BIOENGINEERING BUILDING MASTER PLAN DPP

RBB ARCHITECTS INC

DETAILED PROJECT PROGRAM

UNIVERSITY OF CALIFORNIA SANTA BARBARA

UCSB No. 981650
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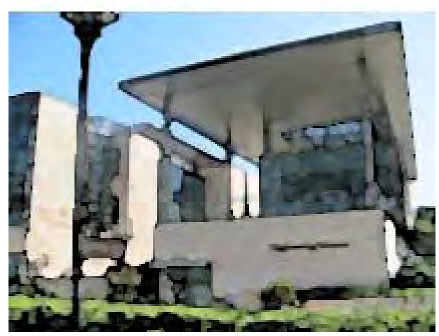

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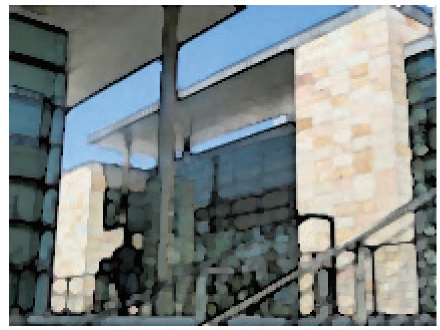

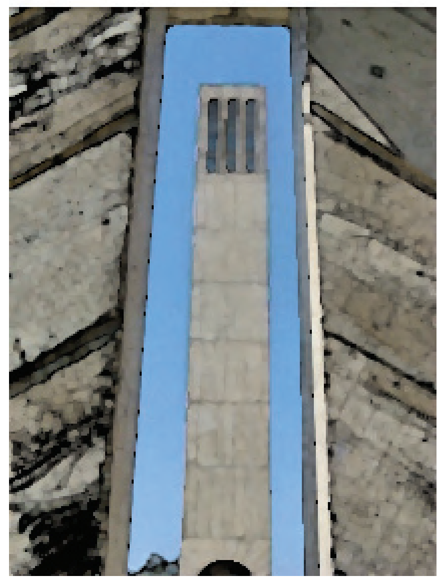

ACKNOWLEDGEMENTS

BIOENGINEERING BUILDING MASTER PLAN DPP

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BIOENGINEERING BUILDING MASTER PLAN DPP

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EXECUTIVE SUMMARY

BIOENGINEERING BUILDING MASTER PLAN DPP

2.0.0

EXECUTIVE SUMMARY

GOALS

The following Detailed Project Program (DPP) has been developed for the University of California, Santa Barbara in order to establish project scope for a new Bioengineering Building. The purpose of the DPP is to define the goals, parameters and constraints of the project in sufficient detail to establish the construction budget. It is also the intent to provide design guidance to the design architect by establishing a clear definition of design goals, space program, functional relationships, laboratory design criteria, and site and building design requirements. The overarching goal is to establish a financially feasible project scope and budget.

PROCESS

In the course of preparing this document, the programming team met with the UCSB Bioengineering Building Committee, UCSB staff and faculty members who have background and expertise in many areas pertinent to the project. These areas include campus planning, design and construction, environmental health and safety, sustainability, site utilities and infrastructure, and laboratory research. The significant issues addressed in these data gathering workshops included: flexible, generic laboratory planning and design, adaptable office planning, the building's relationship to existing and future buildings, implications of hazardous materials storage, and location and capacity of existing campus utilities and infrastructure.

PROGRAM

Interdisciplinary research programs involving faculty and researchers from the College of Engineering and the Biological Sciences from the Division of Mathematical, Life and Physical Sciences are rapidly growing and are in need of top-notch education and research facilities. Increasingly, research programs are integrating or leveraging their technological capabilities and resources across the evolving fields of biology, chemistry and engineering sciences. The *Institute for Collaborative Biotechnologies* (ICB) and the *Center for Stem Cell Biology and Engineering* (Stem Cell) are two such programs that are pioneering bioengineering research. The ICB Medical group is an emerging program that will focus on biomedical research.

The Bioengineering Building will be a multidisciplinary research and teaching facility that will be occupied primarily by faculty, staff, and students from College of Engineering and the Division of Math, Life and Physical Sciences.

Two optional building scenarios and programs were developed to provide UCSB with the opportunity to construct a larger building if proper funding sources are secured. The goal of the project is to integrate three main departments within one facility: the core and medical group of the Institute for Collaborative Biotechnologies (ICB), System Biology / Stem Cell, and Bioengineering. Two of these (ICB and Bioengineering) will include an administrative component. The vision of administration and faculty is to integrate diverse research disciplines and groups on each of the building floors. Similarly administrative staff should be integrated with researchers throughout the building.

The proposed space program for option “A” consists of approximately 43,567 net assignable square feet (ASF) with several program elements including: research laboratories, research support spaces, lecture hall, conference rooms, and offices for faculty, administrative staff, post doctoral students and graduate students. The program for option “B” consists of approximately 37,725 ASF with similar program elements. The decreased area has been achieved by reducing the program by two principal investigators as well as research and office space that is associated with their needs.

Ideally the building design will allow for future needs and flexibility including: renovation and restructuring of research laboratory spaces, accommodation of new and changing technology, and accommodation of changes in building use and academic curriculum over time. Potential future expansion of the Bioengineering Building has been carefully considered while exploring the building placement and configuration.

SITE

The project’s master plan is to provide state-of-the-art facilities to house all of these organizations under one roof. The site for the Bioengineering Building is located within the central development site of the Main Campus. This development site is bordered by Campus Green to the north, Davidson Library to the west, Science Walk to the east and open space to the south. Several existing buildings in the north portion house existing academic programs and should remain in place. The south portion of the development site has been determined to be most appropriate for the new Bioengineering Building. The building will define the edge of the future extension to the Pardall Mall. Its precise placement needs to be carefully considered in relation to the south arcade of the Davidson Library and the axial corridor of the entire, existing and future Pardall Mall.

The Bioengineering Building should be sited to allow for future expansion on the remaining portions of the development site in accordance with planning goals set out in Vision 2025. The total capacity for the site as listed in LRDP Implementation Document is 515,000 GSF. This total is based on the removal and relocation of existing temporary structures to meet these goals. It is assumed that this total will be developed in multiple phases. The Bioengineering Building, along with the Davidson Library Addition, is among the first of these phases.

Conceptual Site Master Plan is included in the DPP and is intended to establish principles and guidelines for future development of the site. Site design concepts should recognize and address the larger contextual issues in terms of the interface between the built and natural environments of the UCSB campus. The campus objective is to achieve a design equivalent to a LEED Silver rated building. Conceptual site design will require an understanding of pedestrian traffic patterns, bike paths, vehicular campus and building access. The new facility will require truck and service access and it is recommended that these functions be combined with service needs of the adjacent Davidson Library to create a single service court to serve existing, proposed and future facilities.

PROJECT BACKGROUND

BIOENGINEERING BUILDING MASTER PLAN DPP

3.0.0

PROJECT BACKGROUND

The UCSB Institute for Collaborative Biotechnologies (ICB) is a unique and powerful alliance between Academia, Industry and the Army, led by the University of California, Santa Barbara (UCSB), in partnership with the Massachusetts Institute for Technology (MIT) and California Institute of Technology (Caltech). Created to accelerate the technological and scientific transformation of the Army, ICB research is driven by premier faculty and researchers, working together as interdisciplinary teams of molecular biologists, chemists, physicists, psychologists and engineers.

The Center for Stem Cell Biology and Engineering (Stem Cell) has tremendous potential to transform medical practice, with the development of regenerative cellular therapies for many insidious diseases. UCSB's Stem Cell program is very well positioned to make unique, significant contributions in stem cell research, with extraordinary enabling technologies in biomaterials, systems biology, nanotechnology, micro-processing and bioengineering, all of which are synergistic with fundamental biomedical research efforts.

The project seeks to integrate ICB and portions of the Stem Cell organization along with ICB Medical and the Bioengineering Program. The ICB Medical group is an emerging program that will focus on biomedical research, bioengineering and a computational research. These pioneering programs are growing at a very rapid rate; they need state-of-the-future facilities to achieve their potential.

The College of Engineering has prepared a Preliminary Space Program for the Bioengineering Building. Space needs were issued for Research Laboratories, Offices and Administration Support. The program includes headquarters for the ICB organization, ICB Medical research initiative, a graduate student academic program for Bioengineering, and space for the Center for Stem Biology and Engineering. The space needs totaled 40,380 assignable square feet, with 23,400 asf for Laboratories, 13,160 asf for Offices and 3,820 asf for Administration Support. This space assessment was reevaluated during the development of the DPP and resulted in two programs that ranged between 37,725 asf and 43,457 asf. Increases and decreases in both programs were seen in both laboratory areas and office areas. Refer to Section 4.0 Space Program for details.

PROJECT GOALS

The project is to provide facilities to house all these organizations under one roof and integrate students with top researchers. Additional goals are to attract faculty and world class researchers and pursue top quality graduate students, produce a high performing building to attract top faculty, and bring labs into close proximity to co-locate talent and create a powerful group of bioengineers.

The faculty's vision is to bring collaborative research into one location, and provide each program their own identity, while being seamless in terms of operational overlap. This can be achieved by creating an environment that allows bench scientists [in wet laboratories] to interact with dry computational scientists, which will create a more diverse and flexible building. This is critical since there is an intersection between sciences and engineering that can be developed to address an arrary of problems using common technologies.

SPACE PROGRAM

BIOENGINEERING BUILDING MASTER PLAN DPP

4.0.0

INTRODUCTION

The laboratory and office spaces contained in the Bioengineering Program have been developed based upon a prototype design that responds to scientific research requirements and at the same time allowing for changes in personnel, technology, and research missions. The laboratory and laboratory support spaces have been defined based upon a laboratory planning module of 11' in width. This planning module provides circulation space in the center of the module with lab casework and/or lab equipment on either side of the circulation space. The 11' module is the least common denominator for defining lab space square footage requirements. The prototype method and lab module help define a space program that will adapt to changing requirements over the life of the building.

The research lab design is based upon locating laboratories adjacent to each other and maintaining an open lab environment in which laboratory units are assigned according to lab modules, rather than specific rooms. This approach will allow more flexibility for the assignment of laboratory units as specific research groups expand and contract due to new research missions and grant funding opportunities. Lab support functions consist of two types- 1. Lab support rooms that are part of the research lab unit, and are dedicated to those units. These spaces includes dedicated procedure rooms for tissue culture procedures, PCR, electrophoresis, and other similar research activities; and fume hood alcoves and microscopy rooms. 2. Lab support rooms that are remote to the research lab units, and are shared by all labs on a floor. These consist of equipment rooms, large procedure rooms, controlled temperature rooms, and other shared functions.

The BSL3 laboratory has been defined using the prototype method and lab module, and also responds to the specific requirements of the Centers for Disease Control design guidelines for BSL3 labs. The BSL3 laboratory acknowledges the desire of UCSB faculty to work with a variety of select agents, and maintain separation and contamination control by the use of smaller BLS3 procedure rooms within the BSL3 laboratory suite.

The office and meeting spaces have also been defined using the 11' module for convenience only. The consistent module application will allow for a standard structural bay unit to be applied to the building plan (22' bay width).

PROGRAM SCHEME A

BIOENGINEERING BUILDING MASTER PLAN DPP

4.2.0

Gross Building Area 79,001 gsf (gross square feet)

assumes average asf/gross ratio of ~.55

gross area includes corridors, restrooms, stairways,
elevator shafts, main mechanical and electrical rooms,
mechanical shafts, and other non-assigned spaces.

Net Building Area 43,567 asf (assignable square feet)

Research Labs- 100% exhaust 19798 asf

Shared Lab Support- 100% exhaust 5456 asf

Offices & Office Support- recirculated air 18314 asf

Other Non-assignable Spaces 3661 gsf

included in gross area above-
not considered part of assignable square feet

A

Research Labs- 100% exhaust 19798 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Bioengineering Research Laboratory multi-function basic research laboratory for biology, engineering, & stem cell Includes (2) dedicated lab support rooms Average of ~(2) lab units per P.I. (2) 6' fume hoods per P.I. lab One lab prototype to be used for bioengineering, ICB, and stem cell; Lab assignment to bioeng, ICB, and stem cell to be made later during building occupancy	33' x 32' Concept diagrams for Schemes A and B in section 6.0 reflect lab planning module of 33'x32'	32.5' x 31.5'	**9**	x	2048	=	18428
BSL3 Laboratory Shared lab for BSL3 select agent work (6) 6' biological safety cabinets Class II Type B 100% exhaust Pass thru autoclave	44' x 32'	43.5' x 31.5'	**1**	x	1370	=	1370

A

Shared Lab Support- 100% exhaust 5456 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Procedure/Equipment Room (1) per floor shared for various procedure work	22' x 22'	21.5' x 21.5'	**4**	x	462	=	1849
Freezer Room (1) per floor shared, storage of -80 deg. C freezers	11'x22'	10.5' x 21.5'	**4**	x	226	=	903
Cold Room- 4 deg. C (1) per floor shared, procedure cold room	11'x22'	10.5' x 21.5'	**4**	x	226	=	903
Warm Room- 25-45 deg. C (2) per building shared, procedure warm room	11'x16'	10.5' x 15.5'	**2**	x	163	=	326
Autoclave Room (1) per floor shared, sterilization work	11' x 22'	10.5' x 21.5'	**4**	x	226	=	903
Media Prep (1) per building shared, preparation of media	22' x 22'	21.5' x 21.5'	**1**	x	462	=	462
Bio/Chem Waste (1) per building shared, short term storage of biological and chemical waste Ideally located adjacent to Autoclave Room	11' x 11'	10.5' x 10.5'	**1**	x	110	=	110

A

Offices & Office Support- Recirculated air 18314 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
P.I. Office private office for principal investigator	11' x 14.5'	10.5' x 13.33	**12**	x	140	=	1680
Visiting Faculty Office shared office for two visiting faculty	11' x 14.5'	10.5' x 13.33	**2**	x	140	=	280
P.D./G.S. Office shared office for post docs and grad students 2-3 people per office	11' x 14.5'	10.5' x 13.33	**50**	x	140	=	6998

Bioengineering Admin "home" for Bioengineering

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Chair Office	11' x 18'	10.5' x 17.15	**1**	x	180	=	180
Staff Office	11' x 14.5'	10.5' x 13.33	**4**	x	140	=	560
Reception Office	11' x 14.5'	10.5' x 13.33	**1**	x	140	=	140
Storage Room	22' x 14.5'	21.5'x14'	**1**	x	301	=	301

ICB Admin "home" for Institute for Collaborative Biotechnologies

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Director Office	11' x 18'	10.5' x 17.15	**1**	x	180	=	180
Staff Office	11' x 14.5'	10.5' x 13.33	**19**	x	140	=	2659
Reception Office	33' x 14.5'	32.5' x 13.33	**1**	x	433	=	433
Storage Room	22' x 14.5'	21.5'x14'	**1**	x	301	=	301

A

Offices & Office Support- Recirculated air continued

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Kitchen/Coffee Bar (1) per floor	11' x 11'	10.5'x10.5'	**4**	x	110	=	441
Small Conference Room 10 people locate (1) adjacent to Bioeng. Chair Off.	22' x 14.5' locate (1) adjacent to ICB Dir. Off.	21.5'x14'	**2**	x	301	=	602
Conference Room 30 people	22' x 28'	21.5' x 27.5'	**2**	x	591	=	1183
Lecture Hall 100 people	33' x 65'	32.5' x 64.5'	**1**	x	2096	=	2096
Copy/Mail Room	11' x 14.5'	10.5' x 13.33	**2**	x	140	=	280

Other Non-assignable Spaces 3661 gsf

subtotal is not considered part of net area

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Technology Closet 1 per floor	11' x 11'	10.5' x 10.5'	**4**	x	110	=	441
Janitor Closet 1 per floor	11' x 8.5'	10.5' x 7.5'	**4**	x	79	=	315
Recycle Space 1 per floor	2' x 5.5'	2' x 5.0'	**4**	x	10	=	40
Custodial Supply	11' x 11'	10.5' x 10.5'	**1**	x	100	=	100
Building Recycle Room	11' x 11'	10.5' x 10.5'	**1**	x	110	=	110
Receiving Area ground floor, exterior access	11' x 22'	10.5' x 21.5'	**1**	x	226	=	226
Vending	11' x 6.5'	10.5' x 6'	**1**	x	63	=	63
Lobby	33' x 33'	32.5' x 32.5'	**1**	x	1056	=	1056
Shower/Locker included in men's and women's ground floor restrooms	11'x11'	10.5'x10.5'	**2**	x	110	=	221
Covered Bicycle Storage	33' x 33'	n.a.	**1**	x	1089	=	1089

A

PROGRAM SCHEME B

4.3.0

Gross Building Area 69,000 gsf (gross square feet)

assumes average asf/gross ratio of ~.55

gross area includes corridors, restrooms, stairways, elevator shafts, main mechanical and electrical rooms, mechanical shafts, and other non-assigned spaces.

Net Building Area 37,725 asf (assignable square feet)

Research Labs- 100% exhaust	**15225 asf**
Shared Lab Support- 100% exhaust	**5456 asf**
Offices & Office Support- recirculated air	**17044 asf**

Other Non-assignable Spaces	**3661 gsf**

included in gross area above-
not considered part of assignable square feet

B

Research Labs- 100% exhaust 15225 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Bioengineering Research Laboratory multi-function basic research laboratory for biology, engineering, & stem cell Includes (2) dedicated lab support rooms Average of approximately (2) lab units per P.I. (2) 6' fume hoods per P.I. lab One lab prototype to be used for bioengineering, ICB, and stem cell; Lab assignment to bioeng, ICB, and stem cell to be made later during building occupancy	44' x 46' Concept diagrams for Schemes A and B in section 6.0 reflect lab planning module of 33'x32'	43.5.5' x 45.5'	**7**	x	1979	=	13855
BSL3 Laboratory Shared lab for BSL3 select agent work (6) 6' biological safety cabinets Class II Type B 100% exhaust Pass thru autoclave	44' x 32'	43.5' x 31.5'	**1**	x	1370	=	1370

Shared Lab Support- 100% exhaust 5456 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Procedure/Equipment Room (1) per floor shared for various procedure work	22' x 22'	21.5' x 21.5'	**4**	x	462	=	1849
Freezer Room (1) per floor shared, storage of -80 deg. C freezers	11'x22'	10.5' x 21.5'	**4**	x	226	=	903
Cold Room- 4 deg. C (1) per floor shared, procedure cold room	11'x22'	10.5' x 21.5'	**4**	x	226	=	903
Warm Room- 25-45 deg. C (2) per building shared, procedure warm room	11'x16'	10.5' x 15.5'	**2**	x	163	=	326
Autoclave Room (1) per floor shared, sterilization work	11' x 22'	10.5' x 21.5'	**4**	x	226	=	903
Media Prep (1) per building shared, preparation of media	22' x 22'	21.5' x 21.5'	**1**	x	462	=	462
Bio/Chem Waste (1) per building shared, short term storage of biological and chemical waste Ideally located adjacent to Autoclave Room	11' x 11'	10.5' x 10.5'	**1**	x	110	=	110

Offices & Office Support- Recirculated air 17044 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
P.I. Office private office for principal investigator	11' x 14.5'	10.5' x 13.33	**10**	x	140	=	980
Visiting Faculty Office shared office for two visiting faculty	11' x 14.5'	10.5' x 13.33	**2**	x	140	=	280
P.D./G.S. Office shared office for post docs and grad students 2-3 people per office	11' x 14.5'	10.5' x 13.33	**44**	x	140	=	6578

Bioengineering Admin "home" for Bioengineering

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Chair Office	11' x 18'	10.5' x 17.15	**1**	x	180	=	180
Staff Office	11' x 14.5'	10.5' x 13.33	**4**	x	140	=	560
Reception Office	11' x 14.5'	10.5' x 13.33	**1**	x	140	=	140
Storage Room	22' x 11'	21.5'x10.5'	**1**	x	226	=	226

ICB Admin "home" for Institute for Collaborative Biotechnologies

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Director Office	11' x 18'	10.5' x 17.15	**1**	x	180	=	180
Staff Office	11' x 14.5'	10.5' x 13.33	**19**	x	140	=	2659
Reception Office	33' x 14.5'	32.5' x 13.33	**1**	x	433	=	433
Storage Room	22' x 11'	21.5'x10.5'	**1**	x	226	=	226

Offices & Office Support- Recirculated air continued

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Kitchen/Coffee Bar (1) per floor	11' x 11'	10.5'x10.5'	**4**	x	110	=	441
Small Conference Room 10 people locate (1) adjacent to Bioeng. Chair Off.	22' x 14.5' locate (1) adjacent to ICB Dir. Off.	21.5'x14'	**2**	x	301	=	602
Conference Room 30 people	22' x 28'	21.5' x 27.5'	**2**	x	591	=	1183
Lecture Hall 100 people	33' x 65'	32.5' x 64.5'	**1**	x	2096	=	2096
Copy/Mail Room	11' x 14.5'	10.5' x 13.33	**2**	x	140	=	280

Other Non-assignable Spaces 3661 gsf

subtotal is not considered part of net area

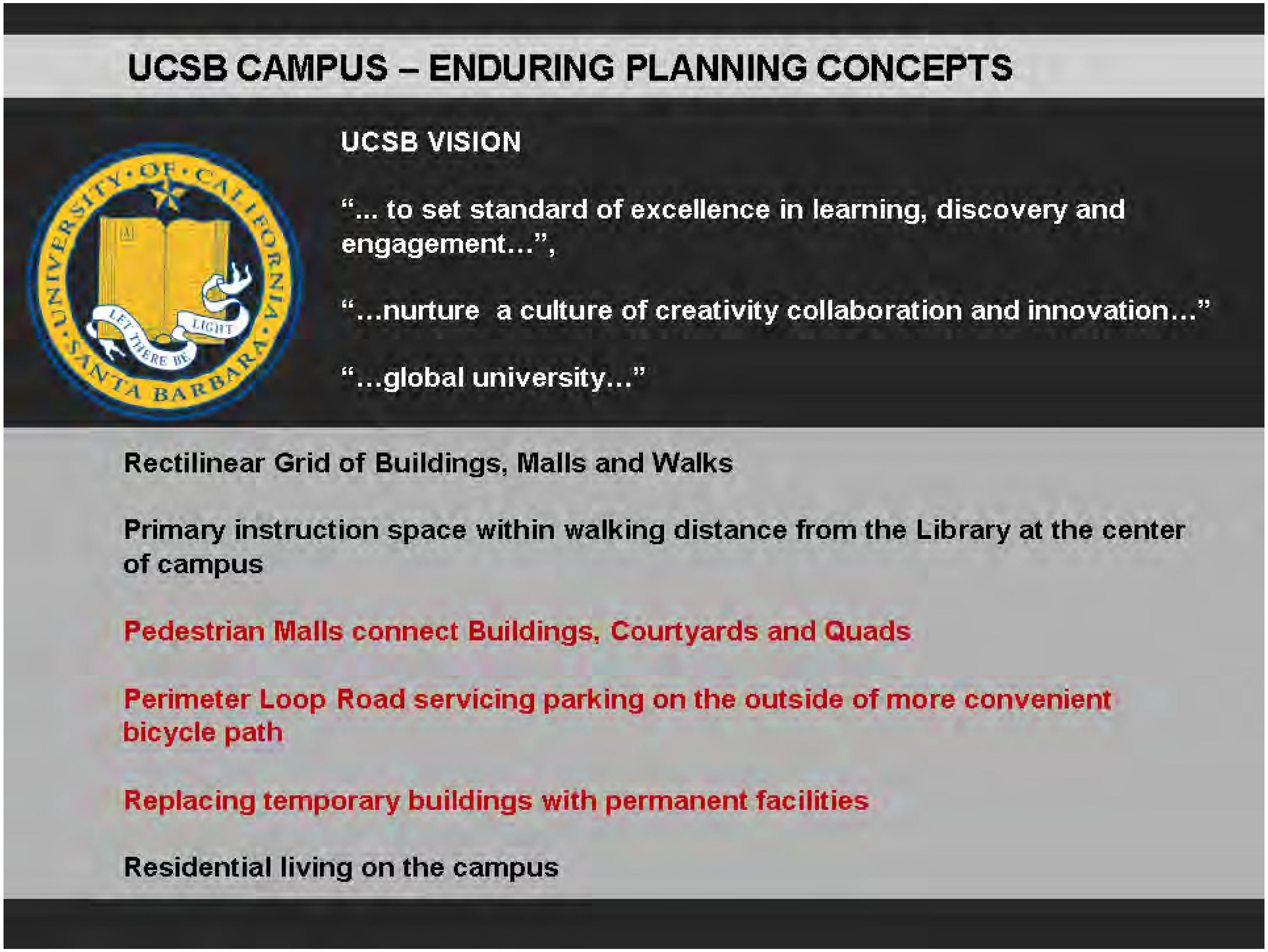
	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Technology Closet 1 per floor	11' x 11'	10.5' x 10.5'	**4**	x	110	=	441
Janitor Closet 1 per floor	11' x 8.5'	10.5' x 7.5'	**4**	x	79	=	315
Recycle Space 1 per floor	2' x 5.5'	2' x 5.0'	**4**	x	10	=	40
Custodial Supply	11' x 11'	10.5' x 10.5'	**1**	x	100	=	100
Building Recycle Room	11' x 11'	10.5' x 10.5'	**1**	x	110	=	110
Receiving Area ground floor, exterior access	11' x 22'	10.5' x 21.5'	**1**	x	226	=	226
Vending	11' x 6.5'	10.5' x 6'	**1**	x	63	=	63
Lobby	33' x 33'	32.5' x 32.5'	**1**	x	1056	=	1056
Shower/Locker included in men's and women's ground floor restrooms	11'x11'	10.5'x10.5'	**2**	x	110	=	221
Covered Bicycle Storage	33' x 33'	n.a.	**1**	x	1089	=	1089

B

SITE REQUIREMENTS

BIOENGINEERING BUILDING MASTER PLAN DPP

5.0.0



Project team reviewed "UCSB Vision 2025 Long Range Development Plan" (LRDP) and "UCSB Master Plan" to understand the UCSB Vision, Goals and Objectives for future campus growth. Subsequent master plans developed for UCSB over the last 50 years exhibit a number of enduring planning concepts that have shaped the growth of the campus (see left).

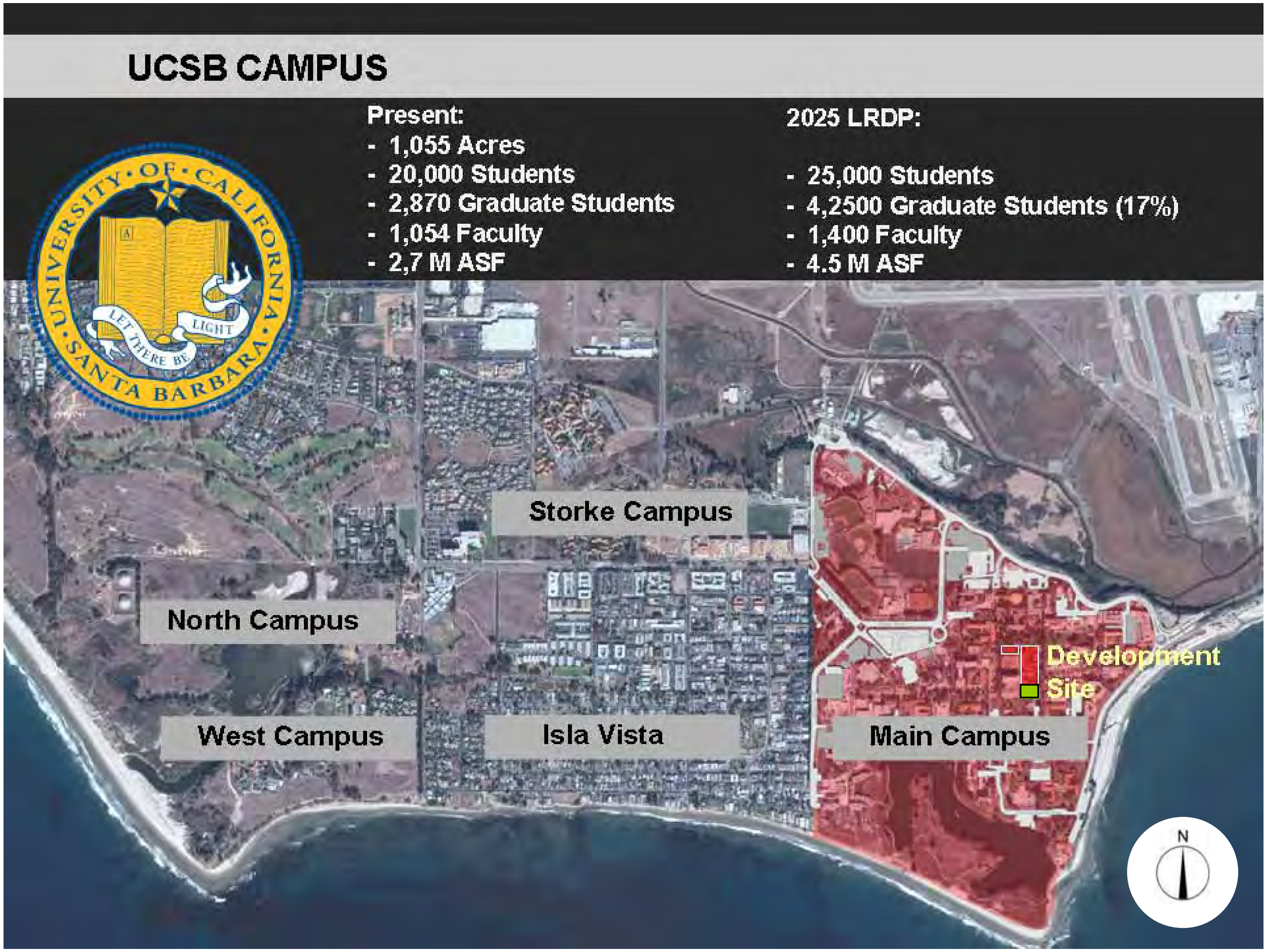
Key Elements of the 2025 LRDP:

1. *The LRDP details UCSB campus plans to the year 2025.*

2. *The LRDP anticipates a growth rate of 1% per year in student enrollment. This projection equals roughly 250 students per year to a maximum enrollment of 25,000 in 2025.*

3. *The LRDP includes the development of housing needed to accommodate all additional students. It also anticipates providing housing for more than 1,600 faculty and staff members. Currently, the University provides 65 units of faculty housing.*

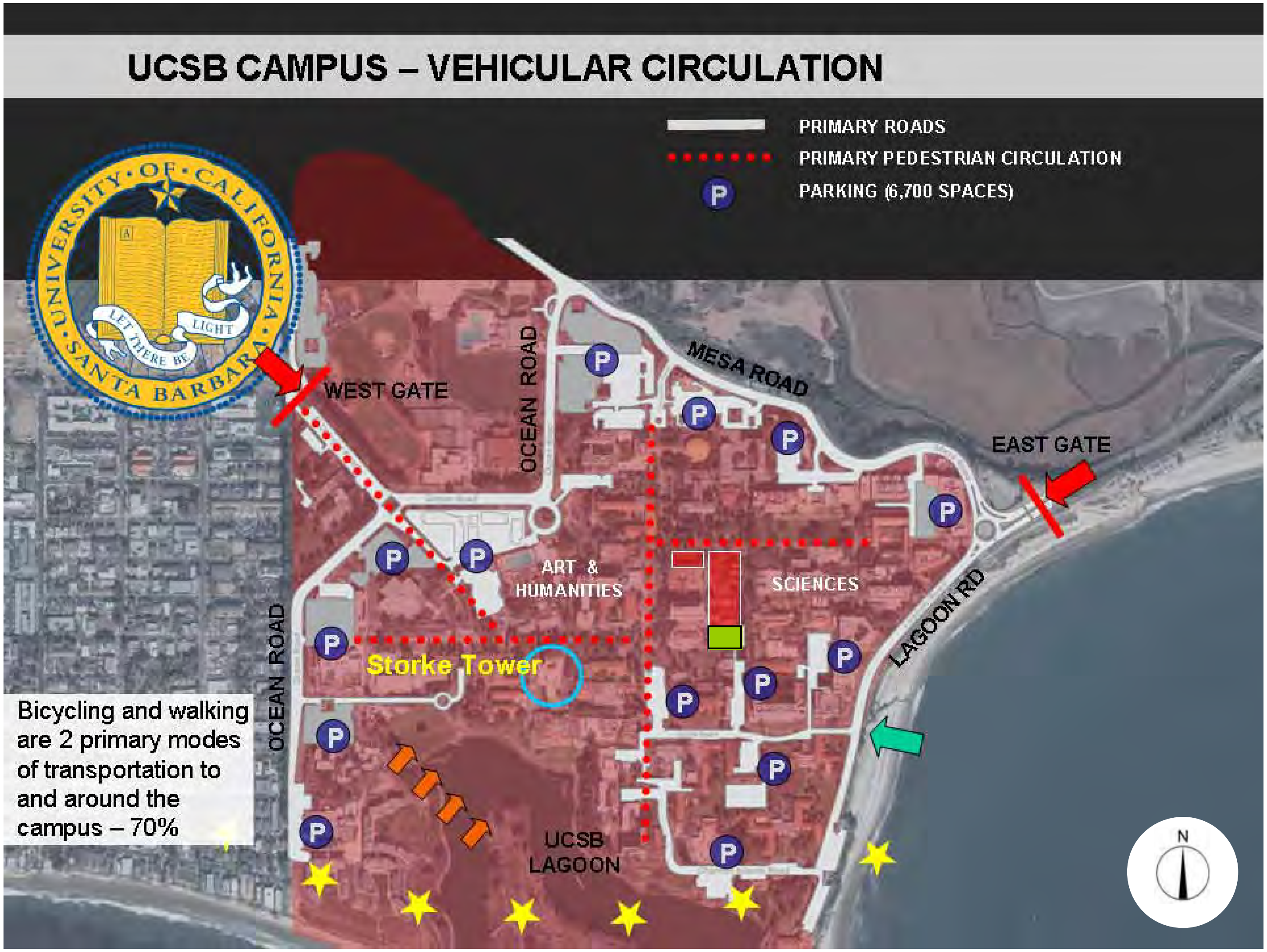
4. *The LRDP reflects the UCSB commitment to environmental issues and includes numerous policies regarding green building, sustainability, coastal protection etc.*



The Bioengineering Bldg. site, marked with a green rectangle, is located in the center of the Main Campus (light red area).

The Project is placed within the Development Site (dark red rectangles) which allows for the highest building density on the campus. The maximum allowed building height is 80' (not including mechanical penthouse).

UCSB is planning for significant growth over the next 20 years. With the increase in student population from 20,000 to 25,000 and 17% increase in graduate students, UCSB will significantly increase its density of campus buildings adding 1.8 M square feet of assignable area (ASF).



West Gate and East Gate (red arrows) provide main access points to the campus.

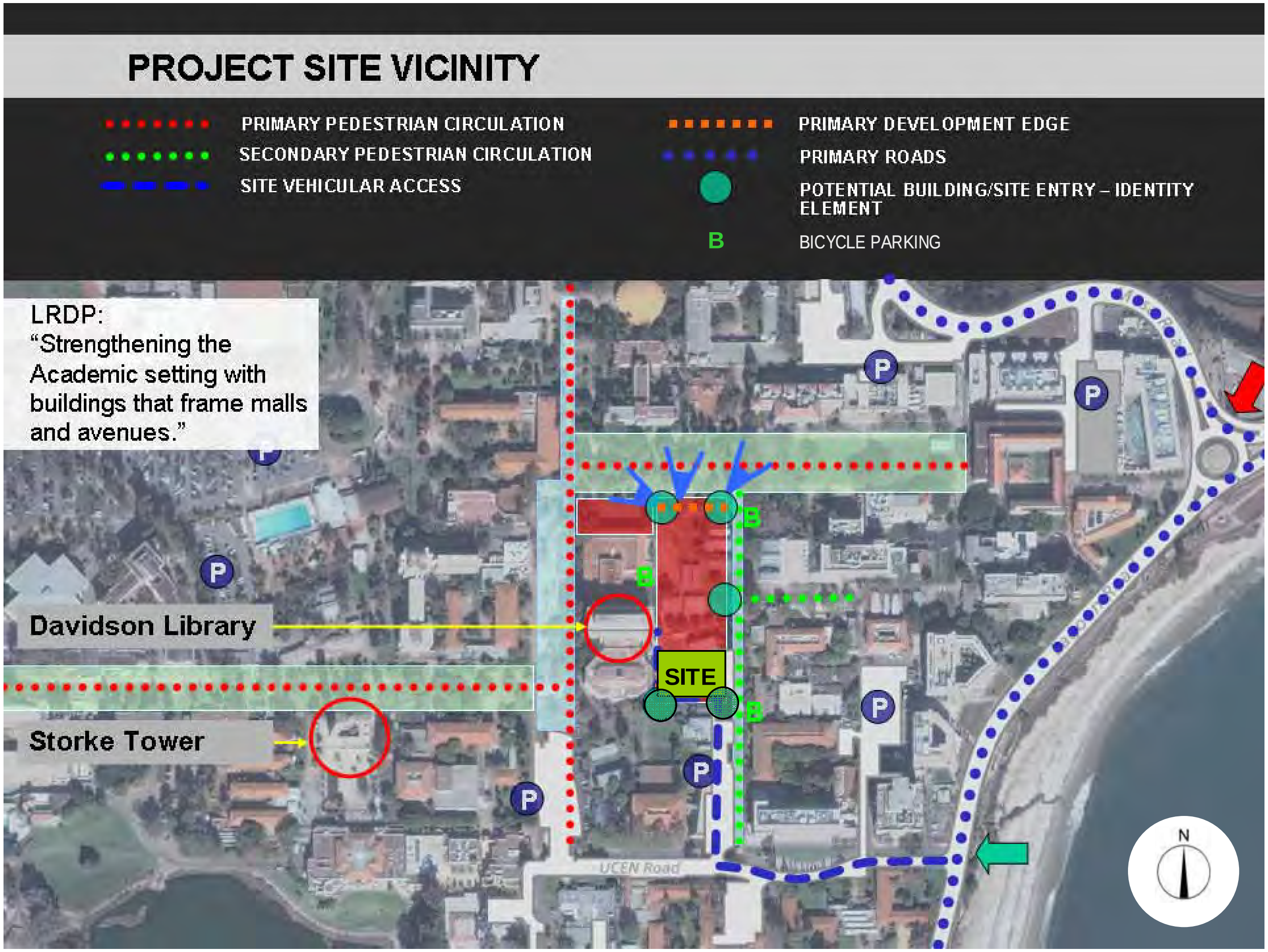
Mesa, Lagoon and Ocean Roads create a campus “open” loop and provide perimeter vehicular access to parking lots and structures.

The project will be developed without the addition of new parking spaces. Existing parking structures to the north and parking lots to the south will be utilized for the needs of the new facility.

Bicycling and walking are primary modes of transportation around the campus.

“Library Mall” is the main pedestrian circulation spine running north-south. “Campus Green” and “Pardall Mall” are primary pedestrian connectors running east-west. Project site is located in the campus center, close to the intersection of main pedestrian corridors and well connected with the rest of the campus.

The service access to the site will be provided from Lagoon Road (green arrow) through the UCEN Road.



Adjacent to the site, Davidson Library and historical Storke Tower are the most significant historical buildings on the campus. UCEN Road provides vehicular service access to the site (blue, dashed line).

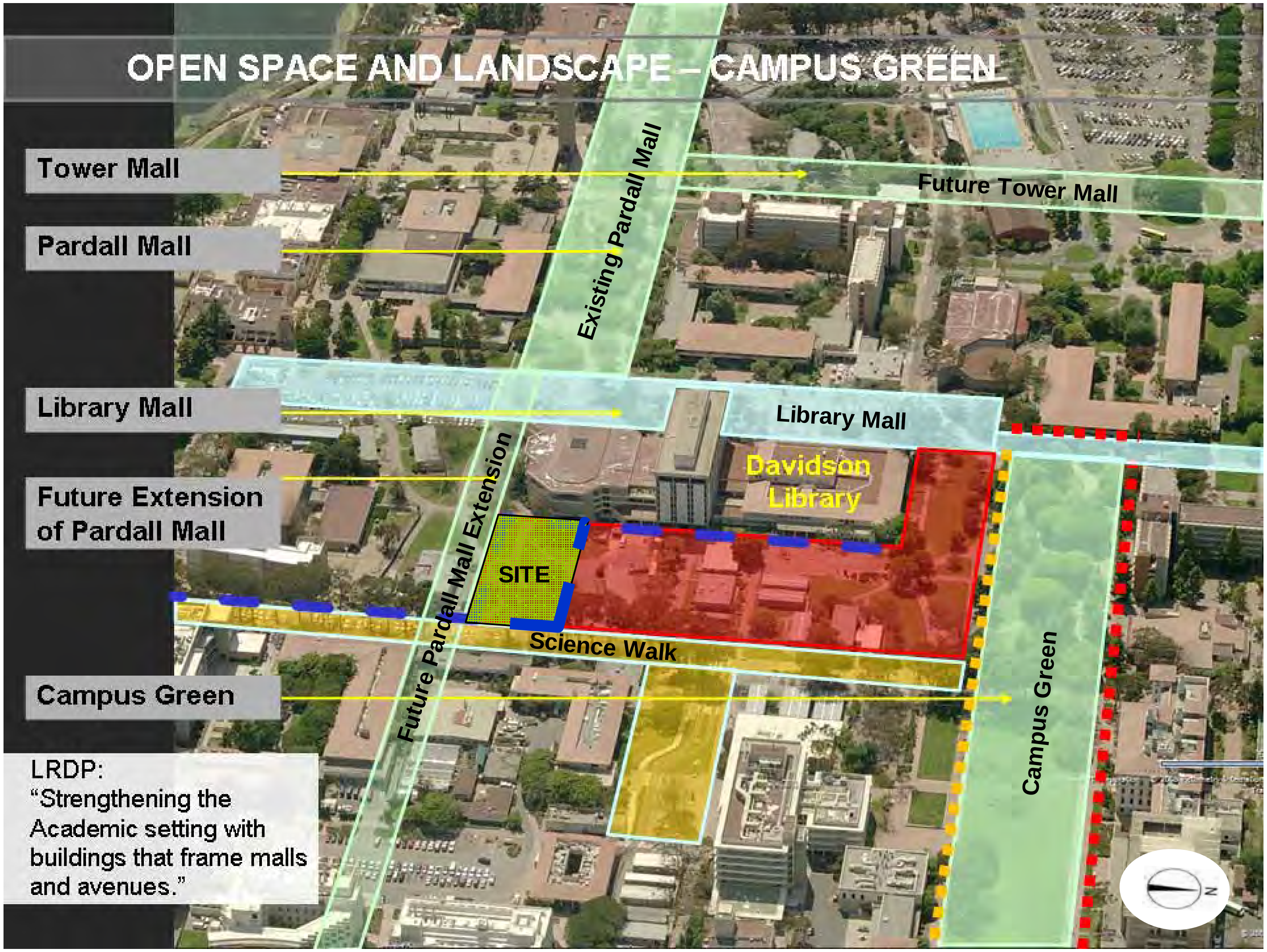
Project team investigated different building placement scenarios within the boundaries of the development site (red rectangle).

North and south placement for the Bioengineering Building were tested.

South site (marked with green rectangle) was selected. It was determined that this location will provide more privacy for researchers. Offices will benefit from southern light and ocean breeze, as upper floors may allow for some ocean views. This placement will allow Temporary Building 406 in the northern portion of the development site to remain operational, not affected by the new Bioengineering Building. Northern site will remain open for a potential extension of the Davidson Library.

Temporary Building 346 to the south will be relocated and Building 407 to the north will be demolished. Its functions will find a new home at a different location on the campus, which will be determined in the future.

"Science Walk" lined with Eucalyptus trees, along the east side of the development site (green dotted line) complements the north-south pedestrian circulation.



Bioengineering Building will have a significant visual identity at the intersection of existing Science Walk and future Pardall Mall. Its south façade will define the physical edge of the extended Pardall Mall.

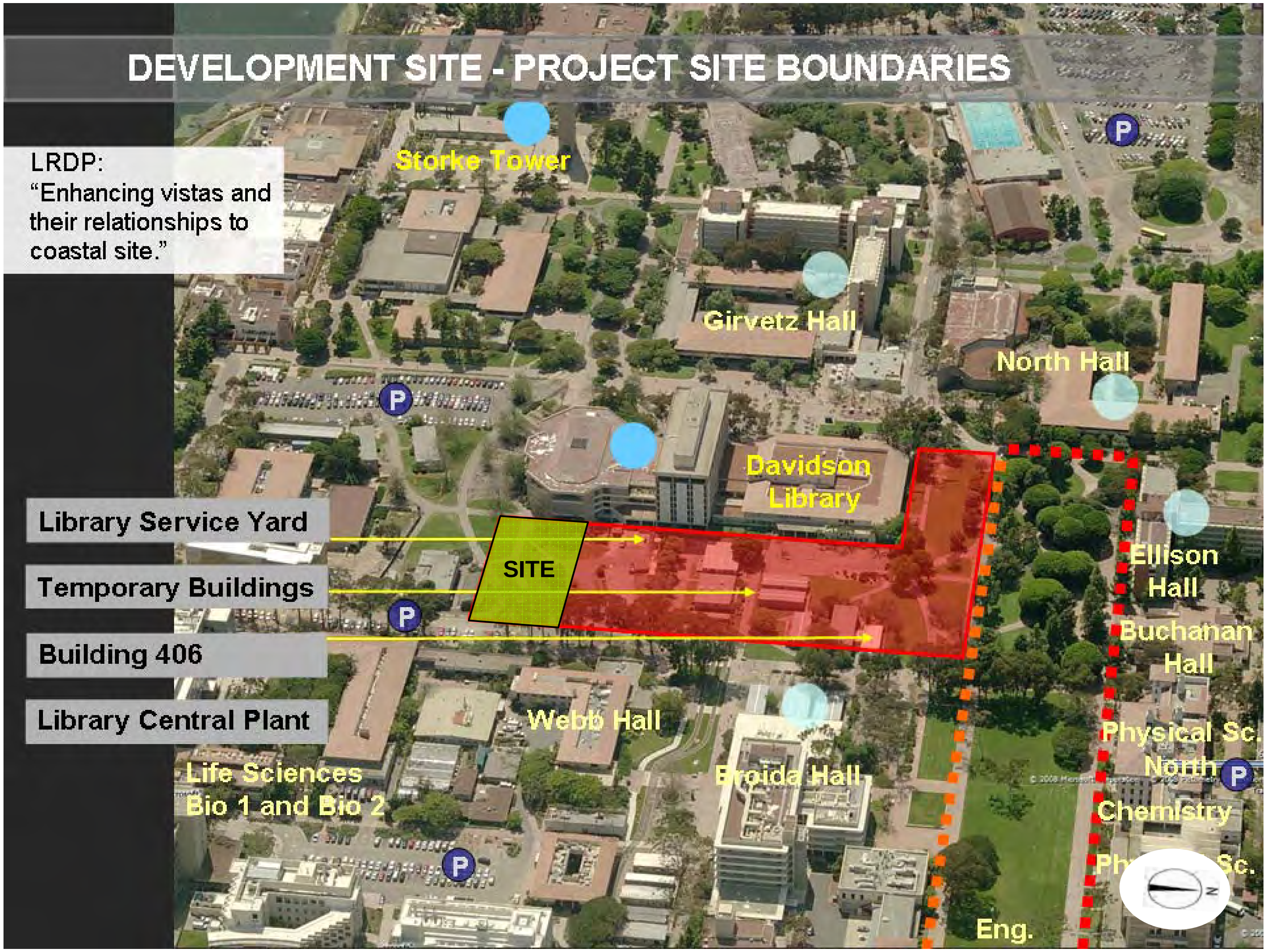
Project site perimeter is defined by Davidson Library to the west, Future Pardall Mall extension to the south and existing Science Walk to the east.

Temporary Building 346 directly to the south will be relocated andTemporary Building 407 to the north will be demolished.

"Library Mall" is the main campus pedestrian circulation spine running north-south. "Science Walk" lined with Eucalyptus trees, along the east side of the development site complements the north-south pedestrian circulation.

"Campus Green" and "Pardall Mall" are primary pedestrian corridors running east-west.

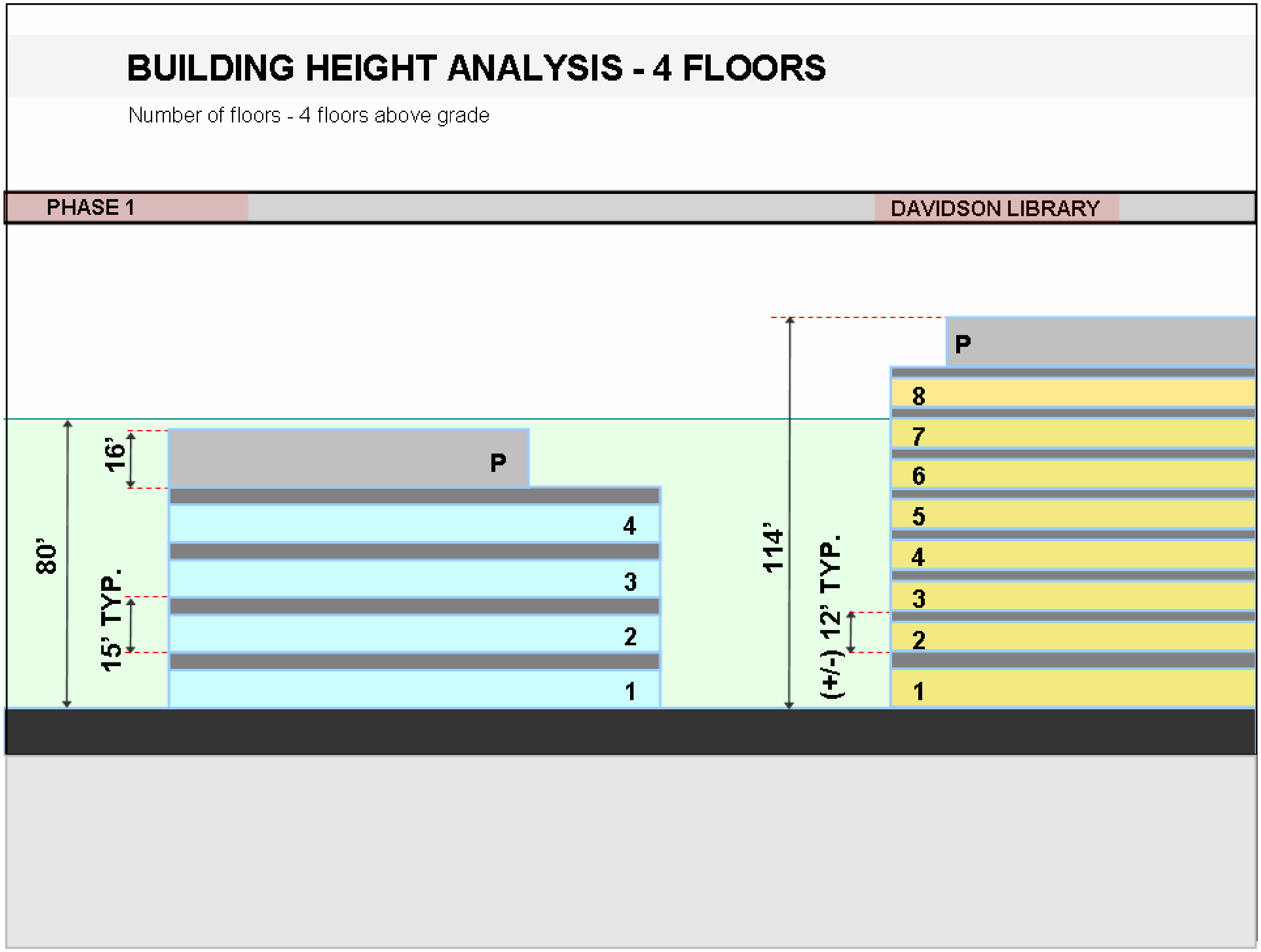
Dashed blue line indicates the vehicular service access to the development site.



Existing Library service yard will connect to the service yard of the Bioengineering Building. Outside, fenced, covered and secured storage area for gas cylinders will be provided as part of this service yard. Required gases will be delivered in cylinders, stored and segregated here.

Existing trailers located in the center of the development site and Temporary Building 406 may remain in place.

Surface parking lots to the south and parking structures to the north will service the new building.



UCSB master plan suggests the maximum allowed building height within the development site to be 80' (not including the mechanical penthouse).

To accommodate required infrastructure within the interstitial space, floor to floor height for Bioengineering Building was defined at 15'-0".

Project Team tested building height as it relates to the number of floors, area of the building footprint, and dimensions of the selected site.

Scheme "A" – 79,000 GSF

79,000 / 3 floors = 26,000 GSF

79,000 / 4 floors = 19,750 GSF

79,000 / 5 floors = 15,800 GSF

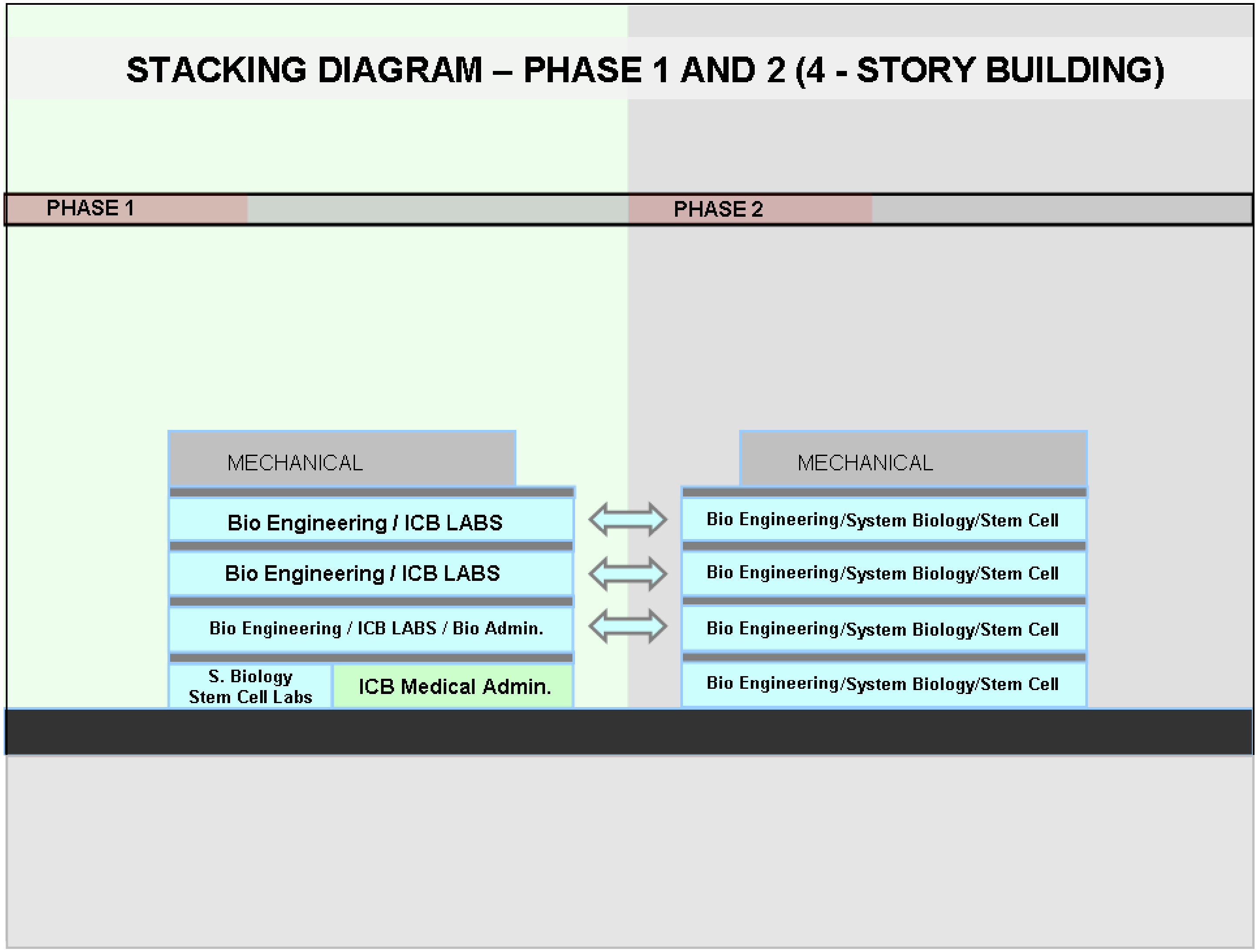
Scheme "B" – 69,000 GSF

69,000 / 3 floors = 23,000 GSF

69,000 / 4 floors = 17,250 GSF

69,000 / 5 floors = 13,800 GSF

It was determined that a 4-story building will provide an efficient building footprint for both schemes (A & B). It will remain below the suggested height limit of 80' and will fit effectively within the site envelope.



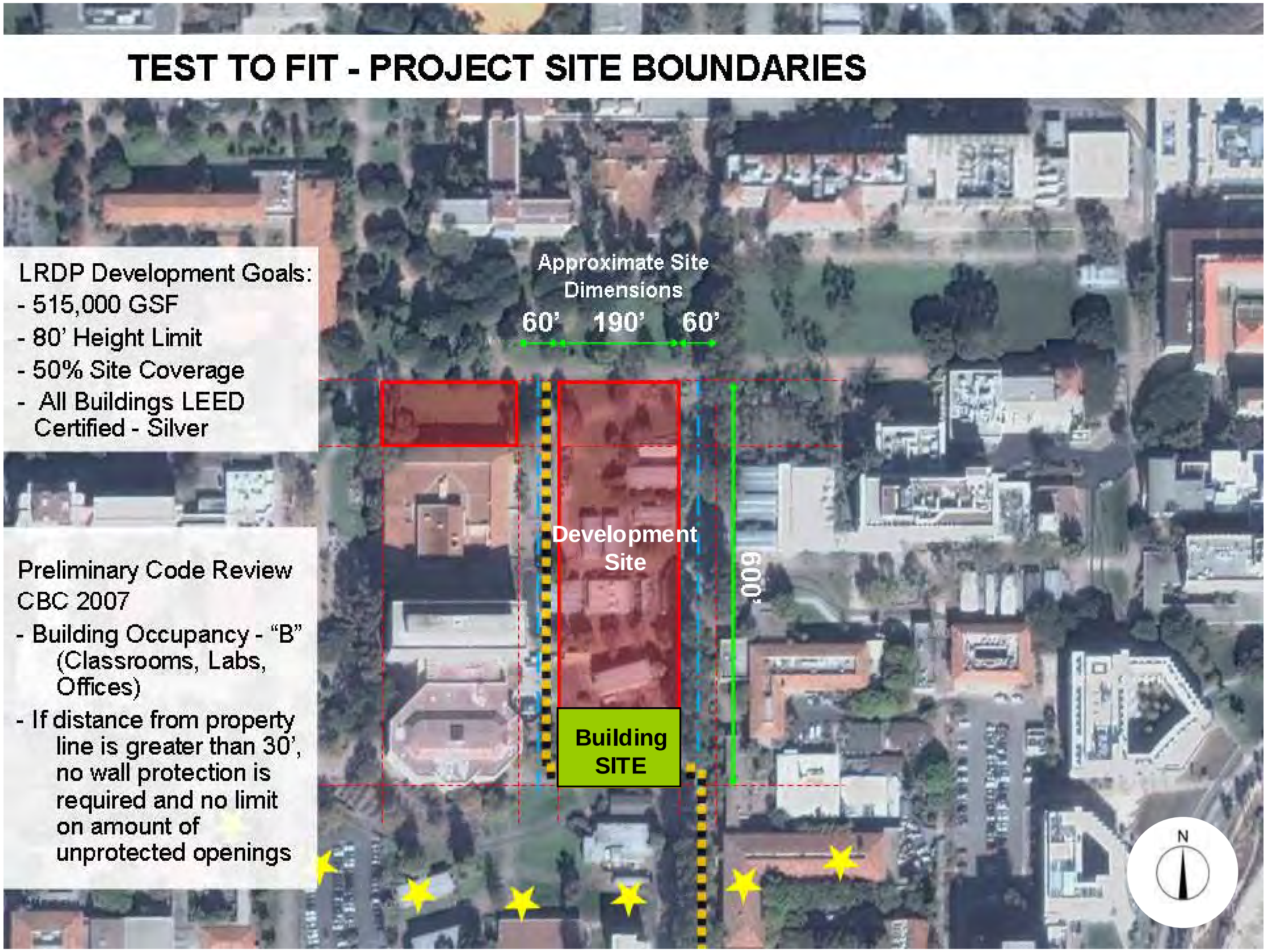
The project seeks to integrate 3 functional components:

1. ICB
2. Bioengineering Program
3. Center for Stem Cell Biology and Engineeing

The intent is to integrate these three disciplines under one roof and have the option of placing researchers from different disciplines on the same floor to support and promote interdisciplinary collaboration. Similarly, administrative staff will be integrated with researchers on different building levels.

