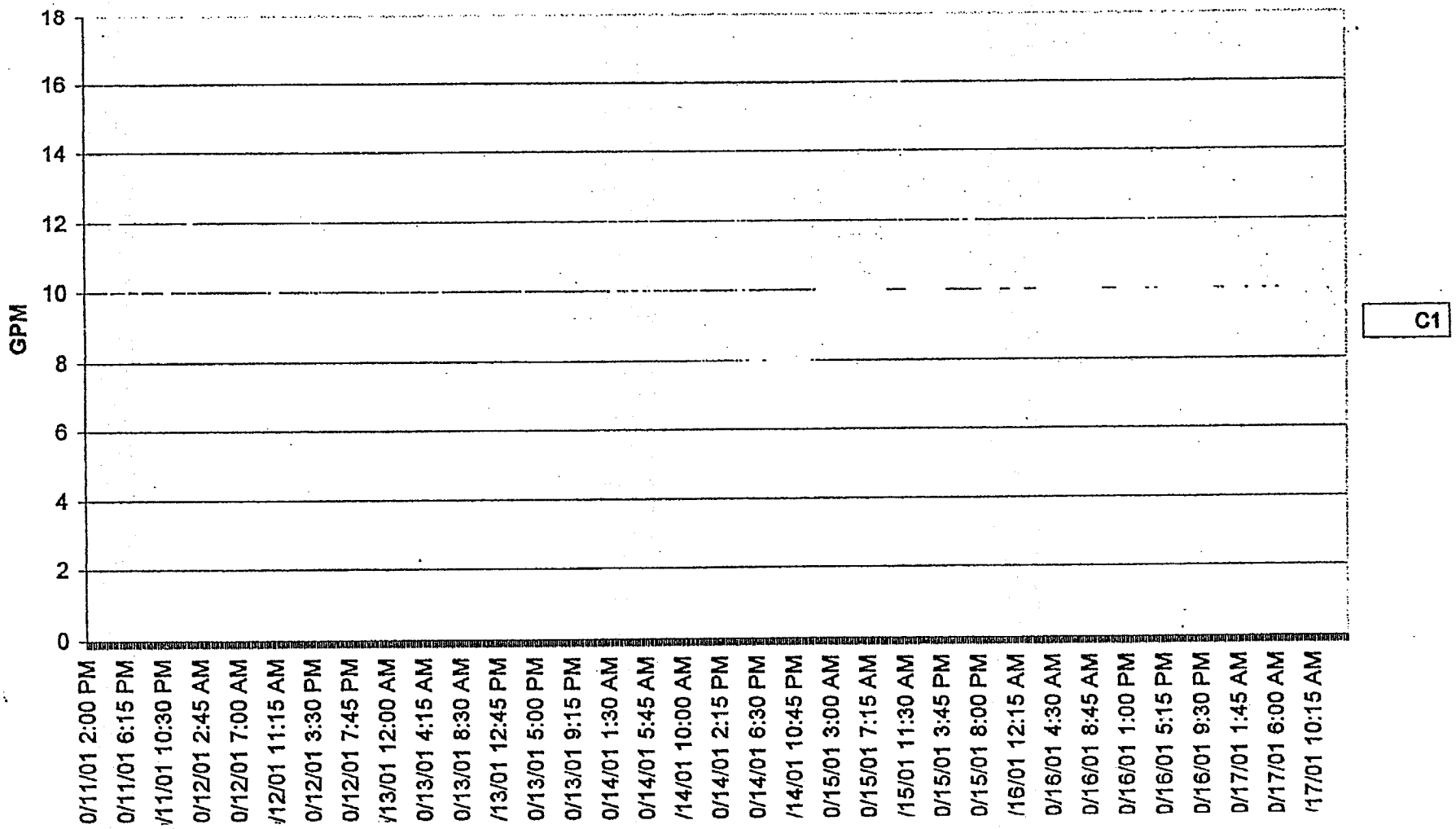


10/25/01 - 10/02/01

Sites A1 + C1: 8 inch

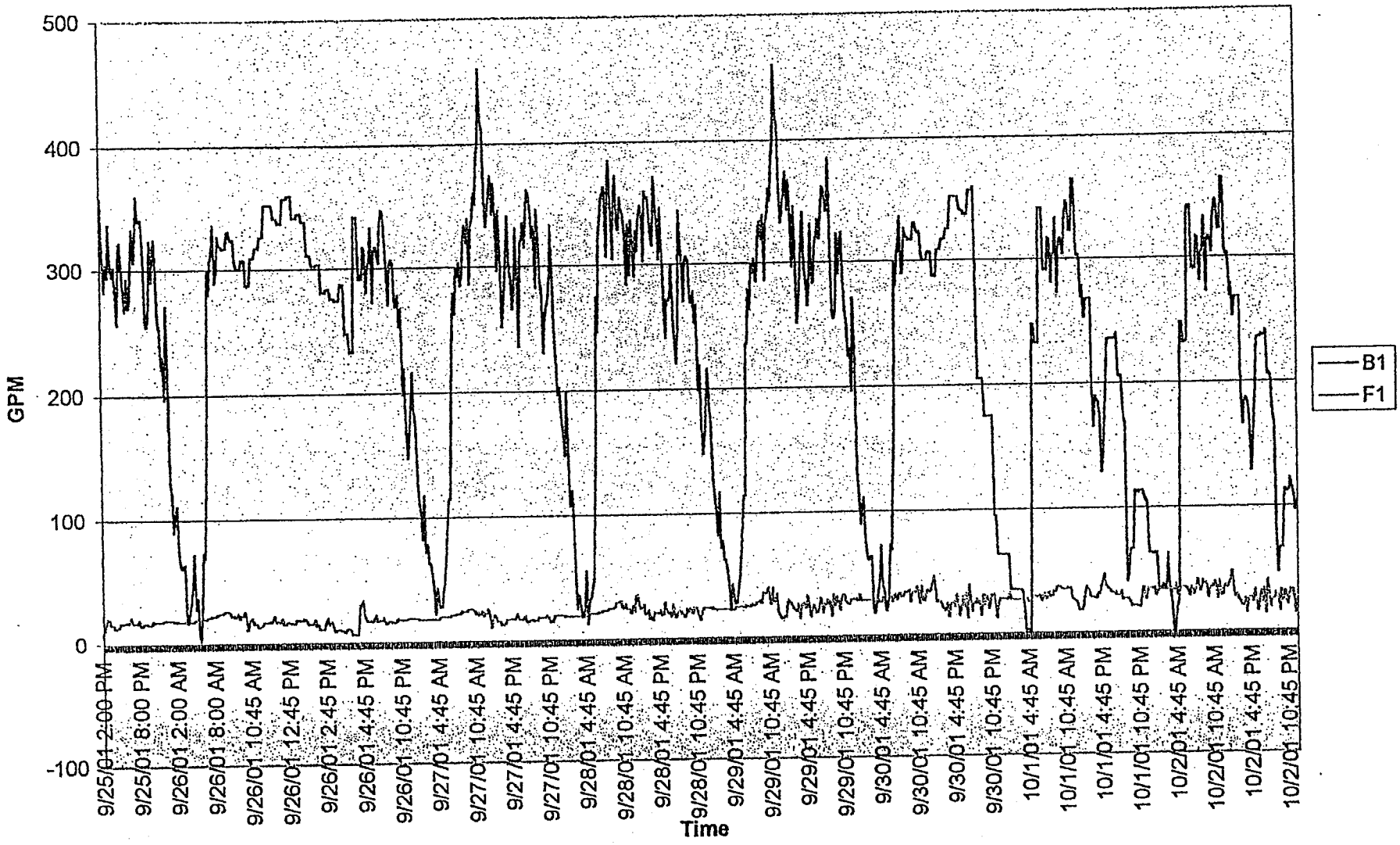


Site C1: 8 inch

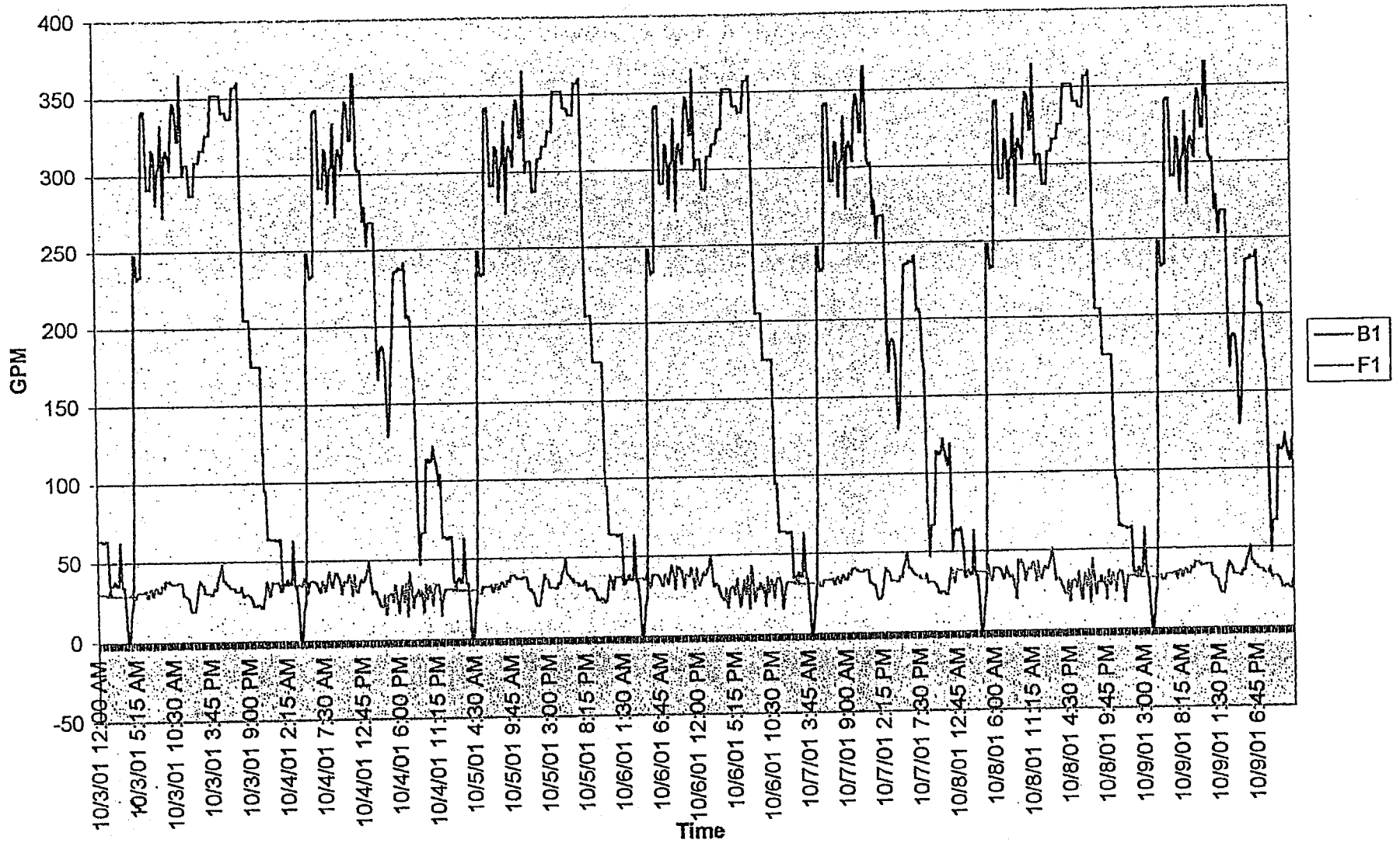


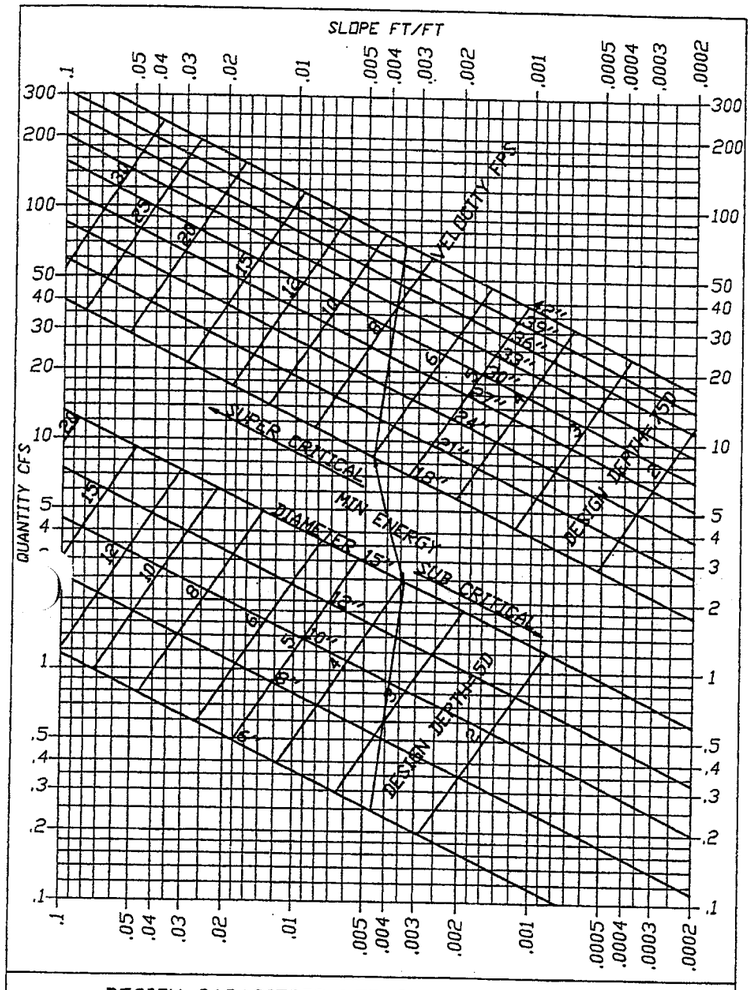
10/27/01 - 10/28/01

Sites B1 + F1: 8 inch



Sites B1 + F1: 8 inch

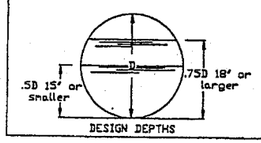




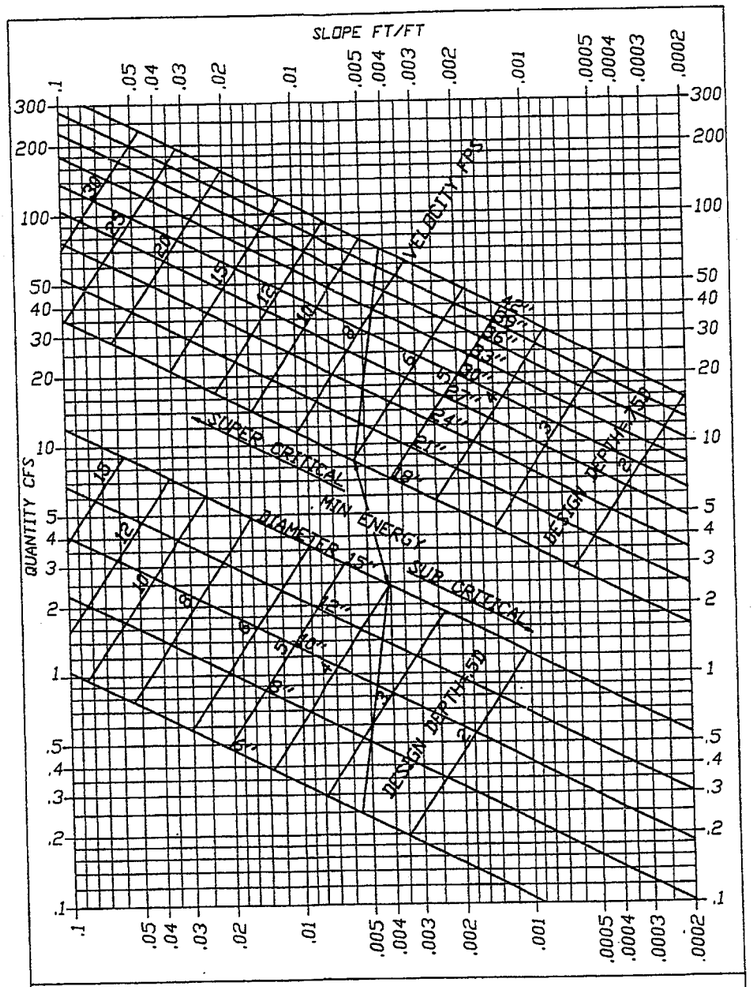