Labs will be designed to allow for maximum flexibility and adaptability to requirements of each discipline and can easily change over time from Bioengineering to Stem Cell/Biology or Medical use.

Potential future building expansion would require connectivity at multiple building levels.

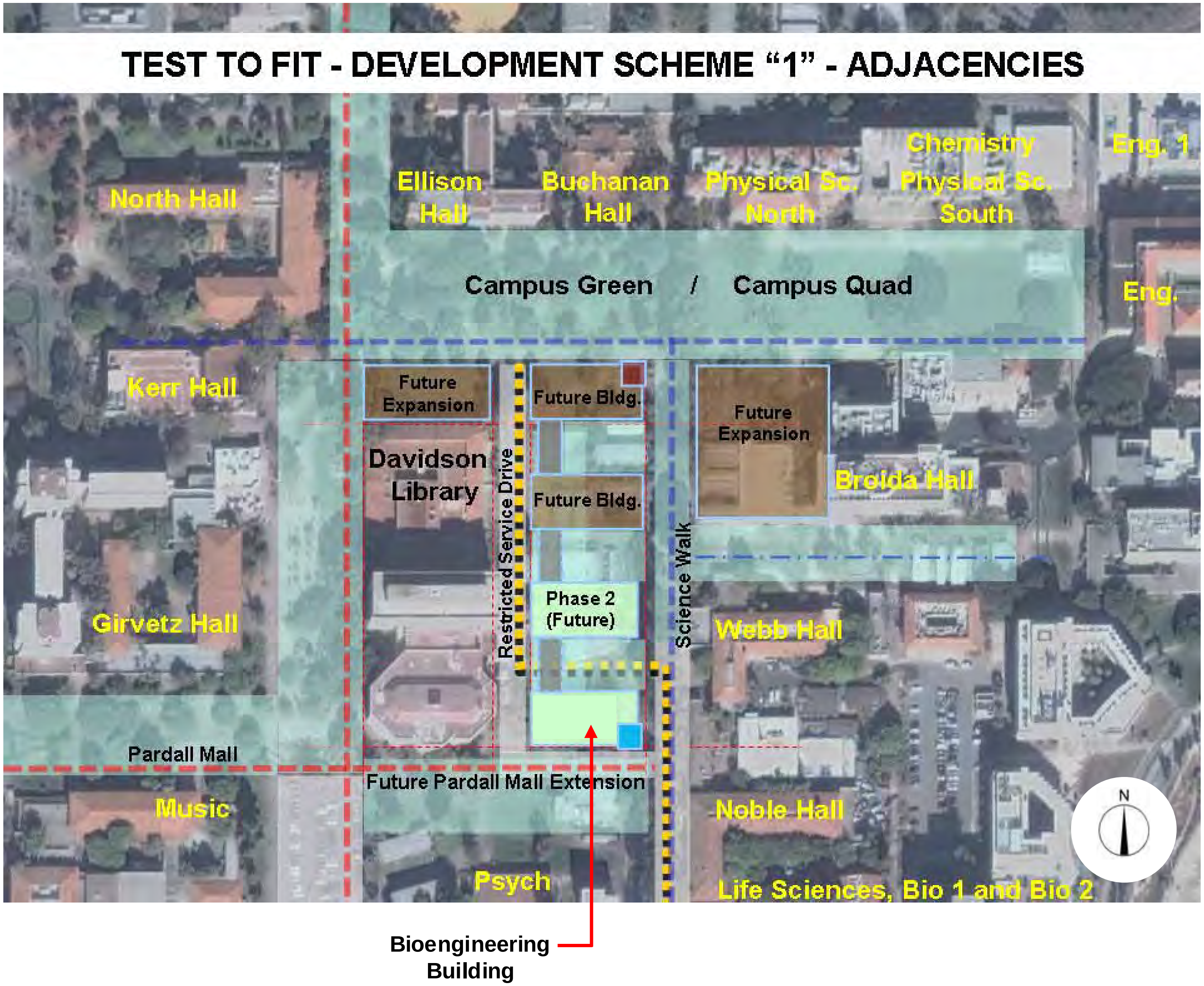


Preliminary Code review (CBC 2007) indicated Bioengineering Building could be placed as close as 30' from the existing library if there were no openings in the west facade.

Project team will reduce this distance to a feasible minimum to allow for increased width of the Science Walk corridor on the opposite side.

It is anticipated that a number of traffic related functions will be accommodated between the east face of the Bioengineering Building and structures on the east side of the Science Walk.

These include: reconfigured bike path, sidewalk, restricted vehicular access drive, turnaround, and parking (see site plan for schemes A and B in section 6).



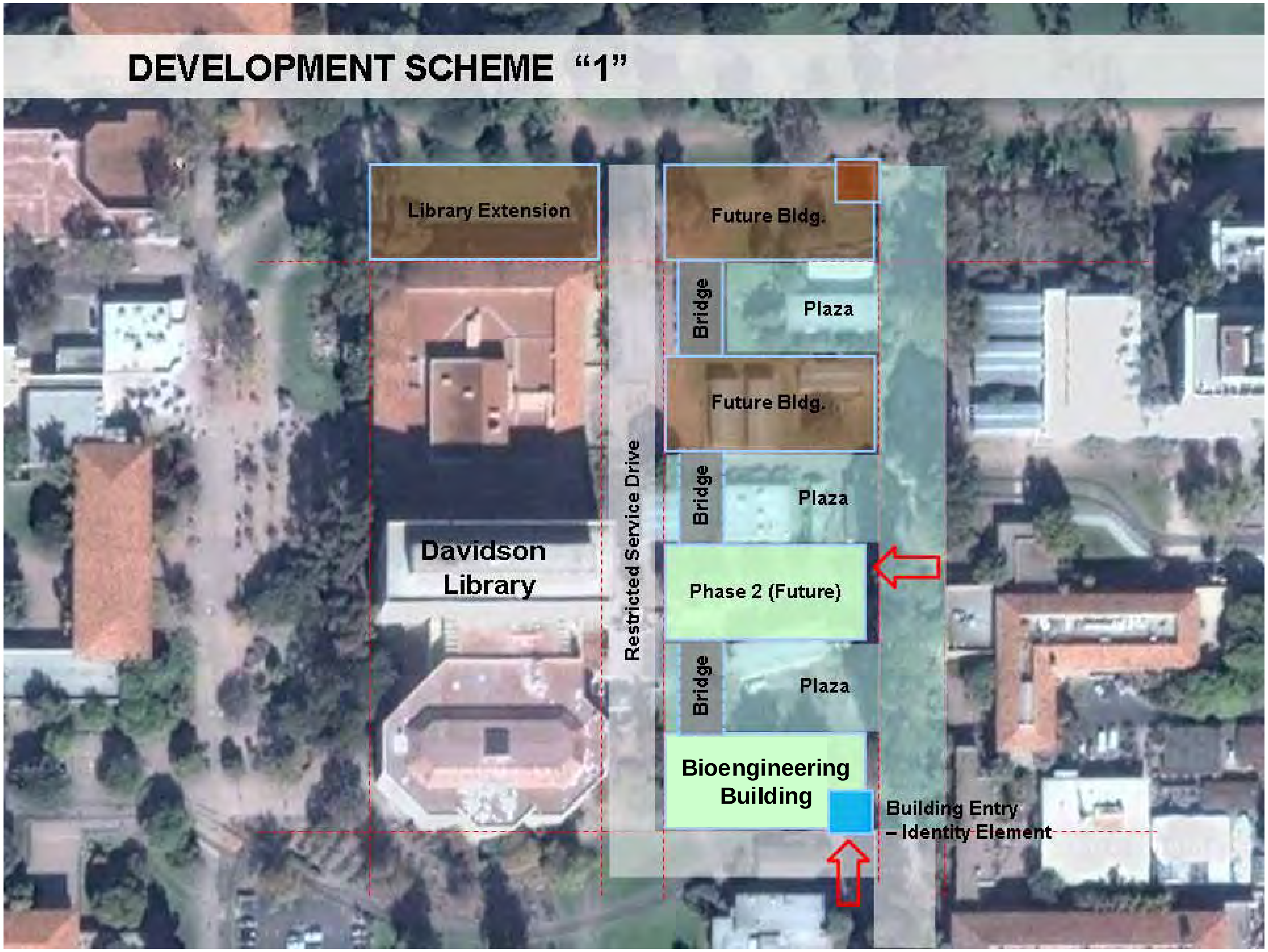
Project team tested a number of schemes for the entire development site (see also appendix E) providing a master planning concept for future growth.

Future buildings on the north side will define the edge of the Campus Green. It is likely that Davidson Library will eventually expand in this direction.

Accepted scheme placed Bioengineering Building in the south portion with its long axis running east-west. This optimizes building orientation from an energy efficiency point of view. It increases the length of south and north facades while reducing building faces exposed to lower east and west light. North building side will benefit from indirect, diffused natural light while south facade will incorporate horizontal shading devices that control exposure to southern light.

Bioengineering Building will define the edge of the future Pardall Mall Extension.

The South location is adjacent to Life Sciences Building as well as Bio 1 and Bio 2.

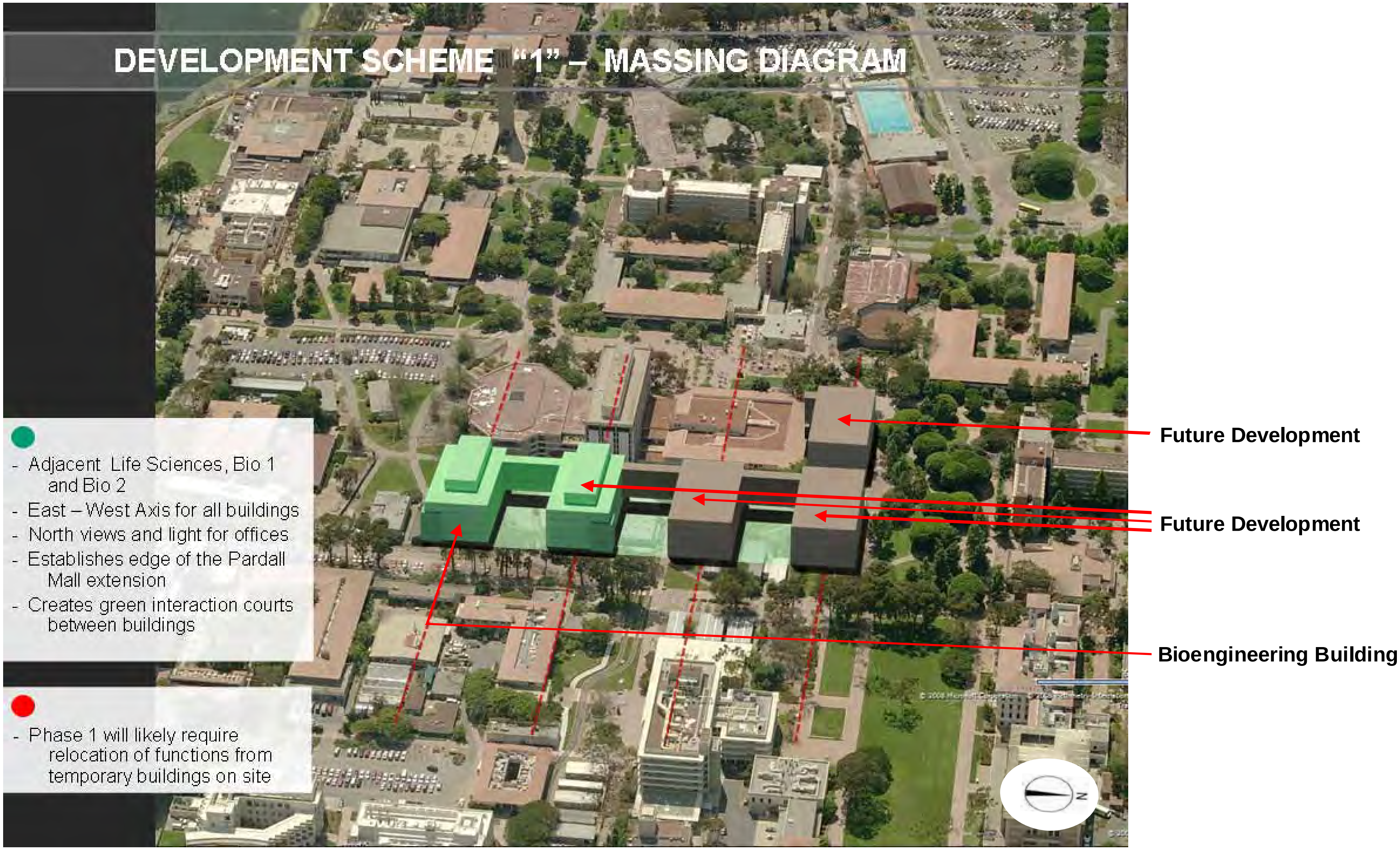


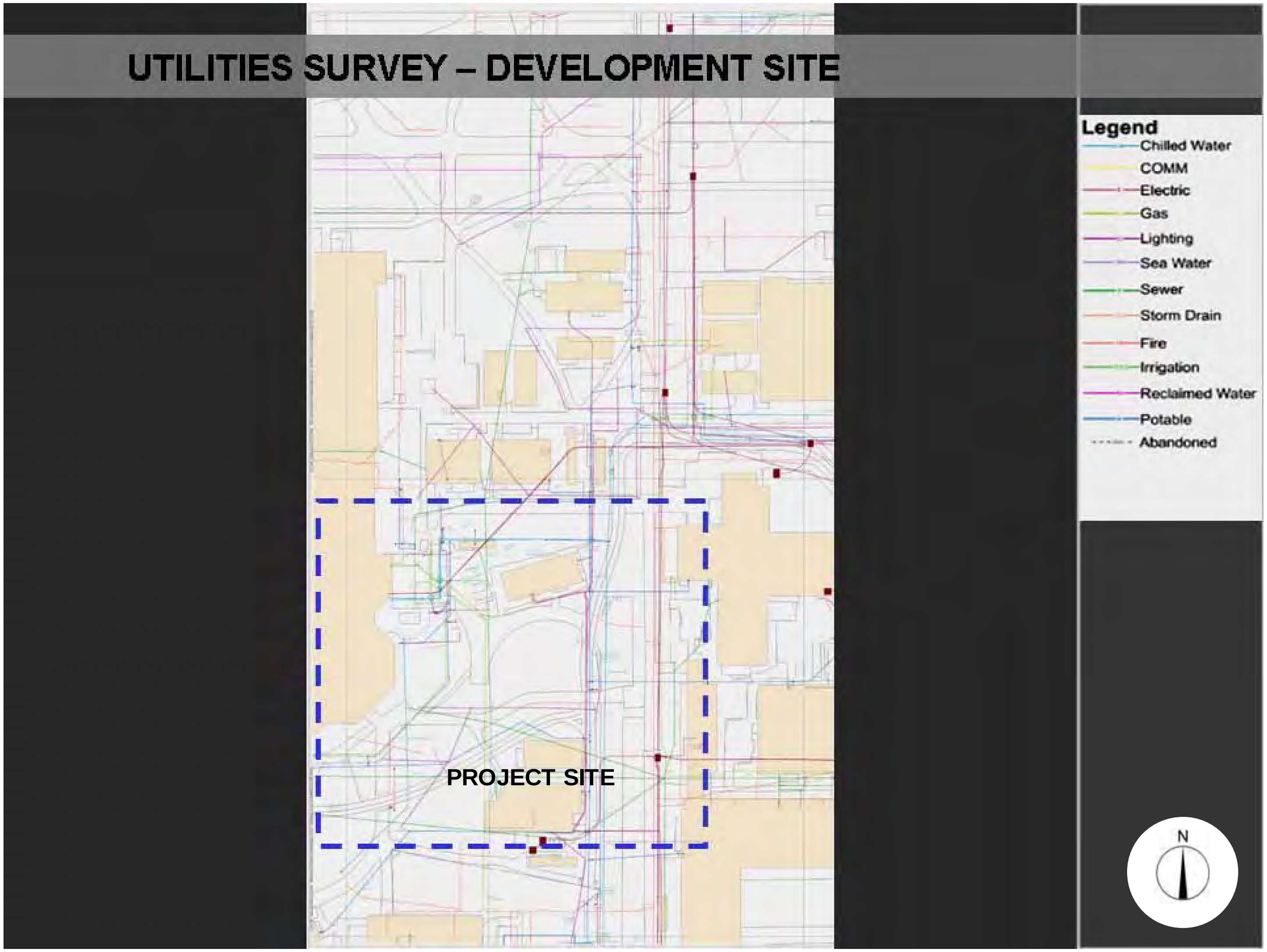
Future buildings will follow similar, east-west orientation.

Bridges could be provided to support functional connectivity where required.

This concept creates landscaped, outdoor interaction courtyards / plazas between future buildings.

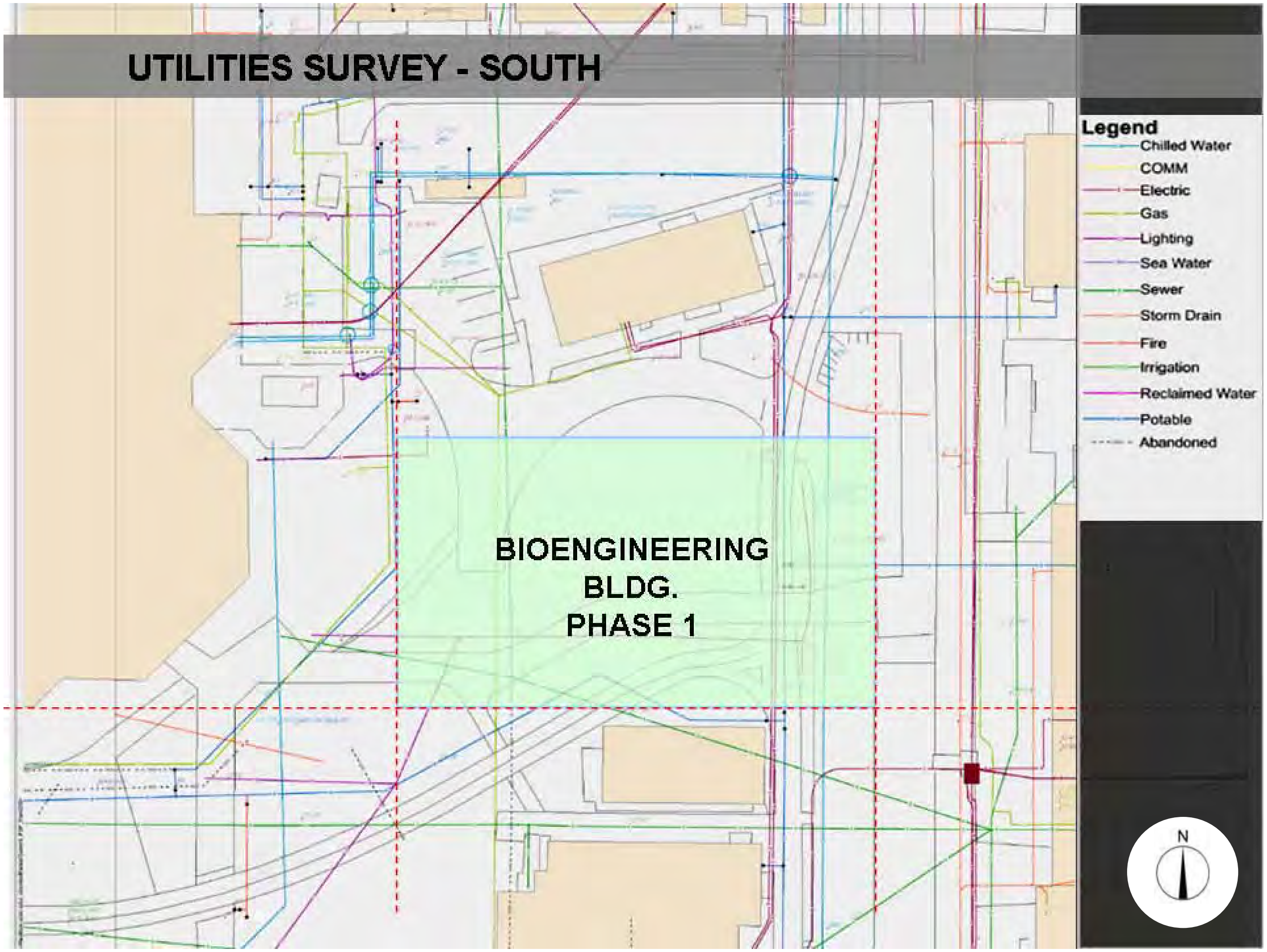
South-east corner at the intersection of Science Walk and future Pardall Mall extension could become Bioengineering Building identity element marking the main entry location, visible from the south as well as from the approach along the Science Walk.


DEVELOPMENT SCHEME "1" – MASSING DIAGRAM
- Adjacent Life Sciences, Bio 1 and Bio 2
- East – West Axis for all buildings
- North views and light for offices
- Establishes edge of the Pardall Mall extension
- Creates green interaction courts between buildings
- Phase 1 will likely require relocation of functions from temporary buildings on site
Future Development
Future Development
Bioengineering Building



Utilities Survey for the Development Site.

See section “10 – Civil” for detailed site utilities analysis and information.



Utilities Survey for the Bioengineering Building site

See section "10 – Civil" for detailed site utilities analysis and information.

BUILDING CONCEPT

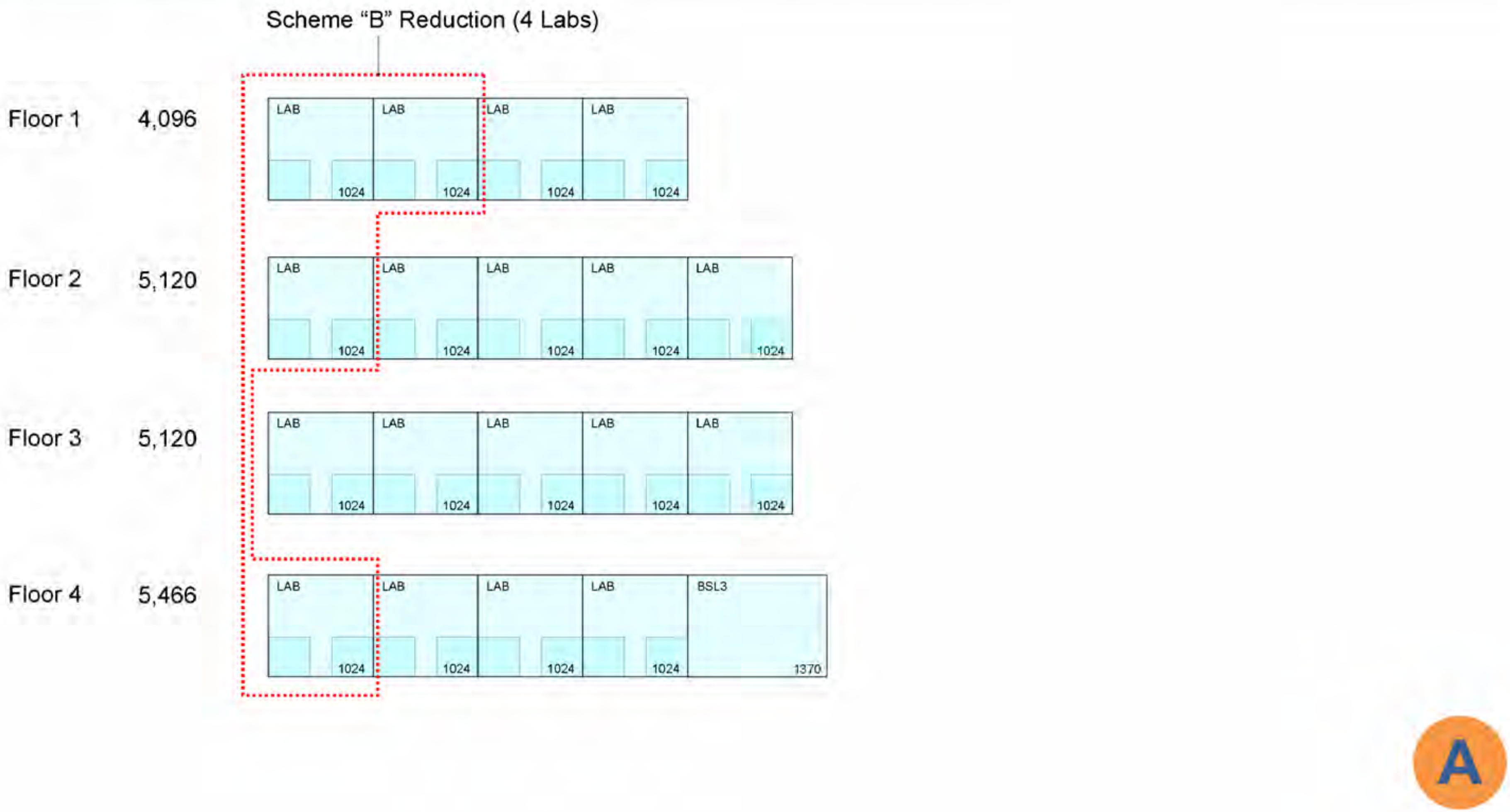
BIOENGINEERING BUILDING MASTER PLAN DPP

6.0.0

PROGRAM ANALYSIS

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

RESEARCH LABORATORIES 19,802 ASF



PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

SHARED LAB SUPPORT 5,348 ASF

		Multi-use Procedure R./ Equipment Room	Freezer Room	Cold Room (4 C)	Warm Room (37 C)	Autoclave Room	Media Prep. Room	Bio./Chem. Waste
Floor 1	1140	Procedure Room Equipment Room 462	Freezer R. 226	Cold R. 226		Autoclaves 226		Bio/Ch Waste 110 (Scheme "B" Addition)
Floor 2	1,303	Procedure Room Equipment Room 462	Freezer R. 226	Cold R. 226	Warm R. 163	Autoclaves 226		
Floor 3	1,602	Procedure Room Equipment Room 462	Freezer R. 226	Cold R. 226		Autoclaves 226	Media Prep 462	
Floor 4	1,303	Procedure Room Equipment Room 462	Freezer R. 226	Cold R. 226	Warm R. 163	Autoclaves 226		

A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

OFFICES 8,960 ASF (64 x 140 SF)

		Principal Investigator Office	P.D./G.S. Shared Office	Visitor Office
Floor 1	2,240	PI O. 140, PI O. 140, PI O. 140	Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140, Sh.O. 140	
Floor 2	2,100	PI O. 140, PI O. 140, PI O. 140	Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140	
Floor 3	2,240	PI O. 140, PI O. 140, PI O. 140	Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140, Sh.O. 140	
Floor 4	2,380	PI O. 140, PI O. 140, PI O. 140	Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140, Sh.O. 140 / Sh.O. 140, Sh.O. 140	V. O. 140, V. O. 140

Scheme "B" Reduction (2 P.I & 6 Shared Offices)

A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

SHARED ADMINISTRATIVE SUPPORT 720 ASF

		Kitchen	Copy / Mail
Floor 1	110	K. 110	
Floor 2	250	K. 110	C/M. 140
Floor 3	110	K. 110	
Floor 4	250	K. 110	C/M. 140

A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

OFFICE SUPPORT FACILITIES 3,880 ASF

		Conference Room - Small	Conference Room	Lecture Hall
Floor 1	2,397	Small C.R. 301		Lecture Hall. 2096
Floor 2	591		Conf. Room 591	
Floor 3	301	Small C.R. 301		
Floor 4	591		Conf. Room 591	

A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

ADMINISTRATIVE CLUSTER 4,742 ASF

		Chair/Director Office	Staff Office	Reception	Storage	
Floor 1	420		Staff 140, Staff 140, Staff 140			ICB Administration could be placed on the first floor.
Floor 2	1,601	Dir. 180	Staff 140, Staff 140, Staff 140, Staff 140, Staff 140, Staff 140	Rec. 140, Rec. 140	Storage 301	
Floor 3	1,540		Staff 140, Staff 140, Staff 140, Staff 140, Staff 140, Staff 140, Staff 140, Staff 140, Staff 140, Staff 140	Rec. 140		
Floor 4	1,181	Chair 180	Staff 140, Staff 140, Staff 140, Staff 140	Rec. 140	Storage 301	Bio-Eng. Admin. should be located on floors with departmental researchers

A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

FLOOR TOTAL 43,462 ASF

Floor 1	10,403	1	4096	1140	2240	110	2397	420	10403
Floor 2	10,965	2	5120	1303	2100	250	591	1601	10965
Floor 3	10,913	3	5120	1602	2240	110	301	1540	10913
Floor 4	11,171	4	5466	1303	2380	250	591	1181	11171
TOTAL	**43,452 ASF**		19802	5348	8960	720	3880	4742	43452
TOTAL @ 55% EF.	**79,003 GSF**								

A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME “A”

UNASSIGNED

	Stair 1 and 2	Elevators	Toilet 1 and 2	Shower, Locker	Vending	Janitor Closet	Custodial Supply	Recycle Room	Receiving Area
Floor 1 -	Stair Stair	ELEV 120 ELE 100	WC - M 350 WC - F 350	Sh 110 Sh 110	Ven. 80	Jan. 80	Cust. 110	Rec. 110	Receiving 226
Floor 2 -	Stair Stair	ELEV 120 ELE 100	WC - M 350 WC - F 350		Ven. 80	Jan. 80			
Floor 3 -	Stair Stair	ELEV 120 ELE 100	WC - M 350 WC - F 350		Ven. 80	Jan. 80			
Floor 4 -	Stair Stair	ELEV 120 ELE 100	WC - M 350 WC - F 350		Ven. 80	Jan. 80			

First Floor has additional 656 SF of Unassigned SF

A

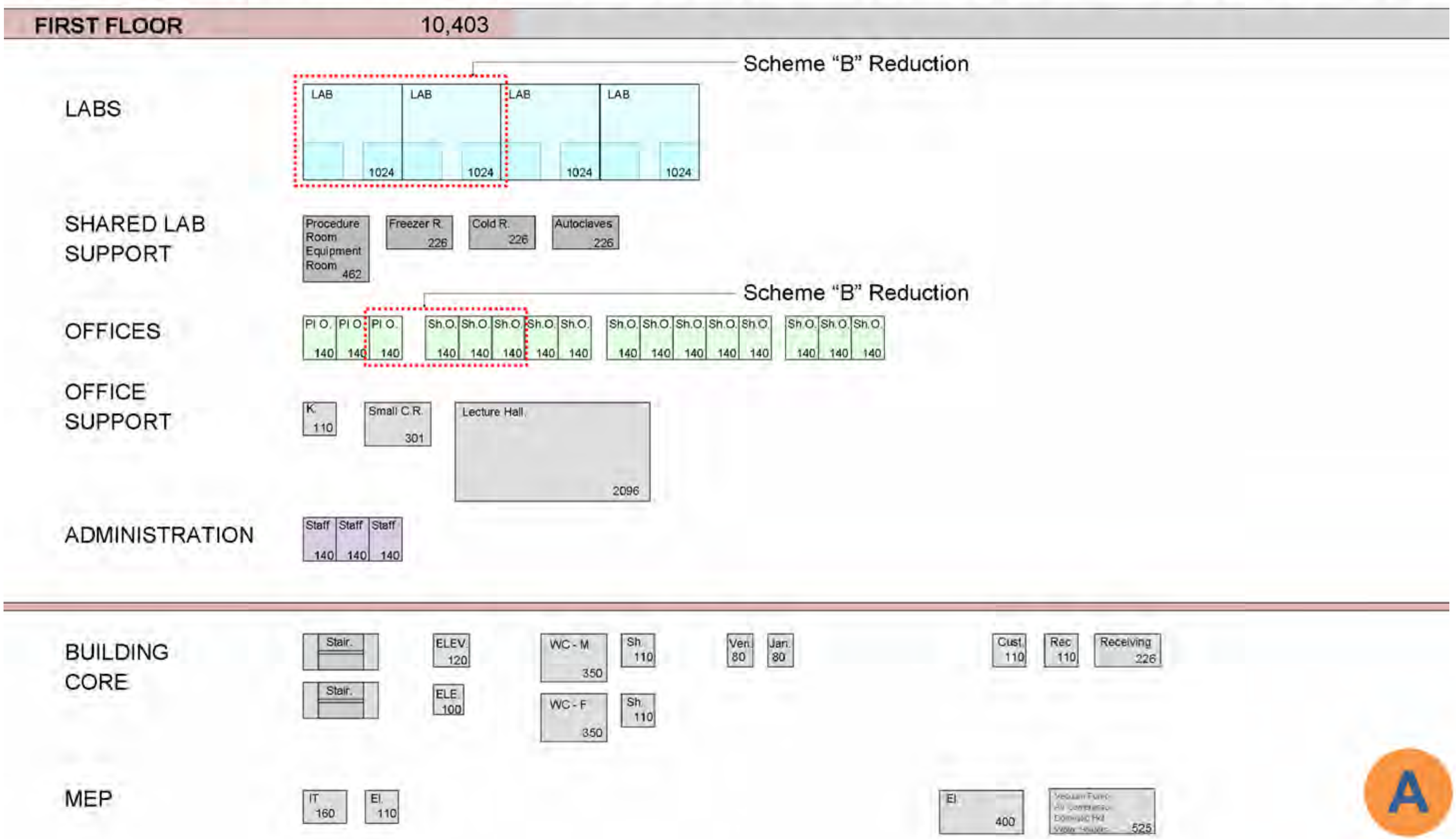
PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME "A"

UNASSIGNED MEP

		IT Room	Electrical Room	Mech. Shafts	Vacuum Pump	Fire Pump	Notes
Floor 1	-	IT 160	El 110 El 400		Vacuum Pump Air Compressor Domestic Hot Water Heaters 525	N/A	First Floor has additional 935 SF of Unassigned MEP SF Vacuum Pump could be placed on roof with additional cost to reduce vibration
Floor 2	-	IT 110	El 110	Shaft 120, Shaft 120			
Floor 3	-	IT 110	El 110	Shaft 120, Shaft 120, Shaft 120			
Floor 4	-	IT 110	El 110	Shaft 120, Shaft 120, Shaft 120			
	-						

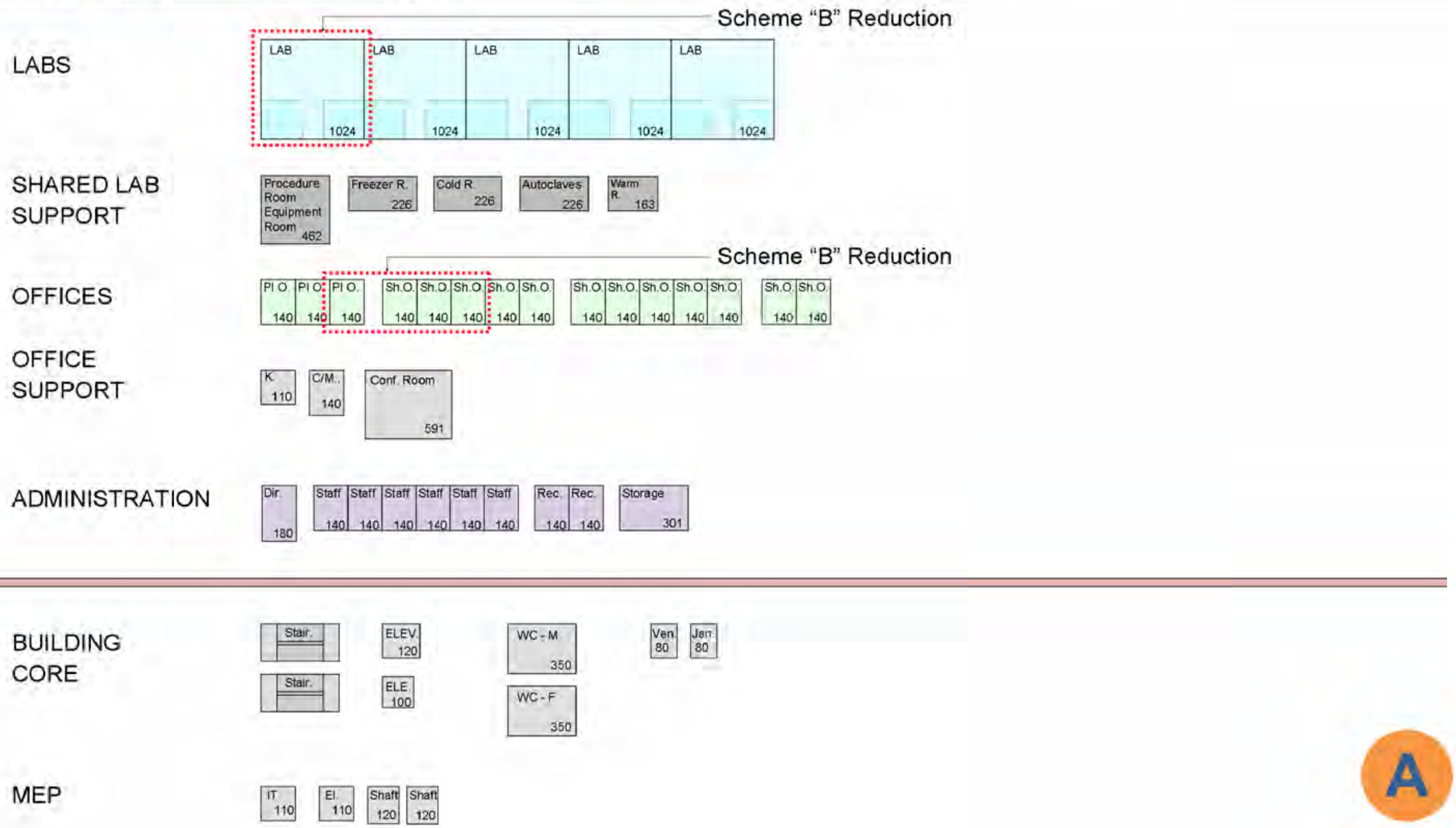
A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME “A”



PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME “A”

SECOND FLOOR 10,965



PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME “A”

THIRD FLOOR 10,913

LABS

LAB 1024 | LAB 1024 | LAB 1024 | LAB 1024 | LAB 1024

SHARED LAB SUPPORT

Procedure Room Equipment Room 462 | Freezer R. 226 | Cold R. 226 | Autoclaves 226 | Media Prep 462

OFFICES

PI O. 140 | PI O. 140 | PI O. 140

Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140

Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140

Sh.O. 140 | Sh.O. 140

Sh.O. 140

OFFICE SUPPORT

K. 110 | Small C.R. 301

ADMINISTRATION

Staff 140 | Staff 140 | Staff 140 | Staff 140 | Staff 140 | Staff 140 | Staff 140 | Staff 140 | Staff 140 | Staff 140

Rec. 140

BUILDING CORE

Stair | Stair

ELEV. 120 | ELE 100

WC - M 350 | WC - F 350

Ven. 80 | Jan. 80

MEP

IT 110 | El. 110 | Shaft 120 | Shaft 120 | Shaft 120

A

PROGRAM ANALYSIS – 4 FLOORS – 43,400 ASF – SCHEME “A”

FOURTH FLOOR 11,171

Scheme “B” Reduction

LABS

LAB 1024 | LAB 1024 | LAB 1024 | LAB 1024 | LAB - BSL3 1370

SHARED LAB SUPPORT

Procedure Room Equipment Room 462 | Freezer R. 226 | Cold R. 226 | Autoclaves 226 | Warm R. 163

OFFICES

PI O. 140 | PI O. 140 | PI O. 140

Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140

Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140 | Sh.O. 140

Sh.O. 140 | Sh.O. 140

V. O. 140 | V. O. 140

OFFICE SUPPORT

K. 110 | Conf. Room 591 | C/M. 140

ADMINISTRATION

Chair 180 | Staff 140 | Staff 140 | Staff 140 | Staff 140 | Rec. 140 | Storage 301

BUILDING CORE

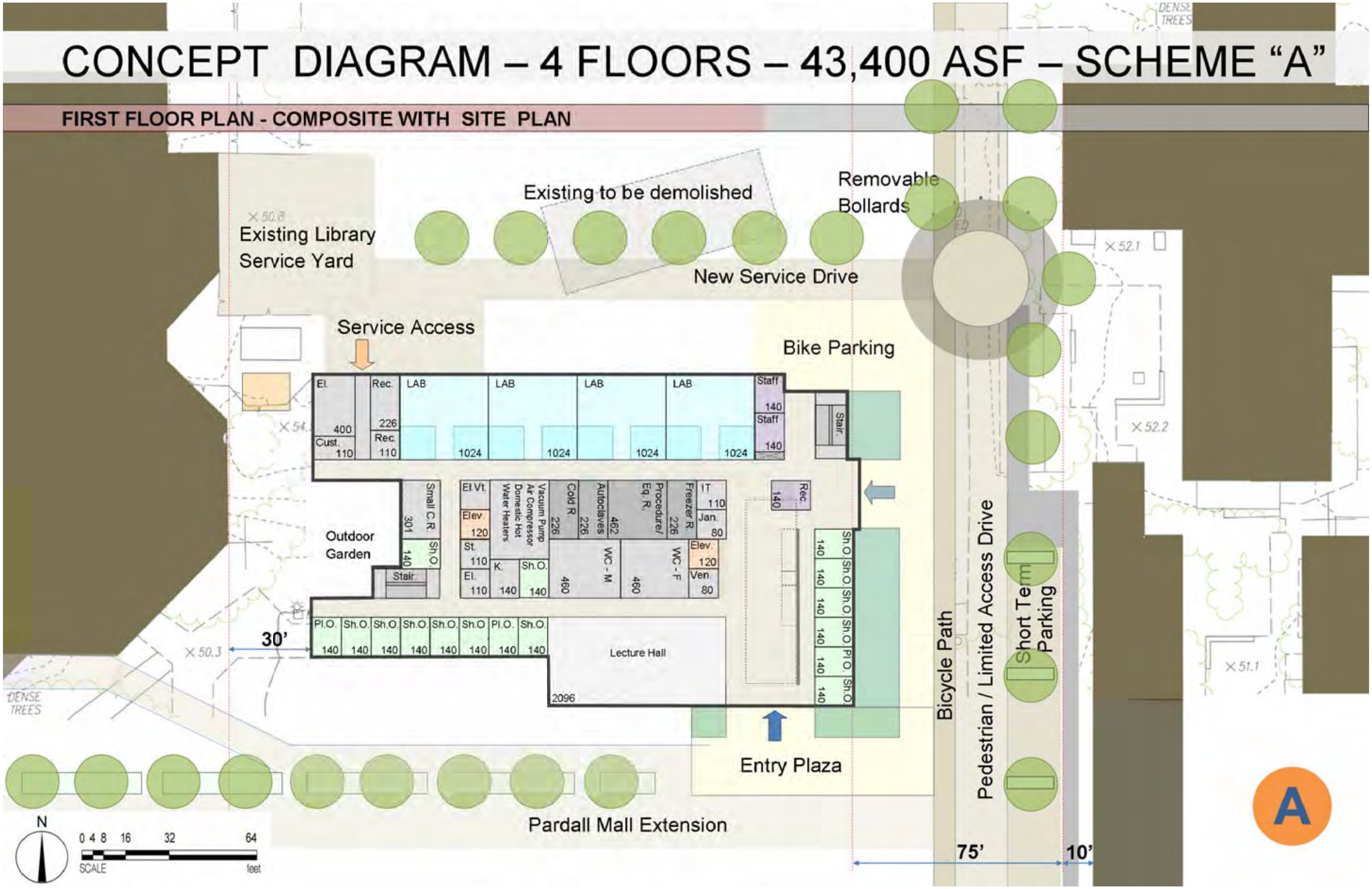
Stair. | Stair. | ELEV 120 | ELE. 100 | WC - M 350 | WC - F 350 | Ven. 80 | Jan. 80

MEP

IT 110 | El. 110 | Shaft 120 | Shaft 120 | Shaft 120

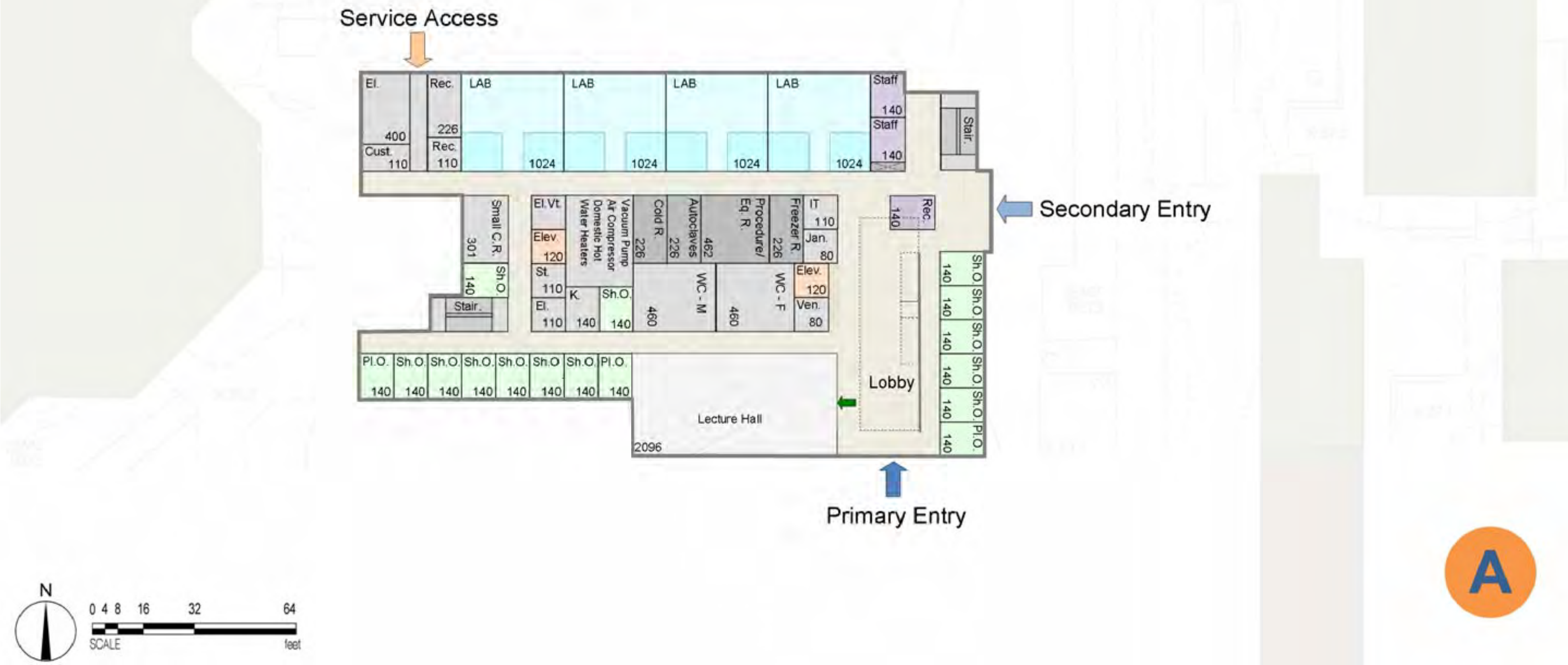
A

CONCEPT DIAGRAMS “A”


CONCEPT DIAGRAM – 4 FLOORS – 43,400 ASF – SCHEME "A"
FIRST FLOOR PLAN - COMPOSITE WITH SITE PLAN
Existing to be demolished
Removable Bollards
Existing Library Service Yard
New Service Drive
Service Access
Bike Parking
LAB 1024
LAB 1024
LAB 1024
LAB 1024
El. 400
Cust. 110
Rec. 226
Rec. 110
Staff 140
Staff 140
Stair
Rec. 140
Outdoor Garden
Small C.R. 301
Sh.O. 140
Stair
El.Vt.
Elev. 120
St. 110
El. 110
K. 140
Sh.O. 140
Water Heaters
Domestic Hot
Air Compressor
Vacuum Pump
Cold R. 226
Autoclaves 226
462
Procedure/ Eq. R.
Freezer R. 226
IT 110
Jan. 80
Elev. 120
Ven. 80
WC - M 460
WC - F 460
Pl.O. 140
Sh.O. 140
Sh.O. 140
Sh.O. 140
Sh.O. 140
Sh.O 140
Pl.O. 140
Sh.O. 140
Lecture Hall
2096
30'
Entry Plaza
Bicycle Path
Pedestrian / Limited Access Drive
Short Term Parking
Pardall Mall Extension
75'
10'
N
0 4 8 16 32 64
SCALE
feet
DENSE TREES
A

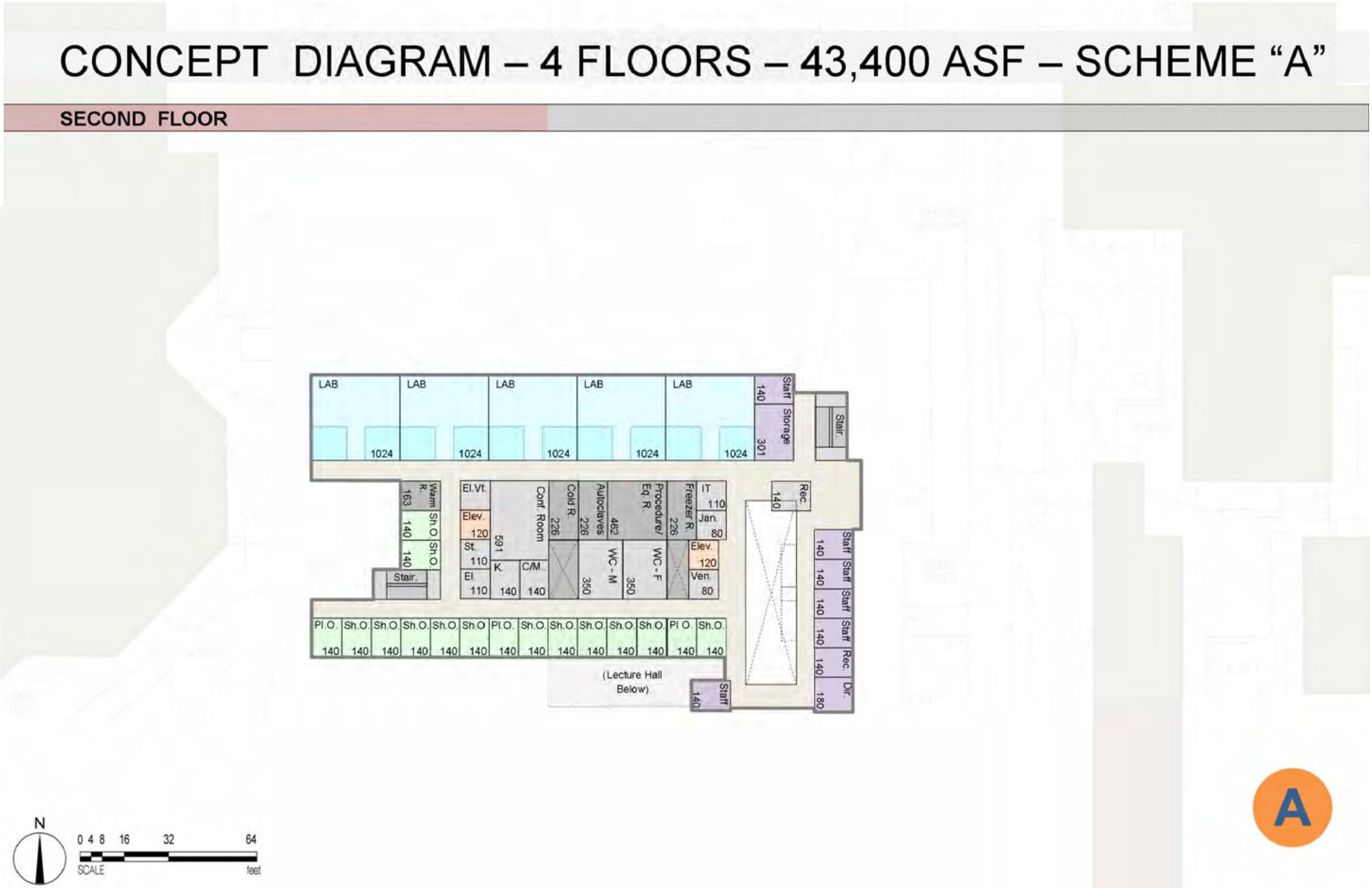
CONCEPT DIAGRAM – 4 FLOORS – 43,400 ASF – SCHEME "A"

FIRST FLOOR



CONCEPT DIAGRAM – 4 FLOORS – 43,400 ASF – SCHEME "A"

SECOND FLOOR

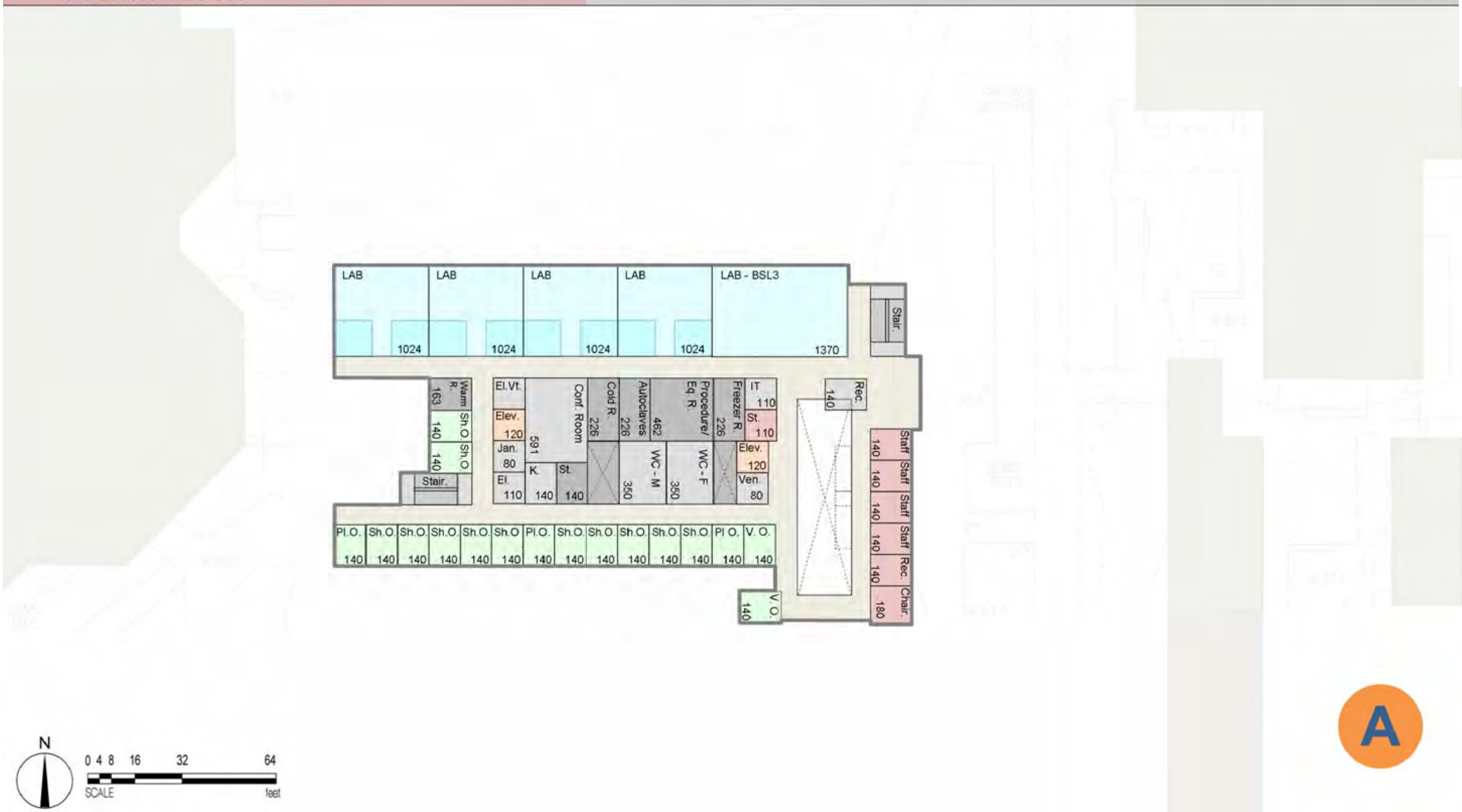


CONCEPT DIAGRAM – 4 FLOORS – 43,400 ASF – SCHEME “A”

THIRD FLOOR

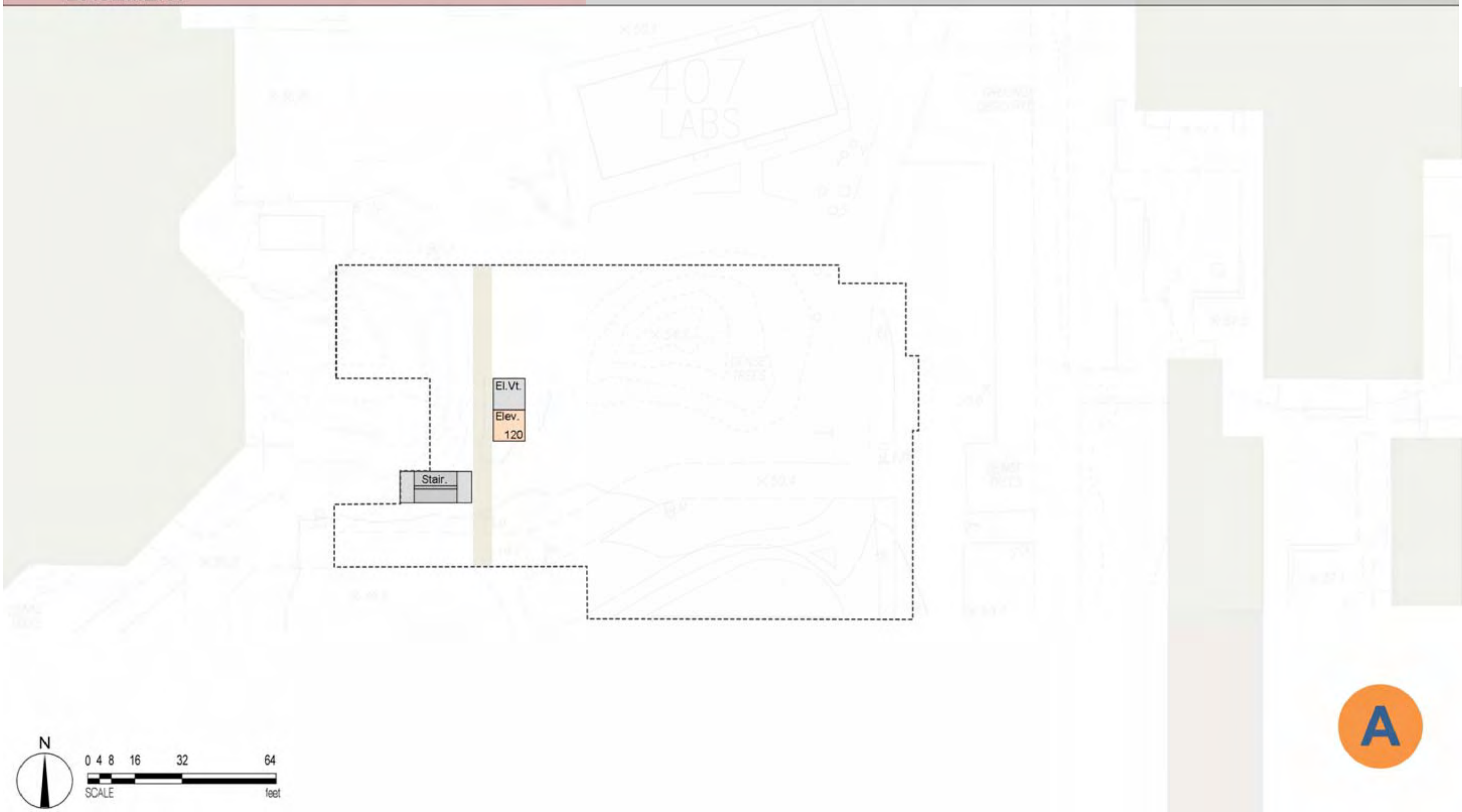
CONCEPT DIAGRAM – 4 FLOORS – 43,400 ASF – SCHEME "A"