DESIGN CAPACITIES FOR CLAY PIPE SEWERS

BASED ON MANNING'S EQUATION

$Q=AV \qquad V=\frac{1.486}{n} R^{2/3} S^{1/2}$



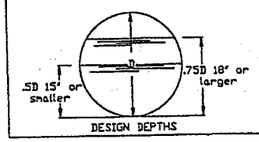
n=.010



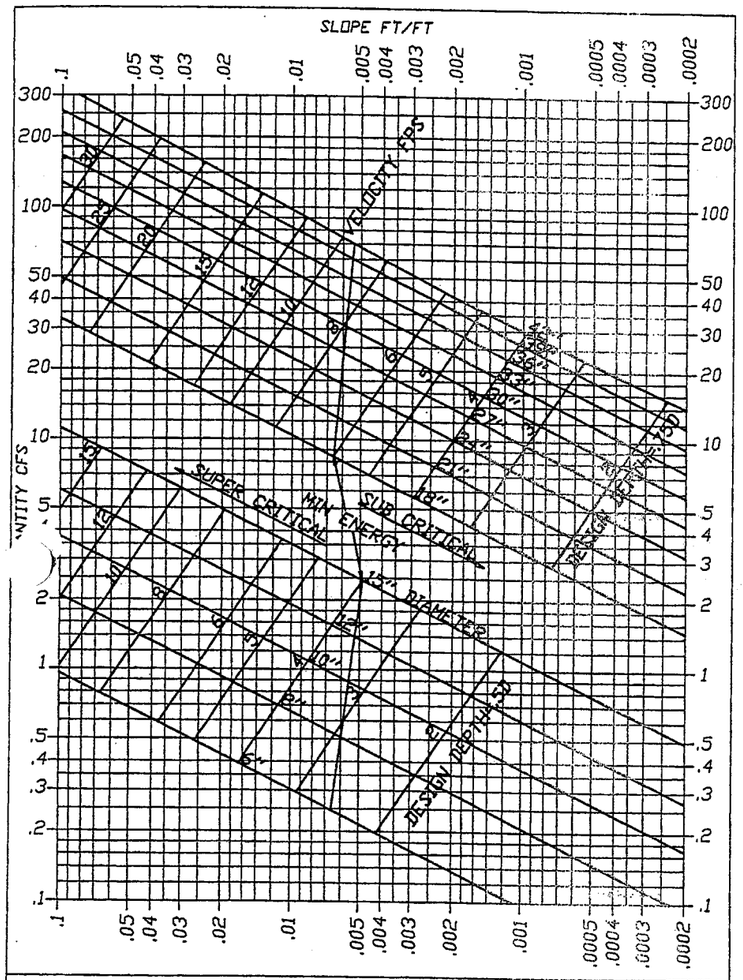
DESIGN CAPACITIES FOR CLAY PIPE SEWERS

BASED ON MANNING'S EQUATION

$Q=AV \qquad V=\frac{1.486}{n} R^{2/3} S^{1/2}$



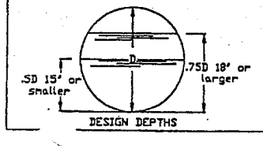
n=.011



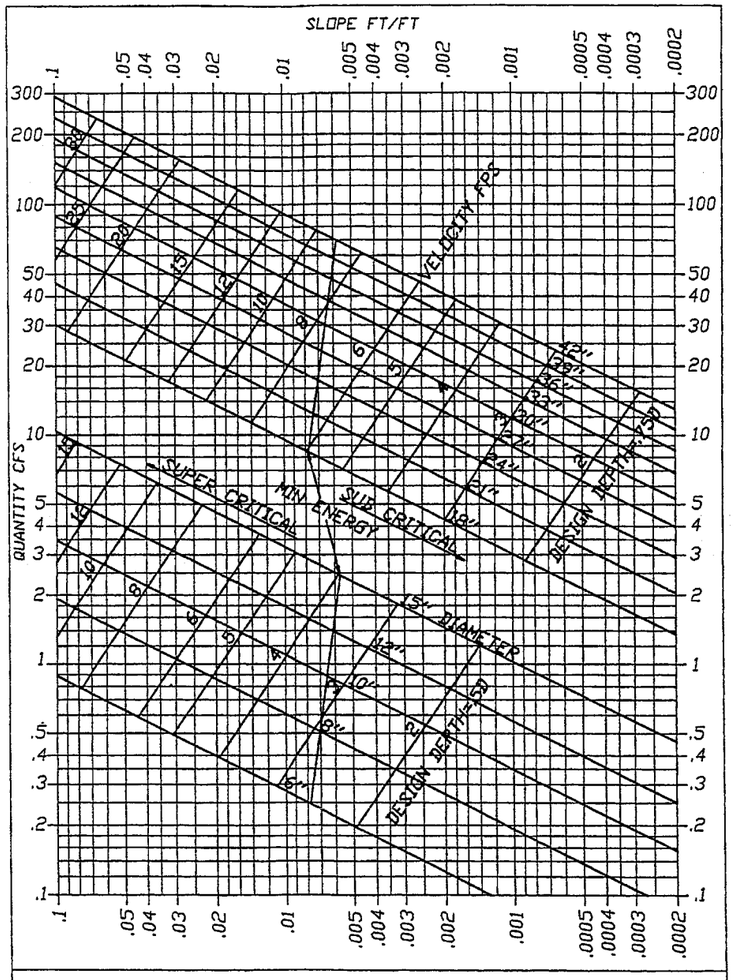
DESIGN CAPACITIES FOR CLAY PIPE SEWERS

BASED ON MANNING'S EQUATION

$Q=AV \quad V=\frac{1.486}{n} R^{2/3} S^{1/2}$



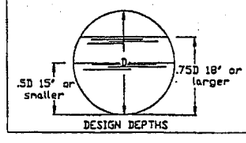
n=.012



DESIGN CAPACITIES FOR CLAY PIPE SEWERS

BASED ON MANNING'S EQUATION

$Q=AV \quad V=\frac{1.486}{n} R^{2/3} S^{1/2}$



For 'n' equal to:
.014 multiply Q or V by .93
.015 multiply Q or V by .87
.016 multiply Q or V by .81

n=.013

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-11			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	WEST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	7,000.0	CY	$ -	$ -	$ 97.40	$ 681,800	$ 97.40	$ 681,800
REMOVE EXISTING PIPE	2,500.0	LF	$ -	$ -	$ 1.00	$ 2,500	$ 1.00	$ 2,500
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 684,300**		**$ 684,300**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	0.0	LF	$ 7.26	$ -	$ 4.35	$ -	$ 11.61	$ -
12" PVC SDR-35PIPE	2,500.0	LF	$ 12.15	$ 30,375	$ 6.18	$ 15,450	$ 18.33	$ 45,825
MANHOLE	13.0	EA	$ 2,000.00	$ 26,000	$ 1,000.00	$ 13,000	$ 3,000.00	$ 39,000
TOTAL DIVISION 15				**$ 56,375**		**$ 28,450**		**$ 84,825**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 769,125
TAXES (ON MATERIAL)	7.5%							$ 4,228
ESCALATION	2.0%							$ 15,467
OVERHEAD AND PROFIT	20.0%							$ 157,764
CONTINGENCY	15.0%							$ 141,988
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 1,088,572**
SOFT COSTS	20.0%							$ 217,714
GRAND TOTAL								**$ 1,306,286**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-12			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	EUCALYPTUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	450.0	CY	$ -	$ -	$ 97.40	$ 43,830	$ 97.40	$ 43,830
REMOVE EXISTING PIPE	200.0	LF	$ -	$ -	$ 1.00	$ 200	$ 1.00	$ 200
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 44,030**		**$ 44,030**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	200.0	LF	$ 7.26	$ 1,452	$ 4.35	$ 870	$ 11.61	$ 2,322
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 1,452**		**$ 870**		**$ 2,322**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 46,352
TAXES (ON MATERIAL)	7.5%							$ 109
ESCALATION	2.0%							$ 929
OVERHEAD AND PROFIT	20.0%							$ 9,478
CONTINGENCY	15.0%							$ 8,530
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 65,398**
SOFT COSTS	20.0%							$ 13,080
GRAND TOTAL								**$ 78,478**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-13			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	LIFE SCIENCES		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	225.0	CY	$ -	$ -	$ 97.40	$ 21,915	$ 97.40	$ 21,915
REMOVE EXISTING PIPE	100.0	LF	$ -	$ -	$ 1.00	$ 100	$ 1.00	$ 100
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 22,015**		**$ 22,015**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	100.0	LF	$ 3.98	$ 398	$ 4.17	$ 417	$ 8.15	$ 815
8" PVC SDR-35PIPE	0.0	LF	$ 7.26	$ -	$ 4.35	$ -	$ 11.61	$ -
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 398**		**$ 417**		**$ 815**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 22,830
TAXES (ON MATERIAL)	7.5%							$ 30
ESCALATION	2.0%							$ 457
OVERHEAD AND PROFIT	20.0%							$ 4,663
CONTINGENCY	15.0%							$ 4,197
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 32,178**
SOFT COSTS	20.0%							$ 6,436
GRAND TOTAL								**$ 38,613**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-14			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	LIFW SCIENCES		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	225.0	CY	$ -	$ -	$ 97.40	$ 21,915	$ 97.40	$ 21,915
REMOVE EXISTING PIPE	100.0	LF	$ -	$ -	$ 1.00	$ 100	$ 1.00	$ 100
EARTHWORK	100.0	CY	$ -	$ -	$ 50.00	$ 5,000	$ 50.00	$ 5,000
TOTAL DIVISION 2				**$ -**		**$ 27,015**		**$ 27,015**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	100.0	LF	$ 7.26	$ 726	$ 4.35	$ 435	$ 11.61	$ 1,161
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	1.0	EA	$ 2,000.00	$ 2,000	$ 1,000.00	$ 1,000	$ 3,000.00	$ 3,000
TOTAL DIVISION 15				**$ 2,726**		**$ 1,435**		**$ 4,161**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 31,176
TAXES (ON MATERIAL)	7.5%							$ 204
ESCALATION	2.0%							$ 628
OVERHEAD AND PROFIT	20.0%							$ 6,402
CONTINGENCY	15.0%							$ 5,761
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 44,171**
SOFT COSTS	20.0%							$ 8,834
GRAND TOTAL								**$ 53,005**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-15			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	BOYDEN LAB		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	300.0	CY	$ -	$ -	$ 97.40	$ 29,220	$ 97.40	$ 29,220
REMOVE EXISTING PIPE	150.0	LF	$ -	$ -	$ 1.00	$ 150	$ 1.00	$ 150
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 29,370**		**$ 29,370**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	150.0	LF	$ 7.26	$ 1,089	$ 4.35	$ 653	$ 11.61	$ 1,742
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 1,089**		**$ 653**		**$ 1,742**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 31,112
TAXES (ON MATERIAL)	7.5%							$ 82
ESCALATION	2.0%							$ 624
OVERHEAD AND PROFIT	20.0%							$ 6,363
CONTINGENCY	15.0%							$ 5,727
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 43,908**
SOFT COSTS	20.0%							$ 8,782
GRAND TOTAL								**$ 52,689**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-16			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	PIERCE HALL, COMMONS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	450.0	CY	$ -	$ -	$ 97.40	$ 43,830	$ 97.40	$ 43,830
REMOVE EXISTING PIPE	200.0	LF	$ -	$ -	$ 1.00	$ 200	$ 1.00	$ 200
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 44,030**		**$ 44,030**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	200.0	LF	$ 7.26	$ 1,452	$ 4.35	$ 870	$ 11.61	$ 2,322
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 1,452**		**$ 870**		**$ 2,322**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 46,352
TAXES (ON MATERIAL)	7.5%							$ 109
ESCALATION	2.0%							$ 929
OVERHEAD AND PROFIT	20.0%							$ 9,478
CONTINGENCY	15.0%							$ 8,530
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 65,398**
SOFT COSTS	20.0%							$ 13,080
GRAND TOTAL								**$ 78,478**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-17			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	PIERCE HALL		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	300.0	CY	$ -	$ -	$ 97.40	$ 29,220	$ 97.40	$ 29,220
REMOVE EXISTING PIPE	150.0	LF	$ -	$ -	$ 1.00	$ 150	$ 1.00	$ 150
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 29,370**		**$ 29,370**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	150.0	LF	$ 7.26	$ 1,089	$ 4.35	$ 653	$ 11.61	$ 1,742
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 1,089**		**$ 653**		**$ 1,742**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 31,112
TAXES (ON MATERIAL)	7.5%							$ 82
ESCALATION	2.0%							$ 624
OVERHEAD AND PROFIT	20.0%							$ 6,363
CONTINGENCY	15.0%							$ 5,727
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 43,908**
SOFT COSTS	20.0%							$ 8,782
GRAND TOTAL								**$ 52,689**