FOURTH FLOOR



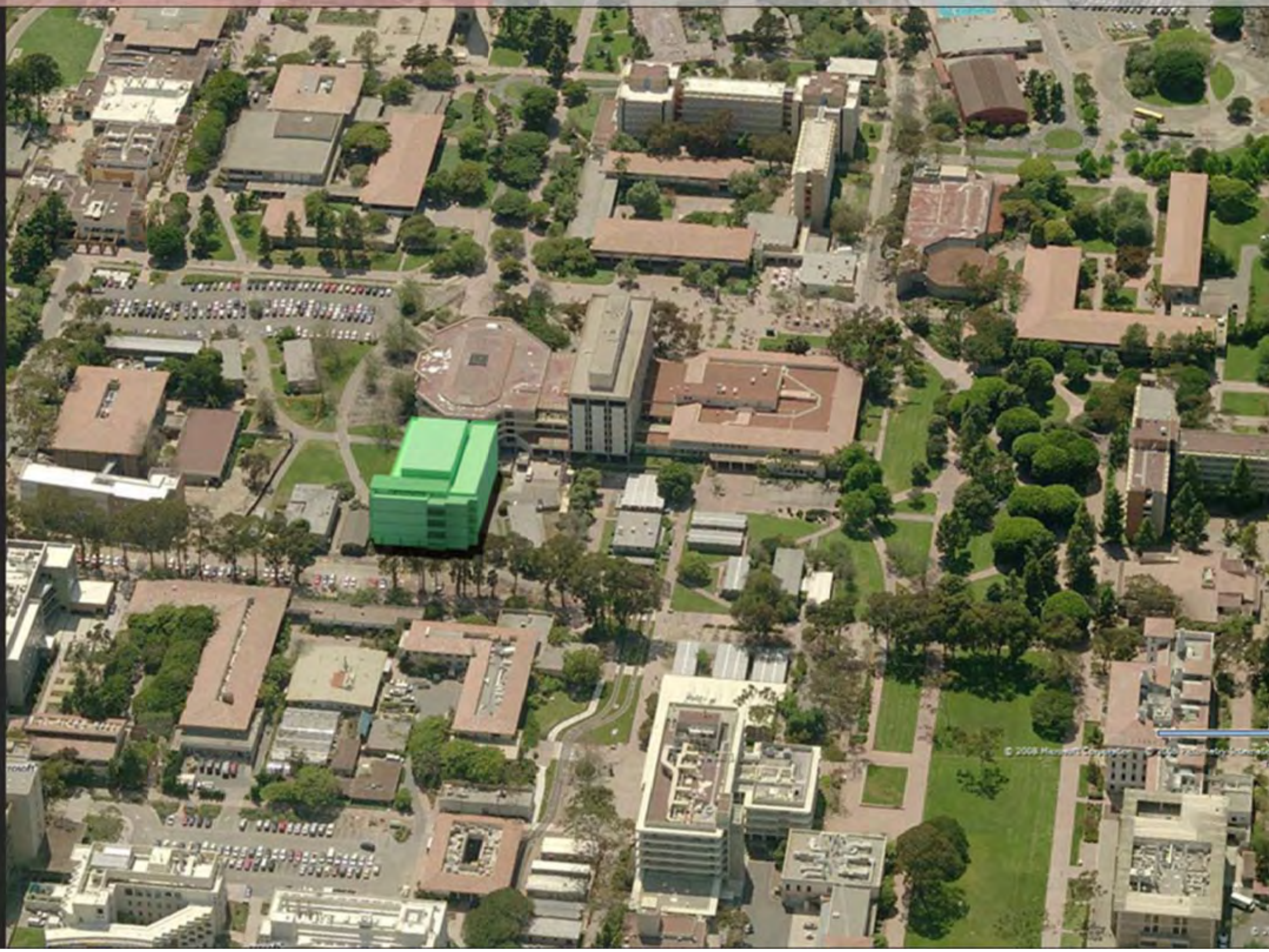
CONCEPT DIAGRAM – 4 FLOORS – 43,400 ASF – SCHEME "A"

BASEMENT



MASSING DIAGRAM, SCHEME "A"

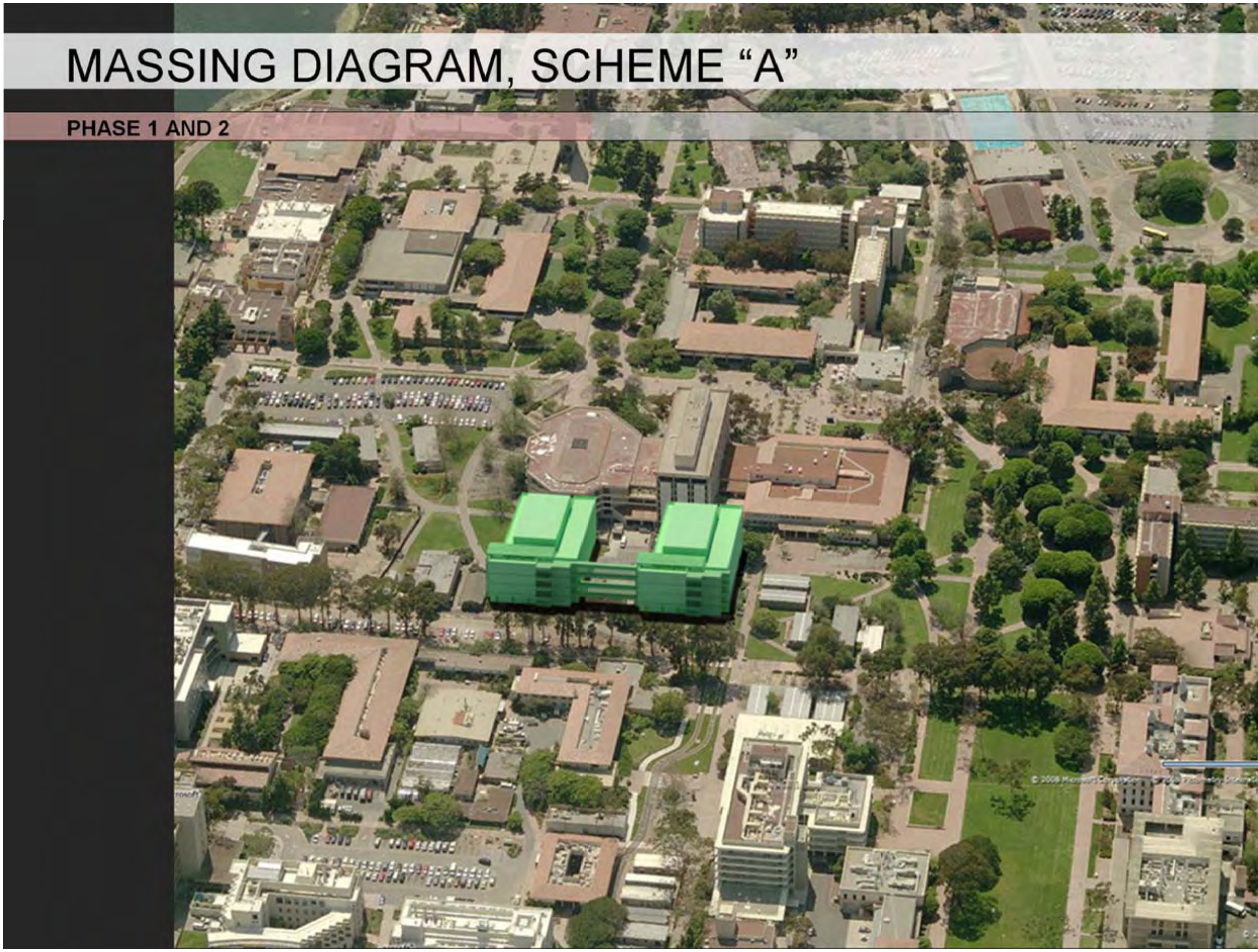
PHASE 1



A

MASSING DIAGRAM, SCHEME "A"

PHASE 1 AND 2

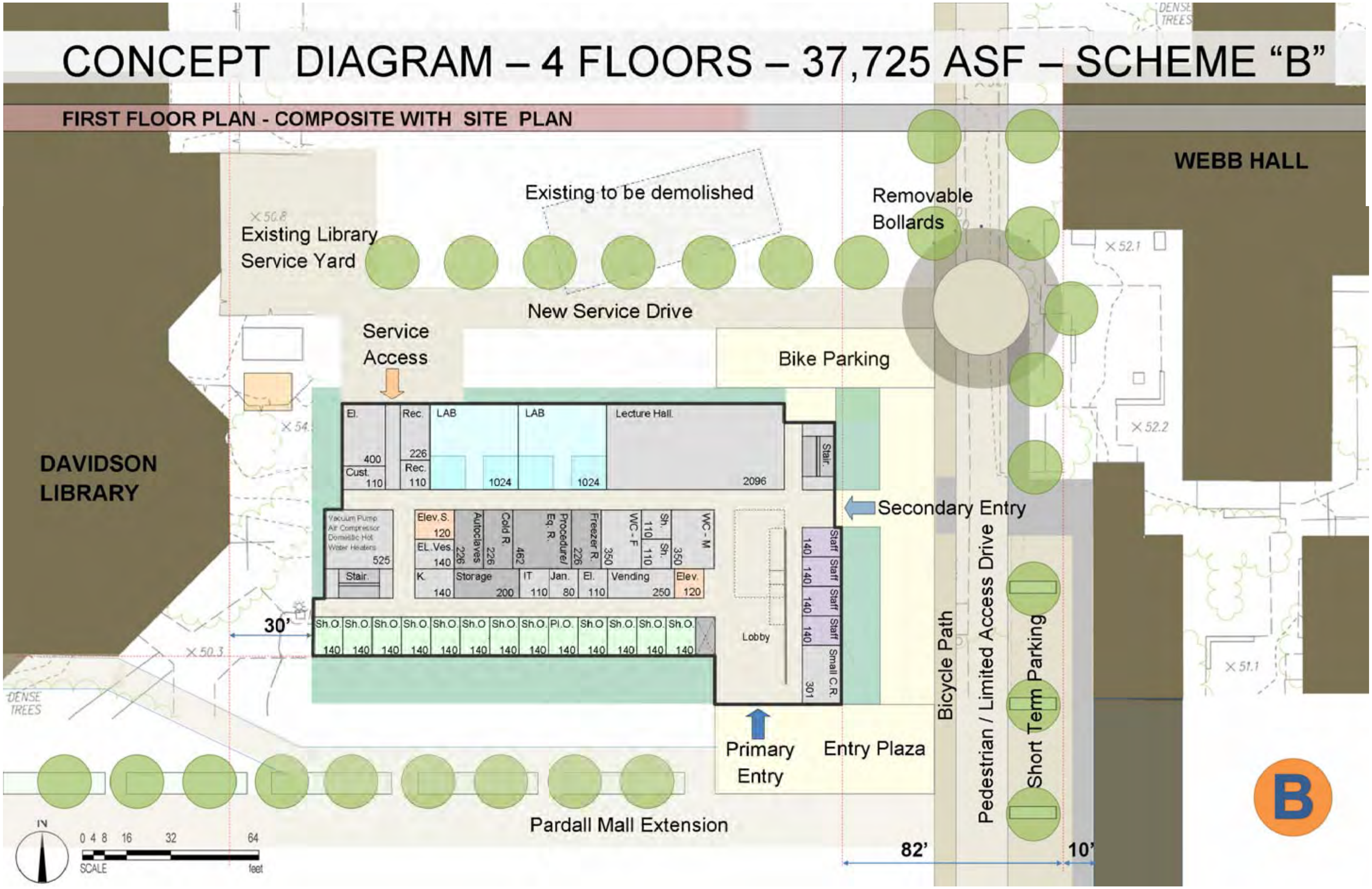


A

CONCEPT DIAGRAMS “B”

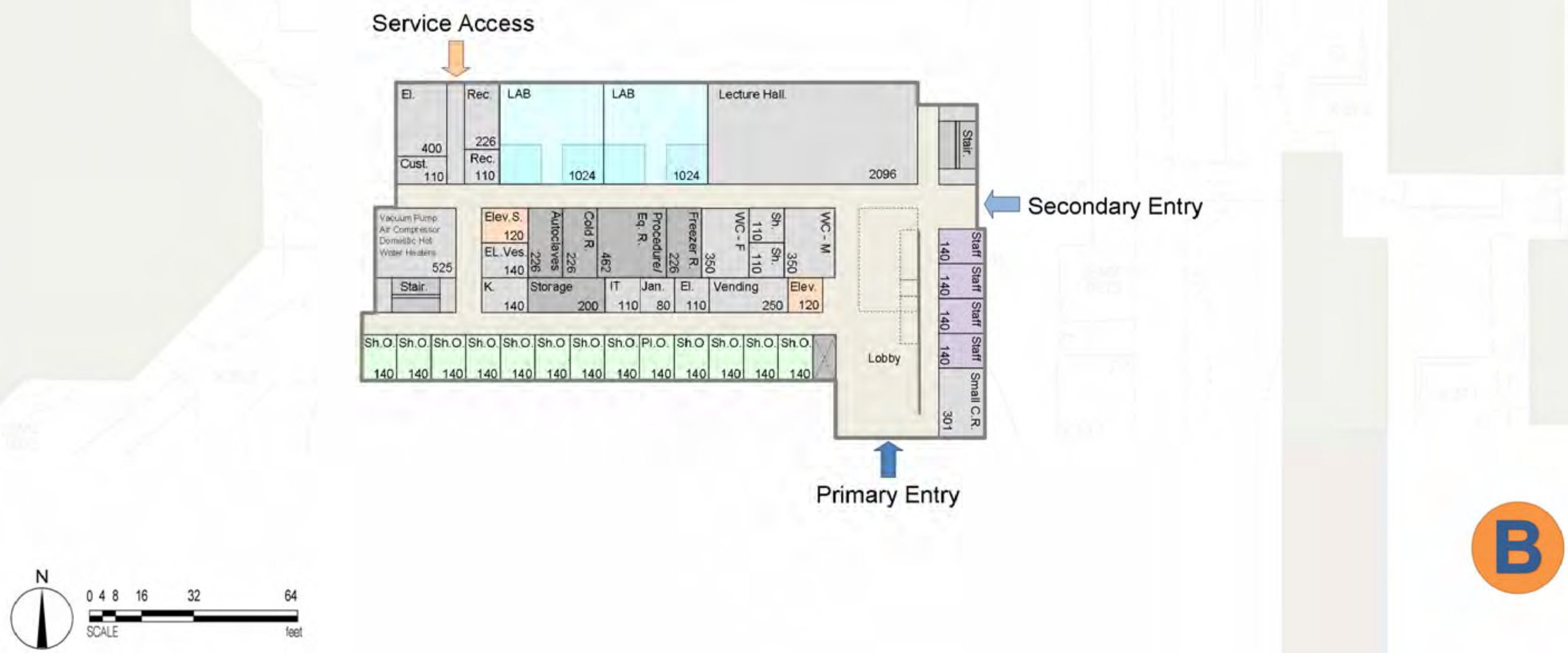
CONCEPT DIAGRAM – 4 FLOORS – 37,725 ASF – SCHEME "B"

FIRST FLOOR PLAN - COMPOSITE WITH SITE PLAN



CONCEPT DIAGRAM – 4 FLOORS – 37,725 ASF – SCHEME “B”

FIRST FLOOR

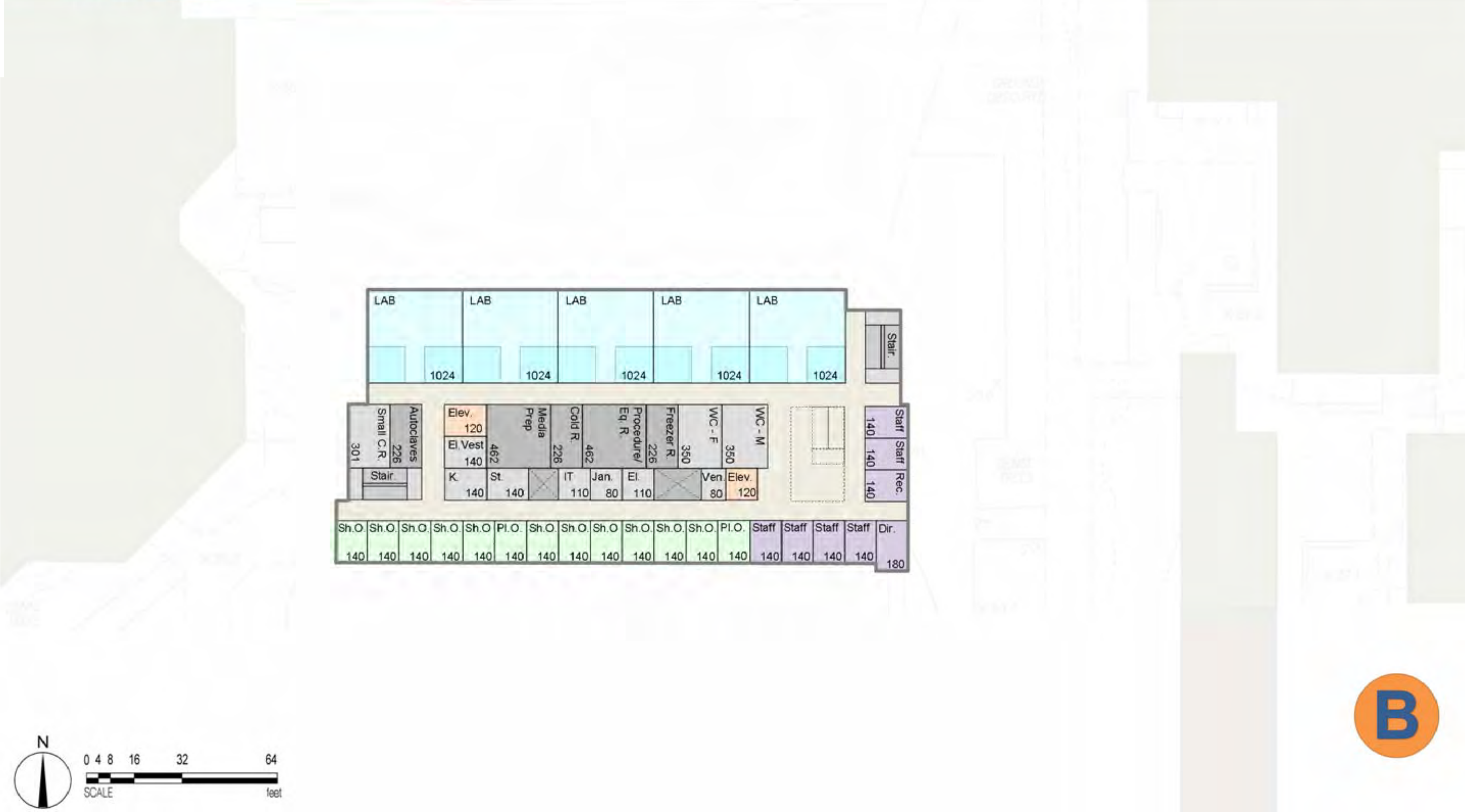


CONCEPT DIAGRAM – 4 FLOORS – 37,725 ASF – SCHEME "B"

SECOND FLOOR

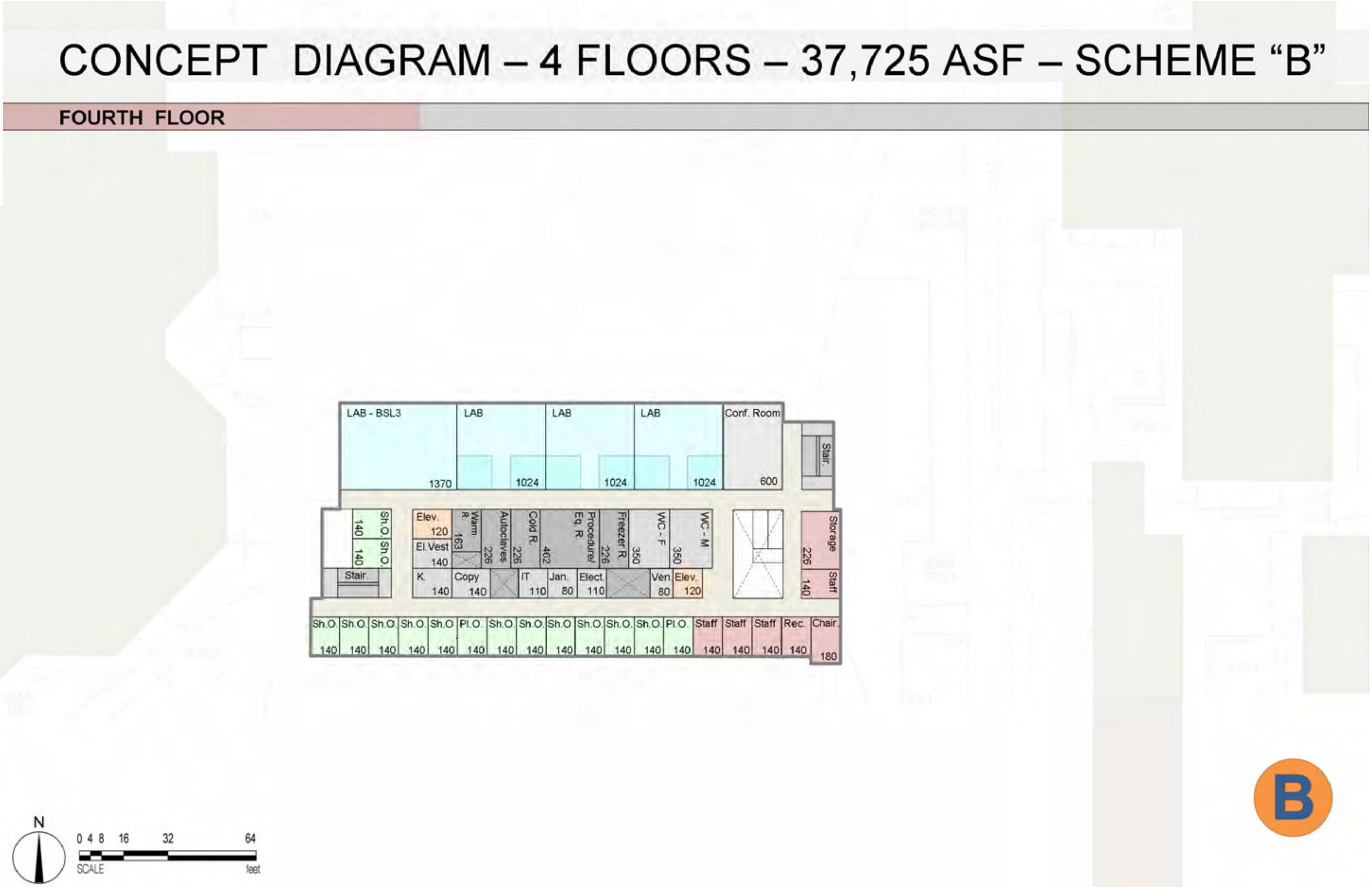
CONCEPT DIAGRAM – 4 FLOORS – 37,725 ASF – SCHEME "B"

THIRD FLOOR



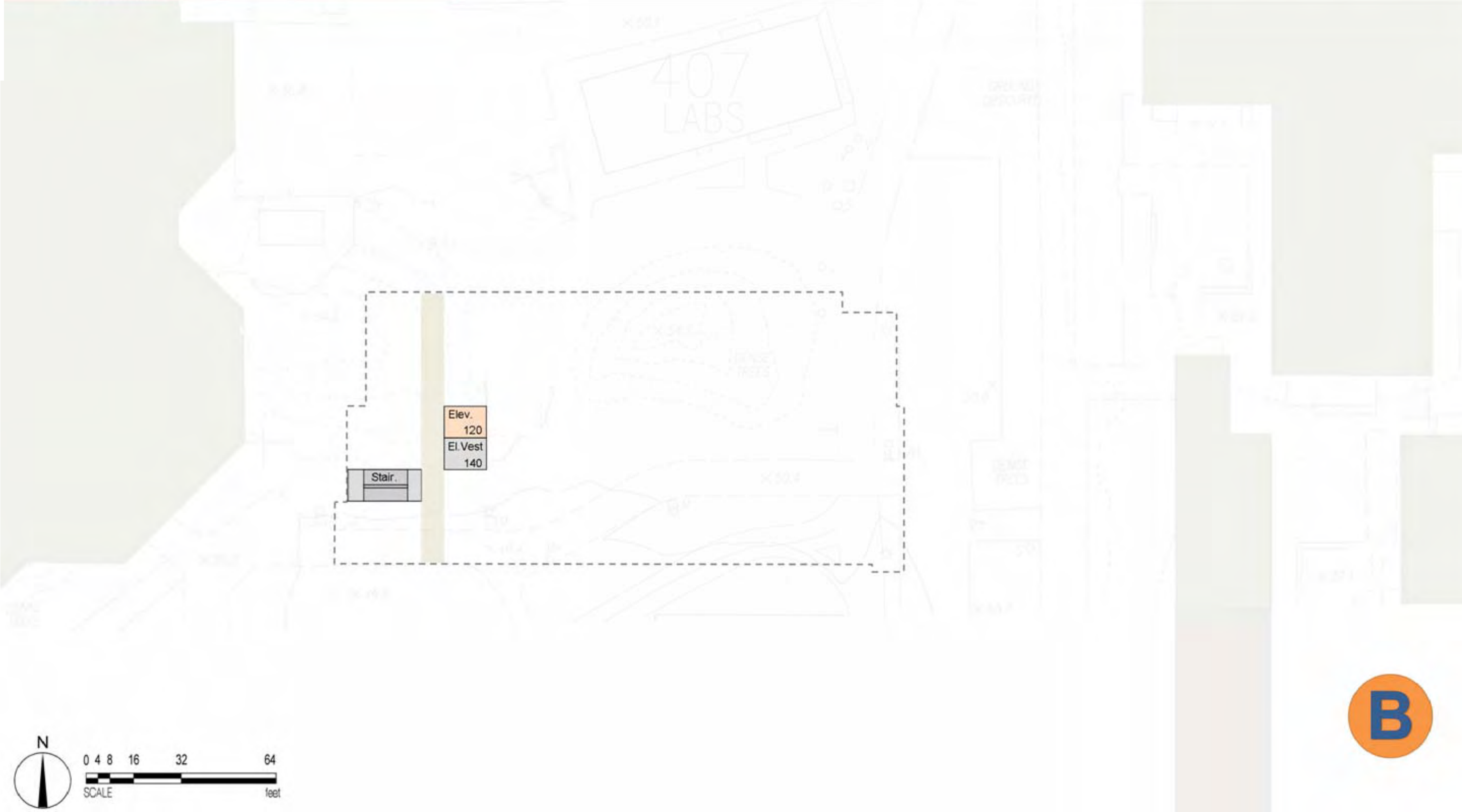
CONCEPT DIAGRAM – 4 FLOORS – 37,725 ASF – SCHEME "B"

FOURTH FLOOR



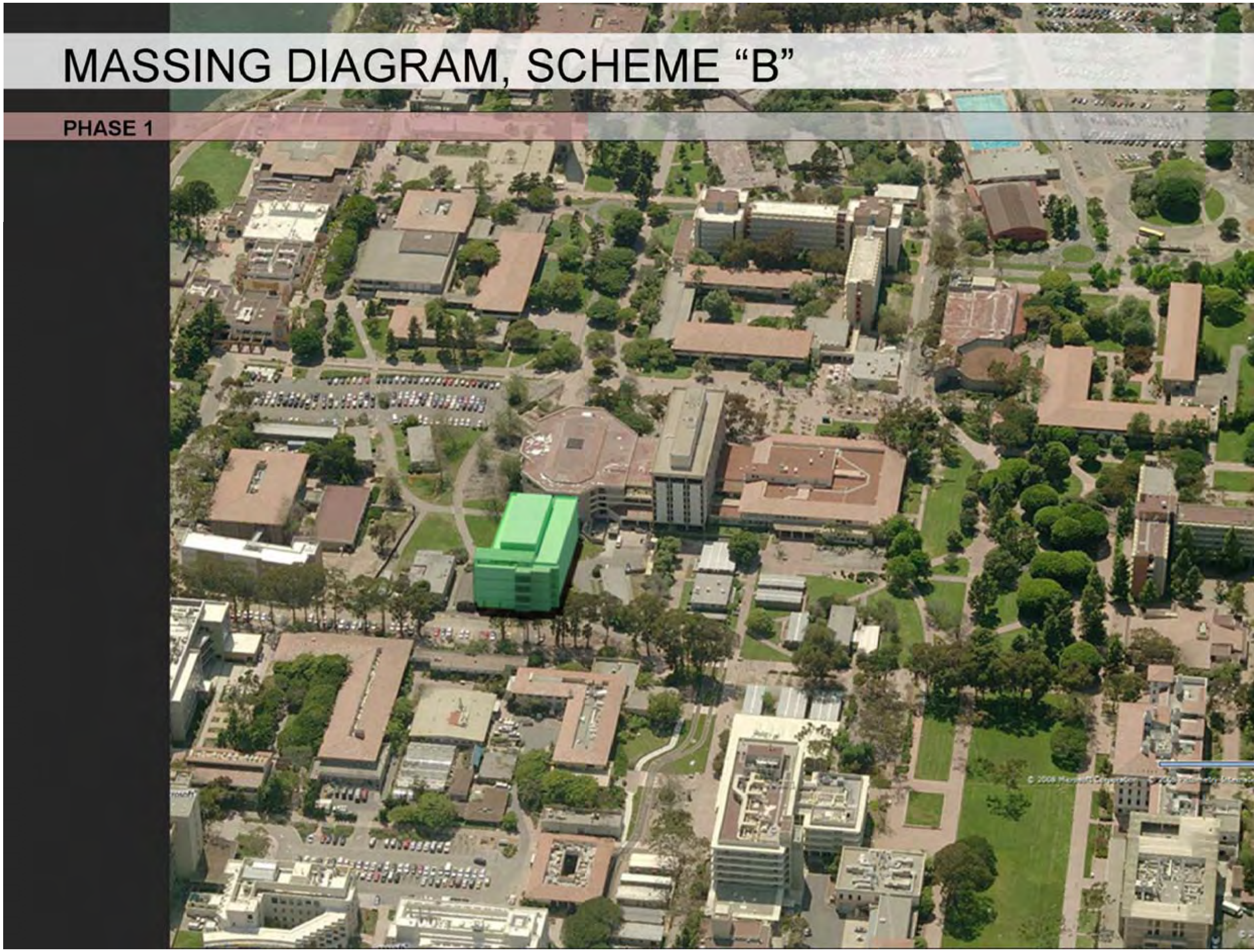
CONCEPT DIAGRAM – 4 FLOORS – 37,725 ASF – SCHEME "B"

BASEMENT



MASSING DIAGRAM, SCHEME "B"

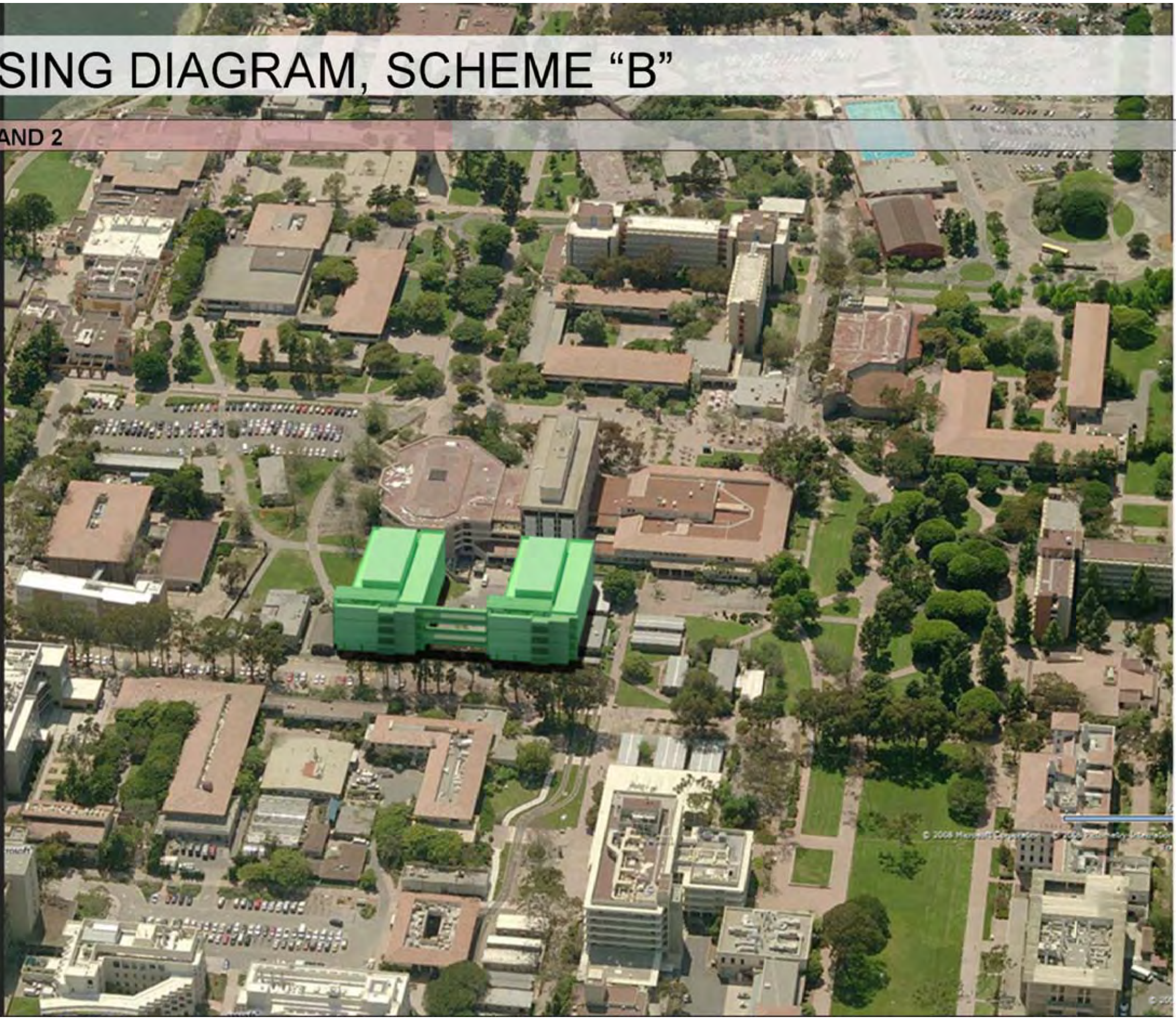
PHASE 1



B

MASSING DIAGRAM, SCHEME "B"

PHASE 1 AND 2



B

BUILDING CODE ANALYSIS

BIOENGINEERING BUILDING MASTER PLAN DPP

7.0.0

APPLICABLE CODES

The design and construction of the Bioengineering Building will comply with the following codes:

California Building Code, 2007 Part 2, Title 24, CCR.
(2006 IBC and 2007 California Amendments)
California Building standards Administrative Code, Part 1
California Code of Regulations (CCR) Part 4 and Part 6.
ASCE 7-05: Minimum Design Loads for Buildings & Other Structures
ACI Building Code, Commentary, ACI 318-05,
AISC Manual of Steel Construction (ASD), Thirteenth Edition
AISC Seismic Provisions for Structural Steel Buildings, Latest Edition
AWS Structural Welding Code, ANSI/AWS D1.1 thru D1.9,
Latest Edition.
California Fire Code, 2007 (will comply with latest
California Fire Code) Part 9, Title 24, CCR (2006 IFC and
2007 California Amendments).
California Energy Commission, Title 24, 2007 (AB970)
American Society of Heating, Refrigerating and Air
Conditioning Engineers (ASHRAE) Design Guidelines
California Electric Code, 2007 Part 3, Title 24, CCR. (2005
NEC and 2007 California Amendments)
California Mechanical Code 2007 Part 4, Title 24, CCR.
(2006 UMC and 2007 California Amendments).
California Plumbing Code 2007 Part 5, Title 24, CCR.
(2006 UPC and 2007 California Amendments)
American Society of Testing of Material
American Water Works Association
Cast Iron Soil Pipe Institute
National Electric Code
National Electric Manufacturer’s Association
National Fire Protection Association Standards

- NFPA 13 Installation of Sprinkler Systems 2007 Edition
- NFPA 14 Installation of Standpipe and Hose Systems 2007 Edition
- Section 34
- Section 45
- Section 54
- Section 90
- Section 91

Occupational Safety and Health Association
Underwriter Laboratories, Inc.
American National Standard Institute
American Air Balance Association
All Construction Materials & Workmanship are to
conform to the standard specifications for Public Works
Constructions (Green Book).
State Fire Marshall Regulations – Division 1, Public
Safety, Title 19, CCR

BUILDING CODE ANALYSIS

The Bioengineering Building is a four-story concrete frame structure.

Classification: Type I, rated construction

Occupancy: B, based on building use identified as Laboratories: Testing and Research, in accordance with Section 304. In order for the classification to be retained, the chemical usage within the control areas must be limited to the quantities allowed in Table 307.1.(2). During the Design Phase the faculty will provide an itemized list of quantities to confirm the building occupancy. If quantities are exceeded, the building occupancy will be classified as an L.

Sprinklers: Fully Sprinklered, Ordinary Hazard II

CODE EXCERPT - SECTION 304, BUSINESS GROUP B

304.1 Business Group B. Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts. Business occupancies shall include, but not be limited to, the following:

Airport traffic control towers
Animal hospitals, kennels and pounds
Banks
Barber and beauty shops
Car wash
Civic administration
Clinic-outpatient *[SFM] (not classified as Group I-2.1)*
Dry cleaning and laundries: pick-up and delivery stations and self-service
Educational occupancies for students above the 12th grade
Electronic data processing
Laboratories: testing and research
Motor vehicle showrooms
Post offices
Print shops
Professional services (architects, attorneys, dentists, physicians, engineers, etc.)
Radio and television stations
Telephone exchanges

CONTROL AREA ANALYSIS

Design and number of Control Areas is in accordance with Table 414.2.2:

The Maximum number of Control Areas allowed per floor, per code are noted below; the exact number of control areas in the building will be determined during the Design Phase once the chemical list is developed by the Faculty:

Floor 1: 4
Floor 2: 3
Floor 3: 2
Floor 4: 2

Fire rating required between Control Areas:

Floor 1: 1 hour
Floor 2: 1 hour
Floor 3: 1 hour
Floor 4: 2 hour

Percentage of maximum quantity per Control Area:

Floor 1: 100 %
Floor 2: 75 %
Floor 3: 50 %
Floor 4: 12.5%

Percentage of maximum quantities per control areas for buildings that are equipped with an automatic sprinkler system throughout and when hazardous materials are stored in approved storage cabinets, gas cabinets or exhausted enclosures:

Floor 1: 400 %
Floor 2: 300 %
Floor 3: 200 %
Floor 4: 50 %

FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA[a]	NUMBER OF CONTROL AREAS PER FLOOR	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS[b]
Above grade plane	Higher than 9	5	1	2
	7-9	5	2	2
	6	12.5	2	2
	5	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below grade plane	1	75	3	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Tables 307.1(1) and 307.1(2), with all increases allowed in the notes to those tables.

b. Fire barriers shall include walls and floors as necessary to provide separation from other portions of the building.

MAXIMUM ALLOWABLE QUANTITY ANALYSIS

Code Excerpt - Table 307.1(1) Maximum Allowable Quantity Per Control Area of Hazardous Materials Posing a Physical Hazard

Maximum allowable quantities per control areas will be in accordance with Table 307.1 (1)

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE[b]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)
Combustible liquid[c, i]	II IIIA IIIB	H-2 or H-3 H-2 or H-3 N/A	N/A	120[d, e] 330[d, e] 13,200[e, f]	N/A	N/A	120[d] 330[d] 13,200[f]	N/A	N/A	30[d] 80[d] 3,300[f]
Combustible fiber	Loose baled[o]	H-3	(100) (1,000)	N/A	N/A	(100) (1,000)	N/A	N/A	(20) (200)	N/A
Consumer fireworks (Class C, Common)	1.4G	H-3	125[d, e, l]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cryogenics flammable	N/A	H-2	N/A	45[d]	N/A	N/A	45[d]	N/A	N/A	10[d]
Cryogenics, oxidizing	N/A	H-3	N/A	45[d]	N/A	N/A	45[d]	N/A	N/A	10[d]
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4 Division 1.4G Division 1.5 Division 1.6	H-1 H-1 H-1 or 2 H-3 H-3 H-1 H-1	1[e, g] 1[e, g] 5[e, g] 50[e, g] 125[d, e, l] 1[e, g] 1[d, e, g]	(1)[e, g] (1)[e, g] (5)[e, g] (50)[e, g] N/A (1)[e, g] N/A	N/A N/A N/A N/A N/A N/A N/A	0.25[g] 0.25[g] 1[g] 50[g] N/A [illegible] [illegible]	(0.25)[g] (0.25)[g] (1)[g] (50)[g] N/A (0.25)[g] N/A	N/A N/A N/A N/A N/A N/A N/A	0.25[g] 0.25[g] 1[g] N/A N/A 0.25[g] N/A	(0.25)[g] (0.25)[g] (1)[g] N/A N/A (0.25)[g] N/A
Flammable gas	Gaseous liquefied	H-2	N/A	N/A 30[d, e]	1,000 N/A	N/A	N/A 30[d, e]	1,000[d, e] N/A	N/A	N/A
Flammable liquid[c]	1A 1B and 1C	H-2 or H-3	N/A	30[d, e] 120[d, e]	N/A	N/A	30[d] 120[d]	N/A	N/A	10[d] 30[d]
Combination flammable liquid (1A, 1B, 1C)	N/A	H-2 or H-3	N/A	120[d, e, h]	N/A	N/A	120[d, h]	N/A	N/A	30[d, h]
Flammable solid	N/A	H-3	125[d, e]	N/A	N/A	[illegible]	N/A	N/A	25[d]	N/A
Organic peroxide	UD I II III IV V	H-1 H-2 H-3 H-3 N/A N/A	1[e, g] 5[d, e] 50[d, e] 125[d, e] NL NL	(1)[e, g] (5)[d, e] (50)[d, e] (125)[d, e] NL NL	N/A N/A N/A N/A N/A N/A	0.25[g] 1[d] 50[d] 125[d] N/L N/L	(0.25)[g] (1) (50)[d] (125)[d] N/L N/L	N/A N/A N/A N/A N/A N/A	0.25[g] 1[d] 10[d] 25[d] NL NL	(0.25)[g] (1)[d] (10)[d] (25)[d] NL NL
Oxidizer	4 3[k] 2 1	H-1 H-2 or H-3 H-3 N/A	1[e, g] 10[d, e] 250[d, e] 4,000[e, f]	(1)[e, g] (10)[d, e] (250)[d, e] (4,000)[e, f]	N/A N/A N/A N/A	0.25[g] 2[d] 250[d] 4,000[f]	(0.25)[g] (2)[d] (250)[d] (4,000)[f]	N/A N/A N/A N/A	0.25[g] 2[d] 50[d] 1,000[f]	(0.25)[g] (2)[d] (50)[d] (1,000)[f]
Oxidizing gas	Gaseous liquefied	H-3	N/A N/A	N/A 15[d, e]	1,500[d, e] N/A	N/A N/A	N/A 15[d, e]	1,500[d, e] N/A	N/A N/A	N/A N/A
Pyrophoric material	N/A	H-2	4[e, g]	(4)[e, g]	50[e, g]	1[g]	(1)[g]	10[e, g]	0	0
Unstable (reactive)	4 3 2 1	H-1 H-1 or H-2 H-3 N/A	1[e, g] 5[d, e] 50[d, e] NL	(1)[e, g] (5)[d, e] (50)[d, e] NL	10[d, g] 50[d, e] 250[d, e] N/L	0.25[g] 1[d] 50[d] NL	(0.25)[g] (1) (50)[d] N/L	2[e, g] 10[d, e] 250[d, e] NL	0.25[g] 1[d] 10[d] NL	(0.25)[g] (1)[d] (10)[d] NL
Water reactive	3 2 1	H-2 H-3 N/A	5[d, e] 50[d, e] NL	(5)[d, e] (50)[d, e] NL	N/A N/A N/A	5[d] 50[d] NL	(5)[d] (50)[d] NL	N/A N/A N/A	1[d] 10[d] NL	(1)[d] (10)[d] NL

Mixing

Storing

For SI: 1 cubic foot = 0.023 m^3, 1 pound = 0.454 kg, 1 gallon = 3.785 L.

NL = Not Limited; N/A = Not Applicable; UD = Unclassified Detonable

a. For use of control areas, see Section 414.2.

b. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.

c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited providing the liquids are packaged in individual containers not exceeding 1.3 gallons. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs, consumer or industrial products, and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.

d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.

e. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, day boxes, gas cabinets, exhausted enclosures or safety cans. Where Note d also applies, the increase for both notes shall be applied accumulatively.

f. The permitted quantities shall not be limited in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

g. Permitted only in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

h. Containing not more than the maximum allowable quantity per control area of Class 1A, 1B or 1C flammable liquids.

EXAMPLE OF MAXIMUM ALLOWED QUANTITIES PER FLOOR:

Example of maximum quantities of flammable liquids allowed to be stored in each control area in a building that is equipped with an automatic sprinkler system throughout and when hazardous materials are stored in approved storage cabinets, gas cabinets or exhausted enclosures.

Mixing

Flammable liquid[c]	1A 1B and 1C	H-2 or H-3	N/A	30[d, e] 120[d, e]	N/A	N/A

Storing

Floor 1:	Mix:	120 gallons	(30x4)
	Store:	480 gallons	(120x4)
Floor 2:	Mix:	90 gallons	(30x4x0.75)
	Store;	360 gallons	(120x4x0.75)
Floor 3:	Mix:	60 gallons	(30x4x0.5)
	Store:	240 gallons	(120x4x0.5)
Floor 4:	Mix:	15 gallons	(30x4x0.125)
	Store:	60 gallons	(120x4x0.125)

BUILDING HEIGHT AND ALLOWABLE AREA

Based on the construction type I, Table 503 allows the building height and area to be unlimited.

LOCATION ON PROPERTY

The proposed Bioengineering building will be located to the east of the Davidson Library. The west edge of the Bioengineering building will be 30 feet from the face of the Library building. In accordance with Table 602 and Table 704.8 unprotected openings are allowed between the 2 buildings.

EXITING AND OCCUPANT LOAD

A preliminary exit analysis has been developed based on Table 1004.1, Maximum floor area allowances per occupant as follows:
Classrooms: 20 SF per person
Shops and other vocational room areas: 50 SF per person

LABORATORY DESIGN REQUIREMENTS

BIOENGINEERING BUILDING MASTER PLAN & PHASE 1 DPP

8.0.0

QUALITY ENVIRONMENT

Laboratories shall be designed for people and provide them with a safe and pleasant work environment, which promotes increased productivity. Direct, natural daylight (where appropriate), adequate work space, color, a well organized and logical layout, and functional and durable casework, all will enhance the quality of the laboratory environment, and will play a role in the recruitment and retention of research personnel and students.

Laboratories and offices shall be provided with natural daylight and views to the outside environment, so long as the daylight does not conflict with research requirements. Natural light is not required in laboratory support rooms.

Laboratory artificial lighting shall provide shadow-free illumination of the laboratory work surface. The ability to control lighting in specialized laboratories or in spaces that use computers must be considered.

Effective research is fostered by communication and collaboration among scientists. Laboratory planning concepts should encourage interaction through the strategic location of common facilities, such as conference rooms, small meeting rooms, and lounge and break areas.

Graphics and signage will help staff and visitors find their way through the building. Directional graphics/signage shall be functional and in harmony with the architecture of the building. Artwork may be considered for shared use, common support, and some circulation spaces.

DENSITY OF RESEARCH SPACE

The new building should provide scientists with adequate laboratory workspace, laboratory support space, office space, and administrative space in order to create a safe and functional research environment. Adequate laboratory workspace shall be provided to meet the needs for lab components such as chemical fume hoods, biological safety cabinets, laboratory benches, equipment space, storage space, and desk space. The space must be adequate to provide a safe working area and access to and around equipment, containment devices, and bench top areas.

The ratio of laboratory support space to research laboratories shall be adequate to eliminate the need to locate equipment in non-laboratory functional areas (such as corridors). Consideration shall be given to locating noise, heat, and vibration producing equipment in laboratory support areas adjacent to the research laboratories. These may be dedicated or shared spaces, open alcoves, or securable rooms as required. They may also be on the same planning module as the laboratory.

Office and administrative areas shall be adequate to provide areas outside the laboratory with a quiet, aesthetic environment that is sized to support the number of researchers in the laboratory. Administrative and clerical support areas shall be provided with adequate storage for files and records.

FLEXIBILITY AND ADAPTABILITY

Laboratories must be adaptable. This requirement encourages flexible spaces with the ability to readily accommodate changes in function without requiring significant physical or infrastructure changes to the space itself and with little or no cost. Highly customized spaces, which only meet the needs of one activity or one person, are to be avoided.

Services must be uniformly and repetitively distributed to each laboratory and designed to provide simple extension into the laboratory without disruption to adjacent rooms or laboratory modules. Services may be run overhead or in interstitial space to permit changes without requiring an upgrade to the building infrastructure, capacity, or major distribution systems. All building system components that require routine maintenance and repair shall be accessible without interrupting the day-to-day activities of the research environment.

Utilities and services shall be organized into specific zones, both horizontally and vertically, to provide uniform distribution of systems and services to each lab module. A three dimensional planning approach will allow ease of maintenance and access of services and provide maximum operational flexibility.

PLANNING MODULE

Many researchers have specialized laboratory design requirements. The purpose of establishing a planning module is to form a common denominator, which will meet a variety of research needs while allowing mechanical systems, partitions, and laboratory casework to be provided as required. The laboratory module is the basic conceptual building block, which provides uniformity and repetitiveness to the areas and services of the building. Generally, vertical elements such as stairs, elevators, chases, shafts, and shear walls should be located at the outer perimeter of the laboratory block of space, thereby creating a large, open, unobstructed laboratory environment, in which changes can be accommodated. This permits the rational creation of space and allows the standardization of mechanical, electrical, and plumbing systems. The systems are accessible to each laboratory module.

The laboratory building is based on a laboratory module that is 11' in width, and varies in depth. This allows the rational formation of spaces that can accommodate a wide variety of laboratory and laboratory support functions. The 11' laboratory module width will accommodate bench, equipment, and aisle widths needed for research. The depth of laboratory and laboratory support rooms varies depending upon the function of the space.

Floor to floor heights will be driven by the utilities distribution scheme selected for the building.

The building's structural system and pattern relate to the planning module. The structural grid for the building should be derived from the lab planning module. Spans of between 22' and no more than 30' are desirable'. This bay size provides the most efficient balance between column locations, beam spans, and vibrations attenuation.

CIRCULATION/FLOW

Circulation throughout the laboratory building shall be efficient and direct. Clearly defined horizontal and vertical circulation routes for people, equipment, supplies, waste disposal, and maintenance and repair activities are needed. Primary and secondary circulation between laboratories, lab support, offices and administrative areas shall be clearly addressed early in the design process. Minimum laboratory corridor widths shall be 6' clear.

LABORATORY FURNITURE AND EQUIPMENT

Fixed, built-in casework should be minimized in order to provide a flexible laboratory environment. In the research laboratories, a flexible, adjustable height bench top system should be employed where appropriate, with shelves and work surfaces that can be raised and lowered or removed to meet individual needs. Such a system may be a unistrut cantilevered system, or a slotted metal stud system. Moveable lab tables and moveable casework cabinets will be provided for added flexibility.

Countertops will be resin, either epoxy resin or phenolic resin. Chemical resistant plastic laminate may be used in areas where durability is of not such a great concern. Stainless steel tops and sinks will be used in cold rooms and autoclave rooms. Laboratory sinks will be epoxy resin, mounted flush with the bench top.

Chemical fume hoods will be variable volume. They are to be located in the laboratory so as to avoid entrapment, blocking of egress, or otherwise creating a hazard in the laboratory. Chemical fume hoods will operate continuously and provide a face velocity of 100 feet per minute. All fume hoods anticipated for the building are standard chemical fume hoods. There is no requirement for special purpose hoods such as perchloric acid, or heavy acid digestion type hoods.

Biological safety cabinets in BSL2 laboratories will be Class II, Type A, and are owner furnished, owner installed. These cabinets do not require exhaust connection to the building exhaust system.

Biological safety cabinets in the BSL3 laboratory will be Class II, Type B, and will have 100% exhaust. These cabinets are contractor furnished and installed, and have a dedicated exhaust system.

FINISHES AND MATERIALS

Materials selected for the construction of laboratories must be durable and cleanable, and contribute to the creation of a comfortable, productive, and safe work environment. Design features shall promote cleaning, maintenance, and better storage while minimizing pest access.

Floor materials must be nonabsorbent, skid proof, resistant to wear, and resistant to the adverse effects of acids, solvents, and detergents. Materials may be monolithic (sheet flooring) or have a minimal number joints such as vinyl quartz tile (VQT) or rubber tile. The base may be vinyl or rubber, or an integral cove base when sheet vinyl flooring is used. Special use areas such as autoclave rooms will have epoxy resin floors.

Wall surfaces shall be free from cracks, unsealed penetrations, and imperfect junctions with ceiling and floors. Materials must be capable of withstanding washing with strong detergents and disinfectants and be capable of withstanding the impact of normal traffic. Corner guards and bumper rails shall be provided to protect wall surfaces in high traffic/impact areas.

Ceilings such as washable lay-in acoustical tiles shall be provided in most laboratory support areas. Ceiling height shall be a minimum of 9' in laboratory support areas. Ceilings in the research laboratories shall be open to the structure above.

Windows in laboratories shall be nonoperable and must be sealed and caulked. Window systems shall use energy efficient glass.

Doors into laboratories along a corridor shall consist of a 36" active leaf and an 18" inactive leaf, with a vision panel in the active leaf. All doors to laboratories or support rooms with only one door shall have a minimum width of 42". Doors shall be a minimum of 84" high, although 96" is preferred for laboratory and laboratory support areas. Laboratory doors opening onto a corridor shall be recessed, and open in the direction of egress.

HVAC

HVAC systems must be responsive to research laboratory demands. Temperature must be carefully controlled. Systems must have adequate ventilation capacity to control fumes, odors, and airborne contaminants, permit safe operation of fume hoods, and cool the significant heat loads which can be generated in the laboratory. HVAC systems must be both reliable and redundant and operate without interruption. HVAC systems must be designed to maintain relative pressure differentials between spaces and must be efficient to operate, both in terms of energy consumption and maintenance. Laboratory noise, much of it generated by HVAC systems, shall be maintained at NC 45 or less.

HVAC systems must maintain a safe and comfortable working environment and be capable of adapting to new research initiatives. In addition, they must be easy to maintain, energy efficient, and reliable to minimize lost research time.

Adequate access shall be provided for periodic maintenance and cleaning of coils, filters, and drain pans.

Outdoor air intakes shall be located as far as practical (on directionally different exposures) but not less than 40' from exhaust outlets of combustion equipment stacks, cooling towers, ventilation exhaust outlets from the building or adjoining buildings, vacuum systems, plumbing vent stacks, or from areas that may collect vehicular exhaust and other noxious fumes. The bottom of outdoor air intakes serving central systems shall be located as high as practical but not less than 6' above ground level, or if installed above the roof, 3' above the roof level.

Exhaust outlets shall be located a minimum of 10' above ground, away from occupied areas or from doors and operable windows. The preferred location for exhaust discharge is above the roof level. Prevailing winds, adjacent buildings, and discharge velocities must be taken into account to insure that discharge in not entrained within an outdoor air stream (see Section 11, p. 150, item 26, for Wind Tunnel Testing).

Laboratories containing harmful substances shall be designed and field balanced so that air flows into the laboratory from adjacent spaces, offices and corridors. The requirement for directional airflow into the laboratory is to contain odors and toxic chemicals. Air supplied to the corridor and adjacent clean spaces must be exhausted through the laboratory to achieve effective negative pressurization. Laboratory HVAC systems shall utilize 100% outdoor air, conditioned by central station air-handling systems to offset exhaust air requirements. Laboratory supply air shall not be recirculated or reused for other ventilation needs.

The building HVAC system shall be designed to provide a purge cycle during the building start-up and when future renovations occur. The purge cycle employs 100% outdoor air to ventilate away fumes and odors generated by construction materials, furnishing, and finishes.

The supply air for all laboratory systems shall be filtered on the upstream side of fans with 30% prefilters and 95% efficient afterfilters. Exhaust air, in general, does not require filtration or scrubbing.

Air supplied to a laboratory space must keep temperature gradients and air turbulence to a minimum, especially near the face of laboratory fume hoods and biological safety cabinets. Air outlets must not discharge into the face of chemical fume hoods. Large quantities of supply air are best provided through perforated plate air outlets or linear diffusers designed for large air volumes. The air supply must not discharge on a smoke detector.

Laboratories using chemicals must remain at a negative air pressure in relation to corridors and other nonlaboratory spaces. Laboratory air shall flow from low hazard to high hazard use areas. Offices shall have natural ventilation with operable windows. Corridor supply air distribution shall be sized to offset transfer air to laboratories while maintaining an overall positive building pressure. Loading and receiving docks must be maintained as positive to prevent the entrance of vehicle fumes.

Control of airflow direction in research laboratories controls the spread of airborne contaminants, protects personnel from toxic and hazardous substances, and protects the integrity of experiments. The once-through principle of airflow is applied based on exhausting 100% of the supplied air; maintaining the required airflow with all exhaust units operating at capacity; and providing directional flow of air from areas of least contamination to areas of greatest contamination.

The ventilation rate for laboratory HVAC systems is driven by three factors: fume hood demand, cooling loads, and removal of fumes and odors from the general laboratory work area. The minimum air-change rate for laboratory space is 1 c.f.m. per square foot regardless of cooling load. Some laboratories may require significantly higher rates to support fume hood demand or to cool high instrument heat loads in equipment laboratories.

Implementation of a recirculating HVAC system administrative areas may be utilized for energy conservation. Recirculating air systems shall provide ventilation conforming to ASHRAE standards and must not affect the pressurization and balance between laboratory and administrative zones. Recirculating air systems shall be completely separate from 100% outdoor air laboratory systems.

PLUMBING

The plumbing systems shall be coordinated with the laboratory planning module. A piping distribution method, including mains, risers, and branch lines, shall be designed to accommodate easy service isolation and system maintenance while minimizing disruption to laboratory functions. Emergency isolation valves must be conveniently located on branch lines so that segments can be taken off line quickly in the event of failures.