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-18			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	VEITCH		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	450.0	CY	$ -	$ -	$ 97.40	$ 43,830	$ 97.40	$ 43,830
REMOVE EXISTING PIPE	200.0	LF	$ -	$ -	$ 1.00	$ 200	$ 1.00	$ 200
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 44,030**		**$ 44,030**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	200.0	LF	$ 7.26	$ 1,452	$ 4.35	$ 870	$ 11.61	$ 2,322
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 1,452**		**$ 870**		**$ 2,322**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 46,352
TAXES (ON MATERIAL)	7.5%							$ 109
ESCALATION	2.0%							$ 929
OVERHEAD AND PROFIT	20.0%							$ 9,478
CONTINGENCY	15.0%							$ 8,530
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 65,398**
SOFT COSTS	20.0%							$ 13,080
GRAND TOTAL								**$ 78,478**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-19			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	ENVIRONMENTAL HEALTH		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	675.0	CY	$ -	$ -	$ 97.40	$ 65,745	$ 97.40	$ 65,745
REMOVE EXISTING PIPE	300.0	LF	$ -	$ -	$ 1.00	$ 300	$ 1.00	$ 300
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 66,045**		**$ 66,045**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	300.0	LF	$ 3.98	$ 1,194	$ 4.17	$ 1,251	$ 8.15	$ 2,445
8" PVC SDR-35PIPE	0.0	LF	$ 7.26	$ -	$ 4.35	$ -	$ 11.61	$ -
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 1,194**		**$ 1,251**		**$ 2,445**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 68,490
TAXES (ON MATERIAL)	7.5%							$ 90
ESCALATION	2.0%							$ 1,372
OVERHEAD AND PROFIT	20.0%							$ 13,990
CONTINGENCY	15.0%							$ 12,591
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 96,533**
SOFT COSTS	20.0%							$ 19,307
GRAND TOTAL								**$ 115,839**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-21			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	5,040.0	CY	$ -	$ -	$ 97.40	$ 490,896	$ 97.40	$ 490,896
REMOVE EXISTING PIPE	1,800.0	LF	$ -	$ -	$ 1.00	$ 1,800	$ 1.00	$ 1,800
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 492,696**		**$ 492,696**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	0.0	LF	$ 7.26	$ -	$ 4.35	$ -	$ 11.61	$ -
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
18" REINFORCED CONCRETE CLASS 3 PIPE	1,800.0	LF	$ 22.57	$ 40,626	$ 19.04	$ 34,272	$ 41.61	$ 74,898
MANHOLE	6.0	EA	$ 2,000.00	$ 12,000	$ 1,000.00	$ 6,000	$ 3,000.00	$ 18,000
TOTAL DIVISION 15				**$ 52,626**		**$ 40,272**		**$ 92,898**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 585,594
TAXES (ON MATERIAL)	7.5%							$ 3,947
ESCALATION	2.0%							$ 11,791
OVERHEAD AND PROFIT	20.0%							$ 120,266
CONTINGENCY	15.0%							$ 108,240
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 829,838**
SOFT COSTS	20.0%							$ 165,968
GRAND TOTAL								**$ 995,805**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-22			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	LINDEN		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	9,400.0	CY	$ -	$ -	$ 97.40	$ 915,560	$ 97.40	$ 915,560
REMOVE EXISTING PIPE	1,960.0	LF	$ -	$ -	$ 1.00	$ 1,960	$ 1.00	$ 1,960
EARTHWORK	500.0	CY	$ -	$ -	$ 50.00	$ 25,000	$ 50.00	$ 25,000
TOTAL DIVISION 2				**$ -**		**$ 942,520**		**$ 942,520**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	0.0	LF	$ 7.26	$ -	$ 4.35	$ -	$ 11.61	$ -
12" PVC SDR-35PIPE	3,760.0	LF	$ 12.15	$ 45,684	$ 6.18	$ 23,237	$ 18.33	$ 68,921
MANHOLE	5.0	EA	$ 2,000.00	$ 10,000	$ 1,000.00	$ 5,000	$ 3,000.00	$ 15,000
TOTAL DIVISION 15				**$ 55,684**		**$ 28,237**		**$ 83,921**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 1,026,441
TAXES (ON MATERIAL)	7.5%							$ 4,176
ESCALATION	2.0%							$ 20,612
OVERHEAD AND PROFIT	20.0%							$ 210,246
CONTINGENCY	15.0%							$ 189,221
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 1,450,697**
SOFT COSTS	20.0%							$ 290,139
GRAND TOTAL								**$ 1,740,836**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-23			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	CHASS #2		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	790.0	CY	$ -	$ -	$ 97.40	$ 76,946	$ 97.40	$ 76,946
REMOVE EXISTING PIPE	0.0	LF	$ -	$ -	$ 1.00	$ -	$ 1.00	$ -
EARTHWORK	100.0	CY	$ -	$ -	$ 50.00	$ 5,000	$ 50.00	$ 5,000
TOTAL DIVISION 2				**$ -**		**$ 81,946**		**$ 81,946**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	350.0	LF	$ 7.26	$ 2,541	$ 4.35	$ 1,523	$ 11.61	$ 4,064
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANHOLE	1.0	EA	$ 2,000.00	$ 2,000	$ 1,000.00	$ 1,000	$ 3,000.00	$ 3,000
TOTAL DIVISION 15				**$ 4,541**		**$ 2,523**		**$ 7,064**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 89,010
TAXES (ON MATERIAL)	7.5%							$ 341
ESCALATION	2.0%							$ 1,787
OVERHEAD AND PROFIT	20.0%							$ 18,227
CONTINGENCY	15.0%							$ 16,405
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 125,769**
SOFT COSTS	20.0%							$ 25,154
GRAND TOTAL								**$ 150,923**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-31			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	EAST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	3,000.0	CY	$ -	$ -	$ 97.40	$ 292,200	$ 97.40	$ 292,200
REMOVE EXISTING PIPE	1,200.0	LF	$ -	$ -	$ 1.00	$ 1,200	$ 1.00	$ 1,200
EARTHWORK	0.0	CY	$ -	$ -	$ 50.00	$ -	$ 50.00	$ -
TOTAL DIVISION 2				**$ -**		**$ 293,400**		**$ 293,400**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	0.0	LF	$ 7.26	$ -	$ 4.35	$ -	$ 11.61	$ -
12" PVC SDR-35PIPE	1,200.0	LF	$ 12.15	$ 14,580	$ 6.18	$ 7,416	$ 18.33	$ 21,996
MANHOLE	0.0	EA	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 3,000.00	$ -
TOTAL DIVISION 15				**$ 14,580**		**$ 7,416**		**$ 21,996**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 315,396
TAXES (ON MATERIAL)	7.5%							$ 1,094
ESCALATION	2.0%							$ 6,330
OVERHEAD AND PROFIT	20.0%							$ 64,564
CONTINGENCY	15.0%							$ 58,107
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 445,491**
SOFT COSTS	20.0%							$ 89,098
GRAND TOTAL								**$ 534,589**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
SEWER PROJECT SS-32			BECHARD LONG & ASSOCIATES, INC.				25-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	SOUTH/ WEST CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
TRENCHING & BACKFILL	2,000.0	CY	$ -	$ -	$ 97.40	$ 194,800	$ 97.40	$ 194,800
REMOVE EXISTING PIPE	800.0	LF	$ -	$ -	$ 1.00	$ 800	$ 1.00	$ 800
EARTHWORK	200.0	CY	$ -	$ -	$ 50.00	$ 10,000	$ 50.00	$ 10,000
TOTAL DIVISION 2				**$ -**		**$ 205,600**		**$ 205,600**
DIVISION 15 - MECHANICAL								
4" PVC SDR-35PIPE	0.0	LF	$ 2.33	$ -	$ 3.89	$ -	$ 6.22	$ -
6" PVC SDR-35PIPE	0.0	LF	$ 3.98	$ -	$ 4.17	$ -	$ 8.15	$ -
8" PVC SDR-35PIPE	800.0	LF	$ 7.26	$ 5,808	$ 4.35	$ 3,480	$ 11.61	$ 9,288
12" PVC SDR-35PIPE	0.0	LF	$ 12.15	$ -	$ 6.18	$ -	$ 18.33	$ -
MANOLE	2.0	EA	$ 2,000.00	$ 4,000	$ 1,000.00	$ 2,000	$ 3,000.00	$ 6,000
TOTAL DIVISION 15				**$ 5,808**		**$ 3,480**		**$ 15,288**
DIVISION 16 - ELECTRICAL								
NONE	0.0		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 16				**$ -**		**$ -**		**$ -**
COST SUMMARY								
SUBTOTAL								$ 220,888
TAXES (ON MATERIAL)	7.5%							$ 436
ESCALATION	2.0%							$ 4,426
OVERHEAD AND PROFIT	20.0%							$ 45,150
CONTINGENCY	15.0%							$ 40,635
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 311,535**
SOFT COSTS	20.0%							$ 62,307
GRAND TOTAL								**$ 373,842**

APPENDIX E

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-11			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION	1.0	LS	$ -	$ -	$ 40,000.00	$ 40,000	$ 40,000.00	$ 40,000
MANHOLE	0.0	EA	$ 5,000.00	$ -	$ 2,500.00	$ -	$ 7,500.00	$ -
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	500.0	LF	$ 75.00	$ 37,500	$ 75.00	$ 37,500	$ 150.00	$ 75,000
SF-6 SWITCH	2.0	EA	$ 26,000.00	$ 52,000	$ 5,000.00	$ 10,000	$ 31,000.00	$ 62,000
TRANSFORMER AND MAIN SWITCHBOARD	2.0	EA	$ 60,000.00	$ 120,000	$ 25,000.00	$ 50,000	$ 85,000.00	$ 170,000
REFEED LOADS (CONDUIT AND WIRE)	2.0	EA	$ 10,000.00	$ 20,000	$ 20,000.00	$ 40,000	$ 30,000.00	$ 60,000
TOTAL DIVISION 16				**$ 229,500**		**$ 177,500**		**$ 407,000**
COST SUMMARY								
SUBTOTAL								$ 407,000
TAXES (ON MATERIAL)	7.5%							$ 17,213
ESCALATION	2.0%							$ 8,484
OVERHEAD AND PROFIT	20.0%							$ 86,539
CONTINGENCY	15.0%							$ 77,885
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 597,122**
SOFT COSTS	20.0%							$ 119,424
GRAND TOTAL								**$ 716,546**
ROUNDED TOTAL								**$ 717,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-12			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION	1.0	LS	$ -	$ -	$ 15,000.00	$ 15,000	$ 15,000.00	$ 15,000
MANHOLE	2.0	EA	$ 5,000.00	$ 10,000	$ 2,500.00	$ 5,000	$ 7,500.00	$ 15,000
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	800.0	LF	$ 75.00	$ 60,000	$ 75.00	$ 60,000	$ 150.00	$ 120,000
SF-6 SWITCH	2.0	EA	$ 26,000.00	$ 52,000	$ 5,000.00	$ 10,000	$ 31,000.00	$ 62,000
TRANSFORMER AND MAIN SWITCHBOARD	0.0	EA	$ 60,000.00	$ -	$ 25,000.00	$ -	$ 85,000.00	$ -
REFEED LOADS (CONDUIT AND WIRE)	0.0	EA	$ 10,000.00	$ -	$ 20,000.00	$ -	$ 30,000.00	$ -
TOTAL DIVISION 16				**$ 122,000**		**$ 90,000**		**$ 212,000**
COST SUMMARY								
SUBTOTAL								$ 212,000
TAXES (ON MATERIAL)	7.5%							$ 9,150
ESCALATION	2.0%							$ 4,423
OVERHEAD AND PROFIT	20.0%							$ 45,115
CONTINGENCY	15.0%							$ 40,603
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 311,291**
SOFT COSTS	20.0%							$ 62,258
GRAND TOTAL								**$ 373,549**
ROUNDED TOTAL								**$ 374,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-13			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION		LS	$ -	$ -	$ 10,000.00	$ -	$ 10,000.00	$ -
MANHOLE	2.0	EA	$ 5,000.00	$ 10,000	$ 2,500.00	$ 5,000	$ 7,500.00	$ 15,000
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	600.0	LF	$ 75.00	$ 45,000	$ 75.00	$ 45,000	$ 150.00	$ 90,000
SF-6 SWITCH		EA	$ 26,000.00	$ -	$ 5,000.00	$ -	$ 31,000.00	$ -
TRANSFORMER AND MAIN SWITCHBOARD		EA	$ 60,000.00	$ -	$ 25,000.00	$ -	$ 85,000.00	$ -
REFEED LOADS (CONDUIT AND WIRE)		EA	$ 10,000.00	$ -	$ 20,000.00	$ -	$ 30,000.00	$ -
TOTAL DIVISION 16				**$ 55,000**		**$ 50,000**		**$ 105,000**
COST SUMMARY								
SUBTOTAL								$ 105,000
TAXES (ON MATERIAL)	7.5%							$ 4,125
ESCALATION	2.0%							$ 2,183
OVERHEAD AND PROFIT	20.0%							$ 22,262
CONTINGENCY	15.0%							$ 20,035
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 153,604**
SOFT COSTS	20.0%							$ 30,721
GRAND TOTAL								**$ 184,325**
ROUNDED TOTAL								**$ 184,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-21			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION	1.0	LS	$ -	$ -	$ 10,000.00	$ 10,000	$ 10,000.00	$ 10,000
MANHOLE	1.0	EA	$ 5,000.00	$ 5,000	$ 2,500.00	$ 2,500	$ 7,500.00	$ 7,500
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	300.0	LF	$ 75.00	$ 22,500	$ 75.00	$ 22,500	$ 150.00	$ 45,000
SF-6 SWITCH	1.0	EA	$ 26,000.00	$ 26,000	$ 5,000.00	$ 5,000	$ 31,000.00	$ 31,000
TRANSFORMER AND MAIN SWITCHBOARD	2.0	EA	$ 60,000.00	$ 120,000	$ 25,000.00	$ 50,000	$ 85,000.00	$ 170,000
REFEED LOADS (CONDUIT AND WIRE)	2.0	EA	$ 10,000.00	$ 20,000	$ 20,000.00	$ 40,000	$ 30,000.00	$ 60,000
TOTAL DIVISION 16				**$ 193,500**		**$ 130,000**		**$ 323,500**
COST SUMMARY								
SUBTOTAL								$ 323,500
TAXES (ON MATERIAL)	7.5%							$ 14,513
ESCALATION	2.0%							$ 6,760
OVERHEAD AND PROFIT	20.0%							$ 68,955
CONTINGENCY	15.0%							$ 62,059
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 475,786**
SOFT COSTS	20.0%							$ 95,157
GRAND TOTAL								**$ 570,944**
ROUNDED TOTAL								**$ 571,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-22			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION		LS	$ -	$ -	$ 20,000.00	$ -	$ 20,000.00	$ -
MANHOLE	3.0	EA	$ 5,000.00	$ 15,000	$ 2,500.00	$ 7,500	$ 7,500.00	$ 22,500
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	1,000.0	LF	$ 75.00	$ 75,000	$ 75.00	$ 75,000	$ 150.00	$ 150,000
SF-6 SWITCH		EA	$ 26,000.00	$ -	$ 5,000.00	$ -	$ 31,000.00	$ -
TRANSFORMER AND MAIN SWITCHBOARD		EA	$ 60,000.00	$ -	$ 25,000.00	$ -	$ 85,000.00	$ -
REFEED LOADS (CONDUIT AND WIRE)		EA	$ 10,000.00	$ -	$ 20,000.00	$ -	$ 30,000.00	$ -
TOTAL DIVISION 16				**$ 90,000**		**$ 82,500**		**$ 172,500**
COST SUMMARY								
SUBTOTAL								$ 172,500
TAXES (ON MATERIAL)	7.5%							$ 6,750
ESCALATION	2.0%							$ 3,585
OVERHEAD AND PROFIT	20.0%							$ 36,567
CONTINGENCY	15.0%							$ 32,910
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 252,312**
SOFT COSTS	20.0%							$ 50,462
GRAND TOTAL								**$ 302,775**
ROUNDED TOTAL								**$ 303,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-23			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION	1.0	LS	$ -	$ -	$ 20,000.00	$ 20,000	$ 20,000.00	$ 20,000
MANHOLE	7.0	EA	$ 5,000.00	$ 35,000	$ 2,500.00	$ 17,500	$ 7,500.00	$ 52,500
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	2,000.0	LF	$ 75.00	$ 150,000	$ 75.00	$ 150,000	$ 150.00	$ 300,000
SF-6 SWITCH	2.0	EA	$ 26,000.00	$ 52,000	$ 5,000.00	$ 10,000	$ 31,000.00	$ 62,000
TRANSFORMER AND MAIN SWITCHBOARD	2.0	EA	$ 60,000.00	$ 120,000	$ 25,000.00	$ 50,000	$ 85,000.00	$ 170,000
REFEED LOADS (CONDUIT AND WIRE)	2.0	EA	$ 10,000.00	$ 20,000	$ 20,000.00	$ 40,000	$ 30,000.00	$ 60,000
TOTAL DIVISION 16				**$ 377,000**		**$ 287,500**		**$ 664,500**
COST SUMMARY								
SUBTOTAL								$ 664,500
TAXES (ON MATERIAL)	7.5%							$ 28,275
ESCALATION	2.0%							$ 13,856
OVERHEAD AND PROFIT	20.0%							$ 141,326
CONTINGENCY	15.0%							$ 127,193
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 975,150**
SOFT COSTS	20.0%							$ 195,030
GRAND TOTAL								**$ 1,170,180**