Piping systems shall be designed for flexibility and have redundant components to provide reliable and continuous operation. Adequate fluid temperature, pressure, and volume must be delivered to required laboratory functions through conservatively sized pipe mains. Future capacity allowances need to be considered in the building design.

Floor penetrations in laboratories should be avoided. All required penetrations shall use raised sleeved openings sealed and caulked to prevent leakage and maintain the fire rating of the slab.

ELECTRICAL

Laboratories shall have surface mounted aluminum raceways mounted above all benches and at equipment areas. The power duct shall have a continuous 120/208V60A3Ø 4 wire plus ground circuit installed. Twenty ampere taps as needed shall serve receptacles via 20A single pole circuit breakers mounted in the raceway. Receptacles shall be mounted at 24" on center. Receptacles mounted within 36" of water dispensing shall be ground fault interrupter type. A minimum of one 60A3Ø 4 wire circuit shall serve an 11'x22' laboratory module. In addition, a minimum of three 20A circuits per 11'x22' lab module with three duplex receptacles each will be provided.

The following are to be connected to standby power.

- Fume hood exhaust fans
- Incubators, refrigerators, freezers, cold rooms, warm rooms
- Biological safety cabinets

Voice and data outlets shall be prewired using accessible cable trays and conduit as required. The location and number of voice/data outlets must be carefully evaluated in the design phase.

HEALTH AND SAFETY

Fume hoods shall be tested in accordance with the latest version of ASHRAE Standard 110, after installation but before acceptance by the construction project manager. In general, the fume hoods shall be tied into the laboratory area exhaust system, with no separate exhaust stack.

Vacuum pump systems will have hydrophobic (water-resistant) filters on the suction side, with the exhaust to the outside of the building and not into mechanical spaces. The filter housing shall be designed for easy replacement of the filter, with maximum protection of maintenance employee from possible contamination.

Safety shower/emergency eyewash will be provided in corridors and will serve more than one laboratory; Safety showers shall be no more than 75 feet from any point in the laboratory.

Casework and tops shall be designed to be as vertically flush as possible. Kneehole space shall be provided for waste containers.

Flammable storage cabinets will be incorporated into the design of laboratories. Flammable storage cabinets are to be located as remote as possible from the exit doors of the laboratory. Flammable storage cabinets shall be vented.

Inert gas cylinders will be secured to a vertical surface out of the way of traffic.

Space for waste boxes will be provided in the laboratories.

ROOM DATA SHEETS

BIOENGINEERING BUILDING MASTER PLAN DPP

8.2.0

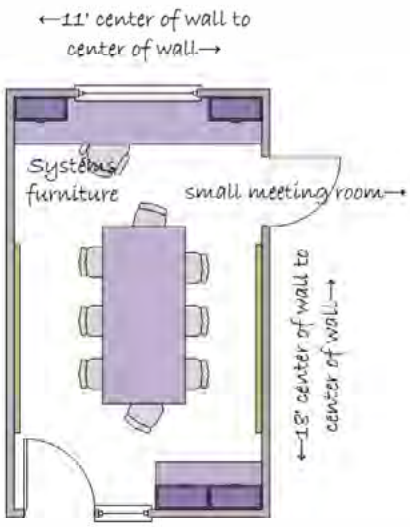
ADMINISTRATIVE OFFICES

BIOENGINEERING BUILDING MASTER PLAN DPP

8.2.1

Chair Office

Bioengineering
180 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: Near Bioeng. Staff offices
Next to small meeting room
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v 15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

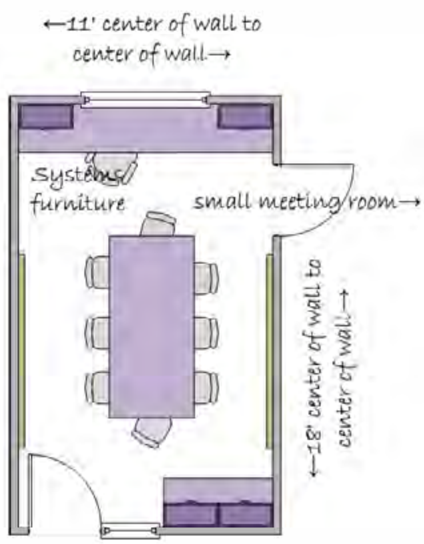
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Systems furniture
Marker Boards
Chairs

Director Office

ICB

180 a.s.f.



ARCHITECTURAL

Occupancy: B
Adjacency: Near ICB staff offices
Next to small meeting room
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL

Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL

Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING

None

ELECTRICAL

110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT

None

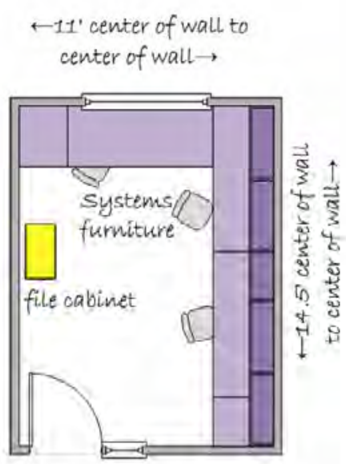
UNIVERSITY FURNISHED EQUIPMENT

Systems furniture
Marker Boards
Chairs

LABORATORY DESIGN REQUIREMENTS

Staff Office

Bioengineering
140 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near Bioeng. Reception office
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

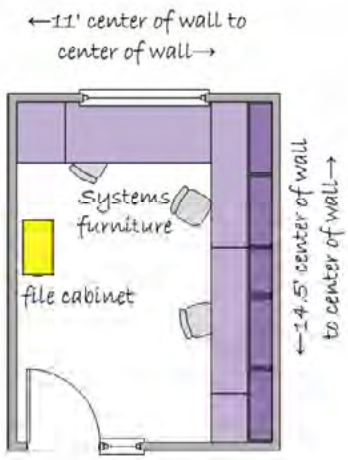
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Systems furniture
Marker Board
Chairs

Staff Office

ICB

140 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near ICB reception office
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

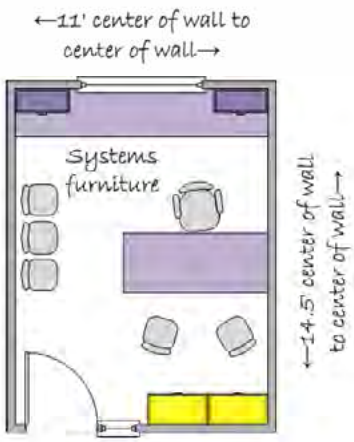
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Systems furniture
Marker Boards
Chairs

Reception Office

Bioengineering

140 a.s.f.



ARCHITECTURAL

Occupancy: B
Adjacency: near Bioeng. staff offices
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL

Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL

Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING

None

ELECTRICAL

110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT

None

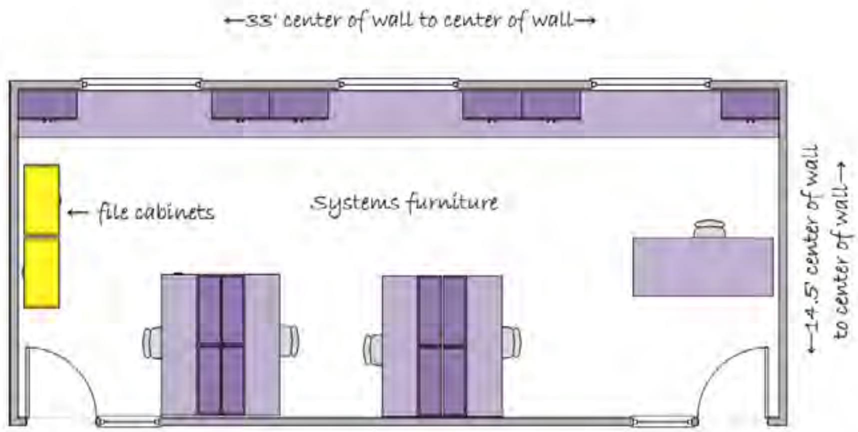
UNIVERSITY FURNISHED EQUIPMENT

Systems furniture
Marker Board
Chairs

Reception Office

ICB

433 a.s.f.



Architectural

Occupancy: B
Adjacency: near ICB staff offices
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

Structural

Vibration Attenuation: 8000 microinches/sec. or less

Mechanical

Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

Plumbing

None

Electrical

110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

Contractor Furnished Equipment

None

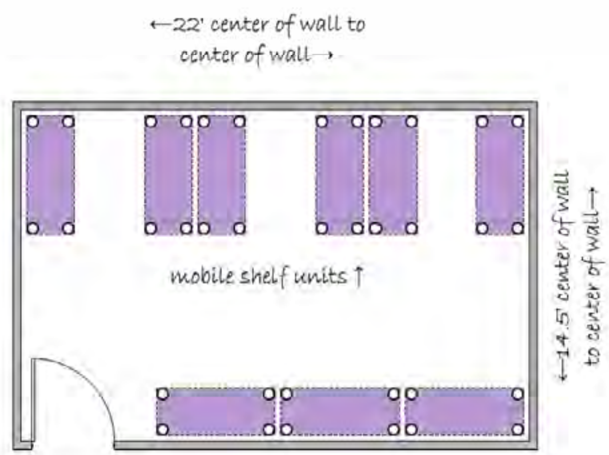
University Furnished Equipment

Systems furniture
Marker Boards
Chairs

Storage Room

Bioengineering

226 a.s.f.



ARCHITECTURAL

Occupancy: B
Adjacency: near Bioeng. Staff office
Floor: sealed concrete
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 42" x 96"
Security: Key access at door

STRUCTURAL

Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL

Temp: 72 deg. F +/- 2 deg. F
Recirculated air
Humidity: ambient

PLUMBING

None

ELECTRICAL

110v15a outlets
Hardwire and wireless data
Lighting: fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT

None

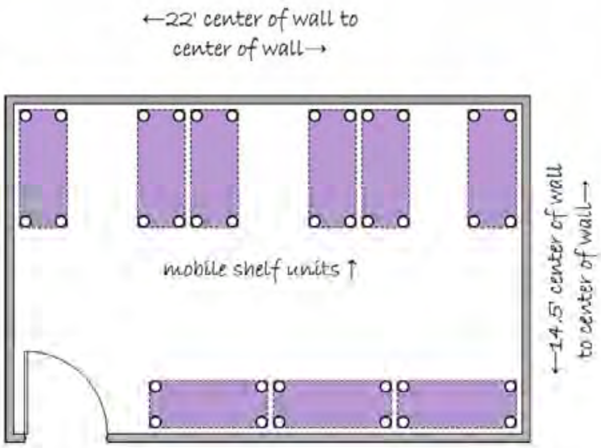
UNIVERSITY FURNISHED EQUIPMENT

Mobile shelf units

Storage Room

ICB

226 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near ICB staff office
Floor: sealed concrete
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 42" x 96"
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Recirculated air
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v 15a outlets
Hardwire and wireless data
Lighting: fluorescent at 60 f.c

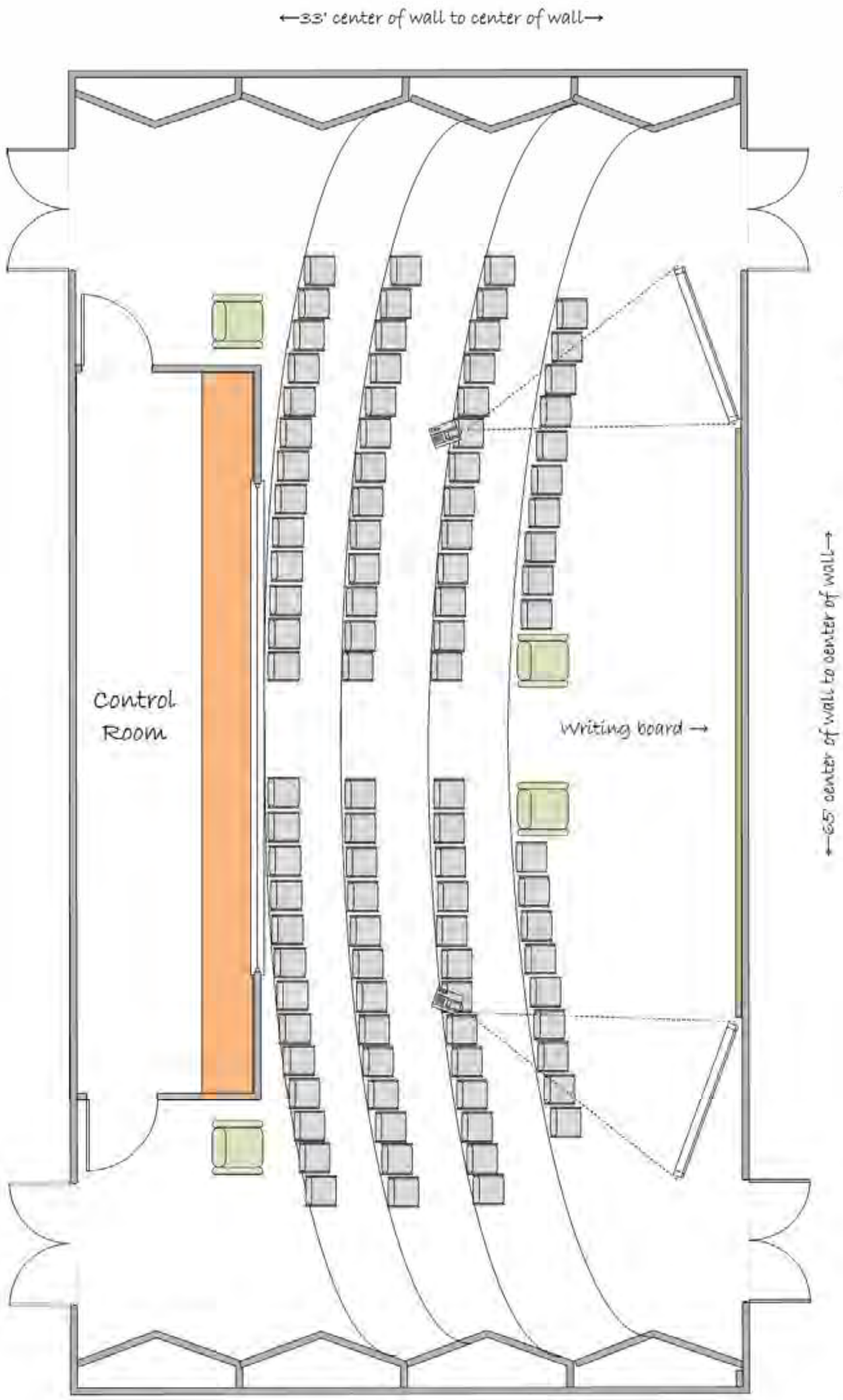
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Mobile shelf units

OFFICE SUPPORT FUNCTIONS

8.2.10

Lecture Hall
2096 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: First floor
Floor: static dissipating carpet
Walls: acoustic panels, gypsum board, enamel paint
Ceiling: acoustic tile, 18' minimum
Door: 36/36"pair x9 6"
Sound Attenuation: NC 35 or less
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Recirculated air
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

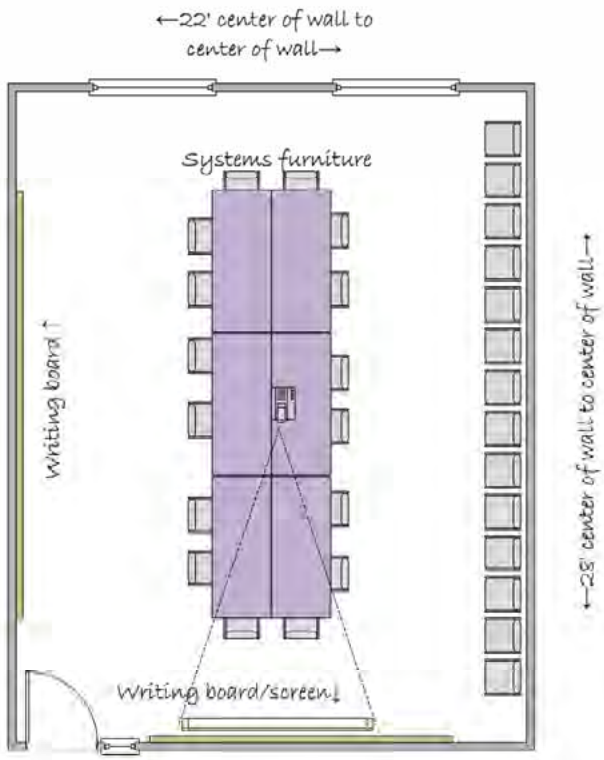
CONTRACTOR FURNISHED EQUIPMENT
Conduit, power for projection system
Screens
Fixed, tiered seating

UNIVERSITY FURNISHED EQUIPMENT
Projection system
Marker boards

Note: Consider flat floor with mobile seating as an option

Conference Room

591 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: None
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36"x96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Recirculated air
Humidity: ambient

PLUMBING
None

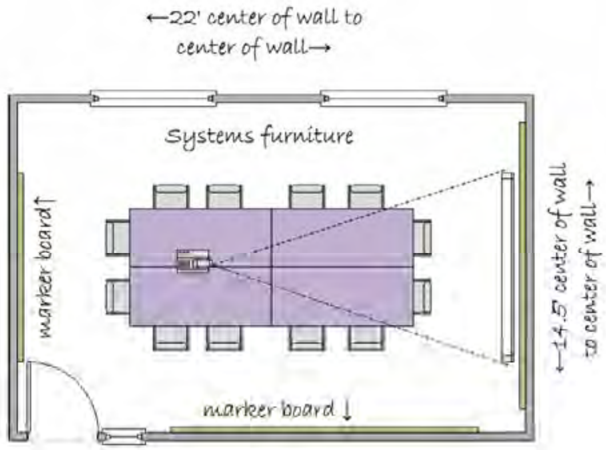
ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Conduit, power for projection system
Screen

UNIVERSITY FURNISHED EQUIPMENT
Tables, chairs
Projection system
Marker boards

Small Conference Room

301 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: Near administrative areas
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36"x96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Conduit, power for projection system
Screen

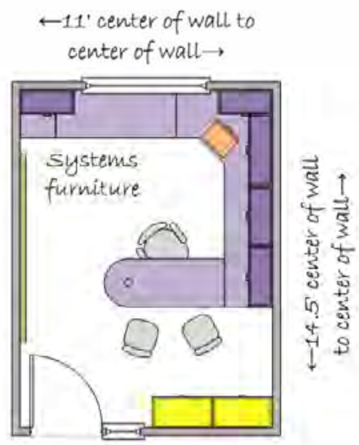
UNIVERSITY FURNISHED EQUIPMENT
Tables, chairs
Projection system
Marker boards

ACADEMIC OFFICES

BIOENGINEERING BUILDING MASTER PLAN DPP

8.2.14

P.I. Office
140 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other faculty offices
On same floor as laboratory
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
None

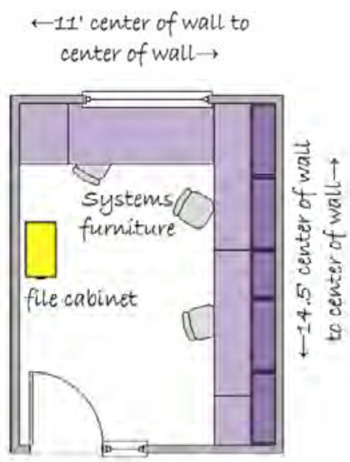
ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Systems furniture
Marker Board
Chairs

LABORATORY DESIGN REQUIREMENTS

P.D./G.S. Office
140 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other P.D./G.S. offices and near labs
On same floor as laboratory
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
None

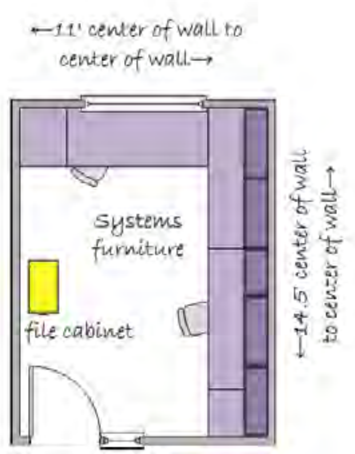
ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Systems furniture
Marker Board
Chairs

Visiting Faculty Office

140 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other faculty offices
On same floor as laboratory
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Systems furniture
Marker Boards
Chairs

SHARED OFFICE SPACE

Kitchen/Coffee Bar

110 a.s.f.

ARCHITECTURAL
Occupancy: B
Adjacency: Near labs
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 40 or less
Light Attenuation: at exterior windows

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
Natural ventilation
Humidity: ambient

PLUMBING
Domestic hot/cold water

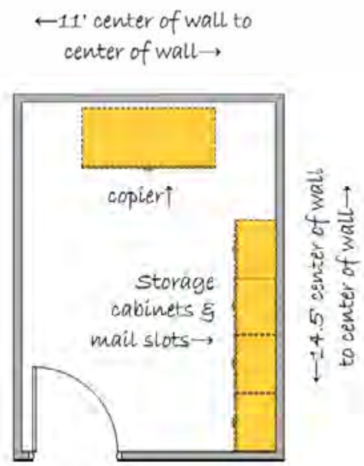
ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Wood casework
Sink, tops

UNIVERSITY FURNISHED EQUIPMENT
Table, chairs
Microwave
Undercounter refrigerator
Coffee machine

Copy/Mail Room

140 a.s.f.



ARCHITECTURAL

Occupancy: B
Adjacency: near administrative areas
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 9' minimum
Door: 42"x96"
Sound Attenuation: NC 45 or less
Security: Key access at door

STRUCTURAL

Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL

Temp: 72 deg. F +/- 2 deg. F
Recirculated air
Humidity: ambient

PLUMBING

None

ELECTRICAL

208v30a1ph for copier
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT

None

UNIVERSITY FURNISHED EQUIPMENT

Copier
Mail slot cabinets

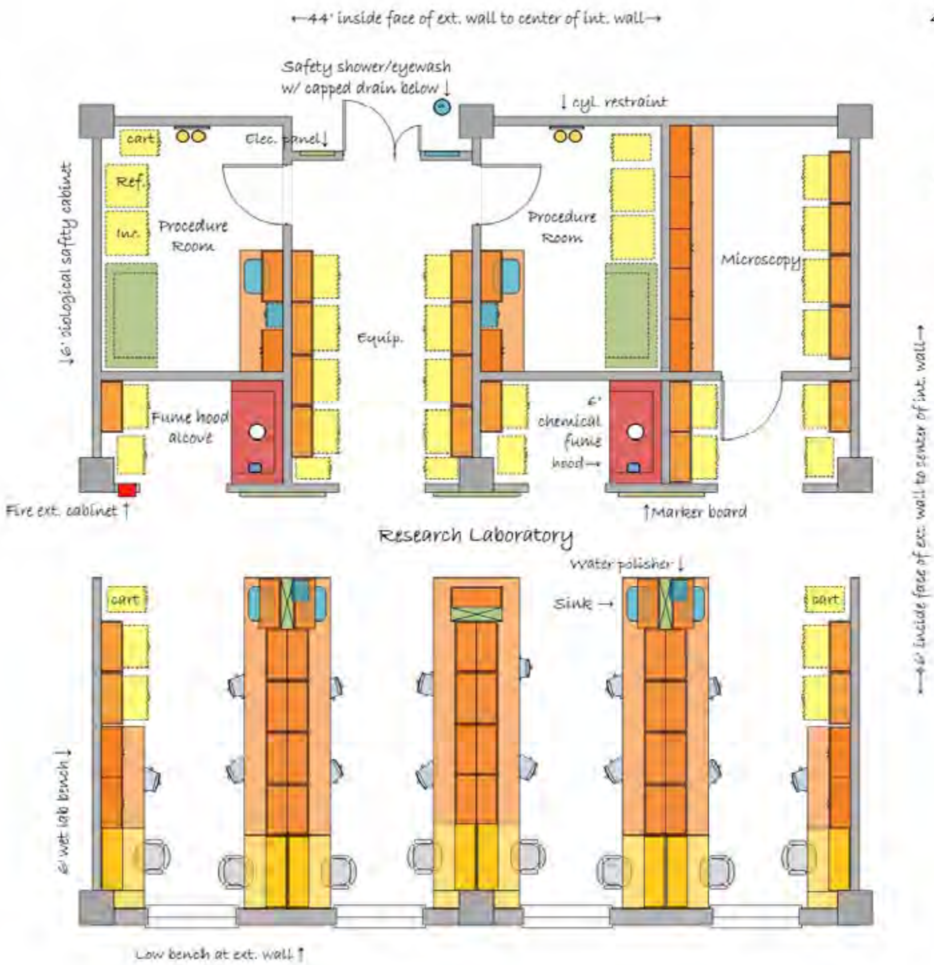
RESEARCH LABORATORIES

BIOENGINEERING BUILDING MASTER PLAN DPP

8.2.21

Research Laboratory

1979 a.s.f.



ARCHITECTURAL

Occupancy: B
Adjacency: Paired with other lab unit to form one PI Lab
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: open to structure in main lab, entry, and fume hood alcove
9' acoustic ceiling in procedure room (mylar tile)
9' acoustic ceiling in microscopy room
Doors: 36"/18" x 96" pair at lab entry
42" x 96" at Procedure Room and Microscopy Room
Sound Attenuation: NC 45 or less
Light Attenuation: at exterior windows
Security: Card reader access at lab entry

STRUCTURAL

Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL

Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Air change rate may be higher
due to equipment heat gain: 25 btuh/sf
Humidity: 30-50%

PLUMBING

Industrial hot/cold water
RO/DI Pure water (Type II)
Domestic water at safety shower/eyewash
Capped drain at safety shower
Natural gas and vacuum
Compressed air- 30 p.s.i.
Specialty gases (inert)

ELECTRICAL

208v30a1ph; 110v20a
Standby power
Cable tray
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT

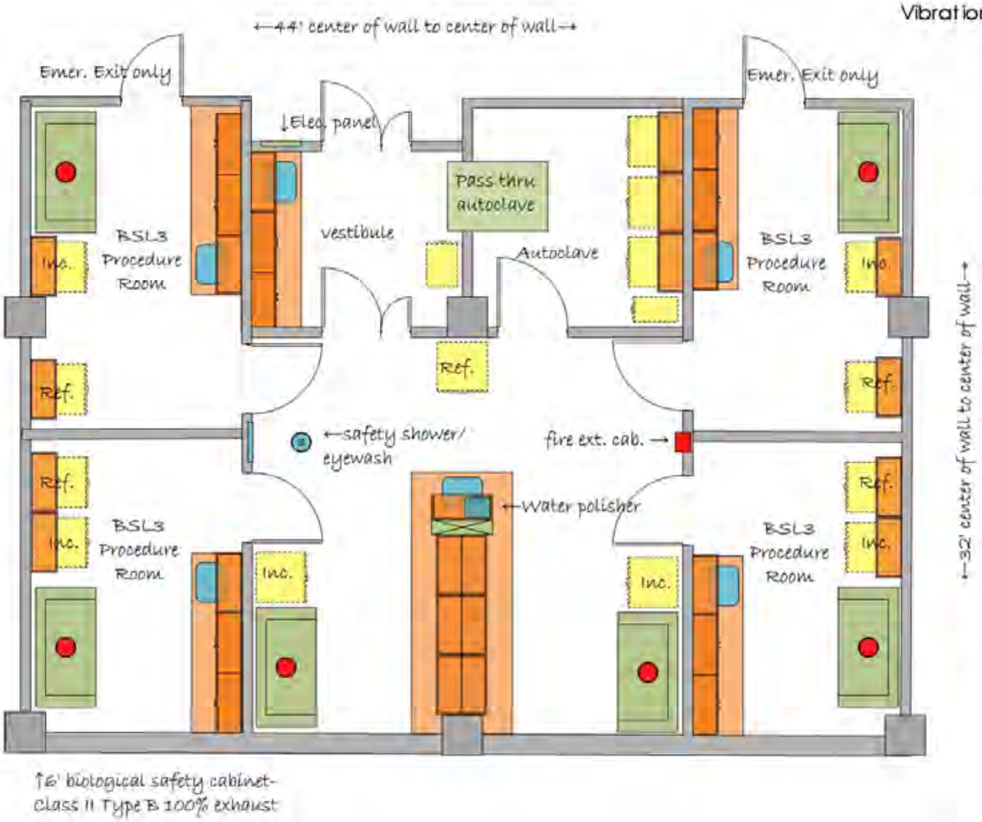
Chemical Fume Hoods
Wood casework: base cabinets, wall cabinets,
Adjustable shelves, sinks, tops

UNIVERSITY FURNISHED EQUIPMENT

Scientific Equipment
Biological safety cabinets
Incubators, refrigerators, freezers
Analytical benchtop instruments
Marker Boards
Chairs

BSL3 Laboratory

1370 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: None required
Floor: seamless rubber
Walls: gypsum board, epoxy paint
Ceiling: gypsum board, epoxy paint; 9' minimum
Doors: 36"/18" x 96" pair at lab entry
42"x96" doors at procedure rooms
Sound Attenuation: NC 45 or less
Security: Card reader access at lab entry

STRUCTURAL
Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Air change rate may be higher due to equipment heat gain: 50 btuh/sf
Humidity: 30-50%

PLUMBING
Industrial hot/cold water
RO/DI Pure water (Type II)
Domestic water at safety shower/eyewash
Natural gas and vacuum
Specialty gases (inert)

ELECTRICAL
208v30a1ph; 110v20a
Standby power
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

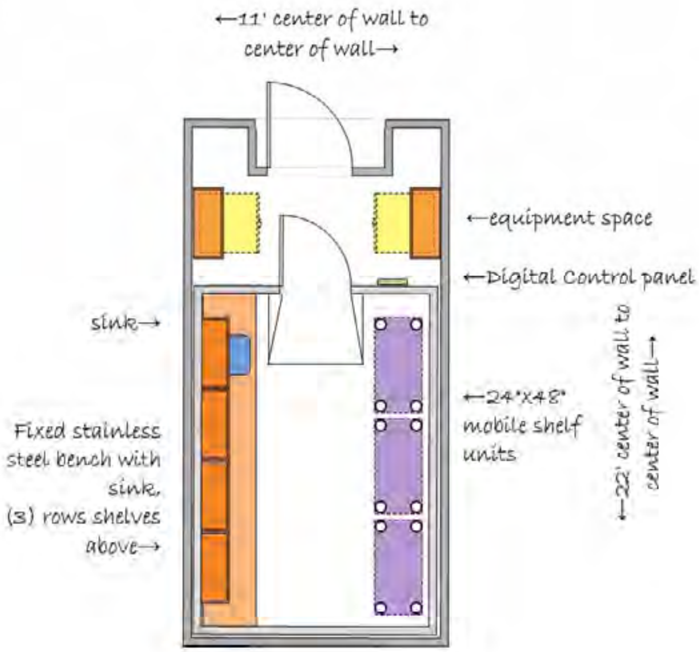
CONTRACTOR FURNISHED EQUIPMENT
(6) Biological safety cabinets- Class II Type B- 100% exhaust
Pass thru autoclave- 20x20x38 chamber
Stainless steel casework: base cabinets, wall cabinets, Adjustable shelves, sinks, tops

UNIVERSITY FURNISHED EQUIPMENT
Scientific Equipment
Refrigerators, incubators, carts
Analytical benchtop instruments
Chairs

SHARED LAB SUPPORT

Cold Room- 4° C

163 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other lab support rooms
Floor: 1" insulated panel
Walls: 4" insulated metal panel
Ceiling: eggcrate, 8'
Doors: 36"x84 insulated with view window at cold room
42"x96" at vestibule entry
Sound Attenuation: NC 50 or less
Security: Card reader access at entry

STRUCTURAL
Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL
Temp: 4 deg. C
Exhaust: 50 cfm
Humidity: 30-50%

PLUMBING
Industrial Cold Water
Connect cold water condensate to sink drain

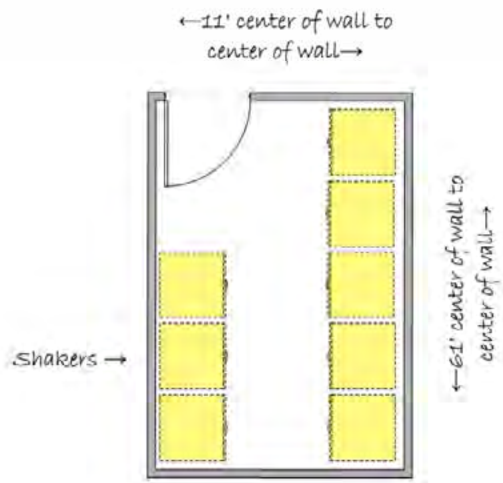
ELECTRICAL
110v20a
Standby power
Hardwire and wireless data
Lighting: fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Stainless steel casework
Mobile shelf units
Locate water cooled compressor unit at rooftop or in ceiling cavity

UNIVERSITY FURNISHED EQUIPMENT
Scientific instruments

Warm Room- 25-40° C

163 a.s.f.



Architectural

Occupancy: B
Adjacency: near other lab support rooms
Floor: sealed concrete
Walls: gypsum board, enamel paint, insulated
Ceiling: gypsum board, enamel paint, insulated
Doors: 42"x96" at entry
Sound Attenuation: NC 50 or less
Security: Card reader access at entry

Structural

Vibration Attenuation: 2000 microinches/sec. or less

Mechanical

Temp: 37 deg. C
100% exhaust: 1 c.f.m./s.f
Humidity: 30-40%

Plumbing

None

Electrical

110v20a
Standby power
Hardwire and wireless data
Lighting: fluorescent at 60 f.c

Contractor Furnished Equipment

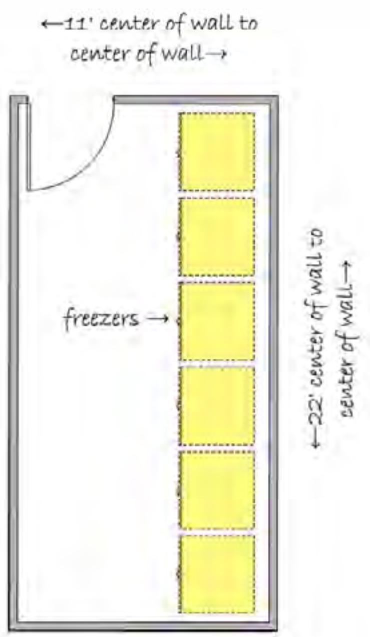
None

University Furnished Equipment

Shakers

Freezer Room

226 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other lab support rooms
Floor: sealed concrete
Walls: gypsum board, enamel paint
Ceiling: open to structure
Doors: 42" x 96" at entry
Sound Attenuation: NC 50 or less
Security: Card reader access at entry

STRUCTURAL
Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Air change rate may be higher due to equipment heat gain: 75 btuh/sf
Humidity: 30-50%

PLUMBING
None

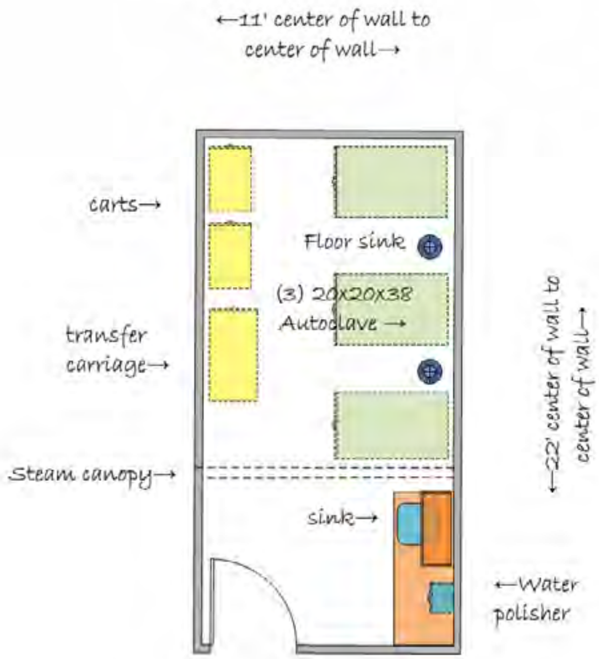
ELECTRICAL
208v30a1ph; 110v20a
Standby power
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Freezers
Nitrogen Dewars

Autoclave Room

226 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other lab support rooms
Floor: sealed concrete
Walls: gypsum board, enamel paint
Ceiling: gypsum board, enamel paint
Doors: 42" x 96" at entry
Sound Attenuation: NC 50 or less
Security: Card reader access at entry

STRUCTURAL
Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Air change rate may be higher due to equipment heat gain: 75 btuh/sf
Humidity: 30-50%

PLUMBING
Industrial hot/cold water
RO/DI Pure water (Type II)
Floor sink

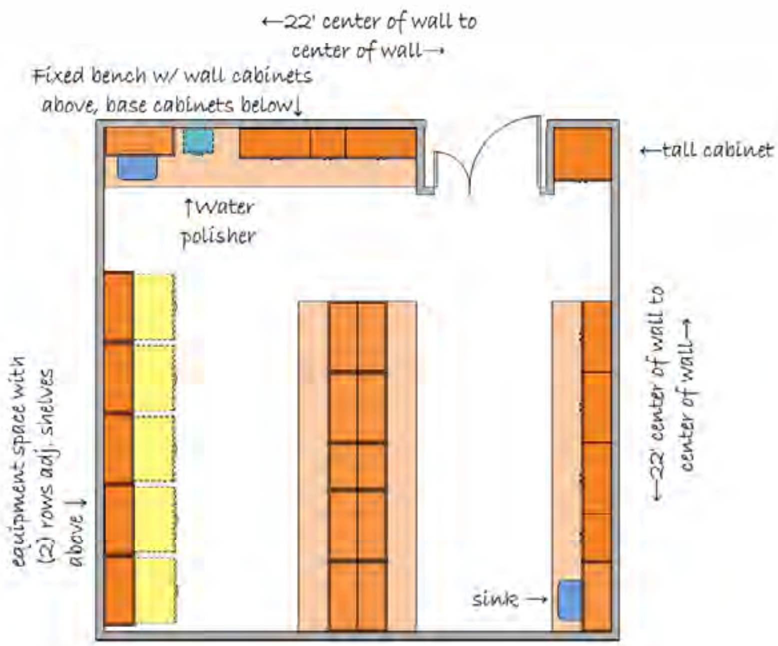
ELECTRICAL
480v30a3ph at autoclaves with disconnect
110v20a
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Stainless steel casework: base cabinets, wall cabinets, sinks, tops

UNIVERSITY FURNISHED EQUIPMENT
Autoclaves- 20x20x38 chamber
Transfer carriage, carts

Media Prep

462 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other lab support rooms
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: mylar acoustic tile, 9' minimum
Doors: 36"/18" x 96" pair at entry
Sound Attenuation: NC 50 or less
Security: Card reader access at entry

STRUCTURAL
Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Air change rate may be higher due to equipment heat gain: 50 btuh/sf
Humidity: 30-50%

PLUMBING
Industrial hot/cold water
RO/DI Pure water (Type II)
Natural gas and vacuum

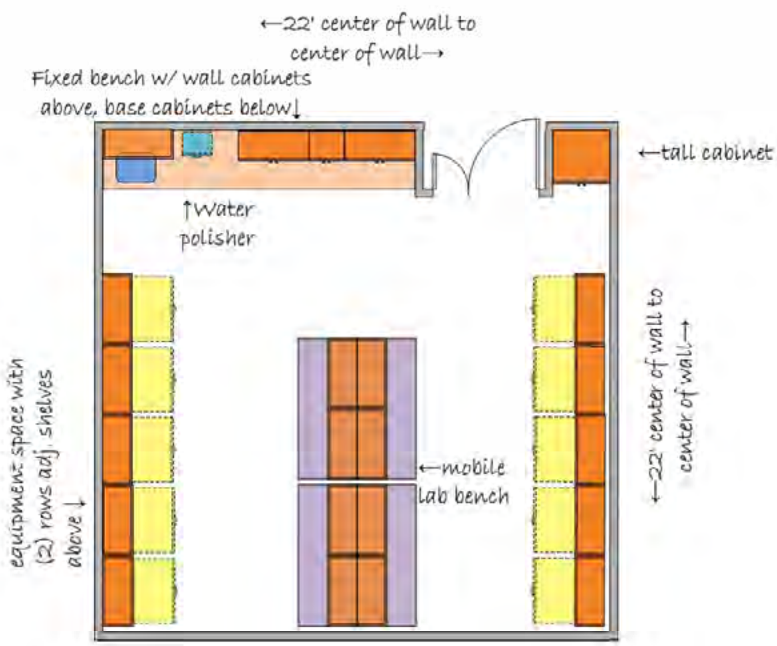
ELECTRICAL
208v30a1ph; 110v20a
Standby power
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Stainless steel casework: base cabinets, wall cabinets, Adjustable shelves, sinks, tops

UNIVERSITY FURNISHED EQUIPMENT
Scientific Equipment
Analytical benchtop instruments
Chairs

Procedure/Equipment Room

462 a.s.f.



ARCHITECTURAL
Occupancy: B
Adjacency: near other lab support rooms
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 9' minimum
Doors: 36"/18" x 96" pair at entry
Sound Attenuation: NC 50 or less
Security: Card reader access at entry

STRUCTURAL
Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Air change rate may be higher due to equipment heat gain: 50 btuh/sf
Humidity: 30-50%

PLUMBING
Industrial hot/cold water
RO/DI Pure water (Type II)
Natural gas and vacuum
Compressed air
Specialty gases (inert)

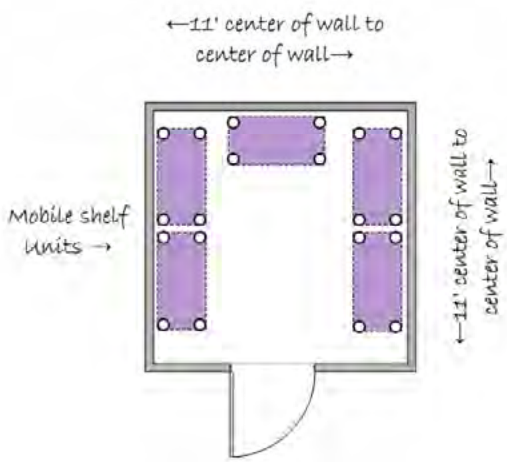
ELECTRICAL
208v30a1ph; 110v20a
Standby power
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Wood casework: base cabinets, wall cabinets, Adjustable shelves, sinks, tops

UNIVERSITY FURNISHED EQUIPMENT
Scientific Equipment
Analytical benchtop instruments
Chairs

Bio/Chem Waste

110 a.s.f.



Architectural

Occupancy: B
Adjacency: First floor
Floor: sealed concrete
Walls: gypsum board, enamel paint
Ceiling: open to structure
Doors: 42" x 96"
Security: Card reader access at entry

Structural

Vibration Attenuation: 2000 microinches/sec. or less

Mechanical

Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Humidity: 30-50%

Plumbing

None

Electrical

110v20a
Lighting: indirect fluorescent at 50 f.c

Contractor Furnished Equipment

None

University Furnished Equipment

Mobile shelf units

LANDSCAPE DESIGN

9.0.0

LANDSCAPE DESIGN

The site is located directly east of Davidson Library and is connected to the larger campus by major campus corridors: North-south corridors Science Walk, directly east of the site, and Library Mall, west of Davidson Library are flanked by major east-west corridors of Pardall Mall and the Campus Green.

The north-south corridors are intended to have "skyline" trees that visually and spatially define circulation routes and give each major corridor a distinct identity. Science Walk is planted with Eucalyptus globulus and can be replaced as necessary with species of similar habit, such as Eucalyptus grandis, E. saligna or E. melliodora. Library Corridor has been planted with tall palms such as Washingtonia filifera (California fan palm), Phoenix dactylifera (Date palm) or Jubaea chilensis (Chilean wine palm). The major east-west corridors of Pardall Mall and Campus Green, are wide and feature a central planting area with large specimen trees in an informal pattern. Specimen trees in both corridors have been planted with space around them to display their form, rather than in rows or groves and to avoid blocking views.

Irrigation for the site should be connected with the existing central irrigation system. Moisture sensors should be utilized and minimal water consumption encouraged.

Landscape Concept Description

General Site Goals:

- Reinforce and strengthen relationship to the Pardall Mall. Site the building to enhance and define its location on the mall with distinctive entry opportunities.
- Utilize skyline trees along East/west and north/south circulation corridors to enhance campus identity and way finding opportunities.
- Maintain and enhance view corridors by framing with trees and orienting views to lagoon and the ocean.
- Safe and clear hierarchy of circulation systems integrating various circulation systems (pedestrians, bicycles, service and vehicular).
- Incorporate bicycle parking courts with tree bosques at new facility and on Pardall Mall to provide shade and alternative site uses.
- Relocate the bicycle path that currently bisects the proposed site, to effectively connect with Pardall Mall and campus-wide bike path system.

Other Site-Wide Concepts

Sustainable Measures. Develop a sustainable materials palette. Integrate permeable paving wherever possible as well as a low water usage plant palette. Minimize the amount of high maintenance turf.

Plant Palette. Proposed plantings should be drought tolerant, low maintenance and offer seasonal interest. The tree, shrub and groundcover palette should be in compliance with the Campus LRDP. Plantings should be selected based on their ability to withstand seacoast conditions, wind, create shade and regulate temperature.

Pedestrian Linkages/Paving. Coordination of the pedestrian routes through and around the site to connect to the campus-wide circulation system and adjacent facilities, such as the Davidson Library colonnade.
Paving materials and patterns used throughout the Bio-Engineering Building will enhance the overall design and tie into the campus–wide materials palette. Consistent with the LRDP, enhanced paving at the entries and proposed gathering nodes will distinguish the new building from others in the precinct and from other campus buildings.

Site Furnishings. Site furnishings should complement furnishings used throughout the campus and should be selected based on durability, ease of maintenance, comfort and ADA accessibility. Movable tables and chairs are recommended at gathering nodes. Provide seating along the Corridors.

Lighting. Reinforce the campus–wide family of lighting types along major pedestrian connections. Site lighting will consist of pole lights, bollards, step lights, and landscape accent lights to afford clear, safe circulation and satisfy security requirements.

Irrigation. Irrigation should be tied into existing points of connection and a new automatic controller should be provided as part of the project. To accurately assess the soil profile, moisture sensors should be included as a part of the required irrigation equipment. A deep water application for proposed trees is recommended.

Key

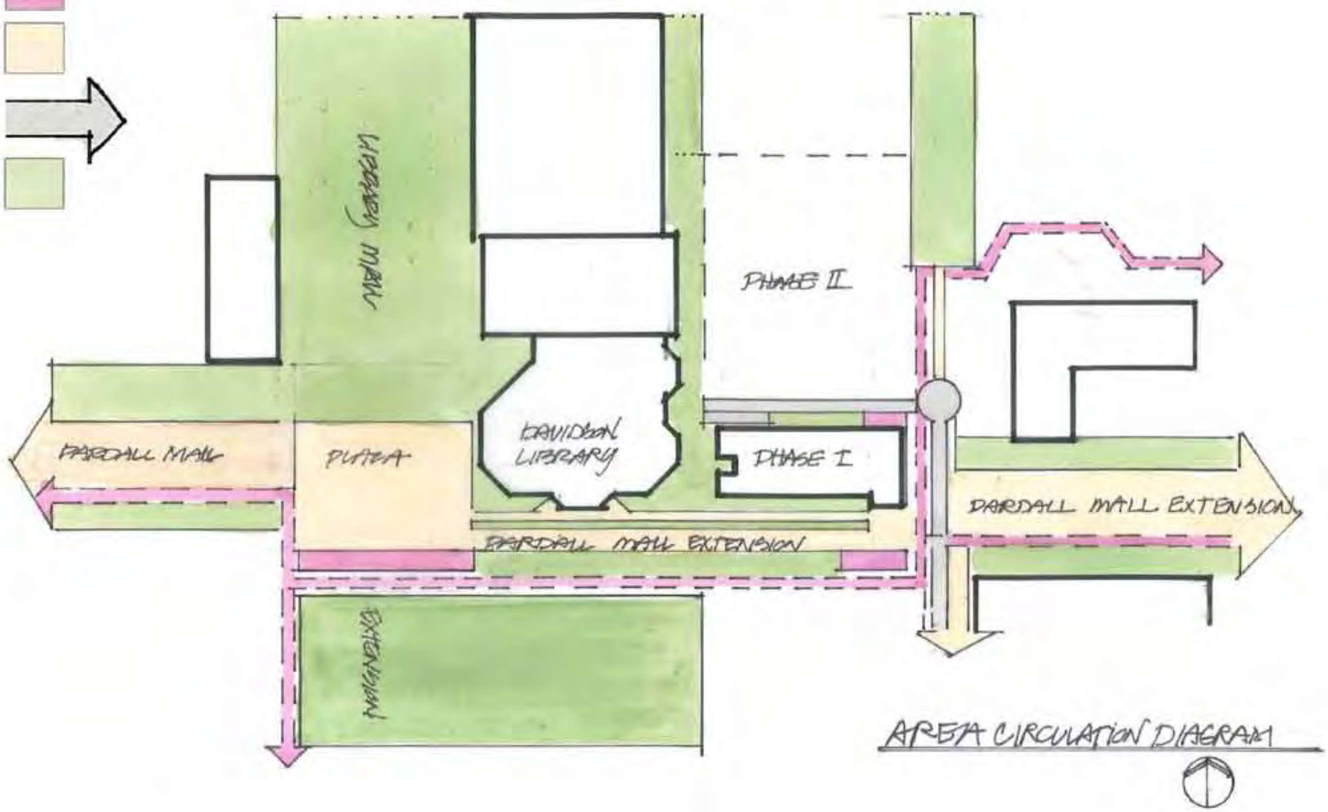
Bicycle

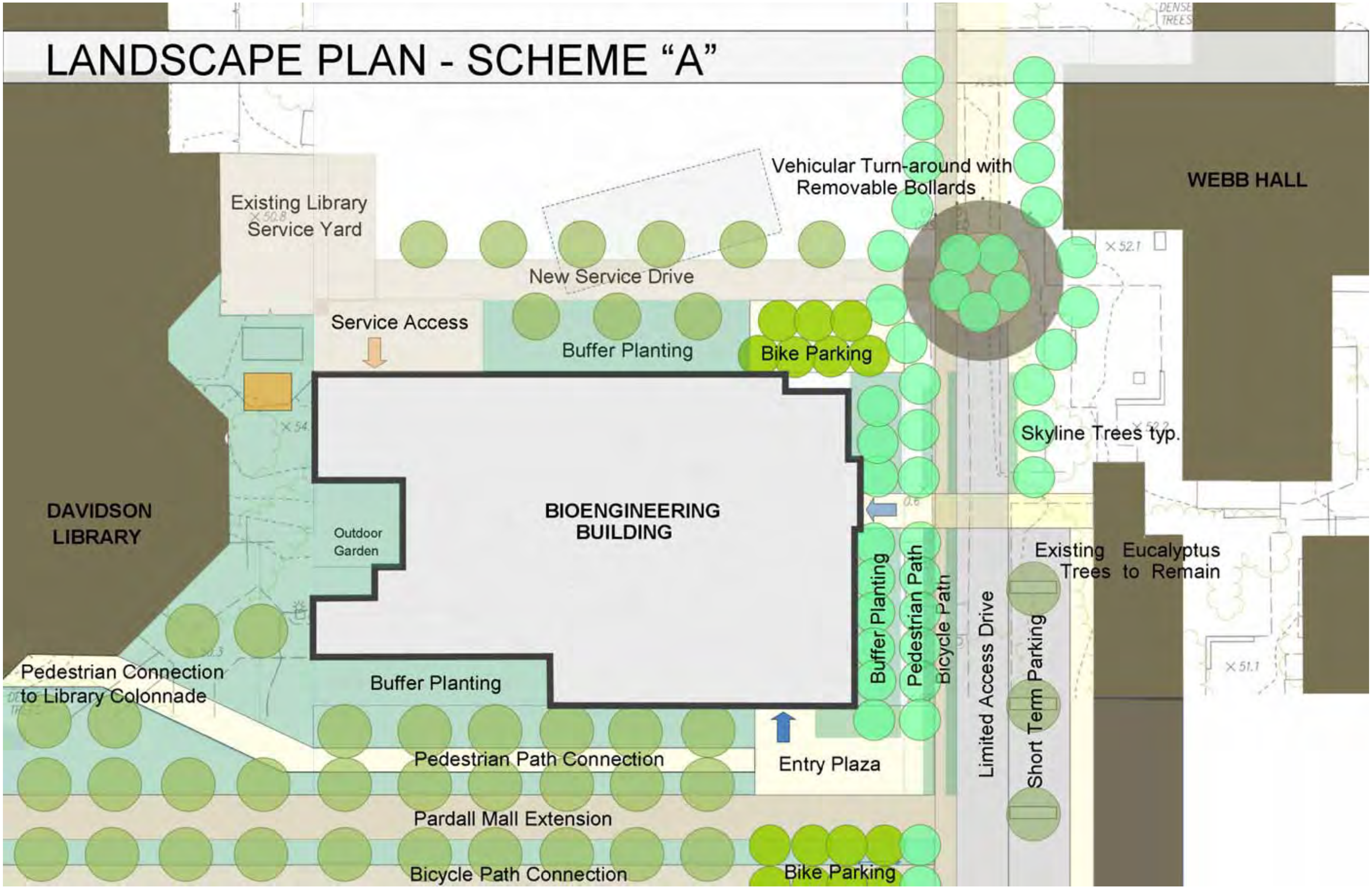
Bike parking court

Pedestrian

Vehicular/service

Open space




LANDSCAPE PLAN - SCHEME "A"
Existing Library Service Yard
New Service Drive
Vehicular Turn-around with Removable Bollards
WEBB HALL
Service Access
Buffer Planting
Bike Parking
Skyline Trees typ.
DAVIDSON LIBRARY
Outdoor Garden
BIOENGINEERING BUILDING
Existing Eucalyptus Trees to Remain
Buffer Planting
Pedestrian Path
Bicycle Path
Limited Access Drive
Short Term Parking
Pedestrian Connection to Library Colonnade
Buffer Planting
Pedestrian Path Connection
Entry Plaza
Pardall Mall Extension
Bicycle Path Connection
Bike Parking

CIVIL

BIOENGINEERING BUILDING MASTER PLAN DPP

10.0.0

A. SITE REQUIREMENTS

1. The UCSB Bioengineering Building Phase I Project will consist of a 4 story building over a partial basement. Geotechnical investigations in the general area of the project were performed in 2004 by Fugro West Inc.

2. The building will have a footprint of 19,750 GSF if Scheme A is selected, or 17,250 GSF if Scheme B is selected, and will propose a bike parking area to the North of the project as well as a new north south bike lane and limited use roadway and parking to the East of the structure.

3. The project occupies a site that had underground tanks that were previously removed according to the university but might have some contaminants that will need to be remediated prior to start of grading and foundation operations.

4. The project will be designed to aim towards LEED Silver equivalent and needs to comply to all state, local and federal guidelines for storm water management during and post construction. The infrastructure shall comply with the latest edition of Standard Plans and Specifications for Public works. Best Management practices and Storm water Pollution Management Plan will be implemented as part of the project.

5. During the design phase, this project will require a comprehensive Soils Report.

B. EXISTING SITE CONDITIONS – SITE ANALYSIS

1. The existing site conditions are adequate for the proposed new building as reported by the geotechnical report. Site preparation will involve removal and re-compaction of up to 3 feet of the existing site soils in preparation for the foundation system chosen by the structural engineer.

2. Approximately 5,000 cubic yards of soils will have to be removed and replaced with engineered fill – existing soils might not be suitable for the engineered fill and would have to be approved by the geotechnical consultant.

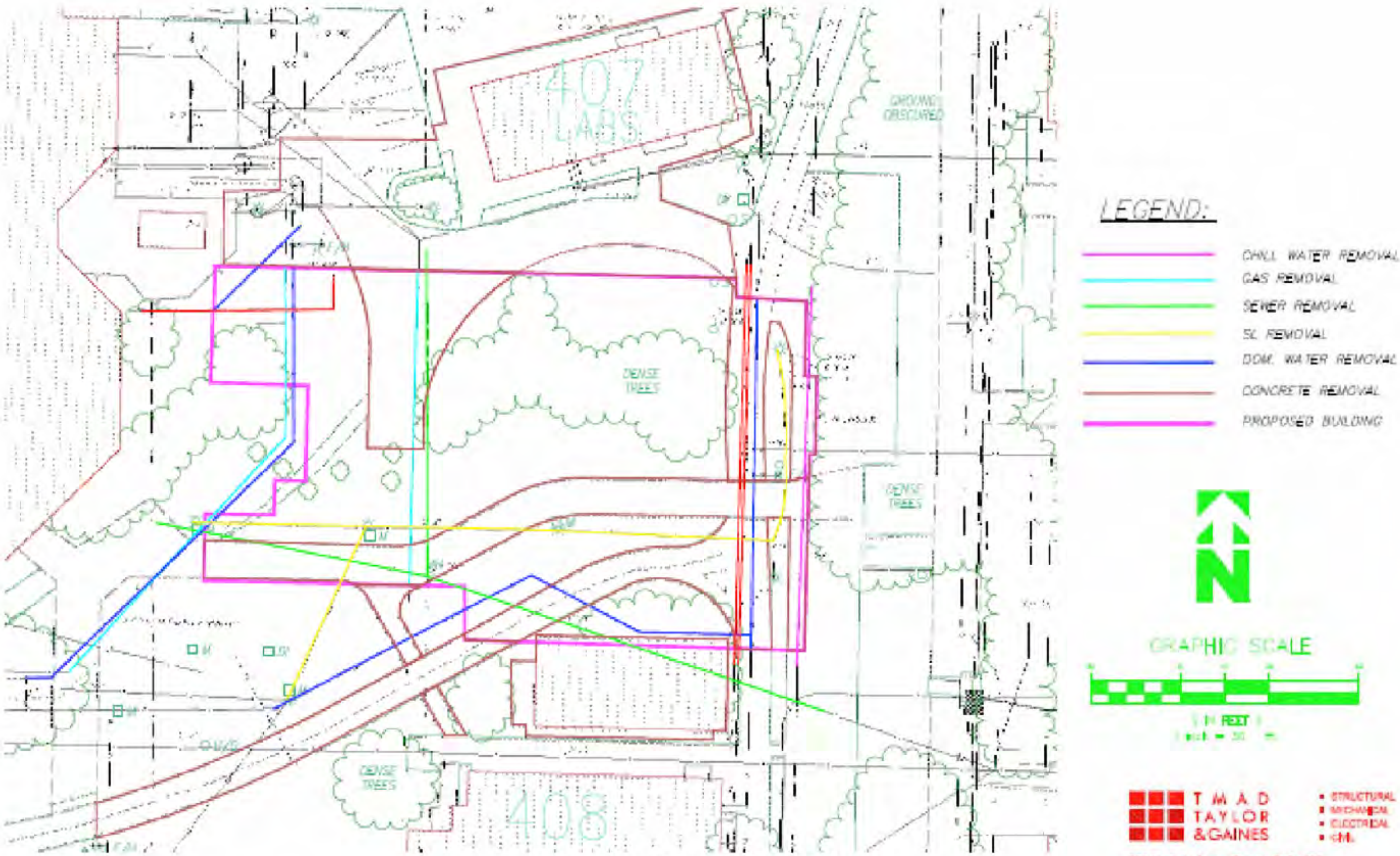
3. The project will require removal of up 10,000 square feet of slab removal including portions of the bike path that will have to be replaced, trees, five light poles, 324 linear feet of street light , 342 linear feet of electrical line,269 linear feet of gas line, 127 linear feet of chilled water line, removal of 1 fire hydrant and 529 linear feet of water lines, removal of 343 linear feet of sewer and 1 sewer manhole.