ROUNDED TOTAL								**$ 1,170,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-31			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION	1.0	LS	$ -	$ -	$ 20,000.00	$ 20,000	$ 20,000.00	$ 20,000
MANHOLE	5.0	EA	$ 5,000.00	$ 25,000	$ 2,500.00	$ 12,500	$ 7,500.00	$ 37,500
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	1,600.0	LF	$ 75.00	$ 120,000	$ 75.00	$ 120,000	$ 150.00	$ 240,000
SF-6 SWITCH	3.0	EA	$ 26,000.00	$ 78,000	$ 5,000.00	$ 15,000	$ 31,000.00	$ 93,000
TRANSFORMER AND MAIN SWITCHBOARD	3.0	EA	$ 60,000.00	$ 180,000	$ 25,000.00	$ 75,000	$ 85,000.00	$ 255,000
REFEED LOADS (CONDUIT AND WIRE)	3.0	EA	$ 10,000.00	$ 30,000	$ 20,000.00	$ 60,000	$ 30,000.00	$ 90,000
TOTAL DIVISION 16				**$ 433,000**		**$ 302,500**		**$ 735,500**
COST SUMMARY								
SUBTOTAL								$ 735,500
TAXES (ON MATERIAL)	7.5%							$ 32,475
ESCALATION	2.0%							$ 15,360
OVERHEAD AND PROFIT	20.0%							$ 156,667
CONTINGENCY	15.0%							$ 141,000
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 1,081,002**
SOFT COSTS	20.0%							$ 216,200
GRAND TOTAL								**$ 1,297,202**
ROUNDED TOTAL								**$ 1,297,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-32			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION	1.0	LS	$ -	$ -	$ 20,000.00	$ 20,000	$ 20,000.00	$ 20,000
MANHOLE		EA	$ 5,000.00	$ -	$ 2,500.00	$ -	$ 7,500.00	$ -
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	500.0	LF	$ 75.00	$ 37,500	$ 75.00	$ 37,500	$ 150.00	$ 75,000
SF-6 SWITCH	2.0	EA	$ 26,000.00	$ 52,000	$ 5,000.00	$ 10,000	$ 31,000.00	$ 62,000
TRANSFORMER AND MAIN SWITCHBOARD	2.0	EA	$ 60,000.00	$ 120,000	$ 25,000.00	$ 50,000	$ 85,000.00	$ 170,000
REFEED LOADS (CONDUIT AND WIRE)	2.0	EA	$ 10,000.00	$ 20,000	$ 20,000.00	$ 40,000	$ 30,000.00	$ 60,000
TOTAL DIVISION 16				**$ 229,500**		**$ 157,500**		**$ 387,000**
COST SUMMARY								
SUBTOTAL								$ 387,000
TAXES (ON MATERIAL)	7.5%							$ 17,213
ESCALATION	2.0%							$ 8,084
OVERHEAD AND PROFIT	20.0%							$ 82,459
CONTINGENCY	15.0%							$ 74,213
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 568,970**
SOFT COSTS	20.0%							$ 113,794
GRAND TOTAL								**$ 682,763**
ROUNDED TOTAL								**$ 683,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-33			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION		LS	$ -	$ -	$ 20,000.00	$ -	$ 20,000.00	$ -
MANHOLE	2.0	EA	$ 5,000.00	$ 10,000	$ 2,500.00	$ 5,000	$ 7,500.00	$ 15,000
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	600.0	LF	$ 75.00	$ 45,000	$ 75.00	$ 45,000	$ 150.00	$ 90,000
SF-6 SWITCH		EA	$ 26,000.00	$ -	$ 5,000.00	$ -	$ 31,000.00	$ -
TRANSFORMER AND MAIN SWITCHBOARD		EA	$ 60,000.00	$ -	$ 25,000.00	$ -	$ 85,000.00	$ -
REFEED LOADS (CONDUIT AND WIRE)		EA	$ 10,000.00	$ -	$ 20,000.00	$ -	$ 30,000.00	$ -
TOTAL DIVISION 16				**$ 55,000**		**$ 50,000**		**$ 105,000**
COST SUMMARY								
SUBTOTAL								$ 105,000
TAXES (ON MATERIAL)	7.5%							$ 4,125
ESCALATION	2.0%							$ 2,183
OVERHEAD AND PROFIT	20.0%							$ 22,262
CONTINGENCY	15.0%							$ 20,035
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 153,604**
SOFT COSTS	20.0%							$ 30,721
GRAND TOTAL								**$ 184,325**
ROUNDED TOTAL								**$ 184,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-34			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION		LS	$ -	$ -	$ 20,000.00	$ -	$ 20,000.00	$ -
MANHOLE	5.0	EA	$ 5,000.00	$ 25,000	$ 2,500.00	$ 12,500	$ 7,500.00	$ 37,500
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	1,600.0	LF	$ 75.00	$ 120,000	$ 75.00	$ 120,000	$ 150.00	$ 240,000
SF-6 SWITCH		EA	$ 26,000.00	$ -	$ 5,000.00	$ -	$ 31,000.00	$ -
TRANSFORMER AND MAIN SWITCHBOARD		EA	$ 60,000.00	$ -	$ 25,000.00	$ -	$ 85,000.00	$ -
REFEED LOADS (CONDUIT AND WIRE)		EA	$ 10,000.00	$ -	$ 20,000.00	$ -	$ 30,000.00	$ -
TOTAL DIVISION 16				**$ 145,000**		**$ 132,500**		**$ 277,500**
COST SUMMARY								
SUBTOTAL								$ 277,500
TAXES (ON MATERIAL)	7.5%							$ 10,875
ESCALATION	2.0%							$ 5,768
OVERHEAD AND PROFIT	20.0%							$ 58,829
CONTINGENCY	15.0%							$ 52,946
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 405,917**
SOFT COSTS	20.0%							$ 81,183
GRAND TOTAL								**$ 487,100**
ROUNDED TOTAL								**$ 487,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-35			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION		LS	$ -	$ -	$ 20,000.00	$ -	$ 20,000.00	$ -
MANHOLE	7.0	EA	$ 5,000.00	$ 35,000	$ 2,500.00	$ 17,500	$ 7,500.00	$ 52,500
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	2,200.0	LF	$ 75.00	$ 165,000	$ 75.00	$ 165,000	$ 150.00	$ 330,000
SF-6 SWITCH		EA	$ 26,000.00	$ -	$ 5,000.00	$ -	$ 31,000.00	$ -
TRANSFORMER AND MAIN SWITCHBOARD		EA	$ 60,000.00	$ -	$ 25,000.00	$ -	$ 85,000.00	$ -
REFEED LOADS (CONDUIT AND WIRE)		EA	$ 10,000.00	$ -	$ 20,000.00	$ -	$ 30,000.00	$ -
TOTAL DIVISION 16				**$ 200,000**		**$ 182,500**		**$ 382,500**
COST SUMMARY								
SUBTOTAL								$ 382,500
TAXES (ON MATERIAL)	7.5%							$ 15,000
ESCALATION	2.0%							$ 7,950
OVERHEAD AND PROFIT	20.0%							$ 81,090
CONTINGENCY	15.0%							$ 72,981
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 559,521**
SOFT COSTS	20.0%							$ 111,904
GRAND TOTAL								**$ 671,425**
ROUNDED TOTAL								**$ 671,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-36			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION OF 5KV SYSTEM	1.0	LS	$ -	$ -	$ 120,000.00	$ 120,000	$ 120,000.00	$ 120,000
MANHOLE	12.0	EA	$ 5,000.00	$ 60,000	$ 2,500.00	$ 30,000	$ 7,500.00	$ 90,000
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	3,600.0	LF	$ 75.00	$ 270,000	$ 75.00	$ 270,000	$ 150.00	$ 540,000
SF-6 SWITCH	16.0	EA	$ 26,000.00	$ 416,000	$ 5,000.00	$ 80,000	$ 31,000.00	$ 496,000
TRANSFORMER, SWITCHBOARD	16.0	EA	$ 60,000.00	$ 960,000	$ 25,000.00	$ 400,000	$ 85,000.00	$ 1,360,000
REFEED LOADS	16.0	EA	$ 10,000.00	$ 160,000	$ 20,000.00	$ 320,000	$ 30,000.00	$ 480,000
TOTAL DIVISION 16				**$ 1,866,000**		**$ 1,220,000**		**$ 3,086,000**
COST SUMMARY								
SUBTOTAL								$ 3,086,000
TAXES (ON MATERIAL)	7.5%							$ 139,950
ESCALATION	2.0%							$ 64,519
OVERHEAD AND PROFIT	20.0%							$ 658,094
CONTINGENCY	15.0%							$ 592,284
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 4,540,847**
SOFT COSTS	20.0%							$ 908,169
GRAND TOTAL								**$ 5,449,017**
ROUNDED TOTAL								**$ 5,449,000**

ENGINEERING COST ESTIMATE

PROJECT			ESTIMATED BY				DATE PREPARED	
ELECTRIC PROJECT E-37			BECHARD LONG & ASSOCIATES, INC.				20-Jan-02	
LOCATION	AREA		STATUS OF DESIGN				JOB NUMBER	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	NORTH CAMPUS		_x_ PED ___ 35% ___ 100% ___ FINAL ___ OTHER ( )				001897	
	QUANTITY		MATERIAL COST		LABOR & EQUIPMENT COST		ENGINEERING ESTIMATE	
ITEM DESCRIPTION	#	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2 - DEMOLITION & SITE WORK								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 2				**$ -**		**$ -**		**$ -**
DIVISION 15 - MECHANICAL								
NONE			$ -	$ -	$ -	$ -	$ -	$ -
TOTAL DIVISION 15				**$ -**		**$ -**		**$ -**
DIVISION 16 - ELECTRICAL								
DEMOLITION OF 5KV SYSTEM	1.0	LS	$ -	$ -	$ 80,000.00	$ 80,000	$ 80,000.00	$ 80,000
RECONFIGURE CHILLER PLANT 4.16KV	1.0	LS	$ -	$ -	$ 50,000.00	$ 50,000	$ 50,000.00	$ 50,000
MANHOLE	8.0	EA	$ 5,000.00	$ 40,000	$ 2,500.00	$ 20,000	$ 7,500.00	$ 60,000
PRI. TRENCHING, CONDUIT, CABLES, CONCRETE, ETC.	2,200.0	LF	$ 75.00	$ 165,000	$ 75.00	$ 165,000	$ 150.00	$ 330,000
SF-6 SWITCH	10.0	EA	$ 26,000.00	$ 260,000	$ 5,000.00	$ 50,000	$ 31,000.00	$ 310,000
TRANSFORMER, SWITCHBOARD	10.0	EA	$ 60,000.00	$ 600,000	$ 25,000.00	$ 250,000	$ 85,000.00	$ 850,000
REFEED LOADS	10.0	EA	$ 10,000.00	$ 100,000	$ 20,000.00	$ 200,000	$ 30,000.00	$ 300,000
TOTAL DIVISION 16				**$ 1,165,000**		**$ 815,000**		**$ 1,980,000**
COST SUMMARY								
SUBTOTAL								$ 1,980,000
TAXES (ON MATERIAL)	7.5%							$ 87,375
ESCALATION	2.0%							$ 41,348
OVERHEAD AND PROFIT	20.0%							$ 421,745
CONTINGENCY	15.0%							$ 379,570
SUBTOTAL (PROJECT CONSTRUCTION COST)								**$ 2,910,037**
SOFT COSTS	20.0%							$ 582,007
ROUNDED TOTAL								**$ 3,492,044**
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