4. This project will require building 346 to be relocated and building 407 to be demolished.

C. SITE UTILITIES AND DEVELOPMENT

1. The project will require 246 linear feet of 6 inch PVC sewer line and 2 manholes, 542 linear feet of 8 inch storm drain pipe, 208 linear feet of 4 inch perforated pipe around all basement area also including the tunnel and 6 – 24x24 area drains with fossil fuel inserts (kristar floguard or equal), 5 roof downspouts with fossil fuel filters (kristar floguard or equal, 1 fire hydrant) 611 linear feet of 2 inch PVC water line, 237 linear feet of chilled water line, 464 linear feet of 1 inch gas line and 541 linear feet of electrical line.

2. New paving, walkways, limited access drive aisle and parking will require a combined paving of 21,200 sf.

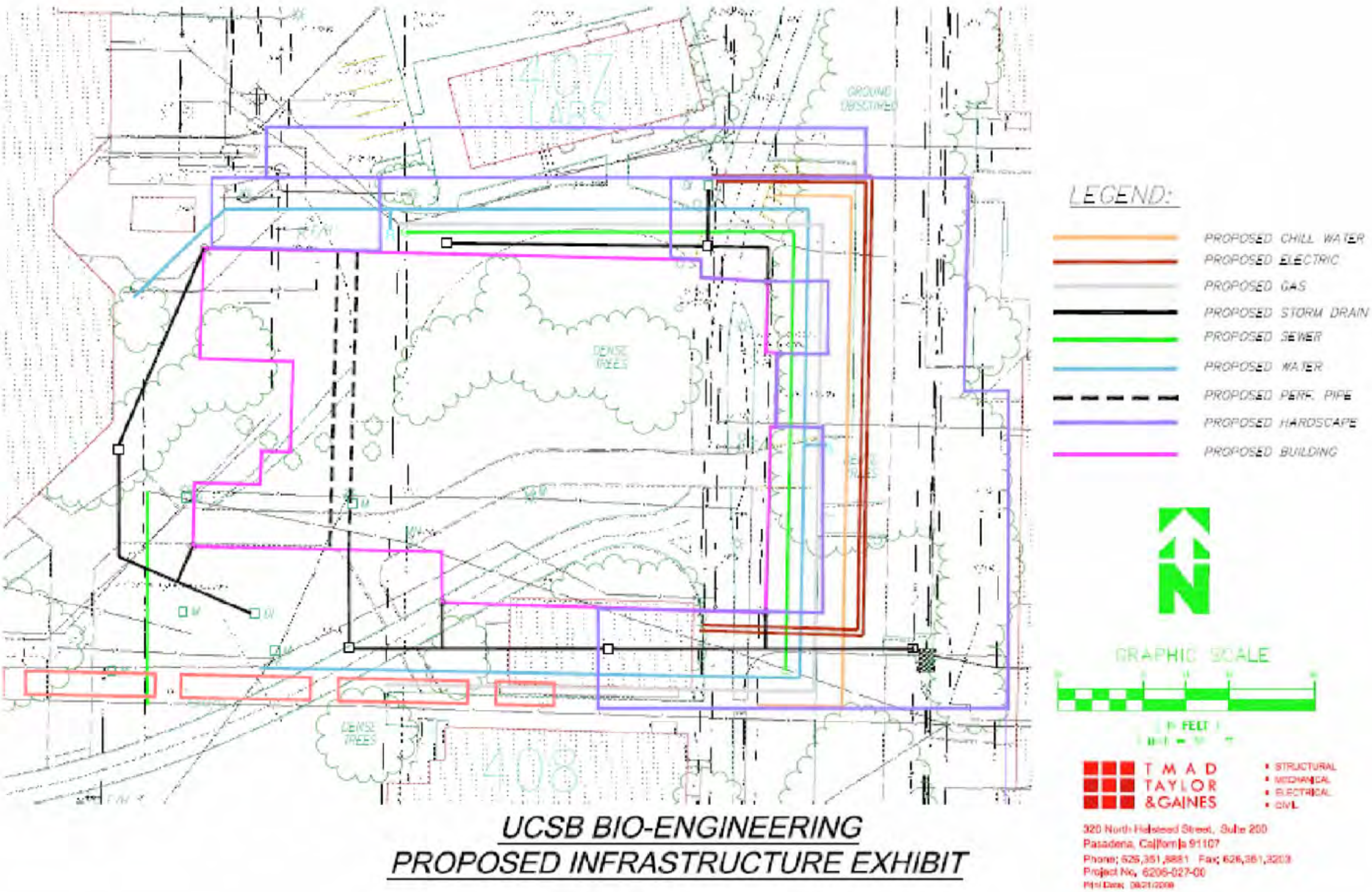


UCSB BIO-ENGINEERING
EXISTING INFRASTRUCTURE REMOVAL EXHIBIT

T M A D
TAYLOR
& GAINES

- STRUCTURAL
- MECHANICAL
- ELECTRICAL
- CIVIL

320 North Halstead Street, Suite 200
Pasadena, California 91107


GROUND OBSCURED
DENSE TREES
DENSE TREES
DENSE TREES
407
408
LEGEND:
PROPOSED CHILL WATER
PROPOSED ELECTRIC
PROPOSED GAS
PROPOSED STORM DRAIN
PROPOSED SEWER
PROPOSED WATER
PROPOSED PERF. PIPE
PROPOSED HARDSCAPE
PROPOSED BUILDING
N
GRAPHIC SCALE
FEET
TMAD TAYLOR & GAINES
• STRUCTURAL
• MECHANICAL
• ELECTRICAL
• CIVIL
320 North Halstead Street, Suite 200
Pasadena, California 91107
Phone: 626.351.8881 Fax: 626.351.3203
Project No. 6206-027-00
UCSB BIO-ENGINEERING
PROPOSED INFRASTRUCTURE EXHIBIT

BUILDING SYSTEM REQUIREMENTS

BIOENGINEERING BUILDING MASTER PLAN & PHASE 1 DPP

11.0.0

STRUCTURAL SYSTEMS

Structural Systems

Overview

The UCSB Bioengineering Building Phase 1 Project consists of the design and construction of a new research facility for the faculty and researchers from the College of Engineering and the Biological Sciences. The research facility will range between 69,000 GSF and 79,000 GSF and will house the Institute for Collaborative Biotechnologies, a component of the Center for Stem Cell Biology and Engineering, and the academic Bioengineering program. The building will have four stories, with an anticipated floor to floor height of 15'-0" and a partial basement with a stair, elevator and tunnel.

This narrative provides a brief summary of the various structural engineering aspects of the building and should be used in conjunction with all other submitted documents for a more complete description of the proposed building.

Gravity Design Loads:

Live Loads

- Laboratories- 125 psf
- Laboratory Support Areas- 125 psf
- General Office- 80 psf
- Exit Corridors- 100 psf
- Stairs- 100 psf
- Roof- 20 psf
- Mechanical Floor and Roof- 150 psf (or per equipment/pads layout and weights)

Gravity Load Systems:

We understand that the Facility Program has specified the vertical vibration criteria of 2,000 micro-inches per second for the dry and wet laboratory spaces. The vertical vibration criteria is expressed in terms of velocity sensitivity, and they are based on the specific type of equipment sensitivity which will be required for these particular areas. The final specified vertical vibration criteria is the driving factor in determining the gravity system which is most appropriate for use in this project.

For other areas of the building the level of vibration imperceptibility, noted above, may not be required. We recommend that these other programmed areas of the building, such as offices and other administration functions, be investigated and a approximately vibration criteria be established.

Based on our past experience, the vertical vibration criteria for the dry and wet research lab areas are such that reinforced concrete floor systems are generally more cost-effective than are steel floor systems, particularly considering the current cost of structural steel.

Gravity Load Systems Continued:

The concrete floor system is generally stiffer than a structural steel alternative, and will also produce more ceiling space to accommodate mechanical, electrical and plumbing systems, given the fixed floor-to-floor height. One possible system would be a concrete flat plate floor slab, supported by reinforced concrete columns and walls.
The lab modules have been established for this project based on 11 feet by 32 feet to provide open areas at lab benches. Hence, likely column/wall layouts will lend themselves to bay sizes of approximately 22 ft. x 32 ft. A concrete flat plate thickness of approximately 14-16 inches would be required to satisfy the 2,000 micro-inches per second criteria. Typical concrete column sizes would be approximately 24 – 28 inches square, depending on the final slab thickness. Note that there would be no drop-panels associated with this floor system. The flat plate system has the advantage of simplicity of formwork in that the entire slab is of a uniform thickness. This issue should be discussed in more detail in order to determine the specific equipment requirements of the researcher's with regard to vibration sensitivity, as it has a significant impact on construction cost.
There will be a lecture hall which may be located on either the north of south side of the building. It will require long span transfer girders to accommodate the spatial requirements of the lecture hall.

Lateral Force Resisting System:

The lateral force resisting system of the building would consist of reinforced concrete shear walls in the two orthogonal directions of the building. While the shear walls have not yet been located, the shear wall can be either placed on the perimeter of the building or at discrete locations in the interior of the building to minimize the impact on the programming layout and overall building functions. Therefore, approximately 125 lineal feet of 24 inch thick shear wall would be required in each of the two orthogonal directions of the building (i.e. a total of 250 lineal feet of shear wall) to accommodate MEP openings and the placement of reinforcing steel in the "coupling beam" areas over the punched openings.

Foundation System:

The information provided to date is the foundation recommendations presented in the Preliminary Geotechnical Engineering Investigation, prepared by Fugro West Inc., dated January 2004, for the Davidson Library Addition. It is our understanding that this Library Addition project site is in the general proximity of the proposed project site and that the recommendations contained in this report can be used for the project site until further investigations are complete on the project site. Per the report, the foundation systems recommended are shallow foundations and or drilled piers.
For the shallow foundations option, the site will need to be over excavated to approximately 3 feet below the existing ground surface or at least 1 foot below the lowest footing elevation (whichever is greater).

Over excavation will be required over the entire building footprint as well as 5 feet beyond the building footprint. The over excavation will need to be replaced with engineered fill. Conventional spread footings are anticipated below building columns, and continuous grade-beam footings are anticipated below walls.

For the drilled pier option, the site will need to be over excavated to approximately 2 feet below the existing ground surface or at least 1 foot below the floor slab level (whichever is greater). Over excavation will be required over the entire building footprint as well as 5 feet beyond the building footprint. The over excavation will need to be replaced with engineered fill. The drilled pier system will consist of concrete drilled piers with concrete pier caps above the piers.

The basement will require temporary shoring system around the perimeter of the building to facilitate the excavation of the basement. The shoring system, if required, would consist of steel soldier piles with horizontal steel grouted tie-back anchors and pressure treated wood lagging spanning between soldier piles.

Structural Materials:

A. Concrete:
All Structural concrete mixes shall be Type II cement. All structural concrete shall have a minimum compressive Strength at 28-days as follows:
Structural Slab: f'c = 5000 psi (145 pcf)
Shear walls: f'c = 5000 psi (145 pcf)
Columns: f'c = 5000 psi (145 pcf)
Basement walls: f'c= 5000 psi (145 pcf)
Foundations: f'c = 4000 psi (145 pcf)
All other Concrete: f'c = 4000 psi (145 pcf)
B. Masonry:
Block ASTM C-90, normal weight
Cement (Low Alkali, Type I or II): ASTM C150
Grout ASTM C476 (f'm = 2000 psi)
C. Reinforcement:
Typical Reinforcement: ASTM A615, Grade 60 (Fy = 60 ksi)
Shear Wall Reinforcement: ASTM A706, Grade 60
Supported Structural Slab Reinforcement: ASTM A706, Grade 60
Welded Rebar: ASTM A706 (Fy = 60 ksi)
D. Structural Steel:
Structural steel shall be ASTM A992, Grade 50 unless noted otherwise.
Steel Angles and Channels: ASTM A36 (Fy = 36 ksi)
Structural Tubes: ASTM A500, Grade B (Fy = 46 ksi)
Structural Pipes: ASTM A53, Grade B (Fy = 35 ksi)
Structural Bolt: A325X unless noted otherwise.
E. Welding:
Conform to AWS D1.1 and D1.4
Electrode Strength
E80XX (Reinforcing Steel)
E70XX (Structural Steel)

MECHANICAL SYSTEMS

BIOENGINEERING BUILDING MASTER PLAN & PHASE 1 DPP

11.2.0

Mechanical Systems

A. Design Code Criteria:

1. The Heating, Ventilating and Air Conditioning Systems shall be designed to meet the building user's requirements and to comply with the following codes and standards:
2. California Building standards Administrative Code, Part 1 Title 24, California Code of Regulations (CCR).
3. California Code of Regulations (CCR) Part 4 and Part 6.
4. California Fire Code, 2007 (will comply with latest California Fire Code) Part 9, Title 24, CCR (2006 IFC and 2007 California Amendments).
5. California Building Code, 2007 Part 2, Title 24, CCR. (2006 IBC and 2007 California Amendments)
6. California Energy Commission, Title 24, 2007 (AB970)
7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Design Guidelines
8. California Electric Code, 2007 Part 3, Title 24, CCR. (2005 NEC and 2007 California Amendments)
9. California Mechanical Code 2007 Part 4, Title 24, CCR. (2006 UMC and 2007 California Amendments).
10. California Plumbing Code 2007 Part 5, Title 24, CCR. (2006 UPC and 2007 California Amendments)
11. American Society of Testing of Material
12. American Water Works Association
13. Cast Iron Soil Pipe Institute
14. National Electric Code
15. National Electric Manufacturer's Association
16. National Fire Protection Association
    a. Section 34
    b. Section 45
    c. Section 54
    d. Section 90

e. Section 91

17. Occupational Safety and Health Association

18. Underwriter Laboratories, Inc.

19. American National Standard Institute

20. American Air Balance Association

B. Energy Conservation:

1. The building envelope and systems shall be designed to meet or exceed by 30% the energy performance requirements of California Title 24.

2. The overall design envelope and system shall be capable to meet or exceed the energy performance requirements of Title 24 by 40%; which could qualify the building for LEEDS Silver Rating.

   Note: All equipment specified shall meet all of the requirements of California Title 24.

C. Mechanical Loads:

The Mechanical Loads in the building will include the building envelope loads which will take into account the following:

1. The building envelope will include walls, roofs and fenestrations. Walls will be specified with R-19 insulation and the roof with R-30 insulation. Glass will be low E type and will exceed Title 24 requirements.

2. Internal laboratory loads will be based on the probability analysis program which was developed in house taking into account the design experience of numerous laboratory buildings.

3. Lighting loads.

4. Ventilation loads. For laboratories the ventilation loads will be based on 100% outside air. Internal offices and non laboratory areas the ventilation load will be based on Title 24 requirements of 15cfm per occupant.

5. The building envelope and the mechanical system will be designed to beat Title-24 by 30%.

D. HVAC Systems:

1. Chilled water to the building will be provided as follows:

   a. Scheme A: Roof mounted built packaged two (2)150 ton chillers connected to evaporative cooling towers and pumps manufactured by E-Pak technology. Chilled water will be supplied to the chilled water coils in the air handlers. Chilled water will also be connected to flat plate heat exchanger and two (2) pumps to produce process cooling water for the laboratories. Process cooling water piping will be schedule 80 PVC. Chilled water will also be connected to the site chilled water line which will be relocated from under the footprint of the building.

b. Scheme B: Roof mounted built packaged two (2)100 ton chillers connected to evaporative cooling towers and pumps manufactured by E-Pak technology. Chilled water will be supplied to the chilled water coils in the air handlers. Chilled water will also be connected to flat plate heat exchanger and two (2) pumps to produce process cooling water for the laboratories. Process cooling water piping will be schedule 80 PVC. Chilled water will also be connected to the site chilled water line which will be relocated from under the footprint of the building.

2. One (1) chilled water pump will be provided to pump the chilled water from the site chilled water line to provide chilled water to the building during shutdown of the chillers and pumps. This pump will be on emergency power. This pump will be activated by building BMS during shutdown of the chillers and pumps.

3. The chillers and pumps will be on emergency power.

4. Heating Hot water system will supplied with two (2) gas fired high efficiency low nox heating hot water boilers with output of 1100 MBH for Scheme A and 850 MBH for Scheme B, and pumps located on the roof in a Penthouse. The heating hot water will be distributed in the building and connected to the VAV supply air terminal units with reheat coils and the laboratory VAV supply air valves with reheat coils. The pumps are on emergency power.

5. The laboratories will be supplied with two (2) 100% outside air 30,000 cfm for Scheme A and 20,000 cfm for Scheme B, VAV air handling units and one 30,000 cfm for Scheme A and 25,700 cfm for Scheme B, VAV air handling unit will return air fan and economizer for indoor offices. These fans will be on emergency power.

6. The laboratory air handlers will have an intake section, 30% prefilter and a Merv 15 final filter, plug fan section with VFD, chilled water coil section and an outlet section.

7. The Office VAV air handling unit will consist of a supply fan and return fan, economizer section, filter section with 30% prefilter and Merv 13 final filters, chilled water coil section. This fan will also be on emergency power.

8. The chilled water coils for the air handling units will be specified with corrosive resistant coating. The air handling units will be specified to be subjected to 1000 hours of salt water spray.

9. The all air handlers will be located on the roof in a penthouse.

10. Duct-mounted sound attenuators with specified for all air handling units. The sound attenuators selected will have good sound attenuating qualities with low pressure drops.

11. The laboratory exhaust system will be connected to two (2) strobic fan systems each capable of exhausting 30,000 cfm for Scheme A and 20,000 cfm for Scheme B. Each Strobic fan system will have four fans with one fan as stand-by. To attenuate sound the Strobic fans will have sound attenuators. The fans will be located 40 feet from all intakes to the air handling units and intakes into the building. The wetted components of the exhaust fans shall be coated with Heresite. The laboratory exchange fans shall be on emergency power.

12. Offices along the outside perimeter of the building which have opening windows will be provided with ceiling fans for adiabatic cooling. Heating in these offices will be provide with heating hot water finned tubes.

13. All outdoor air intakes shall be not less than 40' from exhaust outlets of combustion equipment stacks, cooling tower, exhaust outlets from the building, vacuum system, plumbing vent stacks or from areas that many collect vehicular and other noxious fumes.

14. HVAC systems must be responsive to research laboratory demands. Temperature must be carefully controlled. Systems must have adequate ventilation capacity to control fumes, odors, and airborne contaminants, permit safe operation of fume hoods, and cool the significant heat loads which can be generated in the laboratory. HVAC systems must be both reliable and redundant and operate without interruption. HVAC systems must be designed to maintain relative pressure differentials between spaces and must be efficient to operate, both in terms of energy consumption and maintenance. Laboratory noise, much of it generated by HVAC systems, shall be maintained at NC 40-45 dB.

15. HVAC systems must maintain a safe and comfortable working environment and be capable of adapting to new research initiatives. In addition, they must be easy to maintain, energy efficient, and reliable to minimize lost research time.

16. Adequate access shall be provided for periodic maintenance and cleaning of coils, filters, and drain pans.

17. Laboratories containing harmful substances shall be designed and field balanced so that air flows into the laboratory from adjacent spaces, offices and corridors. The requirement for directional airflow into the laboratory is to contain odors and toxic chemicals. Air supplied to the corridor and adjacent clean spaces must be exhausted through the laboratory to achieve effective negative pressurization. Laboratory HVAC systems shall utilize 100% outdoor air, conditioned by central station air-handling systems to offset exhaust air requirements. Laboratory supply air shall not be recirculated or reused for other ventilation needs.

18. Air supplied to a laboratory space must keep temperature gradients and air turbulence to a minimum, especially near the face of laboratory fume hoods and biological safety cabinets. Air outlets must not discharge into the face of chemical fume hoods. Large quantities of supply air are best provided through perforated plate air outlets or linear diffusers designed for large air volumes. The air supply must not discharge on a smoke detector.

19. Laboratories using chemicals must remain at a negative air pressure in relation to corridors and other non-laboratory spaces. Laboratory air shall flow from low hazard to high hazard use areas. Office and administrative areas must always be positive with respect to corridors and laboratories. Corridor supply air distribution shall be sized to offset transfer air to laboratories while maintaining an overall positive building pressure. Loading and receiving docks must be maintained as positive to prevent the entrance of vehicle fumes.

20. Control of airflow direction in research laboratories controls the spread of airborne contaminants, protects personnel from toxic and hazardous substances, and protects the integrity of experiments. The once-through principle of airflow is applied based on exhausting 100% of the supplied air; maintaining the required airflow with all exhaust units operating at capacity; and providing directional flow of air from areas of least contamination to areas of greatest contamination.

21. The ventilation rate for laboratory HVAC systems is driven by three factors: fume hood demand, cooling loads, and removal of fumes and odors from the general laboratory work area. The minimum air-change rate for laboratory space is six air changes per hour regardless of cooling load. Some laboratories may require significantly higher rates to support fume hood demand or to cool high instrument heat loads in equipment laboratories.

22. Implementation of a recirculating HVAC system for office and administrative areas may be utilized for energy conservation. Recirculating air systems shall provide ventilation conforming to ASHRAE standards and must not affect the pressurization and balance between laboratory and administrative zones.

Recirculating air systems shall be completely separate from 100% outdoor air laboratory systems.

23. Fume hoods shall be tested in accordance with ANSI/ASHRAE Standard 110-1985, after installation but before acceptance by the construction project manager. In general, the fume hoods shall be tied into the laboratory area exhaust system, with no separate exhaust stack. The ASHRAE 110 method of testing includes air flow visualization and tracer gas containment tests. Air flow visualization test involves releasing smoke at prescribed locations to visualize fume hood air flow. The tracer gas involves releasing sulfur haxafluoride gas with the hood at 4 l/min. A mannequin is placed at the front of the hood opening with leak detection instrument attached to it. The tracer gas provides an actual measurement of fume hood containment.

24. Flammable storage cabinets will be incorporated into the design of laboratories. Flammable storage cabinets are to be located as remote as possible from the exit doors of the laboratory. Flammable storage cabinets shall be installed below fume hoods, or in corridors or exit pathways within the laboratory. Flammable storage cabinets shall be vented.

25. All IT, Server Room and Electrical room will be cooled by chilled water fan coil unites. These unit will be on emergency power.

26. The new BioEngineering Building will be subjected to wind tunnel testing by Cermak Paterka Peterson (CCP). This will assist in location of all inlets into the building. CCP has the UCSB site model.

27. Provide rainhoods on all intakes to the air handlers and building intake louvers.

28. Two (2) 1000 cfm general exhaust fans for toilets.

E. BSL-3 Laboratories:

1. Air handling units serving the BSL-3 laboratories will have high capacity low pressure drop HEPA filters.

2. All exhaust fans serving the BSL-3 laboratories will have bag-in-bag-out HEPA filters.

F. Laboratory Duct Material:

1. All laboratory duct material shall be 316 stainless steel with single seem weld. When laboratory exhaust ducts cross fire rated wall; provide 2-hour rated duct wrap from the fume hood to the shaft. There shall be no combination fire smoke dampers in the laboratory exhaust ducts.

G. Fume Hood Controls:

1. All fume hoods will have Proximity Sensors to reduce the exhaust flow rates by reducing the fume hood face velocity from 100 fpm to 60-70 fpm when no one is present in front of the fume hood.

H. Laboratory Pressurization:

1. Laboratories will be pressurized by volumetric offset.

2. All Mechanical Equipment, ductwork and piping will be seismically braced.

I. Steam Boiler:

1. Gas fired steam boiler will be specified to provide 85 psig steam for laboratory sterilizers, washers and dryers. The steam boiler size will be roughly 50hp. Soft water will be provided to the steam boiler. The boiler shall be manufacturer by Parker or Equal.

J. Atrium Smoke Evacuation

1. In the event Scheme A is selected, the project will require the provision of two (2) 80,000 cfm exhaust fans with 30hp motor on emergency power. Scheme B will not require this system.

K. Control System:

1. The Control System will be an Open Protocol system by Johnson Controls. Johnson Controls is a Campus wide system. The Control system will be capable of monitoring the Building HVAC system, Chilled Water System, Heating Hot Water System, Electrical System, Metering, all of the Plumbing Equipment, Laboratory Vacuum system, Laboratory Compressed Air Systems, Pure Water Systems, Cylinder Gas Systems and also monitoring of the combination fire/smoke dampers.

L. Mechanical Equipment List:

1. **Scheme A:** Roof top Packaged Chiller system with two (2) 150 ton chillers with 410a refrigerant and evaporative cooling towers manufactured by E-Pak Technologies or Equal.

2. **Scheme B:** Roof top Packaged Chiller system with two (2) 100 ton chillers with 410a refrigerant and evaporative cooling towers manufactured by E-Pak Technologies.

3. **Scheme A:** Two (2) 1100 MBH output gas fired Parker Heating Hot Water Boilers and pumps located on the roof in a Penthouse.

4. **Scheme B:** Two (2) 810 MBH output gas fired Parker Heating Hot Water Boilers and pumps located on the roof in a Penthouse.

5. **Scheme A:**Two (2) 30,000 cfm air handling units with 100% outside air for laboratories located in the Penthouse.

6. **Scheme B:**Two (2) 20,000 cfm air handling units with 100% outside air for laboratories located in the Penthouse.

7. **Scheme A:** One (1) 30,000 cfm air handling unit for indoor Offices located in the Penthouse.

8. **Scheme B:** One (1) 25,700 cfm air handling unit for indoor Offices located in the Penthouse.

9. **Scheme A:** Two (2) 30,000 cfm laboratory exhaust fans manufactured by Strobic Air. Each fan system with four fans and one fan as stand-by.

10. **Scheme B:** Two (2) 20,000 cfm laboratory exhaust fans manufactured by Strobic Air. Each fan system with four fans and one fan as stand-by.

11. Heating Hot water Finned Tube radiators for offices along the outside perimeter.

12. Flat Plate Heat Exchanger and two (2) pumps for Process Chilled Water System.

13. The Chilled Water and Heating hot water piping 2" and below will be Type 'L' copper and pipes above 2" will be schedule 40 black steel. In the chiller and boiler rooms the piping headers will be schedule 40 black steel. The piping distribution loop on the floor will be type 'L' copper.

14. One (1) gas fired roughly 50 hp steam boiler manufacturer by Parker Boilers.

15. Two (2) 1000 cfm general exhaust fans for toilets.

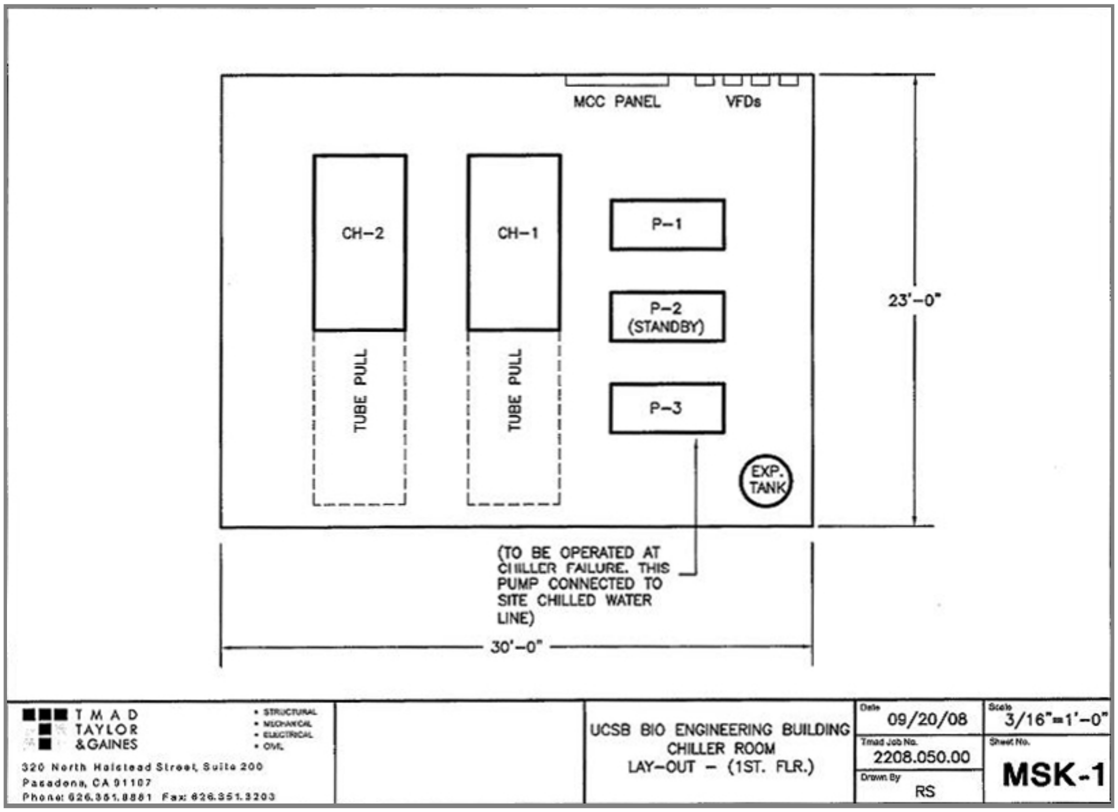
16. In the event Scheme A is selected, provide two (2) 80,000 cfm exhaust fans with 30 hp motors.

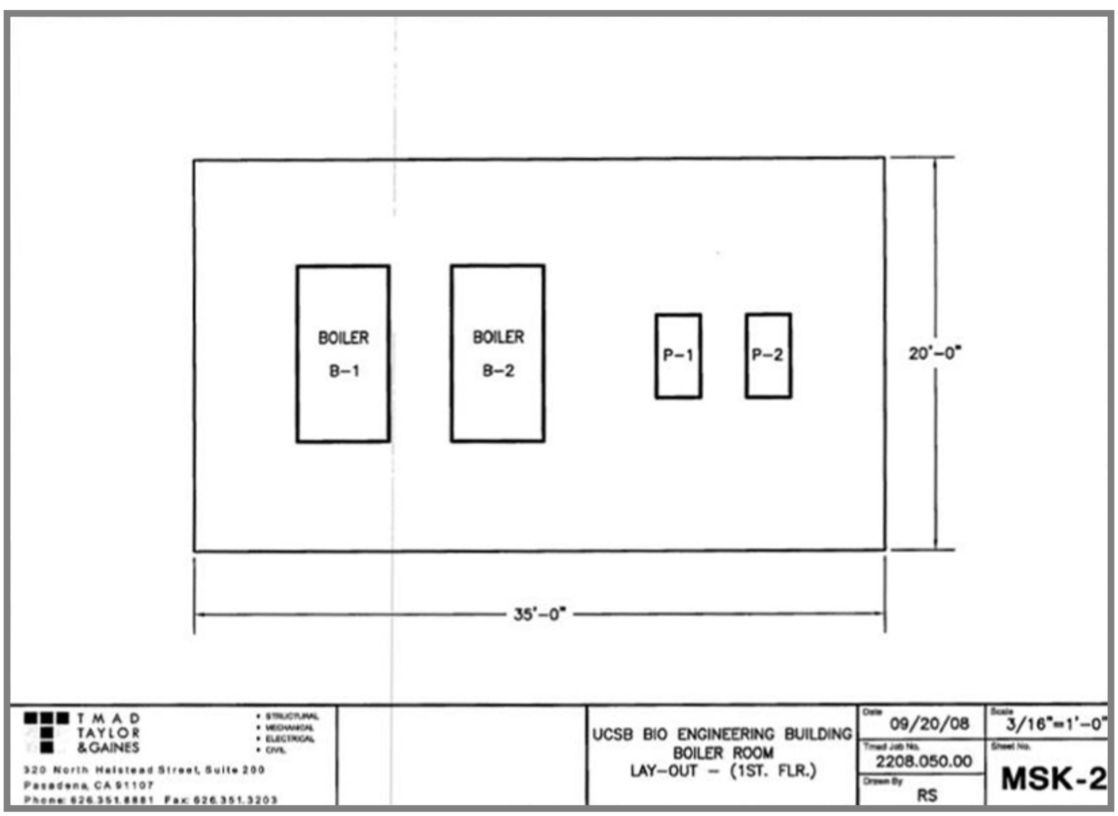
17. In the event Scheme A is selected, provide two (2) 6,000 cfm supply fans with 5 hp motors.

M. Mechanical Exhibits:

1. MSK-1

2. MSK-2


MCC PANEL
VFDs
CH-2
CH-1
TUBE PULL
TUBE PULL
P-1
P-2 (STANDBY)
P-3
EXP. TANK
23'-0"
(TO BE OPERATED AT CHILLER FAILURE. THIS PUMP CONNECTED TO SITE CHILLED WATER LINE)
30'-0"
TMAD TAYLOR & GAINES
• STRUCTURAL
• MECHANICAL
• ELECTRICAL
• CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
CHILLER ROOM
LAY-OUT – (1ST. FLR.)
Date 09/20/08
Tmad Job No. 2208.050.00
Drawn By RS
Scale 3/16"=1'-0"
Sheet No. MSK-1


BOILER B-1
BOILER B-2
P-1
P-2
20'-0"
35'-0"
TMAD TAYLOR & GAINES
• STRUCTURAL
• MECHANICAL
• ELECTRICAL
• CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
BOILER ROOM
LAY-OUT – (1ST. FLR.)
Date 09/20/08
Tmad Job No. 2208.050.00
Drawn By RS
Scale 3/16"=1'-0"
Sheet No. MSK-2

PLUMBING AND UTILITY PIPING

BIOENGINEERING BUILDING MASTER PLAN & PHASE 1 DPP

11.3.0

Plumbing and Utility Piping

A. Design Code Criteria:

1. The Plumbing Systems shall be designed to meet the building user's requirements and to comply with the following codes and standards:
2. California Building standards Administrative Code, Part 1 Title 24, California Code of Regulations (CCR).
3. California Code of Regulations (CCR) Part 4 and Part 6.
4. California Fire Code, 2007 (will comply with latest California Fire Code) Part 9, Title 24, CCR (2006 IFC and 2007 California Amendments).
5. California Building Code, 2007 Part 2, Title 24, CCR. (2006 IBC and 2007 California Amendments)
6. California Energy Commission, Title 24, 2007 (AB970)
7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Design Guidelines
8. California Electric Code, 2007 Part 3, Title 24, CCR. (2005 NEC and 2007 California Amendments)
9. California Mechanical Code 2007 Part 4, Title 24, CCR. (2006 UMC and 2007 California Amendments).
10. California Plumbing Code 2007 Part 5, Title 24, CCR. (2006 UPC and 2007 California Amendments)
11. American Society of Testing of Material
12. American Water Works Association
13. Cast Iron Soil Pipe Institute
14. National Electric Code
15. National Electric Manufacturer's Association
16. National Fire Protection Association
    a. Section 34
    b. Section 45
    c. Section 54
    d. Section 90

e. Section 91

f. Section 13

g. Section 14

17. Occupational Safety and Health Association

18. Underwriter Laboratories, Inc.

19. American National Standard Institute

20. American Air Balance Association

B. The following existing utilities are located to serve this project:

1. Existing Potable water main is on the south side. Part of it is running under the building. It will be relocated away from the building.

2. Fire water is also serviced by the potable water main.

3. Sewer piping is also available under the foot print of the building. It will be relocated away from the footprint of the building.

4. Storm water drains are located on the northeast and the southwest side of the building.

5. Natural Gas piping exists under the building will be relocated.

C. New Plumbing System

1. Domestic cold water system complete with isolation valves, shutoff valves, water hammer arrestors and connections to fixtures and equipment will be provided.

2. Domestic hot water and Industrial hot water systems complete with isolation valves, circulating pump, shutoff valves, water hammer arrestors, aquastats and connections to fixtures and equipment will be provided. New two water heaters each 75 gallon approximately shall be provided. There shall be no instantaneous below sink domestic hot water heaters.

3. Wall mounted regular non-refrigerated drinking fountain with handicap accessibility will be provided.

4. Sanitary waste and vent system complete with cleanouts, traps, vents through roof and connections to fixtures will be provided at the third floor ceiling.

5. Roof will be drained by roof drains or new downspouts from the roof gutter (where it is applicable). The downspout will be connected to the existing storm drain at the site. All over flow drains will be piped separately and daylighted.

6. Condensate drain system including connections to air conditioning equipment and discharging into the sanitary waste system will be provided.

7. Toilet Rooms will be fitted with ADA accessible plumbing fixtures consisting of wall-hung water closets, with flushometer flush valves; waterless urinals, wall mounted lavatories with low flow faucets, grid strainers, loose key angle stops and thermostatic mixing valves for water temperature control.

8. All equipment and piping shall be seismically braced and anchorage.

9. Laboratory instrument air, vacuum, filtered water and pure water system.

   a. Instrument air will be provided by duplex lubricated air compressor with regenerative air dryer.

   b. Duplex vacuum pumps.

   c. Pure Water System.

   d. Deionizer tank exchange service.

10. All laboratory waste will be piped separately up to a monitoring pit (located at the site) prior to the connection to main sewer at site.

11. Low pressure gas will be provided to fume hoods, Bunsen burners and water heaters.

12. Pure water system will consist of sand filters, non salt softeners, RO water system, Deionizers and circulating pumps. It will be designed to produce 2 mega ohm water. The Pure Water Piping will run in a continuous loop and dead legged into the lab. For 18 mega ohm water point of use systems will be strategically located in laboratories.

13. Laboratory Compressed Air System will generate Instrument Grade Air. The system will consist of Duplex dry air compressors with duplex regenerative air dryers, filters and storage tank. The compressor will have energy conservation devices such as variable special drive.

14. The Laboratory Vacuum will be an oil ring type duplex pump with storage tank. The pump will have their individual oil storage tank and will not share the oil for the oil rings. The vacuum pump will have energy conservation device such as variable speed drive.

15. The Cylinder Gas Systems will have semi-automatic switch over capabilities

16. Capacities for lab compressed air, lab vacuum and pure water systems, will be based on probability analysis method.

17. Piping material

    a. Sanitary waste and vent

        i. Pipe: Cast iron hubless, service weight

        Fitting: Cast iron

        Joints: Neoprene gaskets and Type 304 stainless steel clamp

        ii. Below slab sanitary waste and vent

        Pipe: ABS or DWV PVC piping with 4 band "Husky" type mechanical joints.

        iii. Domestic water and condensate

        Pipe: Type "L" Copper and Type "M" for condensate piping.

        Fittings: Wrought copper ANSI/ASTM B32

        iv. Laboratory waste and vent

        Pipe: CPVC corrosive waste drainage Lab Waste" by spear, model number LW-4-1207.

        v. Natural gas system

        Pipe: Schedule 40 black steel ASTM A-53

        Fittings: ASME B-16.3, threaded malleable iron.

        vi. Laboratory Vacuum and Compressed Air System

        Pipe: Copper tubing Type 'L' with brazed joints and fittings.

        vii. Pure water piping

        Piping: Piping and fittings shall be manufactured from a specialty low-extractable PVC compound with a cell classification of 12343 per ASTMD 1784, Model No. LXT manufactured by Spears.

        viii. Cylinder Gas Systems

        Piping: Type 'L' copper tubing with double ferrule "swagelok" type fittings.

316 L stainless tube fittings with double ferrule "swagelok" type fittings.

18. All piping shall be without flex connections and shall be herd connected to fitting and outlets.

19. The plumbing systems shall be coordinated with the laboratory planning module. A piping distribution method, including mains, risers, and branch lines, shall be designed to accommodate easy service isolation and system maintenance while minimizing disruption to laboratory functions. Emergency isolation valves must be conveniently located on branch lines so that segments can be taken off line quickly in the event of failures.

20. Piping systems shall be designed for flexibility and adaptability and have redundant components to provide reliable and continuous operation. Adequate fluid temperature, pressure, and volume must be delivered to required laboratory functions through conservatively sized pipe mains. Future capacity allowances need to be considered in the building design.

21. Floor penetrations in laboratories should be avoided. All required penetrations shall use raised sleeved openings sealed and caulked to prevent leakage and maintain the fire rating of the slab. Floor sinks will be provided on modular basis for drainage of laboratory benches.

22. Vacuum pump systems will have hydrophobic (water-resistant) filters on the suction side, with the exhaust to the outside of the building and not into mechanical spaces. The filter housing shall be designed for easy replacement of the filter, with maximum protection of maintenance employee from possible contamination.

23. A safety shower/emergency eyewash will be provided at each laboratory space containing a chemical fume hood. Safety showers / emergency eyewash shall be no more than 75 feet from any point in the laboratory. No floor sinks will be provided under the safety showers / emergency eyewash. Potable cold water piping connected to the emergency showers / eyewash will have lockable ball valves.

24. Inert gas cylinders will be secured to a vertical surface out of the way of traffic.

25. Space for waste boxes will be provided in the laboratories.

26. Hydrogen Gas Cylinder will be stored in Gas Cabinets and hydrogen gas is routed to the outlets in 316L tubing. Tubing routed in the ceiling space shall be continuous. All fittings and connections below ceiling shall be welded.

27. The piping take-offs into the laboratories will include lab vent, potable cold water, industrial cold water, lab vacuum lab air, industrial hot water, process chilled water and cylinder gas piping with shut off valves.

D. Fire Protection System

1. Fire protection system will consist of a wet pipe sprinkler system throughout the floor area, complete with fire sprinkler riser, distribution piping, fire sprinklers and interlock to the building fire alarm system. Provide cans for fire sprinkler riser penetration through floors manufactured by Hilti to prevent water penetrating through floors.

2. Stand pipes in each stairwell, will be provided and interconnected at the first floor.

3. Fire pump is not required since the water pressure in the fire line is 115 psig.

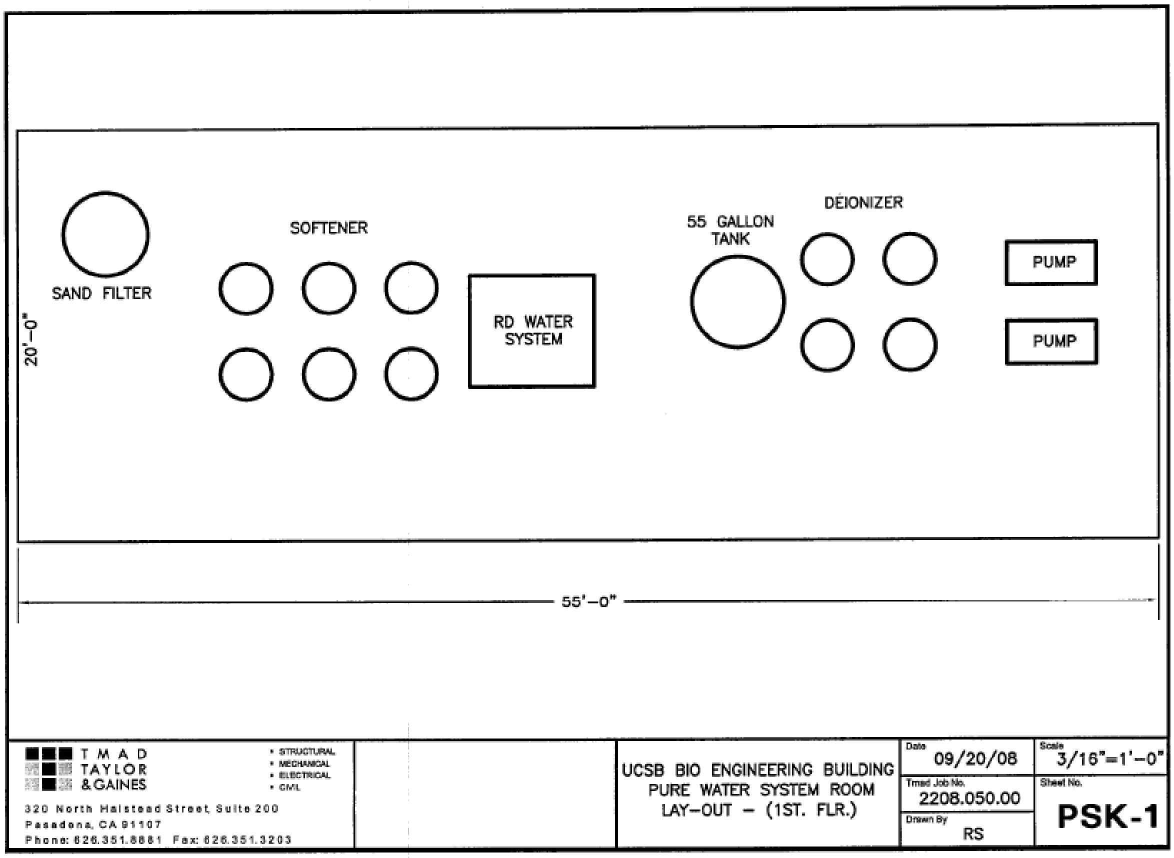
4. For testing fire sprinkler riser on the ground floor provide a 6" floor sink.

E. Fire Protection Piping:

1. Piping: Pipe size below 2" they will be schedule 40, black steel with screw type joint and fittings. Pipe size 2" and above will be schedule, 10 black steel with "Victaulic" type joint and fittings.

F. Plumbing Exhibits

1. PSK-1
2. PSK-2
3. PSK-3
4. PSK-4


SAND FILTER
SOFTENER
RD WATER SYSTEM
55 GALLON TANK
DEIONIZER
PUMP
PUMP
20'-0"
55'-0"
TMAD TAYLOR & GAINES
• STRUCTURAL • MECHANICAL • ELECTRICAL • CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
PURE WATER SYSTEM ROOM
LAY-OUT – (1ST. FLR.)
Date 09/20/08
Tmad Job No. 2208.050.00
Drawn By RS
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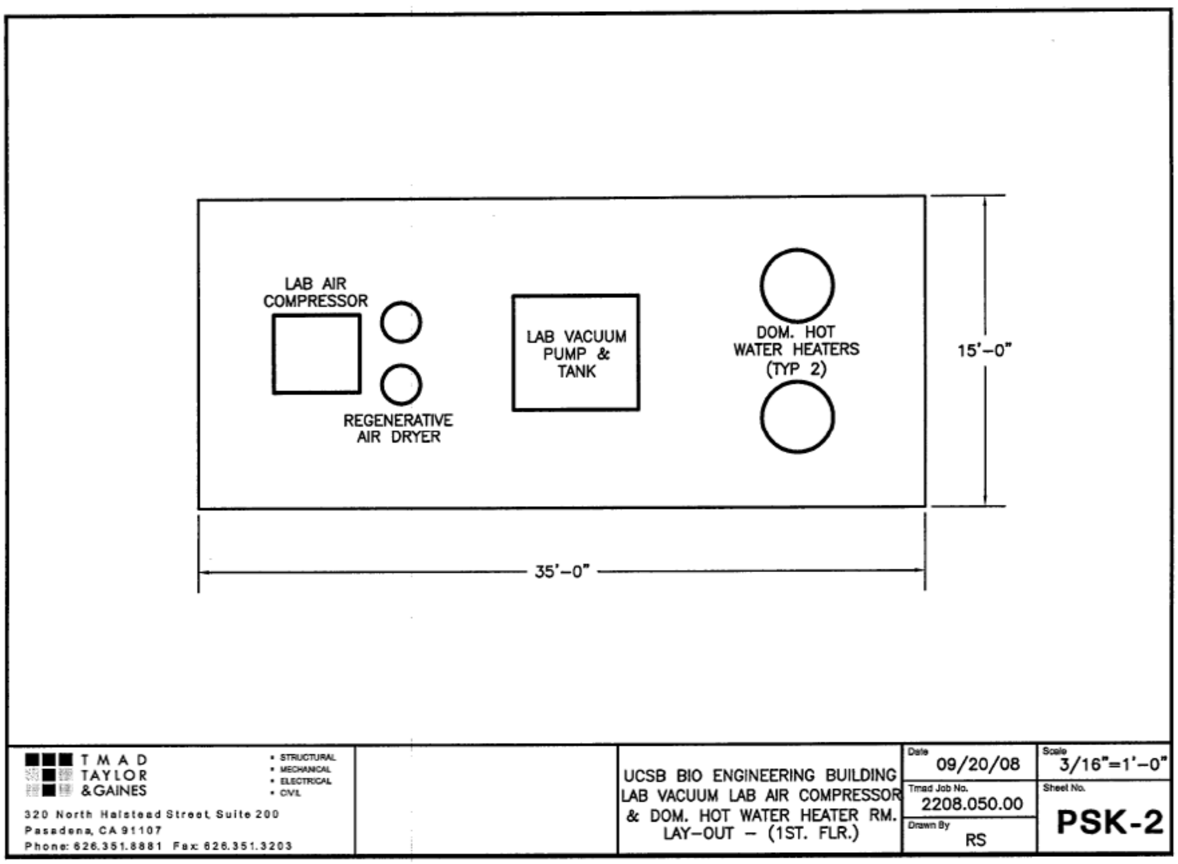
Sheet No. PSK-1


LAB AIR COMPRESSOR
REGENERATIVE AIR DRYER
LAB VACUUM PUMP & TANK
DOM. HOT WATER HEATERS (TYP 2)
15'-0"
35'-0"
TMAD TAYLOR & GAINES
• STRUCTURAL • MECHANICAL • ELECTRICAL • CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
LAB VACUUM LAB AIR COMPRESSOR
& DOM. HOT WATER HEATER RM.
LAY-OUT – (1ST. FLR.)
Date 09/20/08
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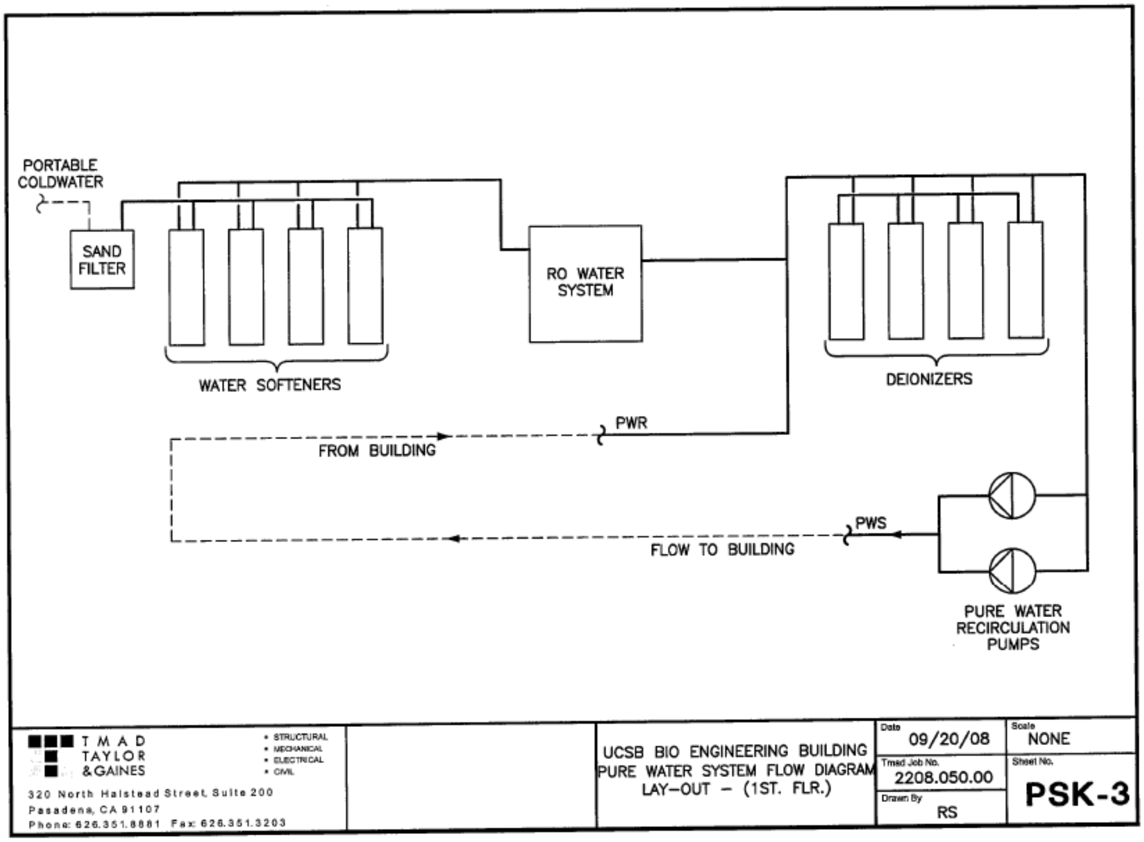
PORTABLE COLDWATER
SAND FILTER
WATER SOFTENERS
RO WATER SYSTEM
DEIONIZERS
PWR
FROM BUILDING
PWS
FLOW TO BUILDING
PURE WATER RECIRCULATION PUMPS
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UCSB BIO ENGINEERING BUILDING
PURE WATER SYSTEM FLOW DIAGRAM
LAY-OUT – (1ST. FLR.)
Date 09/20/08
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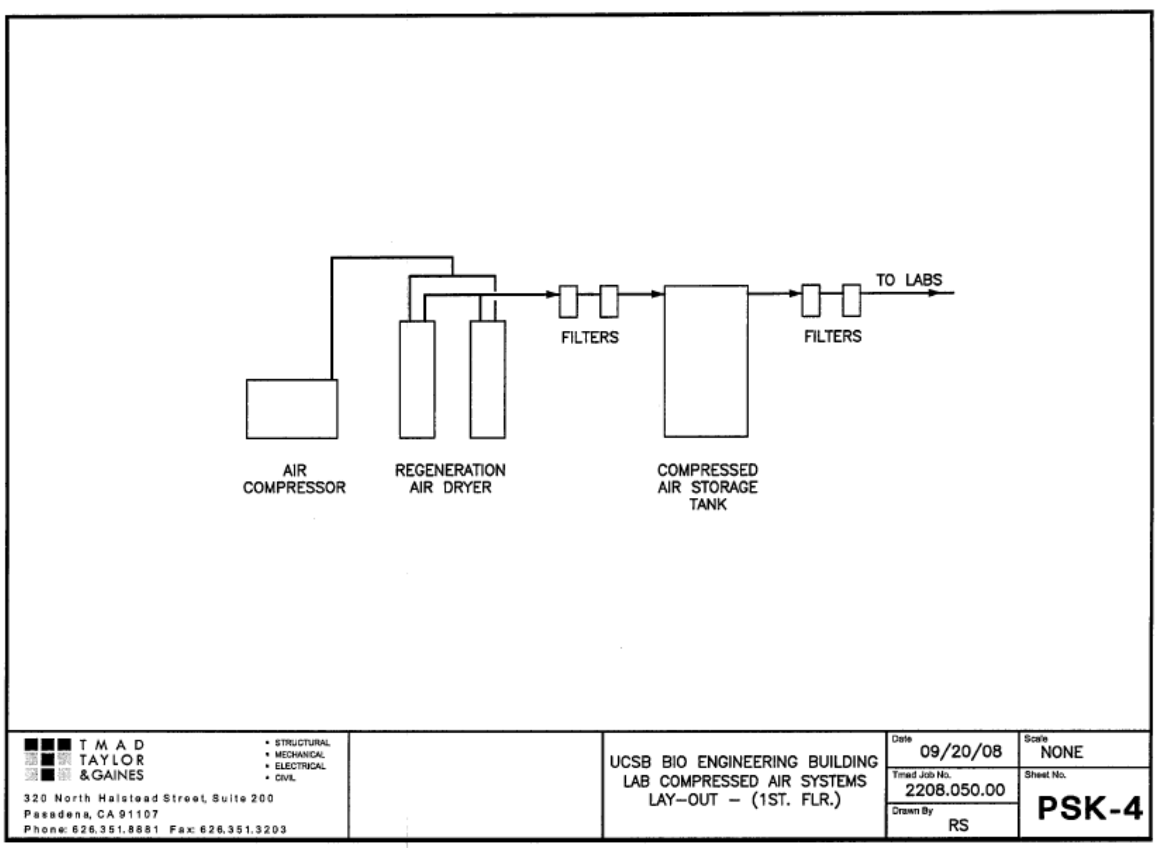
TO LABS
FILTERS
FILTERS
AIR COMPRESSOR
REGENERATION AIR DRYER
COMPRESSED AIR STORAGE TANK
TMAD TAYLOR & GAINES
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320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
LAB COMPRESSED AIR SYSTEMS
LAY-OUT – (1ST. FLR.)
Date 09/20/08
Scale NONE
Tmad Job No. 2208.050.00
Sheet No. PSK-4
Drawn By RS

ELECTRICAL SYSTEMS

11.4.0

Electrical

A. Codes and Standards:

1. California Building standards Administrative Code, Part 1 Title 24, California Code of Regulations (CCR).
2. California Code of Regulations (CCR) Part 4 and Part 6.
3. California Fire Code, 2007 (will comply with latest California Fire Code) Part 9, Title 24, CCR (2006 IFC and 2007 California Amendments).
4. California Building Code, 2007 Part 2, Title 24, CCR. (2006 IBC and 2007 California Amendments).
5. California Energy Commission, Title 24, 2007 (AB970).
6. California Electric Code, 2007 Part 3, Title 24 CCR. (2005 NEC and 2007 California Amendments).
7. National Electric Code, 2005 Edition
8. National Electric Manufacturer's Association
9. National Fire Protection Association
    a. Section 34
    b. Section 45
    c. Section 54
    d. Section 90
    e. Section 91
10. Occupational Safety and Health Association
11. Underwriter Laboratories, Inc.
12. American National Standard Institute

B. High Voltage Distribution System

The 12.47kV electrical service for the Bio Engineering building will be served from the Campus owned and operated distribution circuit RS (Research South). In order to accommodate the new building, several upgrades will have to take place:

1. EMH 2-111 will have to be replaced in order to accommodate new underground electrical duct work and re-routing of the

12.47kV main distribution runs. The new concrete manhole will be 8'L x 8'W x 8'H with a 36" access hole with a bolted steel cover. The manhole will have (2) 10' ground rods installed in opposite corners with a 4/0 copper (bare) ground ring installed around the top of the interior walls of the manhole with #4/0 copper ground jumpers installed tying the ground rods to the ground ring. It will be necessary to intercept the existing underground conduits entering and exiting the manhole.

2. An outside electrical service area for the building has to be determined, which will house a 15kV, S&C Vista Series, HRDS Model 606 (2-600 amp positions and 4-200 amp positions) and will comply/interface with the universities high reliability system. The switch will sit on top of an underground switch vault with a 12'x8' concrete slab top. The area will also house the building 12.47kV/277/480 volt padmount transformer. The switch requires a 10' clearance from the operation side of the switch and 5' on the remaining sides. The transformer will require a 10' clearance in front of the doors and 4' on the remaining 3 sides.

3. Both the switch vault and transformer pads will have a 10' ground rod installed.

4. Remove existing 12.47kV distribution circuit RS and fiber optic cable from SW 408 position #2 to SW 572 position #1.

5. A new (6) 5" conduit duct bank will be installed from EMH 2-111 to the new underground switch vault in the service yard. The duct bank will be comprised of PVC, schedule 40 conduits and shall be encased with 2 sack concrete mix with red dye. The duct bank will maintain a minimum depth of 3' to top of bank from finished grade.

6. Extend (2) 4", PVC, schedule 40 conduits from the switch vault to the new padmount transformer. Stub-out (6) 4" conduits from the switch vault for future service for Library 4 and Bio Engineering Phase 2

7. Extend new 15kV, 500 MCM, EPR compact copper cable with insulated 4/0 ground from SW 408, position #2 through EMH 2-111 to the new S&C vista series switch position #1. Install new 15kV, 500 MCM, EPR compact copper cable with insulated 4/0 ground from new switch position #2 through EMH 2-111 to SW 572 position #1. Install new fiber optic cable with the routing above – leave 25' tails at the switch for make-up and termination.

8. Extend new 15kV, 2/0, EPR copper cable with insulated 4/0 ground from new vista switch to a new pad mounted transformer.

9. The building 480 volt service will only need to be a 4- wire service – no ground conductors need to be installed from transformer secondary to the building main. The neutral

conductors will be bonded at the transformer secondary. The neutral ground bond for the building will be in the main breaker section for the building.

10. The building switchgear must have a metering section with an ITRON Sentinel meter installed. The meter must be connected to campus Ethernet system.

11. Provisions must be made to remove electrical service lateral for Davidson Library 4-story section at some point during Phase 1 or Phase 2, as the service lateral crosses through proposed building site. The existing service lateral originates at SW 572. It is advised to serve Davidson Library 4 from the new S&C vista switch installed during Phase 1 for the Bio Engineering Project. The vista series switch will also have two more spare positions to serve the Phase 2 addition.

12. After the new vista switch is installed and fiber optic cable connected, S&C electric must be contracted to commission, program and integrate the new switch into the campus distribution system and at the main substation.

13. De-energize the breaker in existing Building 408 to disconnect Building 407 prior to the demolition of the building.

14. The University will be responsible in the purchase of the High Voltage switch and pad mounted transformer and the commissioning. All these items will be funded by this Contract. Installation will be done by the Contractor.

C. Normal Power and Distribution System

1. Estimated Electrical Normal Power Load Summary

Mechanical Equipment	=	Scheme A: 730 kw;
	=	Scheme B: 550 kw
Lighting and Receptacles	=	Scheme A: 430 kw
(for office & support areas)	=	Scheme B: 332 kw
60,000 sf x 7 w/sf for Scheme A		
47,400 sf x 7 w/sf for Scheme B		
Elevators, 1 @ 40hp each	=	80 kw
Plumbing Equipment	=	Scheme A: 50 kw
	=	Scheme B: 37 kw
Lab Equipment	=	Scheme A: 600 kw
20,600 sf x 20 w/sf	=	Scheme B: 412 kw
Total	=	**Scheme A: 1880 kw 2265A@288/480V, 3Phase, 4Wires**
	=	**Scheme B:1371 kw 1651A@ 277/480V, 3phase, 4Wires**

2. Building Service Distribution Normal Power

   a. The electrical power supply will be derived from a new 2000 KVA for Scheme A and 1500 kVA for Scheme B liquid filled FR3 or envirotemp oil, transformer. This transformer will be located adjacent to the vista switch. The size of the building electrical service will be 3000 amps for Scheme A and 2500 amps for Scheme B at 277/480 volts, three phase, four wire.

   b. There will be a main electrical room on the first floor in the building. 277/480 and 120/208 volt power distribution boards, panelboards and step-down transformers will be located in electrical rooms throughout the building. Connect main electrical room with other electrical rooms with a 1200A plug-in bus duct riser.

3. Electrical Distribution

   a. The building power distribution will be in conduits with all required distribution equipment at 208Y/l20V or 480Y/277V.

   b. Switchboards, panelboards, and step-down transformers will be located in the electrical rooms. See drawings for room layouts.

   c. Distribution from the electrical service shall be as follows:

      i. The main switchboard will feed 277/480V distribution panels and 120/208V distribution panels via dry-type step-down transformers.

      ii. Lighting and power panels shall be provided.

      iii. The electrical power shall be distributed via copper feeder conductors in conduits as follows:

         - 277V, single phase for all fluorescent fixtures.
         - 120V, single phase for convenience receptacle outlets and motors smaller than ½ horsepower.
         - 208V, single phase for all motor loads larger than ½ horsepower and less than 1 horsepower.
         - 480V, 3 phase, 3 wire for all motor loads that are 1 horsepower and larger.

   d. All over-current protective devices shall be circuit breakers.

   e. 42-pole, 208Y/120V and 277/480V, 3 phase, 4 wire panel boards shall be provided.

f. Electrical equipment shall be seismically braced.

4. Branch circuit power distribution from the distribution panels shall be as follows:

 a. Provide branch circuit power distribution throughout the space. Power distribution shall include, but not be limited to the following:

  i. Specification grade 20A duplex convenience receptacles located throughout the building.

  ii. G.F.I. receptacles at all new restroom counters, and wet locations.

 b. Dedicated circuit duplex receptacles:

  i. Provide dedicated circuit receptacles for miscellaneous equipment such as audio/visual projectors and telecommunication equipment.

  ii. Provide electrical power to all known equipment (including mechanical equipment, kitchen equipment, etc.) for the project.

  iii. All wall plates for devices are to be steel with baked enamel finish for finished spaces, smooth solid anodized aluminum steel for unfinished spaces, damp and wet locations.

  iv. Wall plates for devices to be ivory in color when connected to normal power system, red in color when connected to emergency power system and, blue in color for TVSS devices.

 c. Circuiting requirements shall be as follows:

  i. Allow six (6) convenience outlets in corridors and in finished spaces on each power circuit.

  ii. Allow a maximum of 14 amps for each lighting circuit.

  iii. Outlets in corridor/lobbies/storage rooms/utility areas/toilets etc. can be wired on dedicated circuits and separated from all other circuits.

 d. Provide at least (6) spare circuit breakers per panel board.

 e. All conductors, bussing and windings shall be copper.

5. Switchboards will be sized to accommodate a future 25% growth.

D. Lab Equipment

1. Laboratories shall have surface mounted aluminum raceways mounted above all benches and at equipment areas.
2. The power duct shall have a continuous 120/208V 60A 3 phase, 4 wire, plus ground circuit installed.
3. Twenty ampere taps as needed shall serve receptacles via 20A single pole circuit breakers mounted in the raceway.
4. Receptacles shall be mounted at 24" on center.
5. Receptacles mounted with 36" of water dispensing shall be ground fault interrupter type.
6. A minimum of one 60A, 3 phase, 4 wire circuit shall serve an 11' x 22' laboratory module.
7. In addition, a minimum of three 20A circuits per 11' x 22' lab module with three duplex receptacles each will be provided.
8. The following are to be connected to standby power:
   a. Fume hood exhaust fans.
   b. Incubators, refrigerators, freezer, cold rooms, warm rooms.
   c. Biological safety cabinets.

E. Emergency Power and Distribution System

1. Estimated electrical Emergency Power Load Summary

Mechanical Equipment (Lab Exhaust)	=	Scheme A 60 kw
	=	Scheme B 45 kw
Emergency Lighting	=	Scheme A 30 kw
	=	Scheme B 24 kw
One Elevator	=	Scheme A 40 kw
	=	Scheme B 40 kw
Plumbing Equipment	=	Scheme A 25 kw
	=	Scheme B 20 kw
Lab Equipment 30% x 600 kw for Scheme A and 412 kw for Scheme B	=	Scheme A 180 kw
	=	Scheme B 124 kw
HVAC (Air Conditioning) 50% x 600 kw for Scheme A and 550 kw for Scheme B	=	Scheme A 365 kw
	=	Scheme B 275 kw
Total	**=**	**Scheme A 700 kw**
	=	**Scheme B 528 kw**

2. Provide new outdoor 750 kw for Scheme A and 600 kw for Scheme B, 277/480 volt, 3 phase, 4 wire diesel engine generator set to supply emergency power to lab exhausts, emergency lighting, elevator, lab equipment, lab HVAC units, plumbing equipment and fire alarm system. Provide a new emergency distribution panel and transfer switches in the main electrical room.

3. Dual wall sub-base fuel storage tank at 1500 gal for Scheme A and 1000 gal for Scheme B shall be provided to supply fuel for 24-hours of operation.

F. Lighting Systems:

1. Both interior and exterior lighting systems will be designed to meet the requirements of the State Energy Conservation Code in Title 24.

2. The exterior lighting system will consist primarily of metal halide fixtures to illuminate exterior walkways and canopies. Exterior illumination levels will average three to five footcandles. Exterior lighting will be controlled by the lighting control panel and photocell.

3. The interior lighting system will consist primarily of specification grade recessed or pendant fluorescent fixtures with energy efficient electronic ballasts. Fluorescent fixtures will be 2-foot x 4-foot with 18 cell 3-inch deep parabolic louvers whenever practical.

4. Lighting in the lab will be indirect pendant mounted fluorescents.

5. Lamps will be predominantly T-8 or compact fluorescent with a color temperature of 3500 K.

6. Illuminated exit signs shall be provided in all areas of exit paths and corridors. Exit signs shall be dual circuit LED type with green signage.

7. Emergency lighting shall be provided as required by local codes-minimum one (1) foot candle as measured at the floor in all public areas and internal means of egress.

8. Pendant hung industrial fluorescent fixtures with solid reflectors will be provided in utility rooms.

9. Electronic ballasts shall be manufactured by EBT, Magnatek or other manufacturers that provide a 5-year warranty. Electronic ballasts for linear fluorescent lamps shall be:

   a. Instant start

b. Sound Rating: A

c. Total harmonic distortion rating of less than 10 percent

d. Transient Voltage Protection: Category A or better

e. Lamp Current Crest Factor: 1.7 or less

f. BF: 0.85 or higher

g. Power Factor: 0.95 or higher

h. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

10. Standard building lighting and lighting control switching throughout the project shall be provided in compliance with the latest Title 24 requirements.

a. Lighting in public areas will be controlled by an automatic electronic control system with networking capabilities.

b. Automatic time-clock-based interior lighting control schemes will include a means for local override for after-hours use.

c. Lighting in restrooms, breakrooms, and utility areas will be controlled by occupancy sensors.

d. Lighting in offices will be controlled by occupancy sensors with manual controls accessible to the occupants.

11. The building lighting system shall be designed to the foot-candle levels listed in the following lighting level matrix.

Area	Foot Candles
Clerical Areas	40-60
General or Private Offices	30-50
Lobbies	10-20
Toilets	10-20
Corridors	10-20
Custodial Areas	10-20
Storage	10-20
Communication & Electrical Rooms	30-40
Work Rooms	50-70
Mechanical Rooms	20

G. Fire / Life Safety System:

1. A state of the art addressable fully supervised fire alarm system shall be provided. It will be located in the main electrical room with a remote annunciator panel at the main entrance of the building. The system shall comprise of:

   a. Fire Alarm control panel which will be addressable with capability of networking with campus-wide fire alarm system.

   b. Smoke detectors in some selective areas as required by code.

   c. Combination heat/smoke detectors in mechanical rooms/equipment rooms.

   d. ADA strobe lights.

   e. Flow/Tamper switches connection.

   f. Manual pull stations as required by code.

   g. Door holders.

   h. Headend equipment will be expandable for future building expansions.

2. The current Campus fire alarm system is Simplex.

H. Cables and Conduits

1. All conductors shall be installed in ½" minimum metal conduit. Flexible metal conduit with a maximum of 5' -0" length is acceptable.

2. All conductors to be copper, minimum size no. 12 AWG except for controls and signals, where smaller gauge wires may be used.

I. Mechanical Equipment

1. Wire and connect all HVAC and plumbing equipment as required.

J. Grounding Systems

1. An electrical safety ground system shall be provided for all switchboards, panel boards, metallic conduits and raceways. A separate ground wire shall be provided for all feeders and branch circuit wiring. All ground buses from switchboards, transformers and panel boards shall be connected at a ground bus in main electrical room. All conduits shall have equipment ground conductor.

K. Electrical Sustainable Suggestions

1. Daylight Controls

2. Use photo sensors with dimming system within 15 feet of daylighting areas.

L. Electrical Exhibits

1. EX-1

2. EX-4

3. EX-3

4. E0.1

5. ESK-1

6. ESK-2

7. ESK-3

8. ESK-4

Low Voltage

M. Communications:

1. The Communications Systems design shall be per UCSB Campus Standards and Design Criteria. With the agreed upon exception to project the use of CAT-6E station cabling, the current standards shall be used.

2. The outside plant and inside plant cabling and wiring shall be provided including conduits, inner ducts, raceways, and cable trays.

3. The data network will be spliced via fiber cable to an existing fiber cable from the library and to new cable from either Broida Hall or Noble Hall on the East. These two fiber connections insert the new building into the campus-wide network with access to multiple data centers.

4. The building will be provided with a "MDF" at ground floor and stacked "IDF" rooms at upper floors.

5. Sleeves for riser cables between MDF and IDF's shall be provided.

6. Each floor will have conduits from outlets/stations to cable tray, or pull boxes/large conduits to collect all wiring for outlets and run to the MDF or IDF's.

7. A grounding system shall be provided to connect the ground buses in MDF and IDF's to the main grounding system.

8. Provide one (1) 3" conduit from existing manhole 10-102 to building 406.

9. Run two (2)-4" conduits from Davidson Library and two (2)-4" conduits from MH12-111 to MDF room.

10. Provide one (1) 3" conduit from existing manhole 10-102 located adjacent to temporary building 406.

N. Voice, Data and Structural Cabling:

1. Outlet Design Criteria and Assumptions

   a. The typical voice/data workstation outlet for the project is comprised of (3) 4-pair Category-6e cables terminating in (3) J-45 jacks at the outlet. In the MDF and IDF's (TR) the 4-pair Category-6e cables terminate to rack mounted 48 port RJ-45 patch panels. All cabling is tested and certified to EIA/TIA 568-B.1 specifications and include a 20 year manufacturers' warranty.

   b. Station cabling is 4-pair 24 AWG Category-6e.

   c. Cable from workstation in administrative office areas shall be placed in 5S boxes with 2 gangs plaster rings and run in conduit to a common cable tray which carries all cabling to the floor "IDF".

   d. Laboratory areas are cabled with non-plenum cabling placed in the conduit distribution network from the station outlet to the floor TR.

   e. A typical wall or lab bench outlet is (2) Cat-6e 4-pair cables.

   f. All cabling is installed to campus standards "A" punch-down configuration for all jacks.

   g. All cabling is terminated, tested, certified and protected with a manufacturer's 20 year warranty.

   h. All 4-pair distribution cabling terminated for 48 port patch panels located in open two post relay racks.

   i. Each standard outlet is provided with (2) 5' Cat-6e patch cords.

   j. No active electronics, computers, instruments or devices are included at this time.

2. MDF/IDF Rooms, Racks, Equipment Bracing and Ladder Tray

   a. Included in this narrative are (3) TR (telecommunications rooms) and (1) MDF room. The MDF is located on the first floor and is also the LAN server room. Black 7'x19" open frame relay racks with 7'x6" double sided vertical wire managers are included in this design. All TR's and the MDF room are provided with overhead ladder tray for cable routing and access. All racks are installed to seismic zone 4 requirements and are bonded and grounding per TIA/EIA 607 guidelines is included. A ground buss bar is installed in each TR and in the MDF room.

   b. 7'x19" black open frame relay racks – per requirement

   c. 7'x6" double sided vertical wire managers – per requirement

   d. 12" Ground Bus Bar – per requirement

   e. 12"x10' Ladder Tray – per requirement

3. Inside Plant (ISP) Riser Backbone Cabling

   a. Both fiber and copper cabling is provided from the MDF to each of the (3) TR's located on the 2nd, 3rd and 4th floors. Multi-mode fiber is 62.5/125μm laser-optimized. Riser backbone fiber cabling shall be hybrid 12mm/12sm fiber cable running directly from the MDF to each IDF terminal. Each TR receives a 12 (62.5/125μm) multi mode 12 single-mode (8.3μm) hybrid fiber cable between the MDF and the individual IDF terminal. Fiber shall be enclosed in ¾" yellow inner duct with at least one spare inner duct in the riser and 100 pair of category-3 riser cable. All cabling terminated to patch panels located in relay racks. All fiber is installed in 1.25" inner duct to provide mechanical protection and isolation for other cabling. All backbone cabling is CMR or OFNR rated.

   b. All fiber is tested per TIA/EIA 568-B.1, TIA/EIA 526-7, TIA/EIA 526-14A. Fiber is terminated in 19" rack mounted boxes using SC single mode connectors with ceramic couplings.

   c. Copper (voice) backbone cabling is Cat-3 rated and is terminated on rack mount 110 type blocks. Cross-connects are included for 100% backbone connectivity.

4. Outside Plant (OSP) Site Backbone Cabling

   a. The site cabling also includes both fiber and copper cabling from the MDF to a specified manhole location between Library/Broida Hall Building. Fiber cable from the MDF via nearest manhole to library and Broida Hall building shall be 48SM (8.3µm single mode) cable and 48mm (62.5/125µm multi-mode) cable. Copper entrance is 400 pair category-3. The fiber is installed in 1.25" inner duct and includes (2) spare (empty) 1.25" inner ducts for future connectivity. All cabling is rated for OSP (wet) installation. At the MH between the building, all cables splice to existing cables of like type. The entrance pathway for these cables into the building to the MDF is conduit and shall not exceed 50' from the outside wall.

b. Fiber backbone cables shall be run to adjacent building MDF terminals and fusion spliced via fiber-pigtails to fiber termination panel (FTP) in those buildings and tested per TIA/EIA 568-B.1 standards.

O. Security And Access Control System

1. The security and Access Control system for the building will be linked to existing campus central and alarm monitoring station. The new security systems shall match the existing.

a. The access control shall be provided to isolate:

b. Labs at each floor.

i. Public and service entrances.

ii. Elevator control.

c. The system will have the following main components.

i. Card readers.

ii. Door hardware.

iii. Electric strikes.

iv. Request to exit motion sensors.

v. Alarm contacts.

vi. Alarms.

d. The system will be provided to meet the requirement of UCSB Campus Standards and Design Criteria. The following will be provided:

i. Card readers and door positions switches.

ii. Access control server and access control cards per UCSB's requirement.

iii. Software integration.

iv. Access control panel and power supply.

v. Access control Readers and Reader Interfaces.

vi. Wiring and programming.

P. Closed Circuit Television (CCTV):

1. CCTV is a requirement of BioSafety Laboratory Level 3 (BSL3) specially and not a building requirement. CCTV cameras shall be high quality digital color IP camera with features of fixed and Pan, Tilt and Zoom (PTZ) and in compliance with EIA/NTSC to produce high resolution video without lag image retention or geometric distortion. Cameras shall include 1/3 or ¼ inch format image sensor and provide continuous auto-focus and auto-iris zoom lens functions. PTZ cameras will be provided with the following specifications:

   a. Pan Range: 0° to 360° continuous

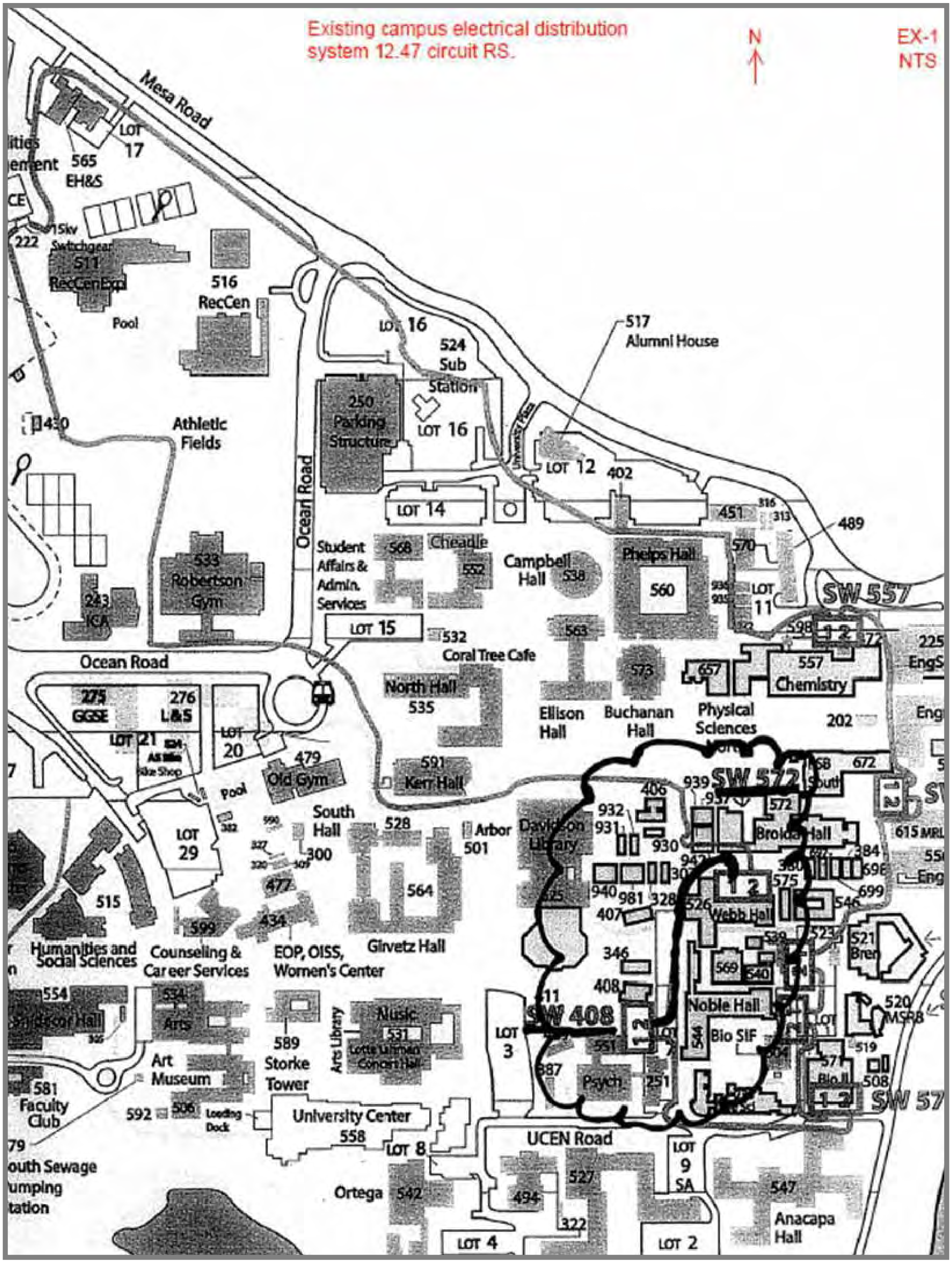
   b. Tilt Range: -5° to 90° from horizontal plane

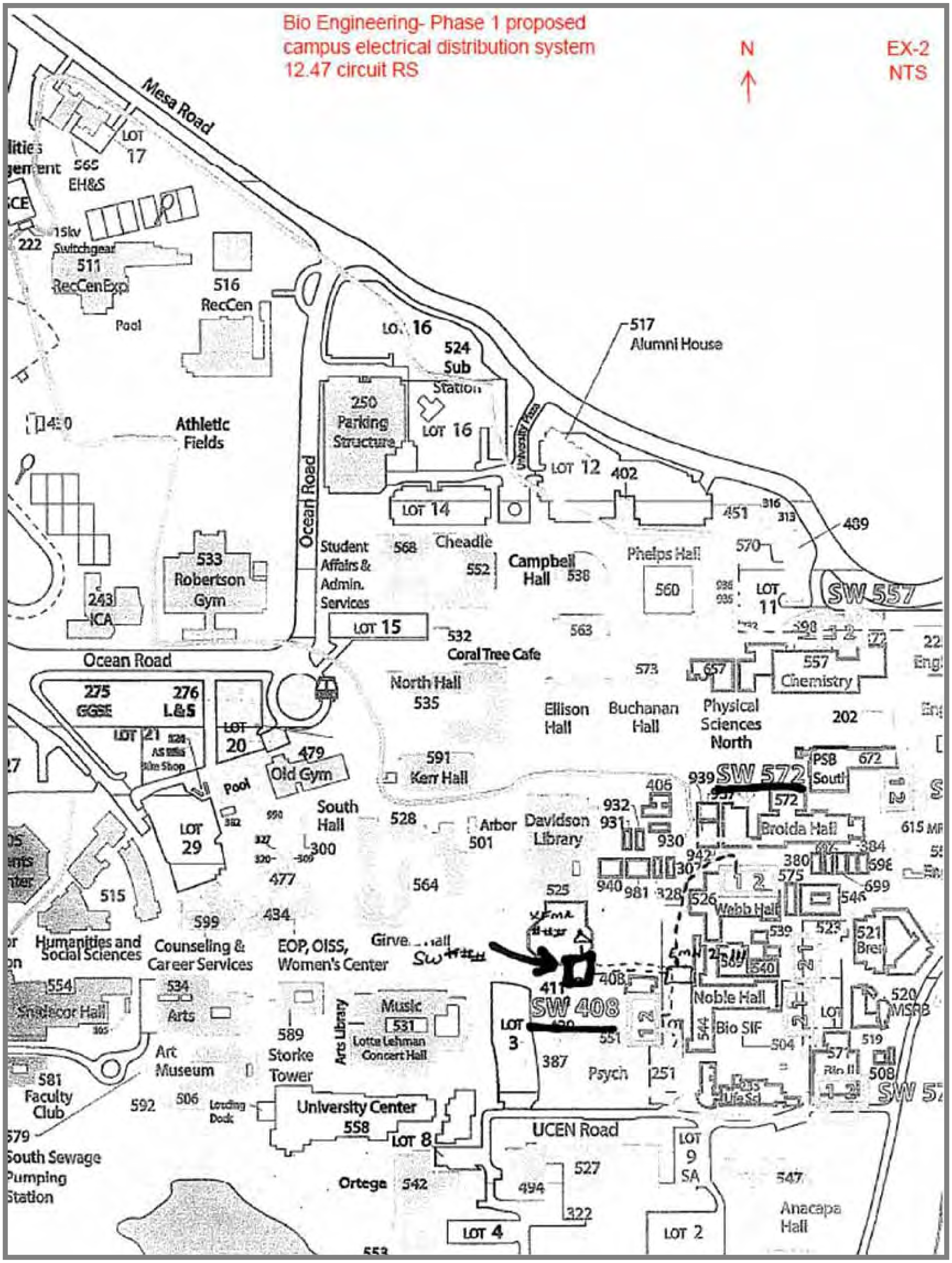
   c. Pan/Tilt speed: 360°/second (pre position speed) 120°/sec (variable speed)

2. The IP cameras equipped with TCP/IP communications module deliver true hybrid operation. The TCP/IP communications module uses MPEG-4 compression, bandwidth throttling and tri-streaming capabilities to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.

Q. Digital Video Controller:

1. The digital video controller shall consist of a CCTV system controller and image server. The image server shall be accessible over an IP network and capable of recording (encoding) and playback (decoding) of image simultaneously. Controller shall provide secure remote access over an IP LAN/WAN via the hyper text transport protocol (HTTP) with secure sockets layer (SSL).


Existing campus electrical distribution system 12.47 circuit RS.
N
EX-1
NTS
Mesa Road
524 Sub Station
15kv Switchgear
517 Alumni House
Ocean Road
UCEN Road
SW 557
SW 572
SW 408
Athletic Fields
Robertson Gym
Campbell Hall
Phelps Hall
Chemistry
Physical Sciences
North Hall
Kerr Hall
Old Gym
Davidson Library
Webb Hall
Noble Hall
Bio SIF
Psych
University Center
Storke Tower
Anacapa Hall


Bio Engineering- Phase 1 proposed
campus electrical distribution system
12.47 circuit RS
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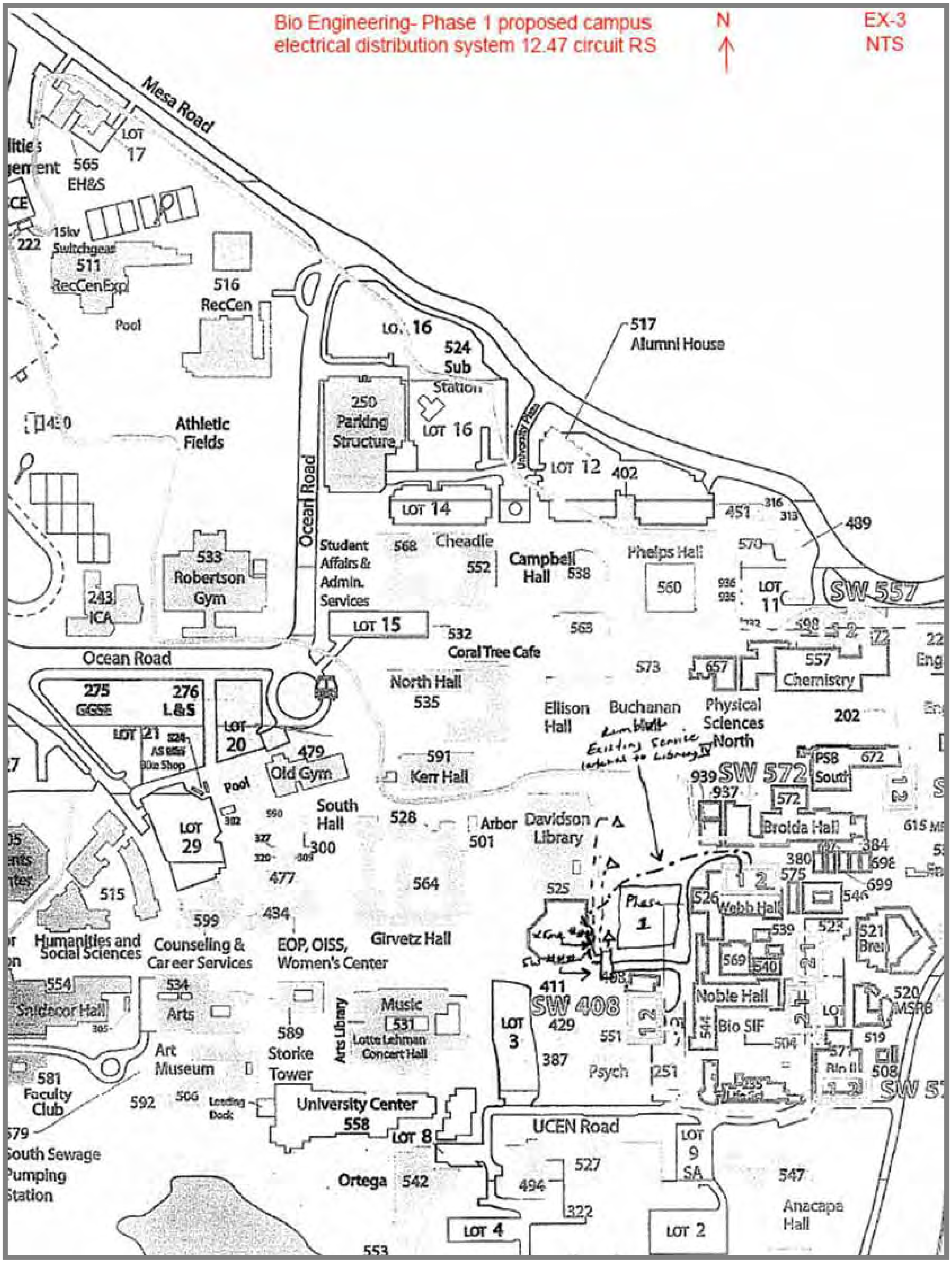
EX-2
NTS
Mesa Road
LOT 17
565 EH&S
15kv Switchgear
222
511 RecCenExp
516 RecCen
Pool
LOT 16
524 Sub Station
517 Alumni House
250 Parking Structure
LOT 16
Athletic Fields
Ocean Road
LOT 12
402
LOT 14
451
489
533 Robertson Gym
243 ICA
Student Affairs & Admin. Services
568
Cheadle
552
Campbell Hall
538
Phelps Hall
570
560
LOT 11
SW 557
LOT 15
532 Coral Tree Cafe
563
557 Chemistry
Ocean Road
275 GGSE
276 L&S
LOT 21
LOT 20
North Hall
535
573
657
Ellison Hall
Buchanan Hall
Physical Sciences North
202
479 Old Gym
591 Kerr Hall
406
939
SW 572
PSB South
672
Pool
LOT 29
South Hall
528
Arbor 501
Davidson Library
932
931
930
572
Broida Hall
615
300
477
564
525
940
981
328
526
Webb Hall
380
575
384
699
546
515
599
434
539
523
521
Humanities and Social Sciences
Counseling & Career Services
EOP, OISS, Women's Center
408
554 Snidecor Hall
534 Arts
Music
531 Lotte Lehman Concert Hall
Arts Library
589 Storke Tower
LOT 3
411
SW 408
551
387
Psych
251
Noble Hall
544
Bio SIF
504
520 MSRB
519
508
581 Faculty Club
Art Museum
592
506
Loading Dock
University Center 558
LOT 8
UCEN Road
LOT 9 SA
579
South Sewage Pumping Station
Ortega
542
494
527
322
547
Anacapa Hall
LOT 4
LOT 2
553


Bio Engineering- Phase 1 proposed campus
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Ocean Road
LOT 14
Cheadle
Campbell Hall
538
Phelps Hall
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LOT 11
SW 557
Student Affairs & Admin. Services
568
552
533 Robertson Gym
243 ICA
LOT 15
532 Coral Tree Cafe
563
598
557 Chemistry
657
573
Ocean Road
275 GGSE
276 L&S
LOT 21
LOT 20
479 Old Gym
North Hall 535
Ellison Hall
Buchanan Hall
Physical Sciences North
202
591 Kerr Hall
939 SW 572
PSB South
672
937
572
Broida Hall
615
Pool
LOT 29
South Hall
528
Arbor 501
Davidson Library
300
384
380
575
699
477
564
525
Phase 1
526 Webb Hall
546
515
599
434
539
523
521
Humanities and Social Sciences
Counseling & Career Services
EOP, OISS, Women's Center
Girvetz Hall
569
540
554 Snidecor Hall
534 Arts
Music
531 Lotte Lehman Concert Hall
Arts Library
411 SW 408
429
Noble Hall
520 MSRB
Bio SIF
LOT 3
551
504
519
589 Storke Tower
387
Psych
251
508
SW 57
581 Faculty Club
Art Museum
592
506
Loading Dock
University Center 558
LOT 8
UCEN Road
LOT 9 SA
579 South Sewage Pumping Station
Ortega
542
527
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Anacapa Hall
LOT 4
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LOT 2
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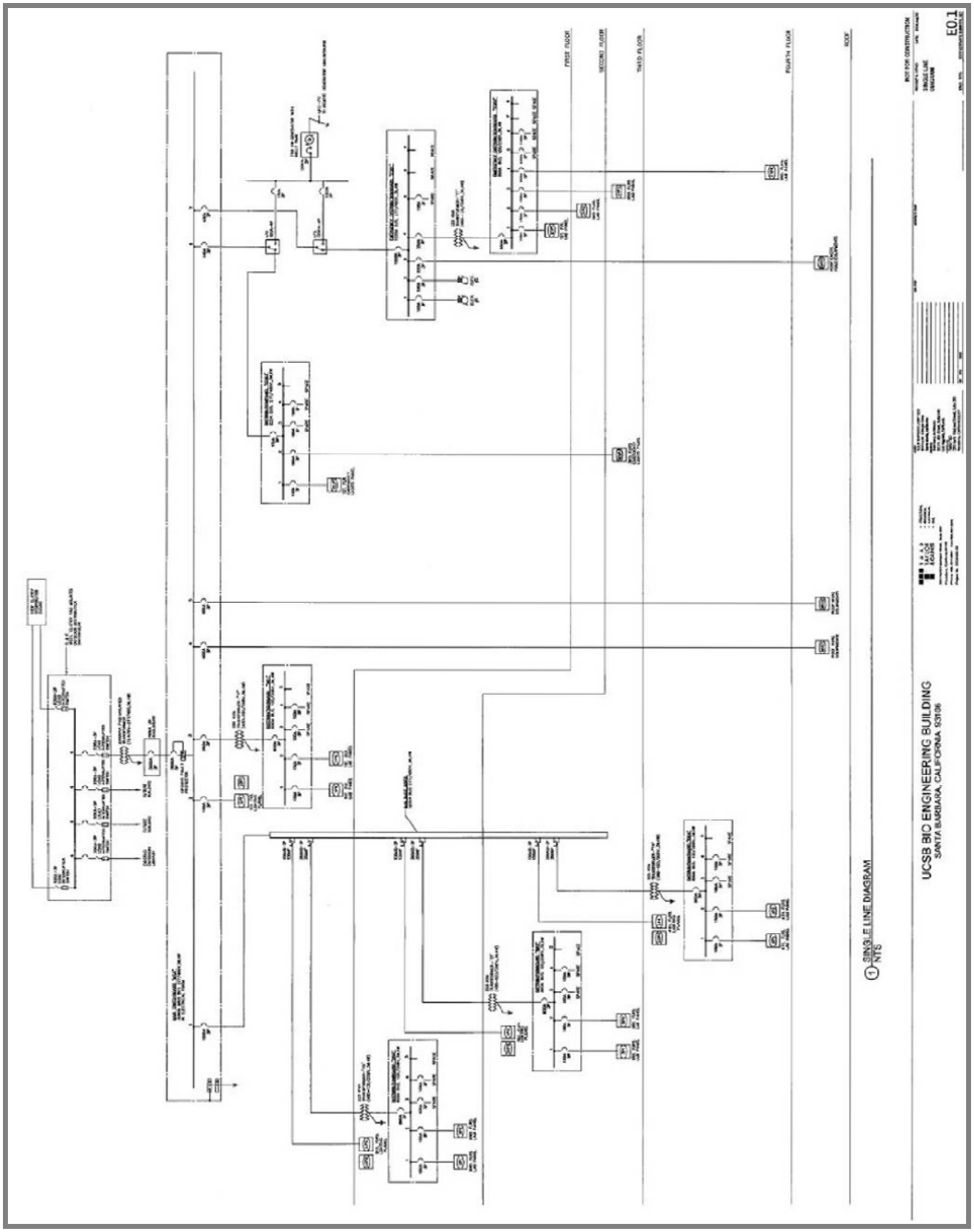
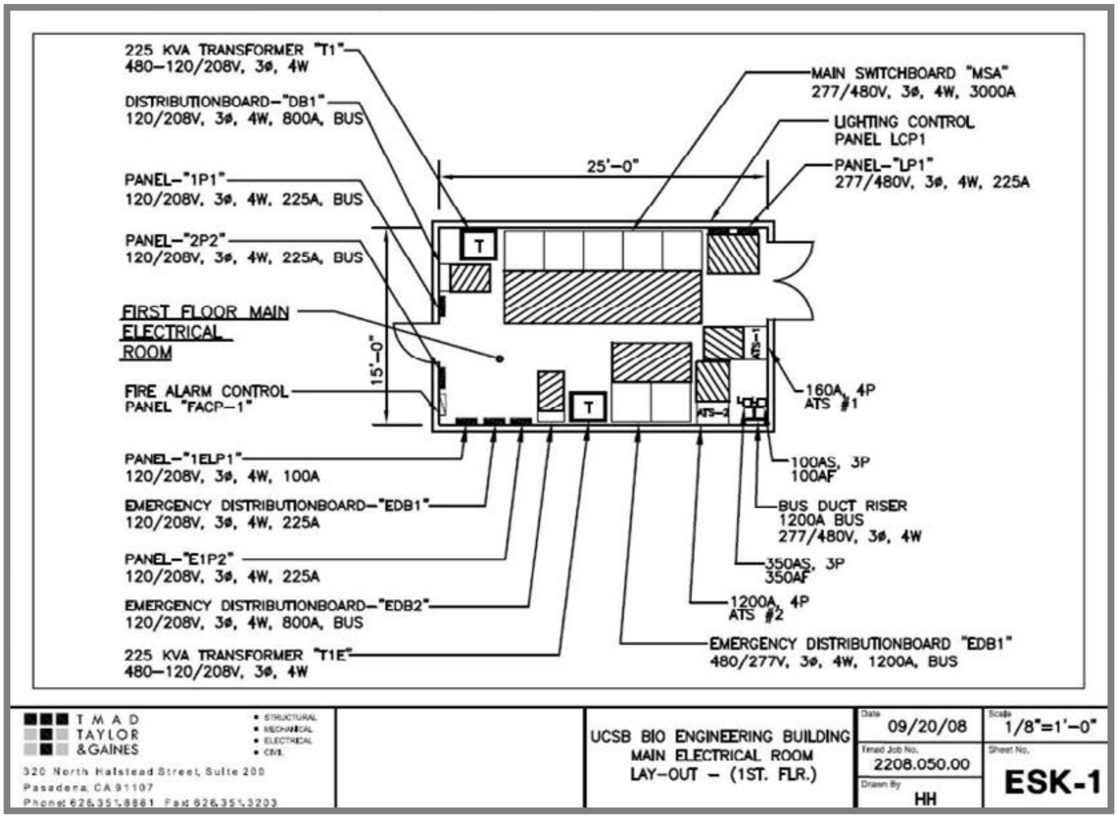
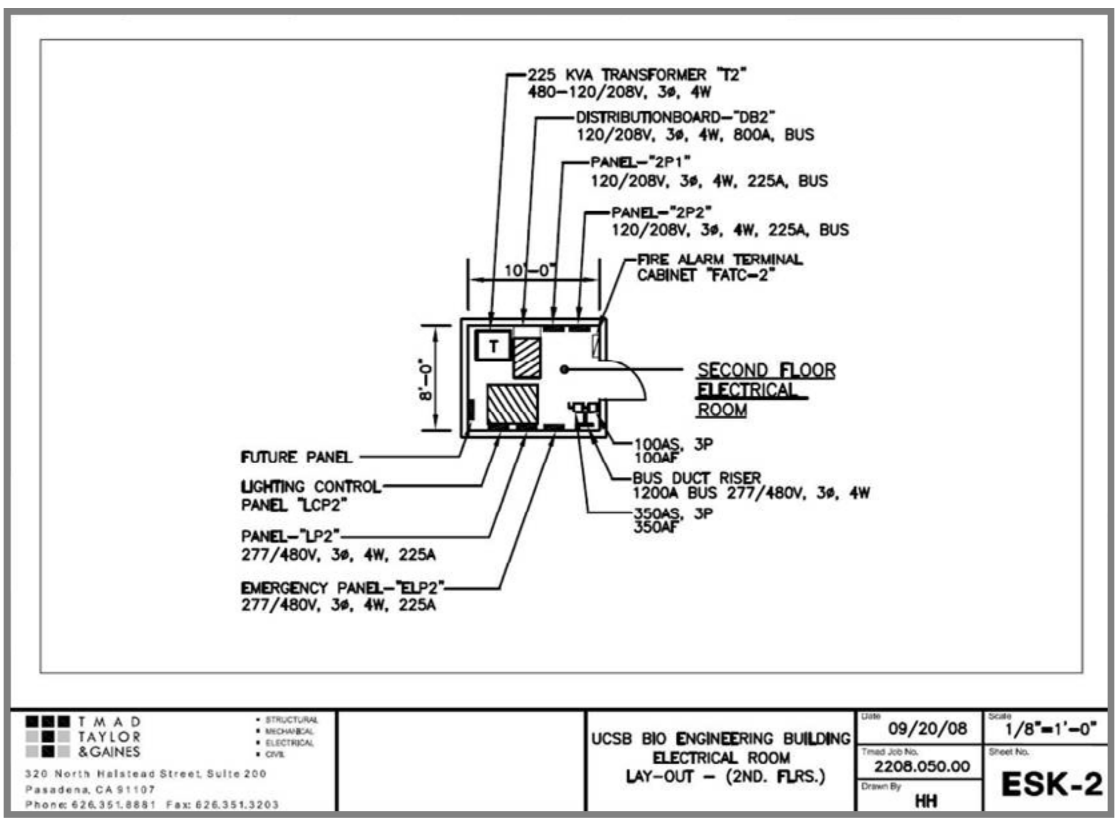
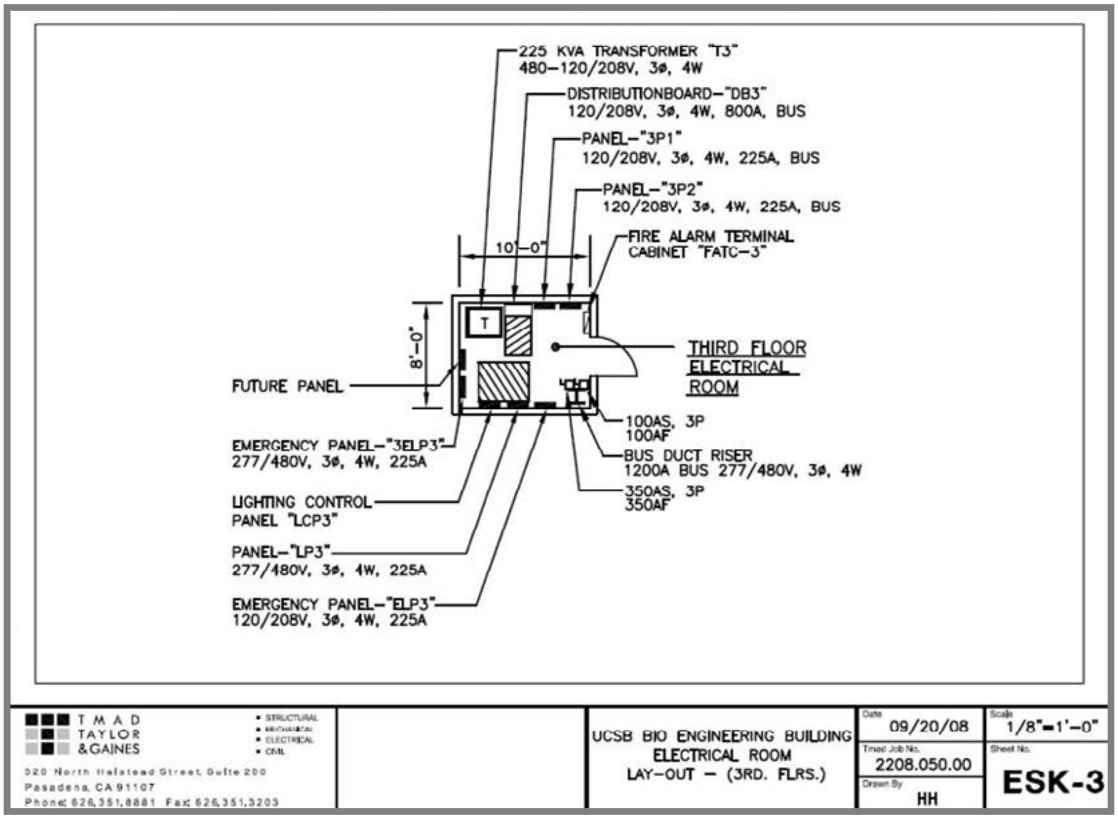
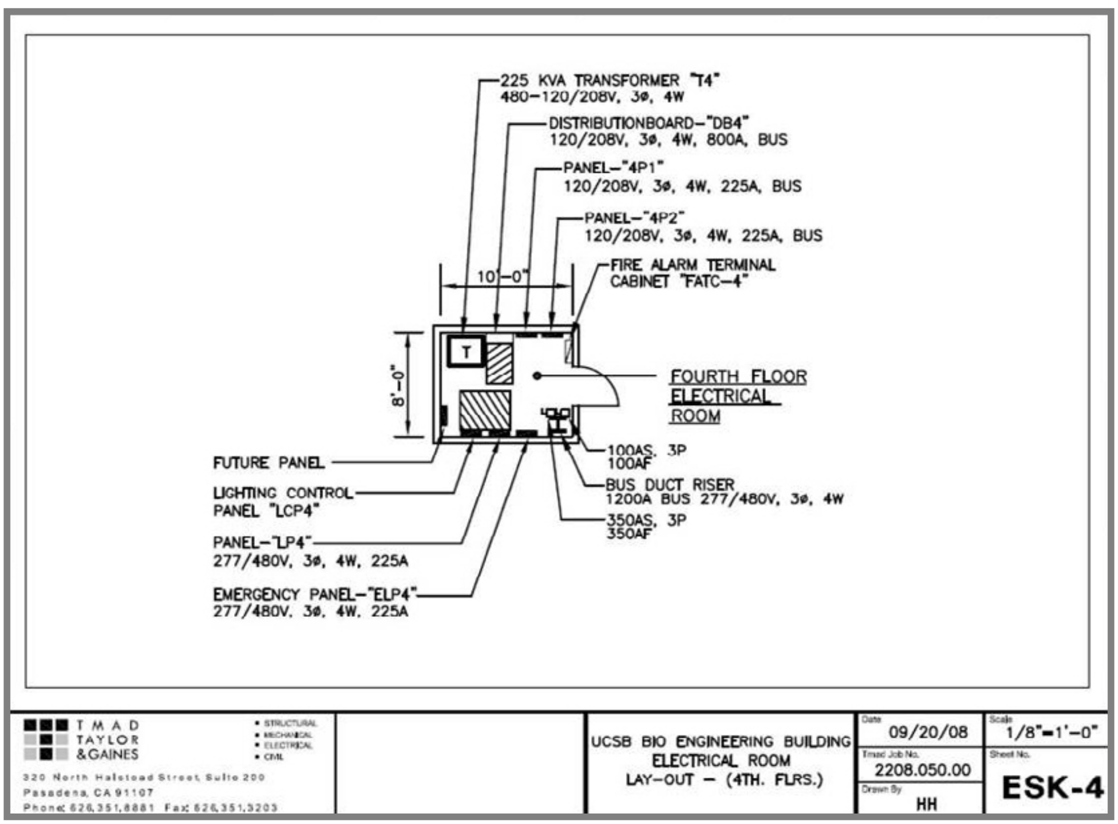

FIRST FLOOR
SECOND FLOOR
THIRD FLOOR
FOURTH FLOOR
ROOF
1 SINGLE LINE DIAGRAM
NTS
UCSB BIO ENGINEERING BUILDING
SANTA BARBARA, CALIFORNIA 93106
E0.1


225 KVA TRANSFORMER "T1"
480–120/208V, 3ø, 4W
DISTRIBUTIONBOARD–"DB1"
120/208V, 3ø, 4W, 800A, BUS
PANEL–"1P1"
120/208V, 3ø, 4W, 225A, BUS
PANEL–"2P2"
120/208V, 3ø, 4W, 225A, BUS
FIRST FLOOR MAIN ELECTRICAL ROOM
FIRE ALARM CONTROL PANEL "FACP–1"
PANEL–"1ELP1"
120/208V, 3ø, 4W, 100A
EMERGENCY DISTRIBUTIONBOARD–"EDB1"
120/208V, 3ø, 4W, 225A
PANEL–"E1P2"
120/208V, 3ø, 4W, 225A
EMERGENCY DISTRIBUTIONBOARD–"EDB2"
120/208V, 3ø, 4W, 800A, BUS
225 KVA TRANSFORMER "T1E"
480–120/208V, 3ø, 4W
MAIN SWITCHBOARD "MSA"
277/480V, 3ø, 4W, 3000A
LIGHTING CONTROL PANEL LCP1
PANEL–"LP1"
277/480V, 3ø, 4W, 225A
25'–0"
15'–0"
T
160A, 4P
ATS #1
100AS, 3P
100AF
BUS DUCT RISER
1200A BUS
277/480V, 3ø, 4W
350AS, 3P
350AF
1200A, 4P
ATS #2
EMERGENCY DISTRIBUTIONBOARD "EDB1"
480/277V, 3ø, 4W, 1200A, BUS
TMAD TAYLOR & GAINES
• STRUCTURAL • MECHANICAL • ELECTRICAL • CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
MAIN ELECTRICAL ROOM
LAY–OUT – (1ST. FLR.)
Date 09/20/08
Tmad Job No. 2208.050.00
Drawn By HH
Scale 1/8"=1'–0"
Sheet No. ESK-1


225 KVA TRANSFORMER "T2"
480–120/208V, 3ø, 4W
DISTRIBUTIONBOARD–"DB2"
120/208V, 3ø, 4W, 800A, BUS
PANEL–"2P1"
120/208V, 3ø, 4W, 225A, BUS
PANEL–"2P2"
120/208V, 3ø, 4W, 225A, BUS
FIRE ALARM TERMINAL CABINET "FATC–2"
10'–0"
8'–0"
T
SECOND FLOOR ELECTRICAL ROOM
FUTURE PANEL
LIGHTING CONTROL PANEL "LCP2"
PANEL–"LP2"
277/480V, 3ø, 4W, 225A
EMERGENCY PANEL–"ELP2"
277/480V, 3ø, 4W, 225A
100AS, 3P
100AF
BUS DUCT RISER
1200A BUS 277/480V, 3ø, 4W
350AS, 3P
350AF
TMAD TAYLOR & GAINES
• STRUCTURAL • MECHANICAL • ELECTRICAL • CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
ELECTRICAL ROOM
LAY–OUT – (2ND. FLRS.)
Date 09/20/08
Tmad Job No. 2208.050.00
Drawn By HH
Scale 1/8"=1'–0"
Sheet No. ESK-2


225 KVA TRANSFORMER "T3"
480-120/208V, 3ø, 4W
DISTRIBUTIONBOARD-"DB3"
120/208V, 3ø, 4W, 800A, BUS
PANEL-"3P1"
120/208V, 3ø, 4W, 225A, BUS
PANEL-"3P2"
120/208V, 3ø, 4W, 225A, BUS
FIRE ALARM TERMINAL
CABINET "FATC-3"
10'-0"
8'-0"
T
THIRD FLOOR
ELECTRICAL
ROOM
FUTURE PANEL
100AS, 3P
100AF
BUS DUCT RISER
1200A BUS 277/480V, 3ø, 4W
350AS, 3P
350AF
EMERGENCY PANEL-"3ELP3"
277/480V, 3ø, 4W, 225A
LIGHTING CONTROL
PANEL "LCP3"
PANEL-"LP3"
277/480V, 3ø, 4W, 225A
EMERGENCY PANEL-"ELP3"
120/208V, 3ø, 4W, 225A
TMAD
TAYLOR
& GAINES
• STRUCTURAL
• MECHANICAL
• ELECTRICAL
• CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
ELECTRICAL ROOM
LAY-OUT - (3RD. FLRS.)
Date 09/20/08
Tmad Job No. 2208.050.00
Drawn By HH
Scale 1/8"=1'-0"
Sheet No. ESK-3


225 KVA TRANSFORMER "T4"
480-120/208V, 3ø, 4W
DISTRIBUTIONBOARD-"DB4"
120/208V, 3ø, 4W, 800A, BUS
PANEL-"4P1"
120/208V, 3ø, 4W, 225A, BUS
PANEL-"4P2"
120/208V, 3ø, 4W, 225A, BUS
FIRE ALARM TERMINAL
CABINET "FATC-4"
10'-0"
8'-0"
T
FOURTH FLOOR
ELECTRICAL
ROOM
FUTURE PANEL
100AS, 3P
100AF
BUS DUCT RISER
1200A BUS 277/480V, 3ø, 4W
350AS, 3P
350AF
LIGHTING CONTROL
PANEL "LCP4"
PANEL-"LP4"
277/480V, 3ø, 4W, 225A
EMERGENCY PANEL-"ELP4"
277/480V, 3ø, 4W, 225A
TMAD
TAYLOR
& GAINES
• STRUCTURAL
• MECHANICAL
• ELECTRICAL
• CIVIL
320 North Halstead Street, Suite 200
Pasadena, CA 91107
Phone: 626.351.8881 Fax: 626.351.3203
UCSB BIO ENGINEERING BUILDING
ELECTRICAL ROOM
LAY-OUT - (4TH. FLRS.)
Date 09/20/08
Tmad Job No. 2208.050.00
Drawn By HH
Scale 1/8"=1'-0"
Sheet No. ESK-4

SUSTAINABILITY

BIOENGINEERING BUILDING MASTER PLAN DPP

12.0.0

Sustainability Assessment

The following table lists LEED prerequisites and credits along with a description of the expected design performance. Commitment to some points will require additional effort in later stages of design. Some credits will require additional funds and may be removed if there are budgetary constraints.
Refer to the LEED Score Card in Section 12.1..2 for Yes, Maybe and No LEED scores. The current checklist and narrative totals 43 credits, which constitutes a strong Silver score.

Prerequisite/Credit Name	Project Condition	Point(s)
SSp1-Construction Activity Pollution Prevention	This prerequisite will be met due to California law requirement for Stormwater Pollution Prevention Plans and the implementation of Erosion & Control Measures.	0
SSc1. Site Selection	This credit is met due to the selection of a previously developed site.	1
SSc2 Development Density & Community Connectivity	UCSB's infrastructure and Best Management Practices have allowed them to consistently obtain this point. In order to obtain this credit, UCSB will need to provide LEED documentation.	1
SSc3 Brownfield Redevelopment	This credit is not applicable as the site is not a Brownfield.	0
SSc4.1 Alternative Transportation, Public Transportation Access	UCSB's infrastructure and Best Management Practices have allowed them to consistently obtain this point. In order to obtain this credit, UCSB will need to provide LEED documentation.	1
SSc4.2 Alternative Transportation, Bicycle Storage & Changing Rooms	With the installation of bike racks and the necessary number of showers, this credit will be met.	1
SSc4.3 Alternative Transportation, Low Emitting & Fuel Efficient Vehicles	UCSB is not expected to obtain this credit. The requirements are: Option 1-Provide low-emitting and fuel-efficient vehicles for 3% of Full-Time Equivalent (FTE) occupants AND provide preferred parking for these vehicles Option 2-Provide preferred parking for low-emitting and fuel efficient vehicles for 5% of the total vehicle parking capacity of the site. Option 3-Install alternative-fuel refueling stations for 3% of the total vehicle parking capacity of the site	0
SSc5.l Site Development, Protect or Restore Open Space	UCSB's infrastructure and Best Management Practices have allowed them to consistently obtain this point. UCSB will provide the LEED documentation for this credit.	1

SSc5.2 Site Development, Maximize Open Space	Option 2 of this credit requires that an open, vegetated space, adjacent to the building be undeveloped for the life of the building. This area must be equal in square footages as the building's footprint. This credit could be obtained. Further discussion during the next phase of design will confirm.	?
SSc6.1 Stormwater Design; Quantity Control	The civil engineer will implement a stormwater management plan that results in a 25% decrease in the volume of stormwater runoff from the two-year, 24-hour design storm.	1
SSc6.2 Stormwater Design: Quality Control	The design team will work together to develop a stormwater management plan that reduces impervious cover, promotes infiltration and captures and treats the SW runoff from 90% of the average annual rainfall using acceptable best management practices. The system used must be capable of removing 80% of the average annual post development total suspended solids (TSS) load based on existing monitoring reports.	1
SSc7.1 Heat Island Effect, Non-Roof	Team members will work together during the design phase to provide for 50% of the site hardscape: shade, reflective paving materials or open grid pavement.	1
SSc7.2 Heat Island Effect, Roof	The roof material will have a Solar Reflectance Index that meets LEED requirements (<2:12, SRI = 78).	1
SSc8 Light Pollution Reduction	UCSB facilities staff will work with the design team to confirm specifications for university standard exterior lights and lighting requirements are. Lighting levels shall not exceed 80% of the lighting power densities for exterior areas and 50% for building facades and landscape features as defined in ASHRAE/IESNA Standard 90.1-2004. During the Design Development Phase the design team shall confirm that interior lights shall not exit out through the windows OR all non-emergency lighting shall be automatically controlled to turn off during non-business hours. Provide manual override capability for after hours use.	1
WEc1.1 Water Efficient Landscaping, Reduce by 50%	UCSB's practices have allowed them to consistently obtain this point. Landscape architect shall specify plant materials and irrigation systems that meet this credit. UCSB will be asked to provide campus standard specification for irrigation and plants.	1
WEc1.2 Water Effic. Landscaping No Potable Water Use or No Irrigation	The campus has a grey water system. The design team shall confirm whether the campus' current grey water system can be extended to this site and whether there is capacity to serve the building's landscaping needs. OR Install landscaping that does not require permanent irrigation systems. Temporary irrigation systems used for plant establishment are allowed only if removed within one year of installation.	1
WEc2. Innovative Wastewater Technologies	This credit needs further study. Currently reducing the amount of wastewater by 50% is not expected.	?
WEc3.1 Water Use Reduction, 20%, 30% Reduction	With the use of low flow faucets, showers, dual flush or Ultra high efficiency toilets and pint flush urinals will allow the school to easily obtain a 30% reduction in water demand.	2

EAp1 Fundamental Commissioning of the Building Energy Systems	Commissioning is a requirement and will likely be handled in a hybrid way in coordination with UCSB staff.	0
EAp2 Minimum Energy Performance	The building's energy system will meet the requirements of this credit by meeting Title 24 energy codes.	0
EAp3 Fundamental Refrigerant Management	Chlorofluorocarbons (CFC) refrigerants will not be used in the base building HVAC & R systems.	0
EAc1.1 Optimize Energy Performance, 10%-50% > T24	The USGBC now requires that all projects perform 14% better than ASHRAE / IESNA Standard 90.1-2004. TMAD expects to be 30% better for 6 of 10 possible points.	6
EAc2.1 On-Site Renewable Energy, 2.5%, 7.5% or 12.5%	The project will not include on-site renewable energy sources.	0
EAc3 Enhanced Commissioning	Commissioning will likely be handled in a hybrid way in coordination with UCSB staff. This credit will be pursued if the budget allows.	1
EAc4 Enhanced Refrigerant Management	Hydrochlorofluorocarbons (HCFC) refrigerants will not be used in base building HVAC & R systems.	1
EAc5 Measurement & Verification	Metering equipment to measure energy use will be installed. An M&V Plan will be developed and implemented consistent with the referenced standards. The M&V period shall cover no less than one year of post-construction occupancy.	1

UCSB Bio Engineering Building-DPP LEED Scorecard

8/22/2008

Y	?	N	Total Project Score		Possible Points 69
43	8	13			

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

Y	?	N		Sustainable Sites	Possible Points 14
10	1	3			
Y			Prereq 1	**Construction Activity Pollution Prevention**	
1			Credit 1	**Site Selection**	1
1			Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
1			Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
		1	Credit 4.3	**Alternative Transportation**, Low Emitting & Fuel Efficient Vehicles	1
		1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1			Credit 5.1	**Site Development**, Protect or Restore Open Space	1
	1		Credit 5.2	**Site Development**, Maximize Open Space	1
1			Credit 6.1	**Stormwater Design; Quantity Control**	1
1			Credit 6.2	**Stormwater Design: Quality Control**	1
1			Credit 7.1	**Heat Island Effect**, Non-Roof	1
1			Credit 7.2	**Heat Island Effect**, Roof	1
1			Credit 8	**Light Pollution Reduction (occupancy sensors and pole standa**	1

Y	?	N		Water Efficiency	Possible Points 5
4	1				
1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
	1		Credit 2	**Innovative Wastewater Technologies**	1
1			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
1			Credit 3.2	**Water Use Reduction**, 30% Reduction (low flow toilets and waterless urina	1

Y	?	N		Energy & Atmosphere	Possible Points 17
6	1	5			
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	
Y			Prereq 2	**Minimum Energy Performance**	
Y			Prereq 3	**Fundamental Refrigerant Management**	
1			Credit 1.1	**Optimize Energy Performance**, 10% > T24	2
1			Credit 1.2	**Optimize Energy Performance**, 20% > T24	2
1			Credit 1.3	**Optimize Energy Performance**, 30% > T24	2
		1	Credit 1.4	**Optimize Energy Performance**, 40% > T24	2
		1	Credit 1.5	**Optimize Energy Performance**, 50% > T24	2
		1	Credit 2.1	**On-Site Renewable Energy**, 2.5%	1
		1	Credit 2.2	**On-Site Renewable Energy, 7.5%**	1
		1	Credit 2.3	**On-Site Renewable Energy, 12.5%**	1
1			Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
1			Credit 5	**Measurement & Verification (part of Johnson controls)**	1
	1		Credit 6	**Green Power** (UCSB is buying power - must have 2 year contract fc	1

Y	?	N		Materials & Resources	Possible Points 13
4	4	5			
Y			Prereq 1	**Storage & Collection of Recyclables**	
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from landfill	1
1			Credit 2.2	**Construction Waste Management**, Divert 75% from landfill	1
		1	Credit 3.1	**Materials Reuse:** 5%	1
		1	Credit 3.2	**Materials Reuse: 10%**	1
1			Credit 4.1	**Recycled Content**, Specify 10% (post-consumer + 1/2 post-industrial)	1
1			Credit 4.2	**Recycled Content**, Specify 20% (post-consumer + 1/2 post-industrial)	1
	1		Credit 5.1	**Regional Materials: 10% Extracted, Processed & Manufactured Re**	1
	1		Credit 5.2	**Regional Materials: 20% Extracted, Processed & Manufactured Re**	1
	1		Credit 6	**Rapidly Renewable Materials**	1
	1		Credit 7	**Certified Wood (only 50% required)**	1

Y	?	N		Indoor Environmental Quality	Possible Points 15
14	1				
Y			Prereq 1	**Minimum IAQ Performance**	
Y			Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
1			Credit 2	**Increase Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	1		Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems: Lighting**	1
1			Credit 6.2	**Controllability of Systems: Thermal Comfort**	1
1			Credit 7.1	**Thermal Comfort: Design**	1
1			Credit 7.2	**Thermal Comfort: Verification**	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces (define what use is)	1

Y	?	N		Innovation & Design Process	Possible Points 5
5					
1			Credit 1.1	**Innovation in Design**: Green Cleaning	1
1			Credit 1.2	**Innovation in Design**: Exem Perf. Const Waste 95% Diversion	1
1			Credit 1.3	**Innovation in Design**: Integrated Pest Management on Campus	1
1			Credit 1.4	**Innovation in Design**: Green Site Maintenance	1
1			Credit 2	**LEED™ Accredited Professional**	1

U S Green Building Council **Scorecard** LEED™ Calculator 2.0

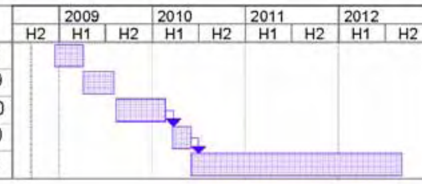
SCHEDULE

BIOENGINEERING BUILDING MASTER PLAN DPP

13.0.0

Bio-Engineering DPP
UCSB PROJECT
FM 090116 / 981650 / 238-26

ID		Task Name	Duration	Start	Finish
1		Schematic Design Phase	14.6 wks	Wed 12/17/08	Tue 4/7/09
2		Design Development Phase	17.2 wks	Wed 4/8/09	Wed 8/5/09
3		Construction Document Phase	26 wks	Fri 8/14/09	Tue 2/23/10
4		Bidding / Award Phase	10.4 wks	Tue 3/23/10	Wed 6/2/10
5		Construction Phase	116.8 wks	Thu 6/3/10	Thu 9/6/12



Project: 2B352001
Date: Thu 9/11/08

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Page 1

APPENDIX

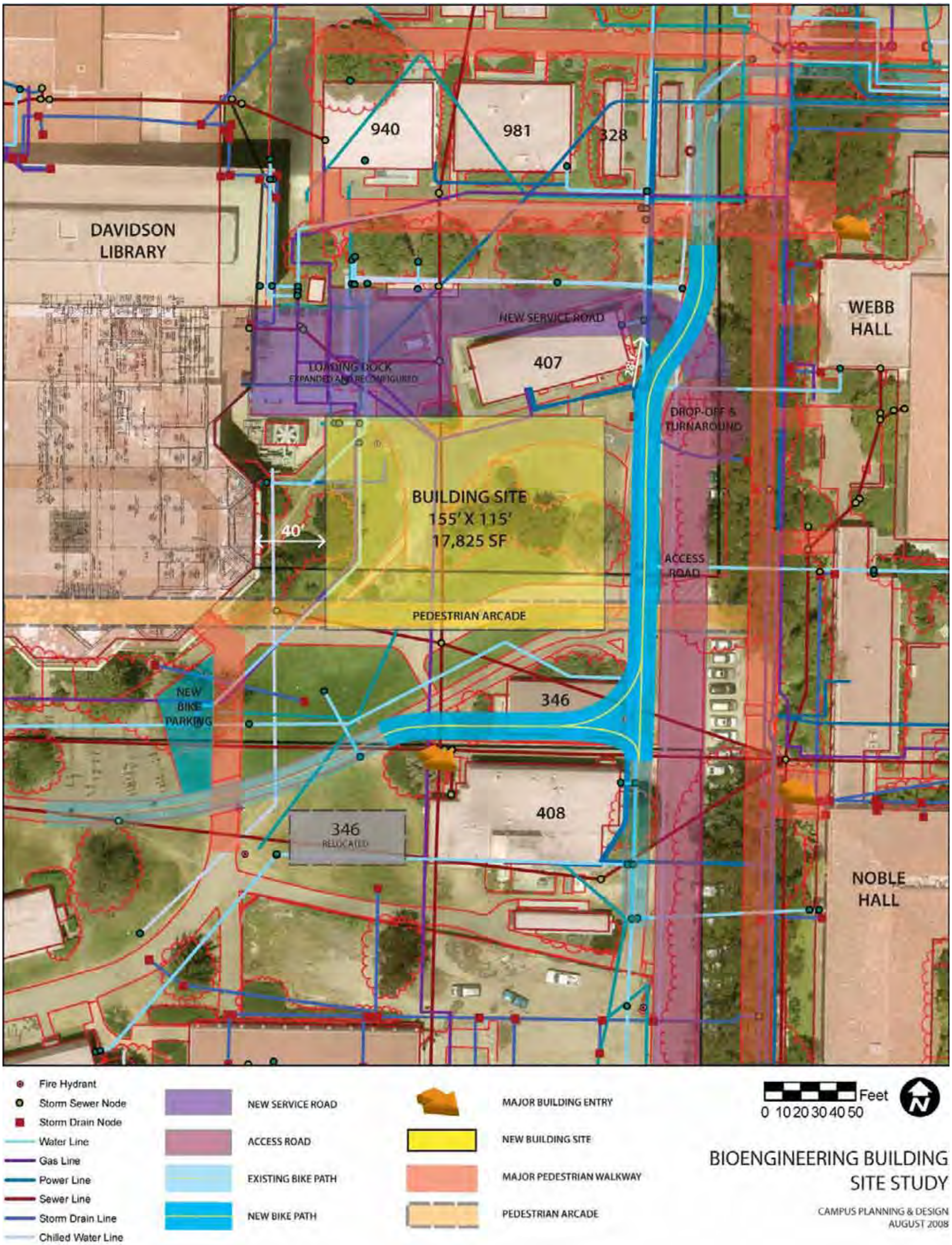
BIOENGINEERING BUILDING MASTER PLAN DPP

14.0.0

APPENDIX A – BUILDING SITE SURVEY

BIOENGINEERING BUILDING MASTER PLAN DPP

14.1.0


940
981
328
DAVIDSON LIBRARY
WEBB HALL
NEW SERVICE ROAD
407
LOADING DOCK
EXPANDED AND RECONFIGURED
DROP-OFF & TURNAROUND
BUILDING SITE
155' X 115'
17,825 SF
40'
ACCESS ROAD
PEDESTRIAN ARCADE
NEW BIKE PARKING
346
346
RELOCATED
408
NOBLE HALL
Fire Hydrant
Storm Sewer Node
Storm Drain Node
Water Line
Gas Line
Power Line
Sewer Line
Storm Drain Line
Chilled Water Line
NEW SERVICE ROAD
ACCESS ROAD
EXISTING BIKE PATH
NEW BIKE PATH
MAJOR BUILDING ENTRY
NEW BUILDING SITE
MAJOR PEDESTRIAN WALKWAY
PEDESTRIAN ARCADE
Feet
0 10 20 30 40 50
N
BIOENGINEERING BUILDING
SITE STUDY
CAMPUS PLANNING & DESIGN
AUGUST 2008

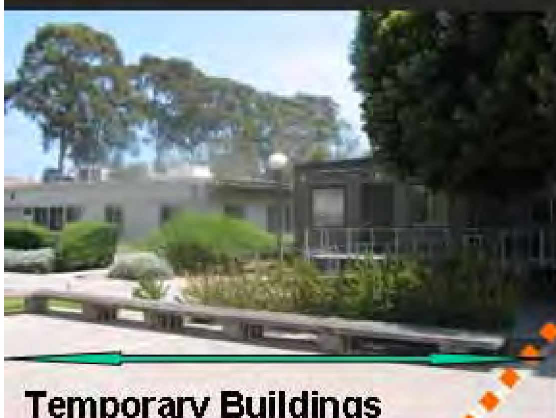
APPENDIX B – PHOTO SURVEY

BIOENGINEERING BUILDING MASTER PLAN DPP

14.2.0

PHOTOGRAPHIC SURVEY – NORTH & WEST

Site from Campus Green

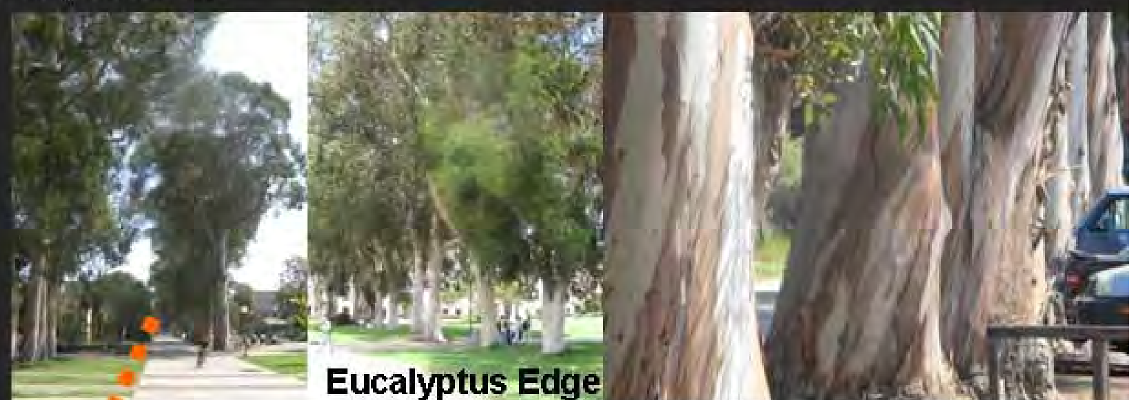


West boundary

Library Secondary Access and Bike parking at the north end,
Restricted Access Service Drive at south end.

PHOTOGRAPHIC SURVEY - EAST

North East Corner of the development site

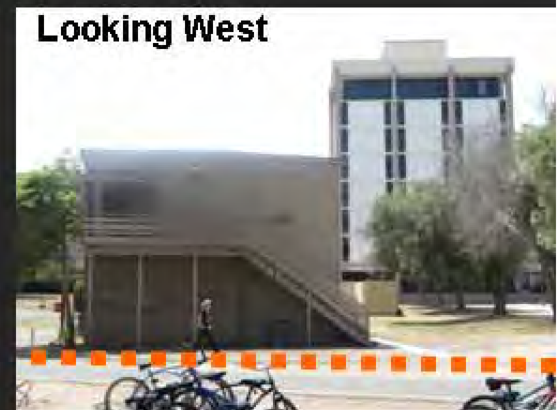


East boundary

One of the main pedestrian connectors between north and south of the campus.
Eucalyptus growth along the "Science Walk".

PHOTOGRAPHIC SURVEY - SOUTH

South East Corner of the development site



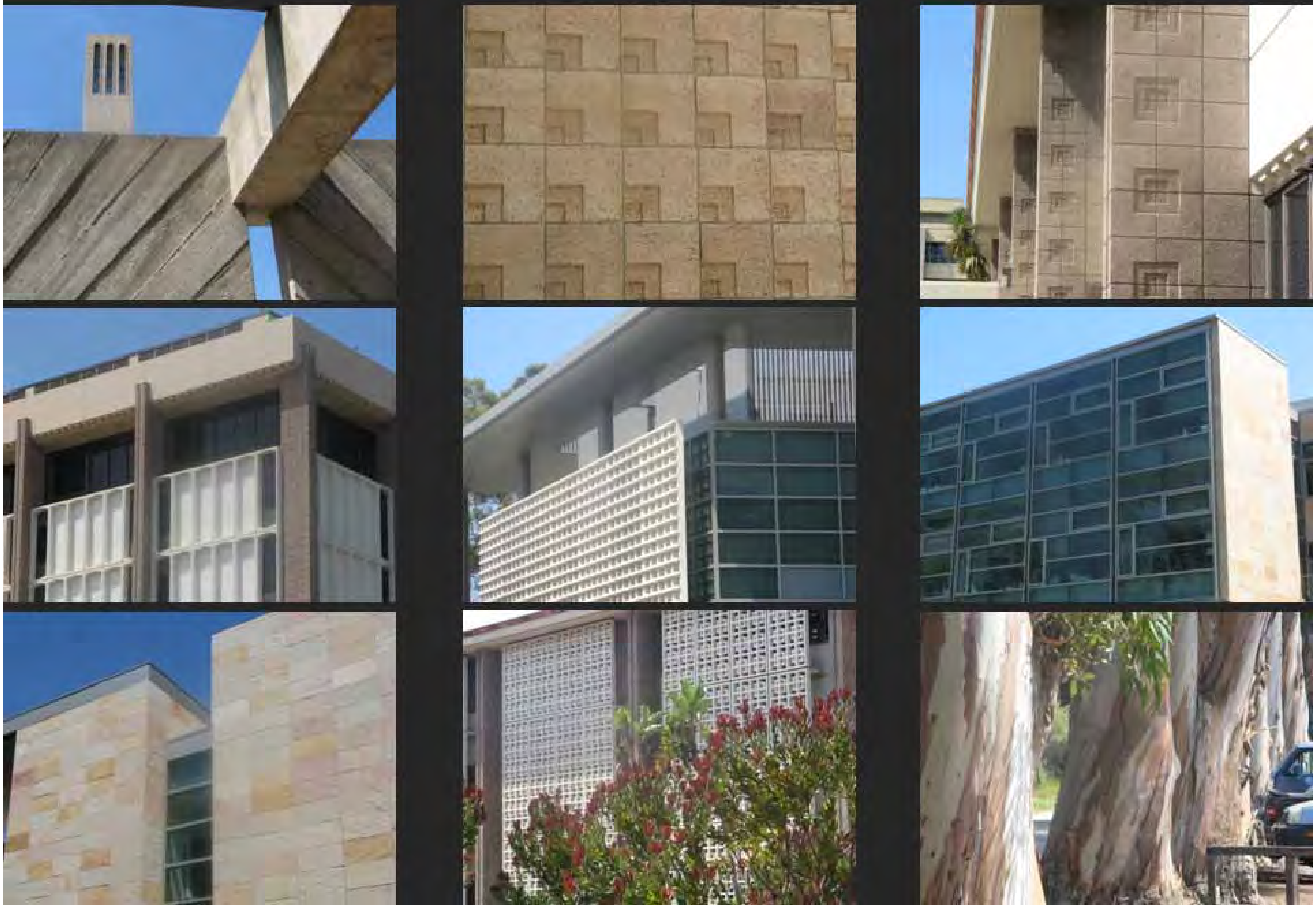
South boundary

East boundary

STYLISTIC DIVERSITY

IMPACT OF LIGHT

PATTERNS AND SCREENS



APPENDIX C – ORIGINAL PROGRAM

BIOENGINEERING BUILDING MASTER PLAN DPP

14.3.0

Bio Engineering Building Program Summary
7/25/08

Phase 1

ICB Core Program
Headquarters for the ICB Organization. Space for staff only, faculty are part of the other groups listed below.

Office ASF	**2,100**

ICB Medical Program
This new research initiative will be housed in the new Building. Space will include offices, research labs, research support space, and administrative support space. Will include 4 faculty; 45 students/post docs/visitors; and 11 staff.

Lab ASF	9,600
Office ASF	4,690
Admin Support	1,280
Total ASF	**15,570**

Bio Engineering Program
A newly reformed Academic Program that will educate graduate students. Initially will include 7 faculty, 73 graduate students/post docs and 4 staff, plus a classroom and administrative space. There will be shared lab facilities, as well as a shared Biological Safety Lab III.

Lab ASF	12,800
Office ASF	5,690
Admin Support	2,540
Total ASF	**21,030**

Systems Biology/Stem Cell
Initially will include one faculty member and his research group. In Phase 2 this area will grow to include a larger number of faculty and their research efforts.

Lab ASF	1,000
Office ASF	680
Admin Support	-
Total ASF	**1,680**

Phase 1 Total ASF

Lab ASF	**23,400**
Office ASF	**13,160**
Admin Support	**3,820**
Total ASF	**40,380**

Phase 2

Bio Engineering Program
Includes expansion of the Program with the addition of 3 existing faculty members, plus the hiring of 6 new FTE. This expansion also includes the addition of 2 staff members, a classroom and additional shared research facilities.

Lab ASF	17,500
Office ASF	6,380
Admin Support	2,000
Total ASF	**25,880**

Systems Biology/Stem Cell
This expansion includes the addition of 4 existing faculty members, plus the hiring of 3 new faculty.

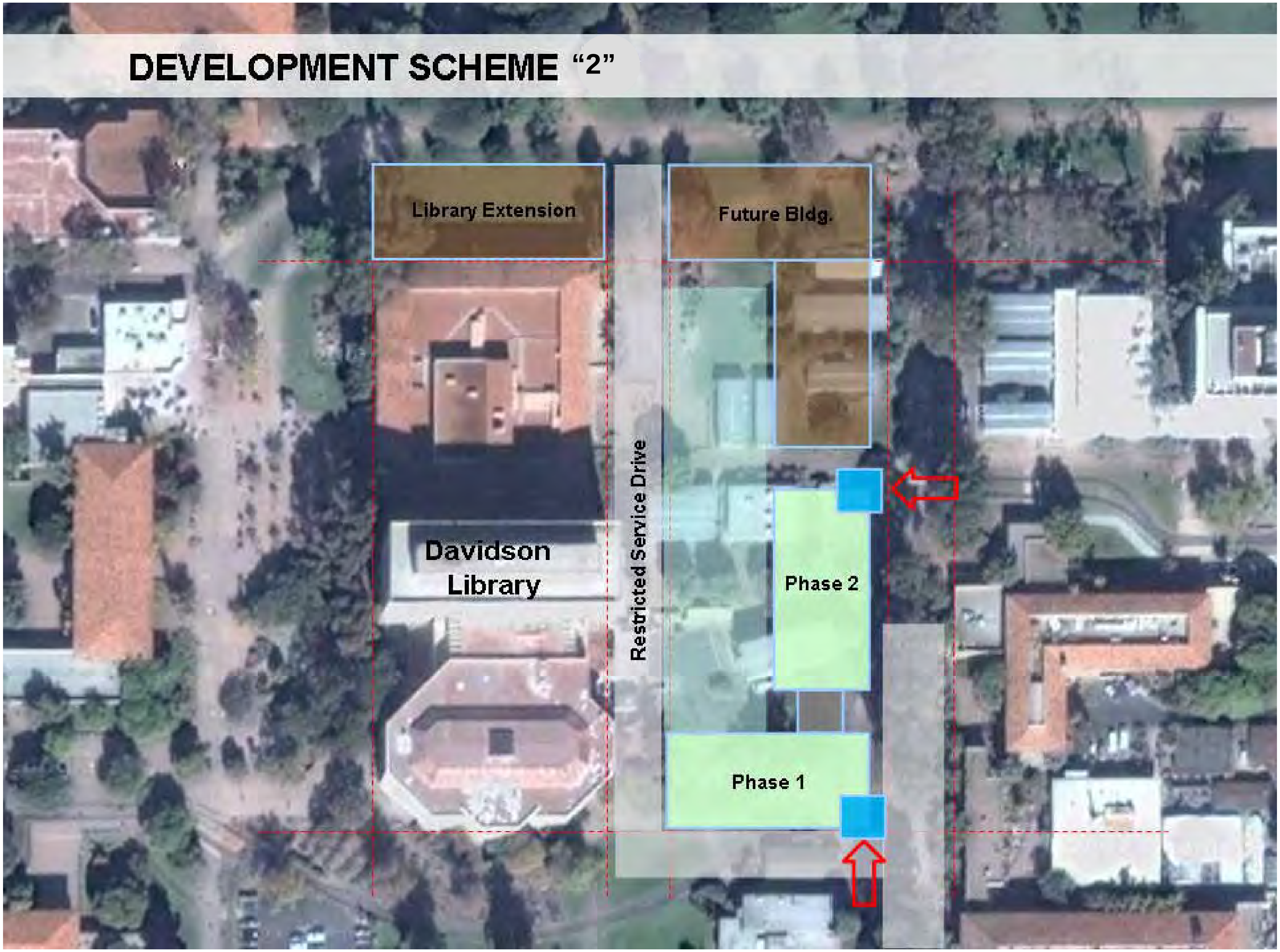
Lab ASF	10,000
Office ASF	4,760
Admin Support	-
Total ASF	**14,760**

Phase 2 Total ASF	
Lab ASF	**27,500**
Office ASF	**11,140**
Admin Support	**2,000**
Total ASF	**40,640**

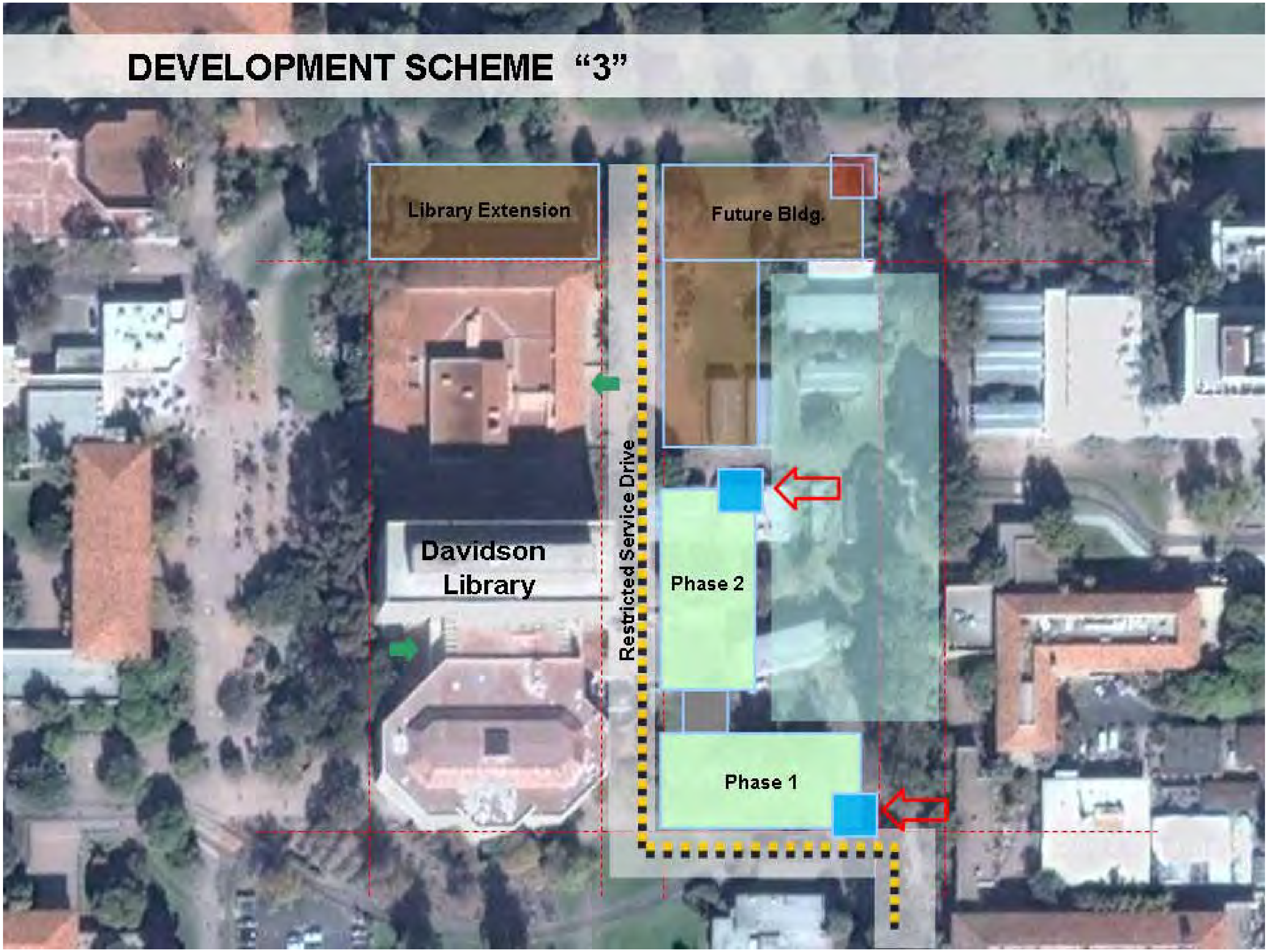
APPENDIX D – SITE DEVELOPMENT SCHEMES

BIOENGINEERING BUILDING MASTER PLAN DPP

14.4.0


DEVELOPMENT SCHEME "2"
Library Extension
Future Bldg.
Davidson Library
Restricted Service Drive
Phase 2
Phase 1

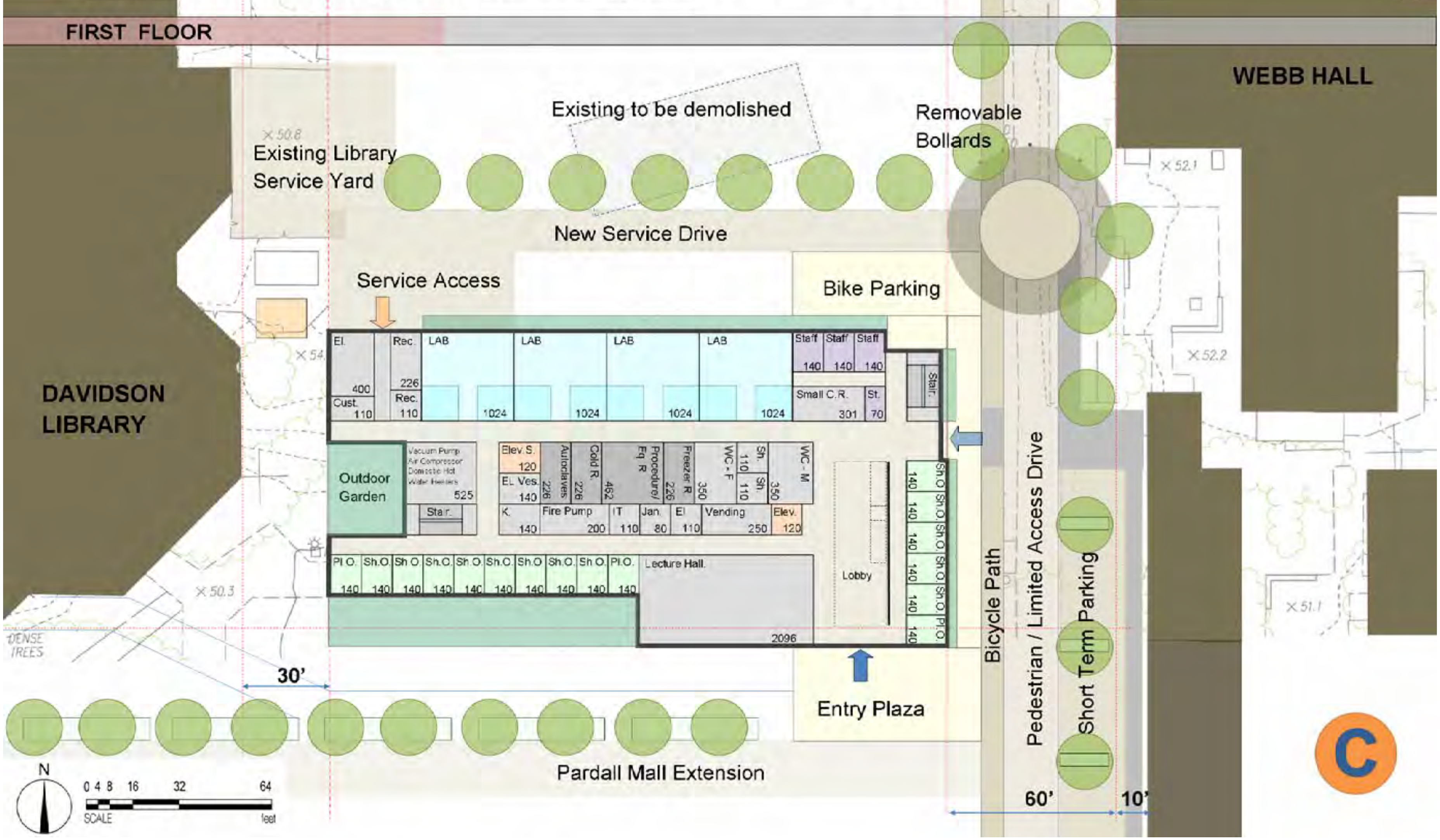

DEVELOPMENT SCHEME "2"
- East – West Axis
- Ocean views from upper floors
- Phase 1 will not impact building 406 and temporary buildings
- Preserves larger open space of the campus green
- Creates inner court between Library and new buildings
- Establishes east edge of he development site
- Remote from science buildings of the Campus Green


DEVELOPMENT SCHEME "3"
Library Extension
Future Bldg.
Restricted Service Drive
Davidson Library
Phase 2
Phase 1


DEVELOPMENT SCHEME "3"
- East – West Axis
- Ocean views from upper floors
- Phase 1 will not disturb building 406 and temporary buildings
- Preserves larger open space of the campus green
- Development creates university quad
- Remote from science buildings of the Campus Green

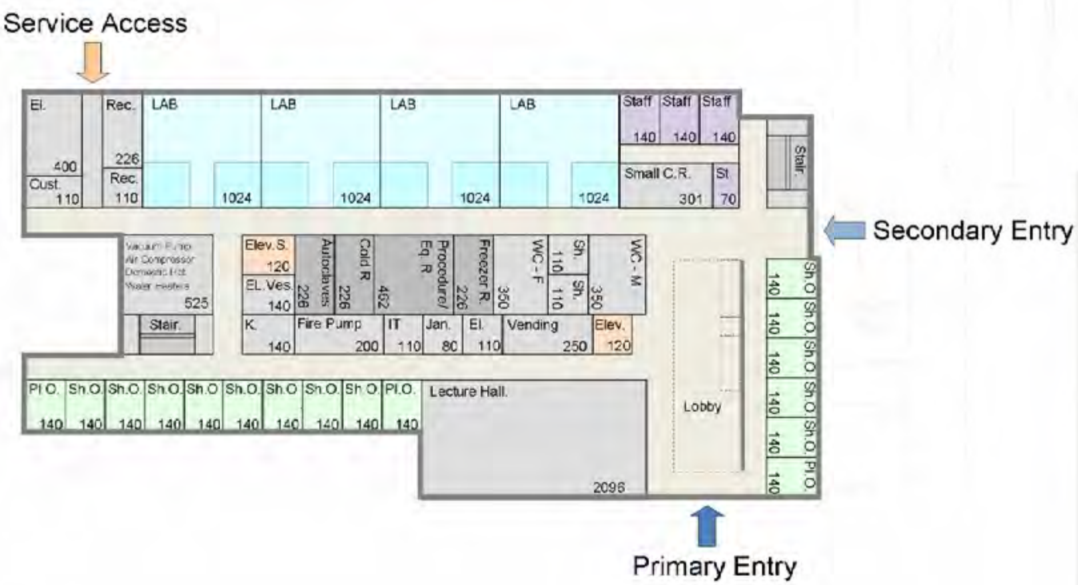
APPENDIX E – CONCEPT SCHEMES C, D, E

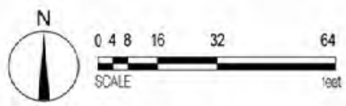
CONCEPT DIAGRAM – 43,400 ASF – SCHEME "C"



CONCEPT DIAGRAM – 43,400 ASF – SCHEME "C"

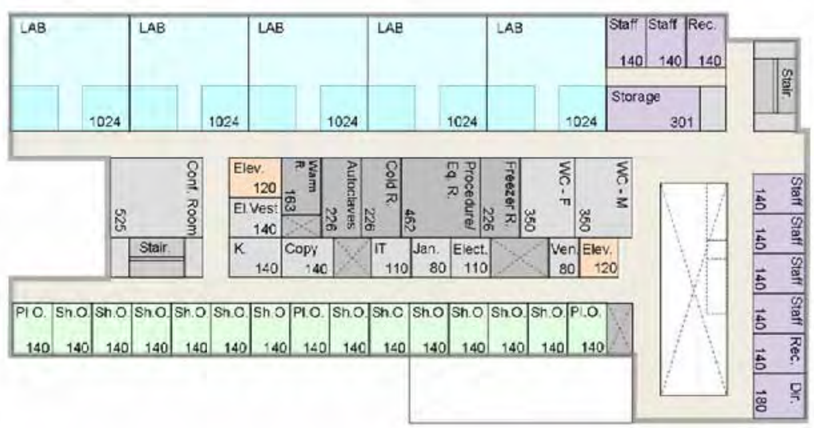
FIRST FLOOR

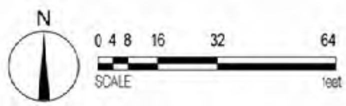




CONCEPT DIAGRAM – 43,400 ASF – SCHEME "C"

SECOND FLOOR





CONCEPT DIAGRAM – 43,400 ASF – SCHEME "C"

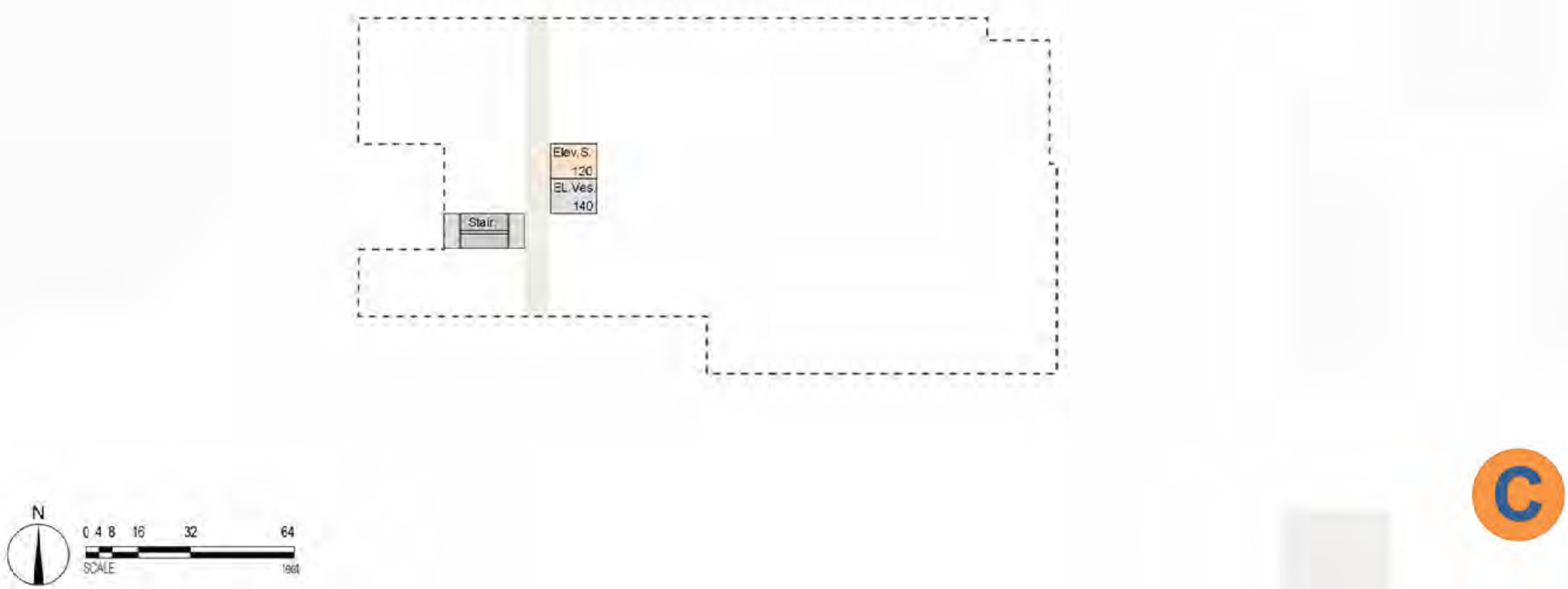
THIRD FLOOR

CONCEPT DIAGRAM – 43,400 ASF – SCHEME "C"

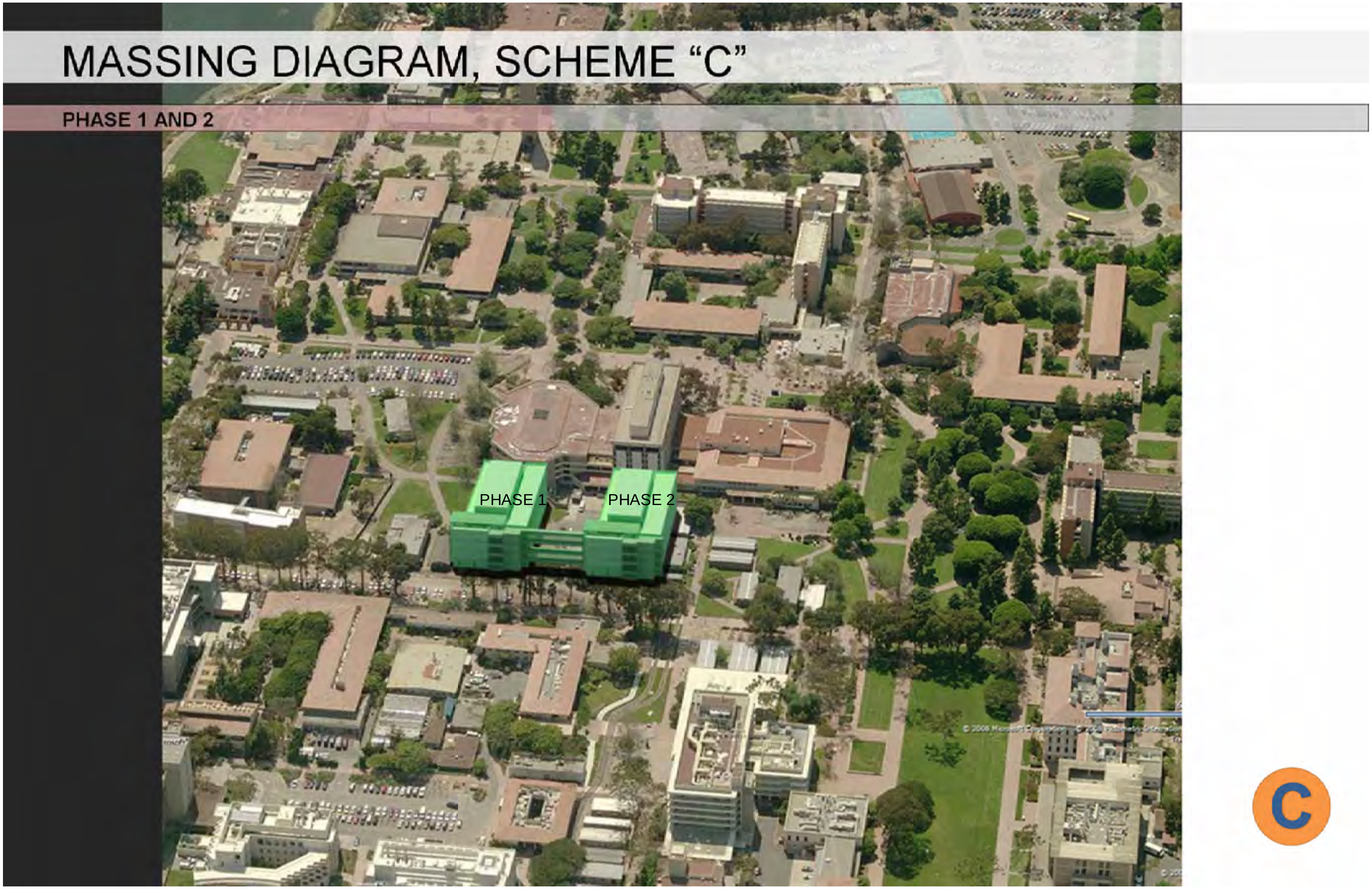
FOURTH FLOOR

CONCEPT DIAGRAM – 43,400 ASF – SCHEME "C"

BASEMENT

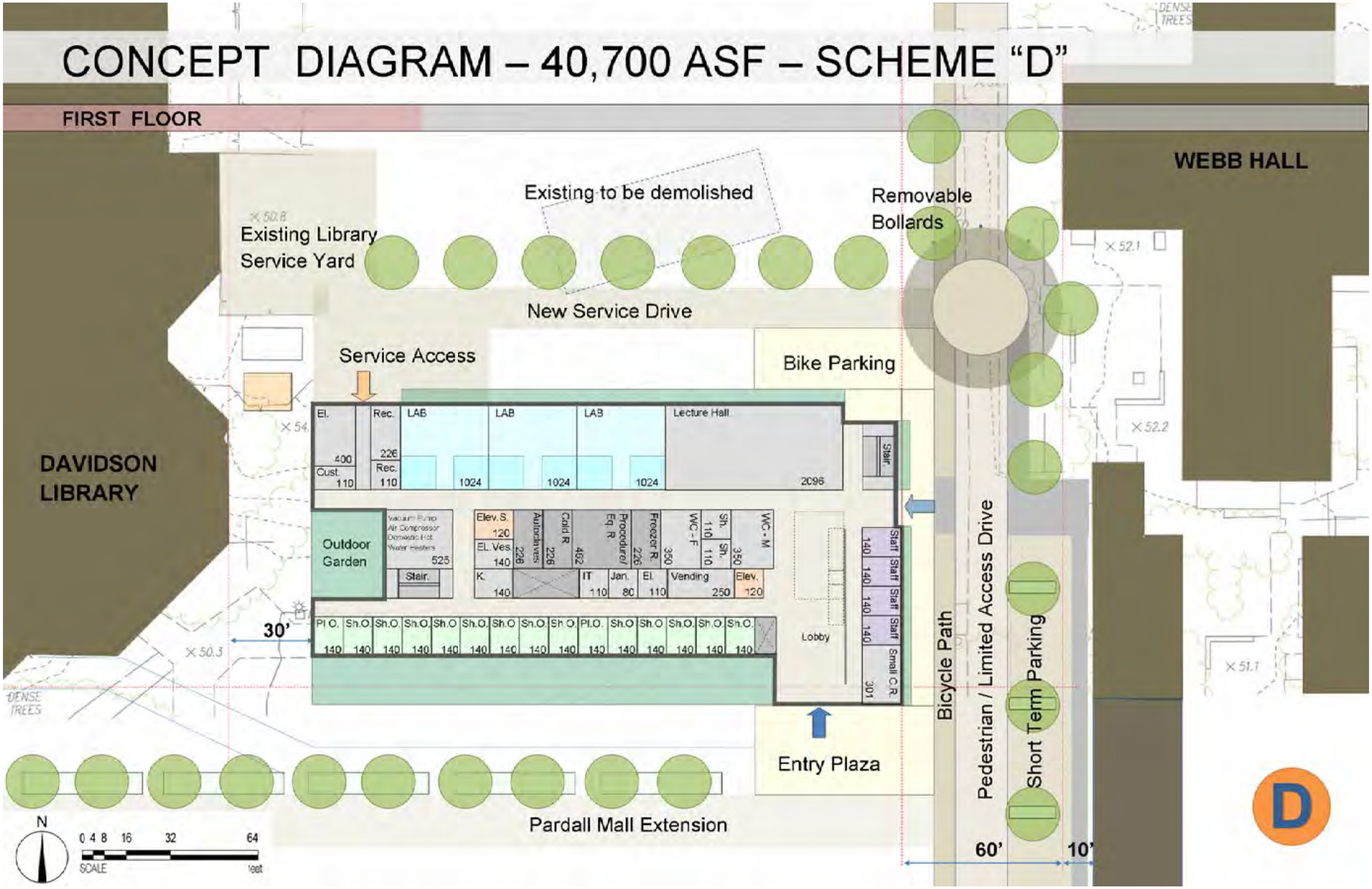


CONCEPT SCHEME C



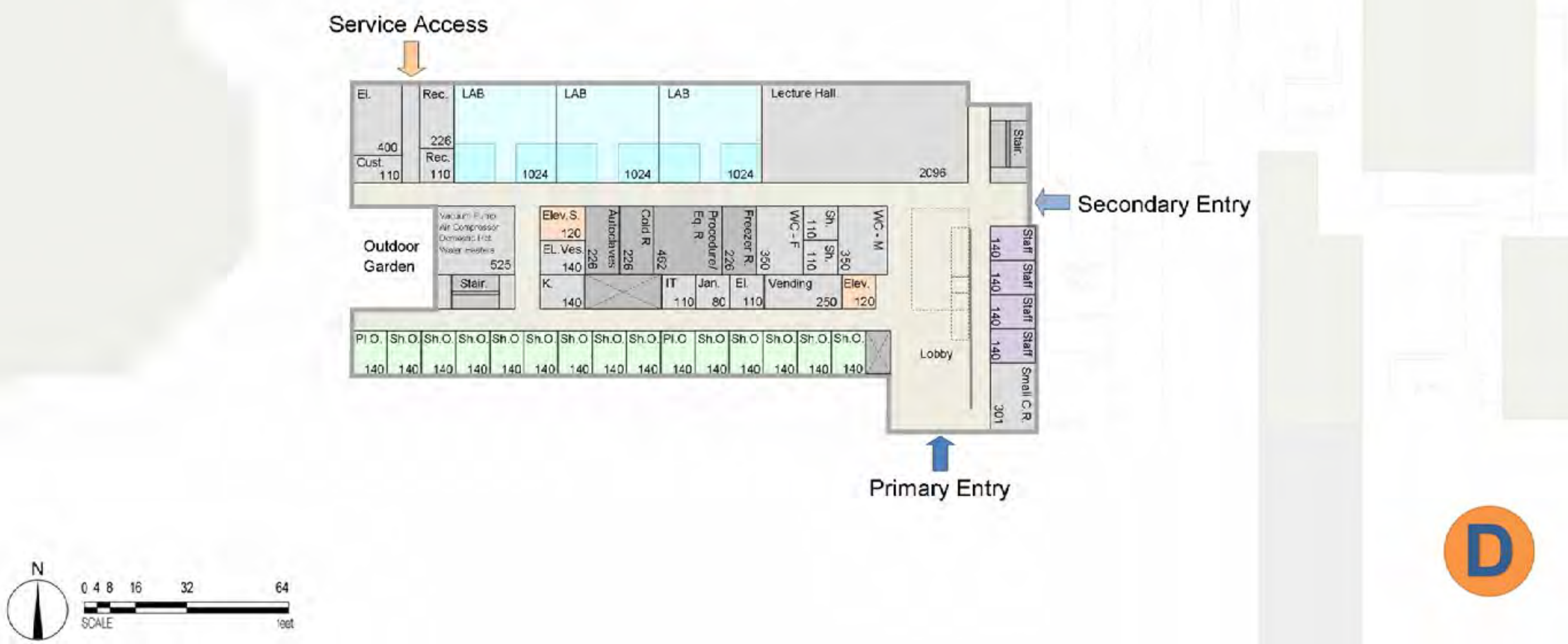
PROJECT PHASING, SCHEME “C”

THIRD FLOOR PLAN - PHASE 1 AND PHASE 2


CONCEPT DIAGRAM – 40,700 ASF – SCHEME "D"
FIRST FLOOR
WEBB HALL
Existing to be demolished
Removable Bollards
Existing Library Service Yard
New Service Drive
Service Access
Bike Parking
DAVIDSON LIBRARY
Outdoor Garden
Lobby
Bicycle Path
Pedestrian / Limited Access Drive
Short Term Parking
Entry Plaza
Pardall Mall Extension
30'
60'
10'
N
SCALE
feet
D

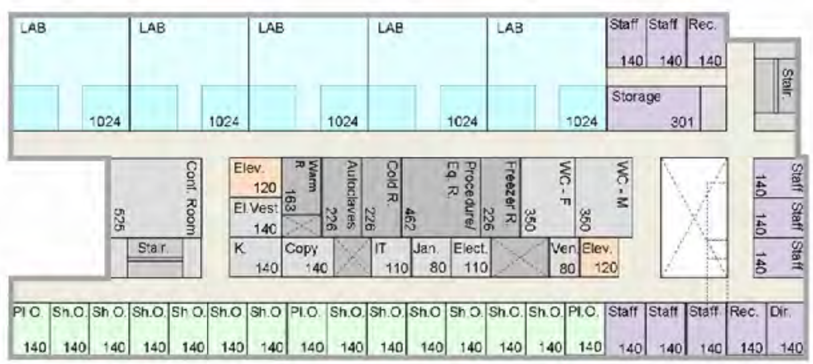
CONCEPT DIAGRAM – 40,700 ASF – SCHEME "D"

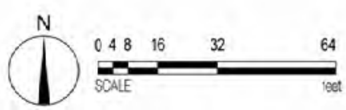
FIRST FLOOR



CONCEPT DIAGRAM – 40,700 ASF – SCHEME "D"

SECOND FLOOR



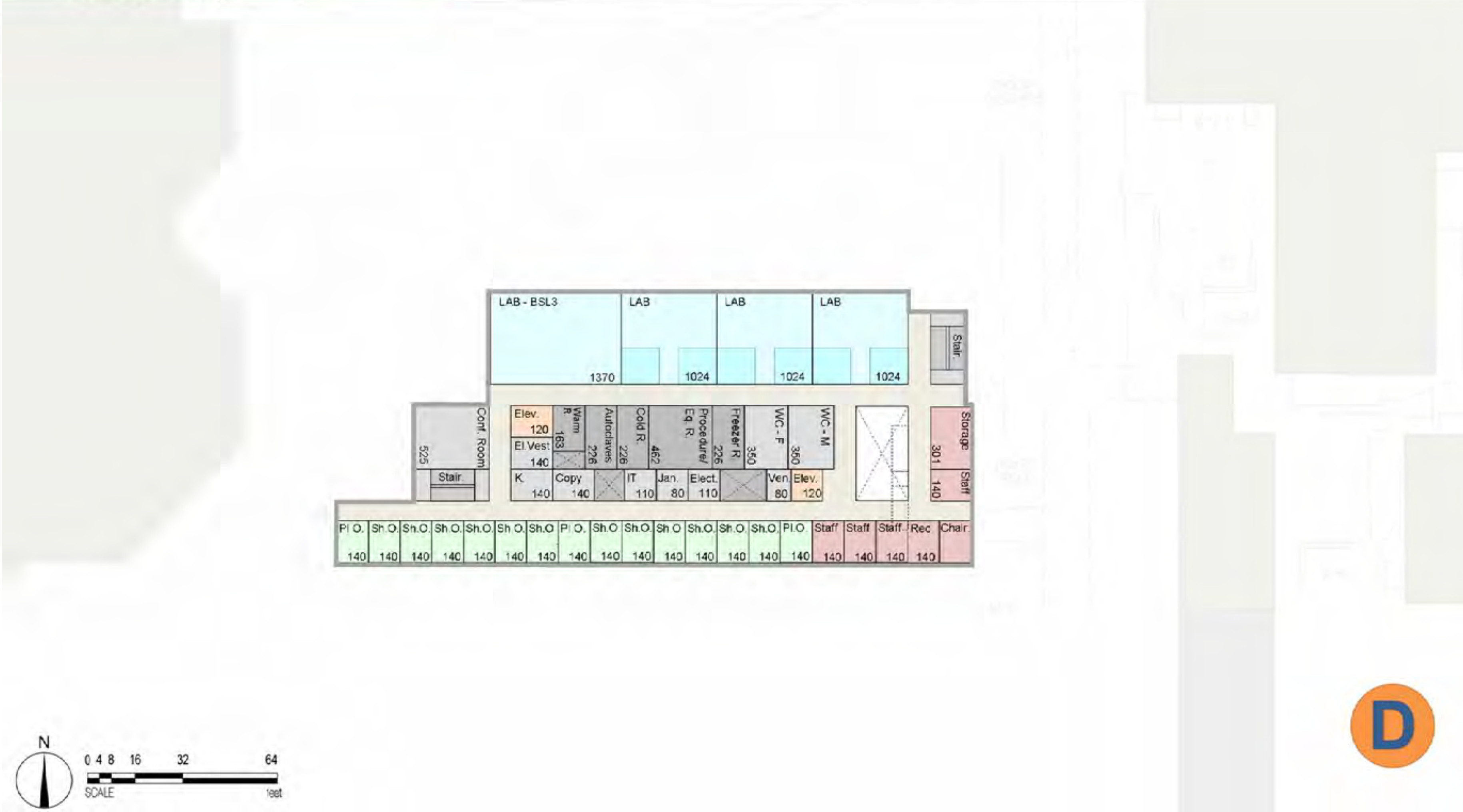


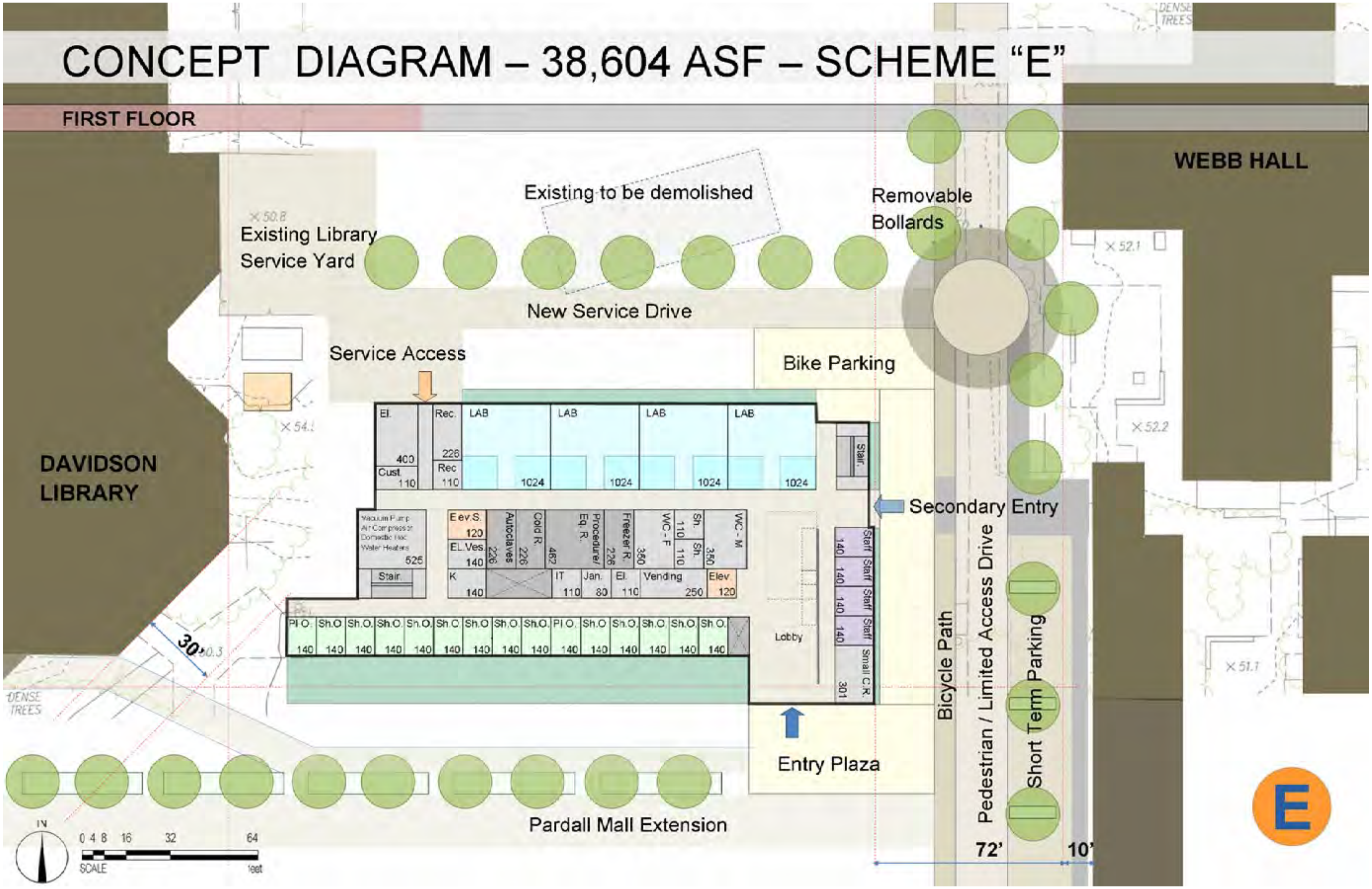
CONCEPT DIAGRAM – 40,700 ASF – SCHEME “D”

THIRD FLOOR

CONCEPT DIAGRAM – 40,700 ASF – SCHEME "D"

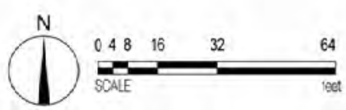
FOURTH FLOOR




CONCEPT DIAGRAM – 38,604 ASF – SCHEME "E"
FIRST FLOOR
WEBB HALL
Existing to be demolished
Removable Bollards
Existing Library Service Yard
New Service Drive
Service Access
Bike Parking
DAVIDSON LIBRARY
Secondary Entry
Lobby
Entry Plaza
Bicycle Path
Pedestrian / Limited Access Drive
Short Term Parking
Pardall Mall Extension
30'
72'
10'
E
SCALE
feet

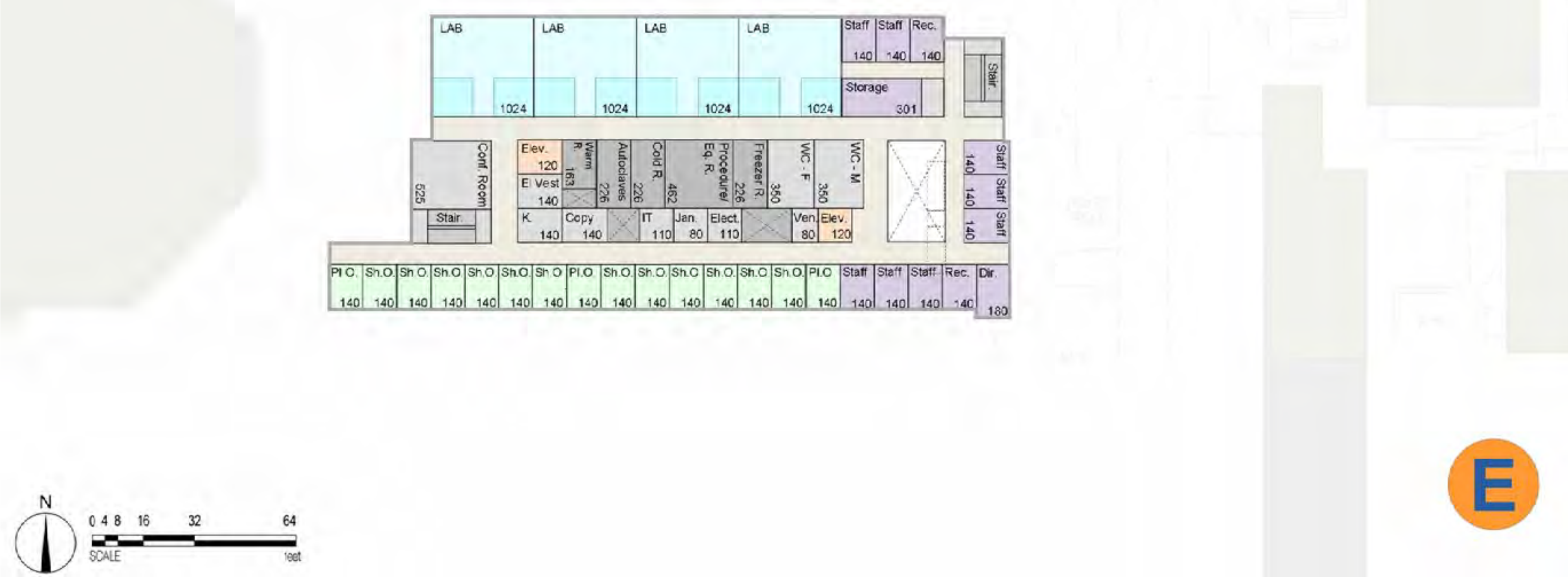
CONCEPT DIAGRAM – 38,604 ASF – SCHEME "E"

FIRST FLOOR



CONCEPT DIAGRAM – 38,604 ASF – SCHEME "E"

SECOND FLOOR



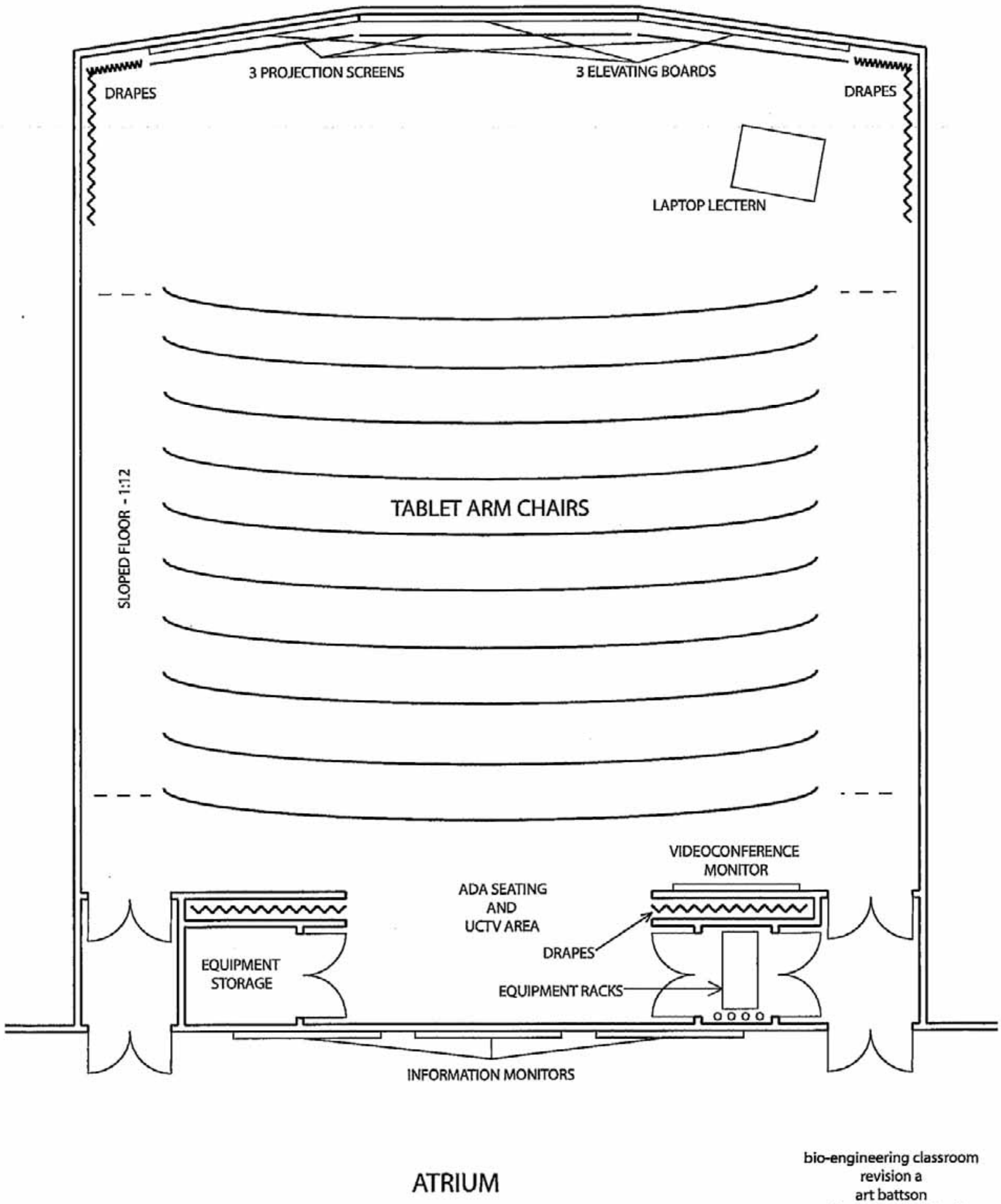
CONCEPT DIAGRAM – 38,604 ASF – SCHEME "E"

THIRD FLOOR

CONCEPT DIAGRAM – 38,604 ASF – SCHEME "E"

FOURTH FLOOR

APPENDIX F – LECTURE HALL CRITERIA



bio-engineering classroom
revision a
art battson
art.battson@pf.ucsb.edu
(805) 448-9505

APPENDIX G – MEETING NOTES

BIOENGINEERING BUILDING MASTER PLAN DPP

14.7.0

RBB ARCHITECTS INC

Joseph A. Balbona, AIA
Arthur E. Border, AIA
Sylvia Botero, AIA
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August 10, 2008
Revised August 13 and 14, 2008

OWNER REVIEW MEETING NOTES 8/7/08

PROJECT:	UCSB Bio-Engineering Building Master Plan and Phase 1 DPP UCSB # RBB #0814700	
PURPOSE:	Kick Off Meeting	
LOCATION:	Elings Hall - 3rd Floor Conference Room	
TIME OF MEETING:	Thursday, August 7, 2008 at 10:00 A.M.	
DATE OF NEXT MEETING:	Thursday, August 14, 2008 at 8:30 A.M.	
DISTRIBUTION AND ATTENDANCE:	Attendance Indicated by (A)	
University of California, Santa Barbara (UCSB)	Mr. Frank Doyle	(A)
	Mr. Mark Nocciolo	(A)
	Mr. Dennis Clegg	(A)*
	Mr. Samir Mitragotri	(A)
	Ms. Chris LaVino	(A)
	Ms. Peggy Cotter	(A)*
	Mr. Rick Dahlguist	(A)
	Mr. Matt Tirrell	(A)*
	Mr. Erich Brown	(A)*
	Ms. Martie Levy	
	Mr. Marc Fisher	(A)*
RBB Architects Inc (RBB)	Ms. Sylvia Botero	(A)
	Mr. Marius Nimitz	(A)
Glen Berry Associates (DFS)	Mr. Glen Berry	(A)
Davis Langdon	Mr. Rick Lloyd	
	Mr. Chris Sterpan	
KPFF	Mr. Ramzi Hodali	
TMAD Engineers	Mr. Sunil Patel	
	Mr. Jamshed Mistry	
	Mr. John Poon	
	Mr. Moe Aziz	
Verde Concepts	Ms. Blair Seibert	

(*) Indicates part time attendance

080708.01 Team Introductions

Each team member introduced themselves and their peers not in attendance and stated their roles for the project:

A. **UCSB:**
   1. Frank Doyle – Committee Chairman, ICB Core, Chemical Engineering, Systems biology; bio-systems analysis and control; biomedical control systems; nonlinear model-based control.
   2. Dennis Clegg – Stem Cell, MCDB, BMSE, NRI; Work involves molecular basis of neural development and disease; retinal development and degeneration; differentiation of ocular cells from embryonic and adult stem cells.
   3. David Low – not in attendance; MCDB, BMSE; work involves genetics and biochemistry of bacterial gene expression, gene silencing, DNA methylation, and adhesive mechanisms of pathogenic bacteria; epigenetic regulation of HESC differentiation.
   4. Tom Soh – not in attendance; Mechanical Engineering; High throughput cell screening, including novel methods for sorting hESC derivatives; molecular screening and directed evolution; integrated biosensors.
   5. Matthew Tirrell – Dean College of Engineering; Materials; Measurement and manipulation of polymer surface properties including intermolecular forces and surface modification.
   6. Mark Nocciolo - Principal Education Facilities Planner
   7. Samir Mitragori - Bio-engineering program; Chemical Engineer, Professor.
   8. Chris LaVino - College of Engineering; Assistant Dean, Building Construction and Space Management.
   9. Peggy Cotter - Molecular, Cellular and Developmental Biology; Associate Professor.
   10. Rick Dahiguist - Chemistry and Bio-Chemistry; protein structure and function.
   11. Erich Brown - Design and Construction Services; Architect and project manager.

B. **Design Team:**
   1. Sylvia Botero: Principal in charge, responsible for schedule, cost controls and performance of the overall team.
   2. Marius Nimitz: Senior project designer, responsible for site planning, massing and design of the building.
   3. Glen Berry: Laboratory Planner, responsible for development of program.

080708.02 Project Goals, Vision and Objectives

A. UCSB has met internally and has agreed to a common goal that meets different researchers' needs for the programs to be integrated in the building.
B. The faculty stated their goals and objectives for the project:
   1. Attract faculty and world class researchers and pursue top quality graduate students.
   2. Integrating students with top researchers.
   3. Produce a high performing building to attract top faculty.
   4. Faculty has a good track record of doing well in material sciences; they use facilities across the campus and want to bring labs into close proximity to co-locate talent and create a powerful group of bioengineers.
   5. It is important for interactive work to take place between biology and engineering.
C. Funding support from the army has been very positive for the faculty.

D. There are 4 main constituents to be located in the building; these are the research groups that will generate research grant funding.
1. Institute for Collaborative Biotechnologies; substantial support from the U.S. army; life science and engineering without medical component. This program will be designated as the headquarters or building core.
2. ICB Medical; this research group will generate research grant funding.
3. Stem cell work; new federal funding anticipated.
4. Bio-engineering and Computational component; this is an academic program with a computational component and top graduate students and post docs researchers.

E. Their vision is to bring collaborative research into one location; this needs to allow each of them to have their own identity, yet be seamless in terms of overlap between different entities:
1. Bench scientist in wet laboratories need to interact with dry computational sciences.
2. Integration of Bio-molecular sciences.
3. Stem Cell program to be a funded project for stem cell biology; interfaces with biology and engineering; involves 20 faculty members. They expect significant growth and want to be integrated with engineering. This would be one more location amongst others on campus.
4. The campus has good electron microscopes and good imaging capabilities; it is not the intent of this program to recreate these functions in the building.
5. The building will be more science oriented; this is critical since there is an intersection between sciences and engineering that can be developed to address main issues in biology and engineering using common technology. The campus does not have a medical school; their idea is to integrate these two departments. Major funding to support this mission has already been accomplished.

F. Design considerations noted by the faculty:
1. A horizontal connection is important; larger footprints are better for interaction.
2. Faculty prefers open stairs.
3. Interaction areas are important.
4. Instructional labs are not anticipated in Phase I.
5. Phase I will have one classroom which will be identified as a shared facility.
6. Phase 1 of the DPP will not deal with impacts of existing released space.

G. Goals noted by Mark Nocciolo:
1. The DPP must properly define the program area, the building development and the costs associated with it.
2. All information to be put in the PPG must be accurately defined no later than September 12, 2008.

080708.03 Laboratory Planning Discussion:

A. The faculty issued a program dated July 25, 2008; it includes Phase 1 and Phase 2. This project will only include Phase 1 but potential impacts of Phase 2 will be assessed and incorporated in the DPP.

B. The program summary for Phase 1 is as follows:
1. ICB Program:
15,570 ASF
2. Bio-engineering program:
21,030 ASF

3. Bio Stem Cell Program:
   1,680 ASF

C. Total program by use:
   1. Lab Area:
      23,400 ASF
   2. Office area:
      13,160 ASF
   3. Support area:
      3,840 ASF

D. Program Approach: There are two approaches to lab planning:

A. Custom:
   1. One for each PI (customized approach).
   2. Typically costs more.
   3. Is likely that the custom design may have to be altered to suit future researchers needs.

B. Prototype:
   1. Science driven.
   2. Under the Bioengineering, with entities like ICB, bio-engineering, with labs for molecular biology, bio-chem and engineering.

080708.04 Space Program Discussion:

A. The current program is broken into 3 programs. Divisions will be created if the designers and faculty see these as distinct programs rather than an integrated process.

B. Glen Berry suggested the team to decide what spaces to include in the program based on prototype and not by department. Definitions and boundaries are eliminated and full integration can be achieved.

C. The team agreed that this is the best way to achieve an optimum program that will satisfy all.

D. A space list, room by room, defined by use was developed.

E. Office prototype (deviation of standard 140 SF offices):
   1. Bio-engineering cluster:
      - Chair Office: 180 SF.
      - Staff office: 4 at 140 SF.
      - Reception: 140 SF (open).
      - Anteroom shared by several offices is highly desirable.

F. ICB cluster:
   1. Director: 180 SF.
   2. Staff: 19 at 140 SF (shared and private).
   3. Reception: 3 at 140 SF (can be used as an office).

G. No stem cell Admin component.

H. Shared Support Functions:
   1. Conference Room: 2 at 600 SF each, 30 people each and similar to CNSI, room 3001.
   2. Lecture Hall: 2000 SF for 100 people.
   3. Small Meeting room: 4 rooms at 280 SF for 10 people each (1,120 SF); 1 near Bio-eng and 1 near ICB Director Office; other dispersed through the building.
   4. Seminar room: 1 at 1000 SF (considered but later eliminated).
   5. Classroom / Multi-purpose room: 500 SF (20 to 25 people), to be located on the first floor (considered but later disregarded).
   6. Kitchen: near each lab block, sinks, vending machines, u/c ref. and seating area; 8 at 70 SF each.
   7. Mail / copy room: 2 at 140 SF each.

8. Animal areas are not anticipated in Phase 1.
9. Outdoor areas.
10. Outdoor eating area.
11. Loading area (small truck has access).
12. Receiving area / room.

I. Lab prototypes:
1. Type A: Engineering (to be designed to BSL-2 level).
2. 10 labs + BSL – 3 lab area (approximately at 2000 SF each).
3. Wet benches for chemistry (2/3) with 3 sinks per person, 6 to 8 feet per person.
4. Open area (1/3) - free floor space for equipment such as ref, freezers, centrifuges, etc.
5. Standard vacuum, compressed air and gas.
6. Fume hoods (average is 2 FH per lab) 10 Persons per lab or 1 hood per 5 persons; this may vary.

J. Cell culture:
1. Cleanable surfaces; possibly maple casework, epoxy tops and vct flooring.
2. Write-up space next to the work bench by the windows.
3. Natural light preferred (windows).
4. White board, catalogs area.
5. Direct relationship with offices and post doc and graduate students.
6. Storage above and below benches.
7. In some of the cases, the support area can be part of the lab area.
8. Vibration criterion is approximately 2000 micro-inches / second; spans will be maintained at around 22'.

K. Type B: Biology: Same as Lab type A.
1. Support Areas for Labs:
   - Cold rooms: 1 per floor (-4 degrees); approximately 180 SF, sink, benches, shelves.
   - Warm Rooms (2 per floor).
     a. 30 degree – 1 small
     b. 37 degree – larger
   - Freezer room: - 80 degree (22 x 11), 1 per floor.
   - Emergency power throughout for freezers, autoclaves and refrigerators.
   - Autoclave (2 machine per floor; 1 per room per floor).
   - Media prep room "kitchen" with autoclave (1 in building); approximately 400 SF.
   - Equipment rooms for centrifuges, sequencers and synthesizers.
   - All other components will be part of the laboratories.

L. The team concluded the type A lab will be used as the basis to develop the prototype for the space program.

080708.05 Security:

A. There are issues associated with army funding and stem cell research. Activists may have presence and team needs to err on the side of caution; this will result in provision of secured access control to all main entry points.
B. BSL-3 lab would be the only lab area not to be located on the exterior of the building. CCTV is required for certification.
C. Key card access to all labs will be required.
D. Video cameras may be required.

080708.06 Vibration Criteria:

A. This is not a high priority; all that is expected is bench scale microscopy.
B. There is no electron microscope anticipated.
C. UC system criteria is typically 2000 micro-inches per second.
D. Team to consider both steel and concrete structures. Team to follow up with structural engineer.

080708.07 Schedule:

A. The DPP process has a very tight schedule; it needs to be completed in 4 weeks.
B. The PPG information must be complete by September 12, 2008; the booklet and finalizing of the DPP documentation can be achieved after the 12th.
C. The team agreed to revise the meetings as follows:
   1. August 14: Site Master Planning, systems, underground utilities, Facilities, State Fire Marshal sustainability components, IT, maintenance and security, bike paths and bike parking, vehicular parking and building services and landscape.
   2. August 19th: Laboratory planning in group sessions; individual meetings are not anticipated, Art Battson will attend for classroom standards.
   3. August 22: Site Planning continuation, rough order of magnitude verification.
   4. August 25th: Laboratory planning conclusion, sustainability and begin final draft process.
D. RBB to revise schedule and issue to all.
E. Marc Fisher mentioned that UCSB would like to do the project design in one year. This requires aggressive contract document development. UCSB's current schedule reflects breaking ground in 08/2010. The team believes this could be reduced by a minimum of 6 months.

080708.08 Parking:

A. Parking is non-existent for this building which is a concern; it will be located many hundred feet away.
B. The team considered locating it under the building but disregarded it.
C. Parking analysis will be seriously considered as part of the development of the DPP.

080708.09 Site Master Planning issues:

RBB presented a site analysis that includes:

A. Site utilization with primary pedestrian vehicular and bike circulation.
B. Test to Fit analysis and project boundaries; study includes analysis of the site as it relates to its consistency with the campus approved LDRP.
C. A photographic survey of the north and south edges of the site, temporary buildings, and main pedestrian walkways.
D. Stylistic diversity, impact of light and patterns and screens used throughout the campus.
E. RBB presented the following site options:
   1. Scheme A:
      - Identifies the campus green areas; reflects close proximity of the science and engineering buildings and pedestrian and bicycle routes.
      - Locates the buildings at the north of the site, in an L shape; phase 1 to be located along the east/west axis and phase 2 along the north/south axis.
      - Benefits established: North views and light for offices, close proximity to engineering buildings, defines green edge along the north

boundary and an east edge of the development of the site and creates an inner court between Phase 1 and the Library.
- Phase 1 will require relocation of Building 406.

2. Scheme A-1:
   - Locates the building along the south side of the site, in similar composition as Scheme 1.
   - Benefits established: ocean views from upper floors, will not impact building 406 in phase 1, creates inner court between the Library and the new buildings, establishes the east edge of the site.
   - Will be removed from Science buildings and from campus green.
3. Scheme B:
   - Locates phase 1 and 2 parallel to each other. All pros and cons are per scheme A above.
   - An added benefit is the creation of interaction courts between buildings.
4. Scheme C:
   This is similar to scheme A-1 except phase 2 will be located adjacent to the Library.

F. The faculty tended to lean towards locating it on the south side. This will result in relocation of key lab spaces currently on the site which begins to create a mall
G. Locating it on the north end it will be closer to parking and to the engineering quad.
H. Locating it on the south side results in less exposure for stem cell and army research controversies and reinforces Pardall mall
I. Library will expand more to the north than to the south
J. 4 floors seem to be optimal for the team.

080708.10 Massing Analysis:

A. RBB presented massing options resulting from preliminary program received from UCSB. Total area is 40,380 ASF and approximately 70,000 GSF.
B. Options developed include:
   1. 5 floors above grade with a floor plate of approximately 14,200 GSF.
   2. 4 floors above grade with floor plate of 17,710 GSF (desirable by UCSB).
   3. UCSB prefers if building height is kept below 80'-0" AFF, including the penthouse.
   4. Direct connectivity is highly desirable between phase 1 and 2.

080808.11 Action Items

A. RBB and the design team will begin to develop new options for site planning based on the revised program issued by the faculty.
B. Glen Berry to begin to create basic adjacencies and develop room standards.
C. TMAD will begin underground utility analysis and building utility development for the building.

The above constitutes our interpretation of matters discussed and decisions reached. Please notify Sylvia Botero of RBB within (7) seven days of the date of this document with any corrections or additions.

Sylvia Botero, AIA
Senior Vice President

RBB ARCHITECTS INC

APPENDIX H – UCSB LEED CRITERIA

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

UCSB Campus points
Santa Barbara, CA

Yes	?	No				Points
			Sustainable Sites			**14** Points
Y			Prereq 1	**Construction Activity Pollution Prevention**		Required
X			Credit 1	**Site Selection**		1
X			Credit 2	**Development Density & Community Connectivity**		1
			Credit 3	**Brownfield Redevelopment**		1
X			Credit 4.1	**Alternative Transportation**, Public Transportation Access		1
X			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms		1
			Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles		1
			Credit 4.4	**Alternative Transportation**, Parking Capacity		1
			Credit 5.1	**Site Development,** Protect of Restore Habitat		1
			Credit 5.2	**Site Development,** Maximize Open Space		1
X			Credit 6.1	**Stormwater Design,** Quantity Control		1
X			Credit 6.2	**Stormwater Design,** Quality Control		1
X			Credit 7.1	**Heat Island Effect,** Non-Roof		1
X			Credit 7.2	**Heat Island Effect,** Roof		1
			Credit 8	**Light Pollution Reduction**		1

Yes	?	No			Points
			Water Efficiency		**5** Points
X			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
X			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
			Credit 2	**Innovative Wastewater Technologies**	1
			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
			Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Yes	?	No			Points
			Energy & Atmosphere		**17** Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
X			Credit 1	**Optimize Energy Performance- Title 24 by 20%**	1 to 10
			Credit 2	**On-Site Renewable Energy**	1 to 3
			Credit 3	**Enhanced Commissioning- who is commissioning project?**	1
X			Credit 4	**Enhanced Refrigerant Management**	1
X			Credit 5	**Measurement & Verification**	1
			Credit 6	**Green Power**	1

continued...

Yes	?	No			Points
			Materials & Resources		**13** Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
			Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
			Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
			Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
X			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
X			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
			Credit 3.1	**Materials Reuse**, 5%	1
			Credit 3.2	**Materials Reuse**,10%	1
X			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
X			Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
X			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regic	1
X			Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regic	1
X			Credit 6	**Rapidly Renewable Materials-(linoleum?)**	1
			Credit 7	**Certified Wood**	1

Yes	?	No			Points
			Indoor Environmental Quality		**15** Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
			Credit 1	**Outdoor Air Delivery Monitoring**	1
			Credit 2	**Increased Ventilation**	1
			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
X			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
X			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
X			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
X			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
X			Credit 6.1	**Controllability of Systems**, Lighting	1
X			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
			Credit 7.1	**Thermal Comfort**, Design	1
			Credit 7.2	**Thermal Comfort**, Verification	1
X			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
X			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes	?	No			Points
			Innovation & Design Process		**5** Points
X			Credit 1.1	**Innovation in Design**: Green Cleaning-Custodial Operation	1
X			Credit 1.2	**Innovation in Design**: Exemplary perfor. in Construction Waste 95%	1
X			Credit 1.3	**Innovation in Design**: IPM	1
X			Credit 1.4	**Innovation in Design**: Green Site Maintanence	1
X			Credit 2	**LEED® Accredited Professional**	1

Yes	?	No		Points
33			**Project Totals** (pre-certification estimates)	**69** Points

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

APPENDIX I – IT COMMENTS

BIOENGINEERING BUILDING MASTER PLAN DPP

14.9.0

August 14, 2008

TO: Mark Nocciolo, Budget and Planning

FROM: David C. Chapman, Engineering Manager, Communications Services

SUBJECT: Comments and Information on Proposed Bio-Engineering Building

1. Location of Phase I building is east of the Library – south end. Building 407 will be removed in the first phase.

CS: This will require re-feeding of communications supporting Building 406. This can be done from existing routes attached to Broida Hall.

2. Multiple disciplinary programs. Funding is federal (military?)

CS: Some review of any requirements of the Federal Security Act should be made. Typically, security for computer room servers and 24/7 pass-card access records as well as protected communications links must be considered.

3. Monitoring of equipment and building access should include cameras, or at least the conduit should be included in the building for future installation.

CS: Note that campus experience with security cameras has been based on coaxial cable and large stored memory. Such a system documents events, but requires review after the fact of the recorded output of all such cameras -very time-consuming and does not allow for intervention of a crime or other activity. We recommend that any cameras considered for this building be IP network attached and be equipment with motion-sensing technology that can trigger a display when a camera's field of vision is shifted.

4. Campus communications standards are posted on the web and that URL is provided below. For the location identified in the initial proposal, several issues and solutions are proposed.

CS: Buildings on campus are supported for communications from two distinct conduit paths into the building, allowing the campus to managed future development and maintenance efficiently. For this proposed building, the fiber (data and CATV) networks will enter via the Library on the west and from Broida Hall or Geology on the East. Telephone cable will enter from the east as well.
There should be a communications closet on each floor as close to the center of the floor area as possible. Wiring outlets should be no further than 90 meters via cable tray run in the hallways. All closets should be provided with Stand-bye emergency power for maintenance of the monitoring networks. On the first floor, the wiring closet (IDF) and the entry closet (MDF) can be combined in a single, larger room. All communications closets shall be dedicated solely to communications.

5. Given the time frame of the building, the wiring specification should be for EIA/TIA Cat 6e station wiring. This may be revised downward to our current Cat5e subject to campus standards review and cost analysis

6. Based on the initial floor layout, cable tray looping through the hallways with a "T" into the communications closet is recommended.

7. Based on much experience with campus buildings, at this very early point, Communications Services **strongly** recommends that the architect take responsibility for development of scaled profiles of the hallways during the DD and CD processes. Providing efficient placement and stacking of the utilities usually run in the corridor should be addressed early and NOT left solely to the contractors in the field.

8. Communications Services will need to provide the specific locations and capabilities for attachment to the campus backbone, telephone and CATV networks. We will also identify the impact of the site on the duct routes serving Buildings 407 and 406 and a recommendation as to how to migrate Building 406 to an alternate communications route and provide capacity for the new building.

Thank you for the opportunity to participate in this early review. Please use the URL information below for current campus communications standards:

http://www.commserv.ucsb.edu/infrastructure/default.asp

Note that all drawings shown or referenced within the specifications are available in AutoCAD format for architect or consultant use at no charge. Requests for these AutoCAD files can be made to dchapman@commserv.ucsb.edu.

These specifications are currently under revision and additional documents will be individually provided to you as they are adopted and as they are relevant to new construction.

August 22, 2008

TO: Mark Nocciolo, Budget and Planning

FROM: David Chapman, Communications Services

SUBJECT: Review and Comments on UCB Bioengineering Bldg M/P Phase 1 DPP

The following comments are based on the DPP MEP Narrative provided by Sylvia Botero of rbbinc.com, dated August 21, 2008:

Narrative 23 Part M Communications

Item 1: "The Communications Systems design shall be per UCSB Campus Standards and Design Criteria". With the agreed-upon exception to project the use of Cat6-e station cabling, the current standards shall be used. The Items below are corrected to reflect that current standard.

Item 2: DELETE "J-Hooks" from list of provided communications materials. The campus standard does not support J-Hooks.

Item 3. DELETE: "The system shall be linked to the existing voice and data head end equipment in the Library on the west and Broida Hall on the East."

REPLACE WITH: "The data network will be spliced via fiber cable to an existing fiber cable from the Library and to new cable from either Broida Hall or Noble Hall on the East. These two fiber connections insert the new building into the campus-wide Network with access to multiple data centers."

Narrative – 24 Part N. Voice, Data and Structural Cabling

Section 1. Outlet Design Criteria and Assumptions

Item a. CHANGE: "…(2) 4-pair Category-6e cables terminating in (2) RJ-45 jacks….."

TO: "**three** (3) 4-pair Category-6e cables terminating in **three** (3) RJ-45 .."jacks….."

Per the campus standard.

Item c. DELETE: "…cable ~~in the ceiling supported by J-hangers spaced at 5' intervals~~…."

REPLACE: "Cable from workstations shall be placed in 5S boxes with 2-gang plaster rings and run in conduit to a common cable tray which carries all cabling to the floor IDF."

Item f. All cabling is installed to EIA/TIA 568-B.1."

NOTE: Campus standards use the "A" punch-down configuration for all jacks.

Item h. Correction " …. Open ~~tow~~ post relay racks."

" …. Open **two** post relay racks."

Section 3. Inside Plant (ISP) Riser Backbone Cabling

Item a.: DELETE: "Multi-mode fiber is ~~50/125um~~ laser-optimized."
REPLACE: "Multi-mode fiber is 62.5/125um laser-optimized."

Item a. INSERT: "Riser backbone fiber cabling shall be hybrid 12mm/12sm fiber cable running directly from the MDF to each IDF Terminal.

Item a.: DELETE: "Each TR receives ~~24 strands of multimode fiber installed in 1.25"~~ innerduct and ~~300 pair~~ of category-3 riser cable."
REPLACE: "Each TR receives a 12 (62.5/125um) multi-mode and 12 single-mode (8.3um) hybrid fiber cable between the MDF and the individual IDF Terminal." Fiber shall be enclosed in ¾" inch yellow innerduct with at lease one spare innerduct in the riser."

Item a.: DELETE "…. And 300 pair of category-3 riser cable."
REPLACE "…. And 100 pair of category-3 riser cable."

Item b: DELETE "…. using ~~Duplex LC~~ connectors and ceramic couplings."
REPLACE "…using **SC single-mode connectors** with ceramic couplings."

Section 4. Outside Plant (OSP) Site Backbone Cabling

Item a: Site cable also includes both fiber and copper cabling from the MDF to specified manhole locations between Library/Broadax Hall Building.

DELETE "Multi~~-modes fibers are 50/125um laser-optimized~~….."
REPLACE "Fiber cable from the MDF via nearest manhole to Library and Broida Hall Buildings shall be 48sm (8.3um single-mode) cable

Item a: Site cable also includes both fiber and copper cabling from the MDF to a specified manhole location between Library/Broida Hall Building.
DELETE "………copper is ~~900~~ pair category-3."
REPLACE "…… copper entrance cable is 400 pair category-3."

Item b: DELETE " Fiber cabling will be fusion-spliced in the MH to existing cables….."
REPLACE "Fiber backbone cables shall be run to adjacent building MDF terminals and fusion-spliced via fiber pigtails to Fiber Termination Panels (FTP) in those buildings.

NOTE: The campus will place a building network switch in the MDF and jumper fiber runs to the closest Backbone Network switch.

August 25, 2008

TO: Mark Nocciolo, Budget and Planning

FROM: David Chapman, Communications Services

SUBJECT: Comments on Bio-Eng Building System Meeting August 22, 2008

Copies: Kevin Schmidt, OIT

Thank you for the insurmountable opportunity to review and respond to the DP process for the proposed Bio-Engineering Building. We have the following comments:

Section 3. Inside Plant (ISP) Riser Backbone Cabling

ADD: From the MDF to each IDF, place a 25pair Cat5e cable terminated on each end on six (6) RJ-45 Cat5e-rated (punchdown 'A') with one pair left-over. This is in the campus standard for use in connecting intra-building network switches without the expense of fiber interfaces.
Note 1: In the MDF, the cables from each floor should share a twenty-four (24) port Cat5e patch panel.
Note 2: A Cat 6e 25pair cable may be used if one has been tested for performance and is so rated.

Section 4. Outside Plant (OSP) Site Backbone Cabling

Current campus standards use BOTH a 48 single-mode AND a 48 multi-mode fiber cable in the building-to-building. It is possible that we will delete the multi-mode cable by the time this project is ready for attachment, but until we can assure that surrounding buildings and switches do not need the multi-mode cable, it should remain in the specification.
ADD: forty-eight (48) multi-mode cable (62.5um/125um) from the building MDF via serving manhole to both the Library and either Broida Hall or Noble Hall.
Note: The 48sm described previously and this 48mm cable are separate sheaths. We no longer specify hybrid 48mm/48sm for the backbone.

M. Communications

Per discussions on August 22nd related to "server room", air conditioning and equipment capacity, we confirm the following items:

1. The MDF on the first floor and the first floor IDF "may" be combined with a square footage of approximately one hundred and sixty square feet (160'). This sizing assumes that this room does NOT have a dual function as a "Server Room".

2. On all other floors, the IDF should have a square footage of one-hundred and ten to one-hundred and twenty square feet (110 sq ft – 120 sq ft.). This size of room is required for termination of riser cabling, station wiring, network switches, UPS for those switches, telephone gear, if required, and related hardware. These rooms are not satisfactory for Servers except possibility those that serve security or system monitoring functions for laboratory and building life support gear.

3. As we discussed, we strongly recommend air conditioning in the MDF and IDF's to account for the increasing power draw and heat associated with network gear (e.g. VOIP).

4. The MDF and the IDF's should be provide with Stand-bye power from a generator supporting the building. Building monitoring via the IDF network switches and the building swith in the MDF is essential to allow continued monitoring of laboratory equipment /experiments, building systems, including HVAC, water, gases and security systems, including card key and CCTV. The continuation of remote monitoring and appropriate remote intervention, allows problems to be efficiently, and immediately, addressed without multiple on-site responses by multiple service agencies.

5. As Kevin Schmidt spelled out, the campus North Hall Computer Server Room, as planned, and perhaps when finished, is primarily designed for research computing clusters and campus administrative computer hardware. It is not intended, and probably will not have the capacity, for individual departmental and program servers. Therefore, we continue to request that every building have a "server room" of at least two-hundred square feet (200 sq ft) minimum, with requisite power (recommended 100 amp 20 position panel) and air conditioning. This should be a separate room from any MDF or IDF and the server room should be directly attached to the cable tray distribution system. Communications Services treats these server rooms as a stand-alone IDF with regard to provision of riser fiber and twenty-five pair (25 pr) Cat5e cabling.

6. We also noted at the meeting, and provided a scaled map of this section of the campus, detailing the existing underground communications conduit. As noted, while the main N-S communications ducts run in the service road and sidewalks immediately east of the project site, the 408, 407 and 406 buildings use a Marine Corp-era duct route which parallels the service road and services each of the these buildings from a small pullbox the southeast corner of each building. Communications cabling enters this route from a manhole in the street opposite Building 408. Therefore, if Building 407 is to be demolished as part of this project, an alternate route will need to be constructed prior to demolishing the building or working the adjacent ground area. This alternate route will likely come from the north via an existing manhole and, perhaps, an existing duct route to which we can add cable capacity.

Thank you for your attention to these comments. Please advise if we can detail these or any other issues.

APPENDIX J – UNDERGROUND STORAGE TANK

BIOENGINEERING BUILDING MASTER PLAN DPP

14.10.0

From: Mark Nocciolo [Mark.Nocciolo@bap.ucsb.edu]
Sent: Monday, August 18, 2008 11:15 AM
To: Aronson, Ray
Cc: Wolever, Jack; Botero, Sylvia; Fisher, Marc; jsagherian@tmadtg.com; Ali Aghayan; Hammond, Shari; Castanha, Frank; Nimitz, Marius; Levy, Martie
Subject: Bioengineering Underground Storage Tanks

Attachments: ucsb_mapUST.jpg

ucsb_mapUST.jpg
(3 MB)

Ray,

According to a site map provided by Ali Aghayan at EH&S, it appears that we have an underground (diesel) storage tank that is a remnant of the Army Base (see #1 in the attached map) near our project. There is a second tank (see #2 on the map) located just south of our project boundary and west of the Love Lab (346).

Because tank #1 appears so close to our building site, I presume we will need to remove it along with any contaminated soil. Although tank #2 is OUTSIDE the current project's boundary, there may be sound reasons to address this tank as well--particularly if we are assuming extension of the Pardall Corridor, which would include the relocation of the Love Lab.

We will need to identify/describe this condition and circumstance in the DPP, along with establishing some probable cost estimate to address these tanks and soil in the project. Also, Ali mentioned that an "Action Plan"
may be required and that Frank C. has some experience with this.

Please advise.

Mark

===
Mark G. Nocciolo	e-mail: mark.nocciolo@bap.ucsb.edu
Capital Development	
Office of Budget & Planning	phone: 805+893-2491
University of California	
Santa Barbara, CA 93106	fax: 805+893-8388
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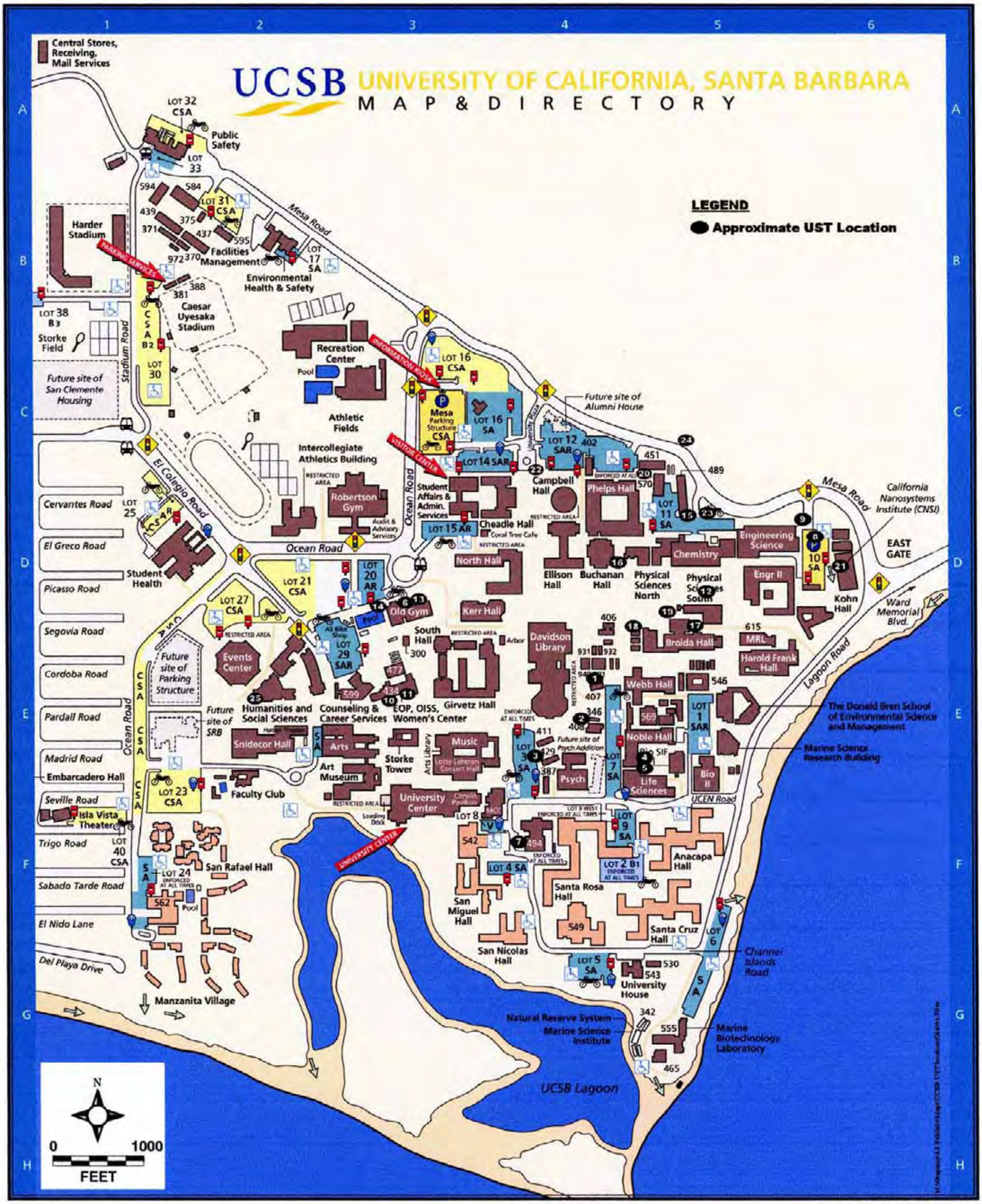

Site Map
University of California at Santa Barbara
Goleta, California
FUDS Site No. J09CA700200

PRI

FIGURE
1

APPENDIX K – GEOTECHNICAL REPORT

BIOENGINEERING BUILDING MASTER PLAN DPP

14.11.0

FUGRO WEST, INC.

211 E. Victoria Street, Suite D
Santa Barbara, California 93101
Tel: (805) 963-4450
Fax: (805) 564-1327

12-11-03
Copy to: HHPA

December 3, 2003
Project No. 3064.027

University of California
Office of Design and Construction, Bld. 439
Santa Barbara, California 93106

Attention: Mr. Ray Aronson

Subject: Preliminary Fault Evaluation, Davidson Library Addition, University of California, Santa Barbara, California, UCSB Report No. 330

Dear Mr. Aronson:

Fugro West, Inc., (Fugro), is pleased to submit this Preliminary Fault Evaluation report for the proposed Davidson Library Addition project. Services associated with the evaluation of faulting were performed in general accordance with our proposal dated October 10, 2003 and consisted of field exploration, data and aerial photograph review, and preparation of this report summarizing our conclusions regarding the location and activity of previously mapped faults in the project area. Authorization for our services was provided by U.C. Fund Number FM040183/238-71, Authorization Number 043/03-04 dated October 14, 2003.

This report summarizes our findings and opinions regarding the location of the Briggs Lineation/Campus fault relative to the building footprint of the proposed library addition. Our opinions are based on bedrock surface elevations from explorations performed for this study and a review of bedrock elevations reported in previous geotechnical engineering reports for projects in the site vicinity. We appreciate the opportunity to provide our services on this project. Please contact the undersigned if you have questions regarding this report or require additional information.

Sincerely,
FUGRO WEST, INC.

Gregory S. Denlinger, G.E. 2249
Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER GREGORY S. DENLINGER NO. 2249 EXP. 3/31/06 GEOTECHNICAL STATE OF CALIFORNIA

Roger C. Slayman, C.E.G.
Senior Engineering Geolgoist

REGISTERED GEOLOGIST ROGER C. SLAYMAN No. CEG 1920 Certified Engineering Geologist

Copies: 5 – Addressee

Table of Contents

PLATES

APPENDIX A – SUBSURFACE EXPLORATION

1. INTRODUCTION

1.1 PROJECT DESCRIPTION AND SITE LOCATION

The proposed project consists of constructing a new addition on the northeast side of the existing Davidson Library. On the basis of information provided to us, we understand the new library addition structure will be three stories above grade without a basement and will have a footprint of about 28,000 square feet.

The project site is located on the northeast side of the existing Davidson Library building on the main campus of the University of California Santa Barbara (UCSB) as shown on Plate 1 - Vicinity Map. The site is relatively flat with ground surface elevations ranging from about +49.5 to +51.5 feet. The site primarily consists of landscaped areas and hardscape/bicycle parking areas on the northeast side of the exiting library. A few portable classroom/office structures are also present within the limits of the project. The general location of the proposed building addition is shown on Plate 2 - Subsurface Exploration Plan.

1.2 PURPOSE AND SCOPE

The purpose of this study was to discuss the local fault setting and evaluate the potential for the Briggs Lineation/Campus fault to exist within or adjacent to the footprint of the proposed library addition structure. The study was performed in response to information provided in an email from Mr. Ray Aronson on September 8, 2003. The work is intended to satisfy the requirements of the LRDP that specifies that new structures be setback at least 50 feet from active or potentially active faults. For this study, the presence or absence of faulting was evaluated on the basis of assessing the elevation of the Sisquoc Formation across the study area through a series of subsurface explorations and review of existing data.

The scope of services for the fault evaluation study was prepared on the basis of discussions with Mr. Ray Aronson and other information provided to us by the University of California, Santa Barbara. A discussion of potential seismic hazards (such as strong ground shaking, liquefaction, seismic settlement) and geotechnical engineering recommendations are provided in a separate stand-alone geotechnical engineering report. The scope of services associated with the fault evaluation phase of work was outlined in our proposal to the University dated October 10, 2003.

1.3 WORK PERFORMED

Our scope of services was presented in our proposal dated October 10, 2003. An outline of our work completed for this study is presented below:

Project Initiation and Data Review. Fugro staff visited the site and met with representatives from UCSB to check the access for exploration equipment, contacted with Underground Services Alert, and coordinated with the field exploration subcontractors. We also reviewed selected historical aerial photographs, in-house geotechnical reports, and selected reports provided to us by UCSB.

Field Exploration. We performed a program of field exploration for this project that consisted of advancing 10 cone penetrometer test (CPT) soundings within and north the footprint of the planned addition and excavated, logged, and sampled five hollow-stem auger drill holes in the project area. Fugro Geosciences performed the CPT soundings at the site on October 20, 2003. The soundings were pushed to depths of approximately 20 to 60 feet below the existing ground surface.

The drilling subcontractor for the project was S/G Drilling Company of Lompoc, California. S/G used a CME75, truck-mounted drill rig to advance five borings (B-1 through B-5) using 8-inch hollow stem augers on October 21 and 22, 2003. The borings were advanced to depths ranging from approximately 20-1/2 feet to 30-1/2 feet below the existing ground surface.

The approximate locations of the borings and CPT soundings are shown on Plate 2. The logs of the soundings and borings are presented in Appendix A – Subsurface Exploration.

Geologic Evaluation. The results of this field investigation and previous data review were used to aid in formulating our opinions regarding the location of the Briggs Lineation/Campus fault with respect to the proposed building addition.

Report Preparation. This report was prepared to summarize the findings of this study and our opinions regarding the potential for the Briggs Lineation/Campus fault to be present within about 50 feet of the proposed building footprint.

2. GEOLOGIC SETTING

2.1 LOCAL GEOLOGY

The University of California, Santa Barbara Campus is located on an elevated marine terrace. Marine terraces are wave-abraded surfaces that are typically covered with a thin veneer of marine sands and overlying alluvium. The topography of the marine terrace is gently sloping to the south to generally flat-lying. The terrace is composed of late Pleistocene age marine sands, with a discontinuous, basal, fossiliferous conglomerate and is overlain in areas by non-marine deposits. These units are undifferentiated and termed older alluvium by Dibblee (1966, 1987). The marine terrace sediments unconformably overlie Tertiary age Sisquoc Formation and Monterey Shale.

Marine terrace deposits ranging in thickness from about 5 to 20 feet underlie the main campus area. The terrace deposits generally consisted of very fine, poorly graded sands and silty sands with minor amounts of clay. Tertiary-age Sisquoc Formation underlies the terrace deposits. The Sisquoc Formation at the site is described as interbedded claystone and siltstone. Review of geologic cross sections (Dibblee, 1966; Olson, 1982) indicates that a minimum thickness of Sisquoc Formation is about 1,200 feet beneath the area of the main campus.

2.2 FAULT SETTING

2.2.1 General

In the Santa Barbara and Goleta area, the structure of the Santa Ynez mountains consists of a south-dipping homocline with east-west striking faults and related folds preserved on the coastal plain (Dibblee, 1966). The More Ranch/Mission Ridge/Arroyo Parida faults are part of the principal fault system on the coastal plain. Late Pleistocene uplift has created the UCSB-Isla Vista-Devereaux marine terraces. Plate 3 – Local Fault Map shows the fault conditions in the vicinity of the main campus area. This map is reproduced from K-C Geotechnical Associates (K-C, 1990a).

Local faults that need to be considered in proposed campus projects are listed in the University of California, Santa Barbara Long Range Development Plan (LRDP, EIP Associates, 1990). Figure 4 – UCSB Fault Map is a reproduction of the campus fault map contained in the LRDP. We note that the faults shown on Plate 4 differ from those faults shown in the Plate 3 – Local Fault Map. The differences exist in large part as a result of studies performed subsequent to the preparation of LRDP and a general change in opinion towards a nexus between the Campus fault and the Briggs Lineation. For purposes of this report the Campus fault and the Briggs Lineation are considered to be one and the same feature in the vicinity of the Davidson Library addition and are therefore referred to as the Briggs Lineation/Campus fault.

The More Ranch fault zone and the Briggs Lineation/Campus fault are the closest faults to the library addition site. The approximate location of the More Ranch and Briggs Lineation/Campus faults is shown on Plate 3. Other proximal faults include the offshore Coal Oil Point and Goleta Point faults. Faults are also mapped north of the site in the Goleta Valley including the Dos Pueblos fault, the Glen Annie fault, the Carneros fault, the Goleta fault, and the San Jose fault (Dibblee, 1987).

The scope of work for this project was focused on evaluating whether the Briggs Lineation/Campus fault could be interpreted to be present within about 50 feet of the proposed Davidson Library Addition. The work is intended to satisfy the requirements of the LRDP that specifies that new structures be setback at least 50 feet from active or potentially active faults. Because the work was generally limited to the Briggs Lineation/Campus fault, the discussion of faulting provided herein will be limited to that fault.

2.2.2 Briggs Lineation/Campus Fault

Upson (1951) first mapped an unnamed fault through the UCSB-Isla Vista area. This northeast-southwest trending fault, which Upson mapped from Mescalitan Island to the sea cliff in Isla Vista, was apparently located based on oil and water well data. No discussion of this fault is provided in the Upson text.

A UCSB geology student, R. C. Briggs identified a subsurface escarpment on the marine platform (terrace/Sisquoc Formation contact) across the northern portion of the main UCSB campus on the basis of geotechnical borings drilled for foundation investigations. This feature, known as the Briggs Lineation, is delineated by a buried, southeast-facing scarp approximately 3 to 4 feet within the marine platform (Dames & Moore, 1972). The location of the Briggs Lineation was originally mapped several hundred feet southeast of the unnamed fault mapped by Upson (1951), and extended about 1,000 feet from the about southeast corner of Phelps Hall to about the southeast corner of North Hall.

Boring and trench investigations by Dames & Moore in 1972 and 1973 documented the presence of a series of small faults along the northeastern trend of the Briggs Lineation. These faults were observed in a trench northeast of Building 489 and in the north facing bluff about 150 feet to the northeast of Building 489. The fault zone was defined as an approximate 5 to 10-foot wide zone that strikes generally 0 to 25° east of north, dipping generally to the west. On the basis of investigations performed subsequent to the Dames and Moore studies it is generally understood that those faults are bedrock faults commonly found in the Monterey/Sisquoc Formation. Observations by Dames and Moore (1972, 1973) indicate that movement on those faults predates the deposition of the 47,000-year-old marine terrace underlying the main campus.

The Briggs Lineation/Campus fault is understood to be an escarpment that also predates the formation of the overlying terrace deposits. However there is an absence of data relative to the actual mechanics or structure of the Briggs Lineation/Campus fault. The feature could be a potentially active fault likely greater that 47,000 years of age or a wave-cut terrace in the bedrock materials.

The location of the feature however has been well documented. Hoover and Associates (1987) and CFS (1999a, 1999b) map the location of the Briggs Lineation/Campus fault north of the library addition structure based on elevation differences of the terrace/Sisquoc contact observed in borings. Gurrola and Alex (1997) maps the Briggs Lineation/Campus fault based on geotechnical borehole data as a relatively pronounced step in the terrace (north side up). The location as mapped by Gurrola is reasonably consistent with other investigators including a distinct ending of the feature about 1,000 feet west of the Davidson Library. This ending of the feature appears to be confirmed by boring and trench explorations performed in the area of the Humanities and Social Sciences Building where the typical subsurface escarpment or significant elevation changes across the marine platform was not found (K-C Geotechnical Associates, 1990a)

3. STUDY FINDINGS AND CONCLUSIONS

The potential for the Briggs Lineation/Campus fault to be present within about 50 feet of the proposed new library addition building limits was assessed by a series of CPT soundings oriented in a general north-south direction through the proposed library addition site. The CPT soundings were performed together with five shallow hollow-stem-auger drill holes as part of the geotechnical investigation for the library addition. The intent of the CPT soundings was to assess vertical change in the bedrock platform elevation within the project area. The borings were performed to confirm our interpretations of the CPT data and to provide data for the preparation of the geotechnical engineering report for the library addition.

The bedrock platform was encountered at an approximate elevation of 32 to 34 feet, msl in the CPT soundings and in the hollow-stem-auger drill holes performed for this study. A generalized cross section compiled using the CPT sounding data is provided on Plate 5 – Geotechnical Cross Section. Bedrock surface elevations provided in previous soil borings performed for selected projects adjacent to the project site are plotted on Plate 2. The previous bedrock surface elevation data shown on Plate 2 are generally consistent with the bedrock elevations observed in this study.

On the basis of the previous investigation data the Briggs Lineation/Campus fault would be located by finding a relatively abrupt vertical change, greater than 4 to 5 feet, within the bedrock elevation, with north side up geometry, over a short horizontal distance of about 10 feet. Because the bedrock surface appears to be at a relatively uniform elevation within the study limits, that data suggests that the Briggs Lineation/Campus fault is not located within the study area. From that data it is reasonable to conclude that a minimum 50-foot setback can be established between the Briggs Lineation/Campus fault and the proposed building footprint. Therefore we can conclude that the potential for ground rupture at the site associated with the Briggs Lineation/Campus fault is low.

4. CLOSURE

The conclusions, recommendations, and professional opinions presented herein were prepared by Fugro in accordance with generally accepted principles and practices of the geotechnical profession. This warranty is in lieu of all other warranties, either expressed or implied. This report has been prepared for use by the University of California and their authorized agents only, and is not intended for use by other parties or for other uses. Subsurface conditions will vary between points of exploration and with time. If any changes are made to the project described in this report, this report should not be considered valid unless Fugro reviews the changes and updates the report in writing.

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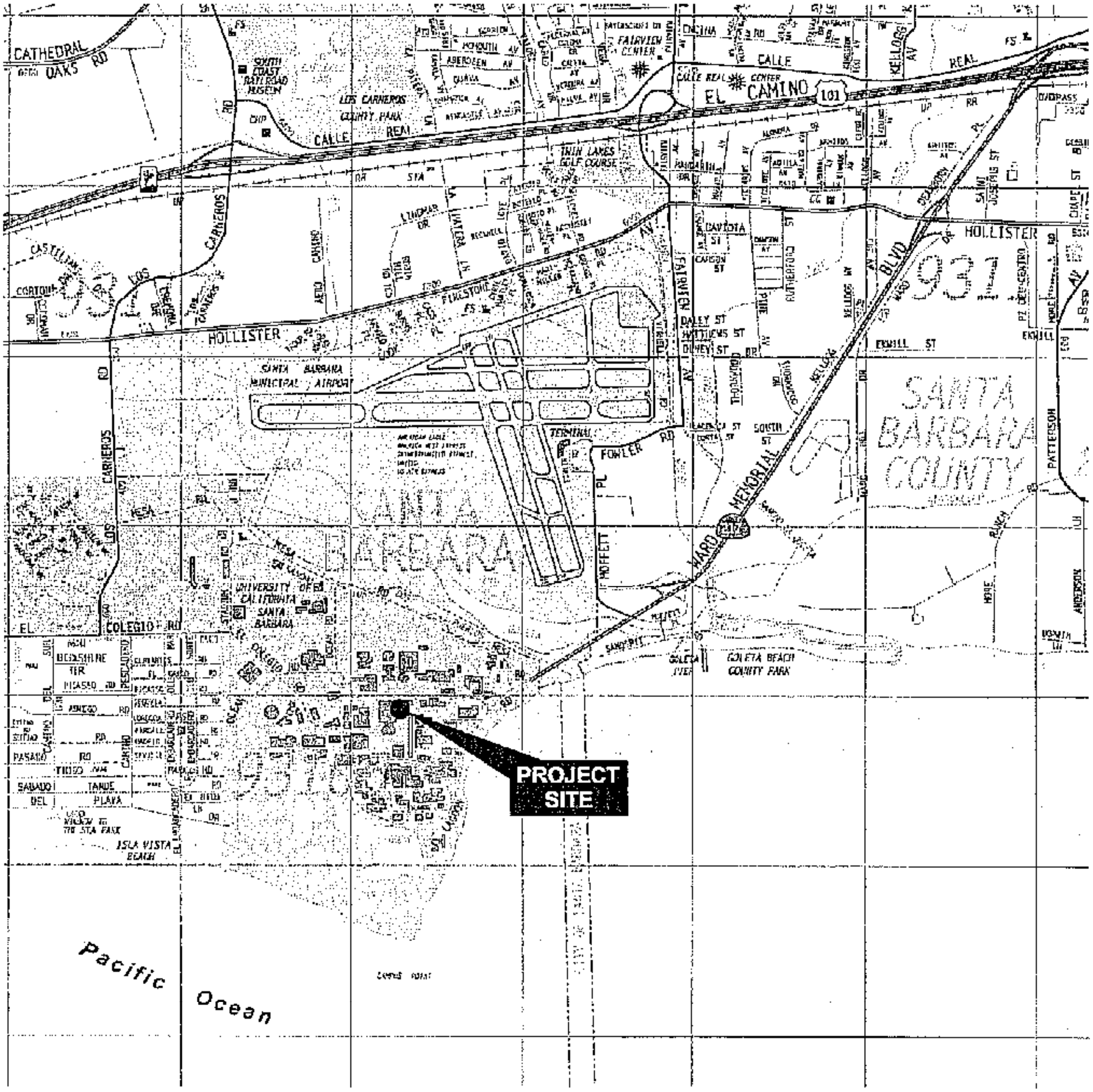
Upson, J.E., (1951), Geology and groundwater resources of the South Coast basins of Santa Barbara and Ventura Counties, California. U.S.G.S. Water Supply Paper 1108.



NORTH

0 1200 2400

FEET

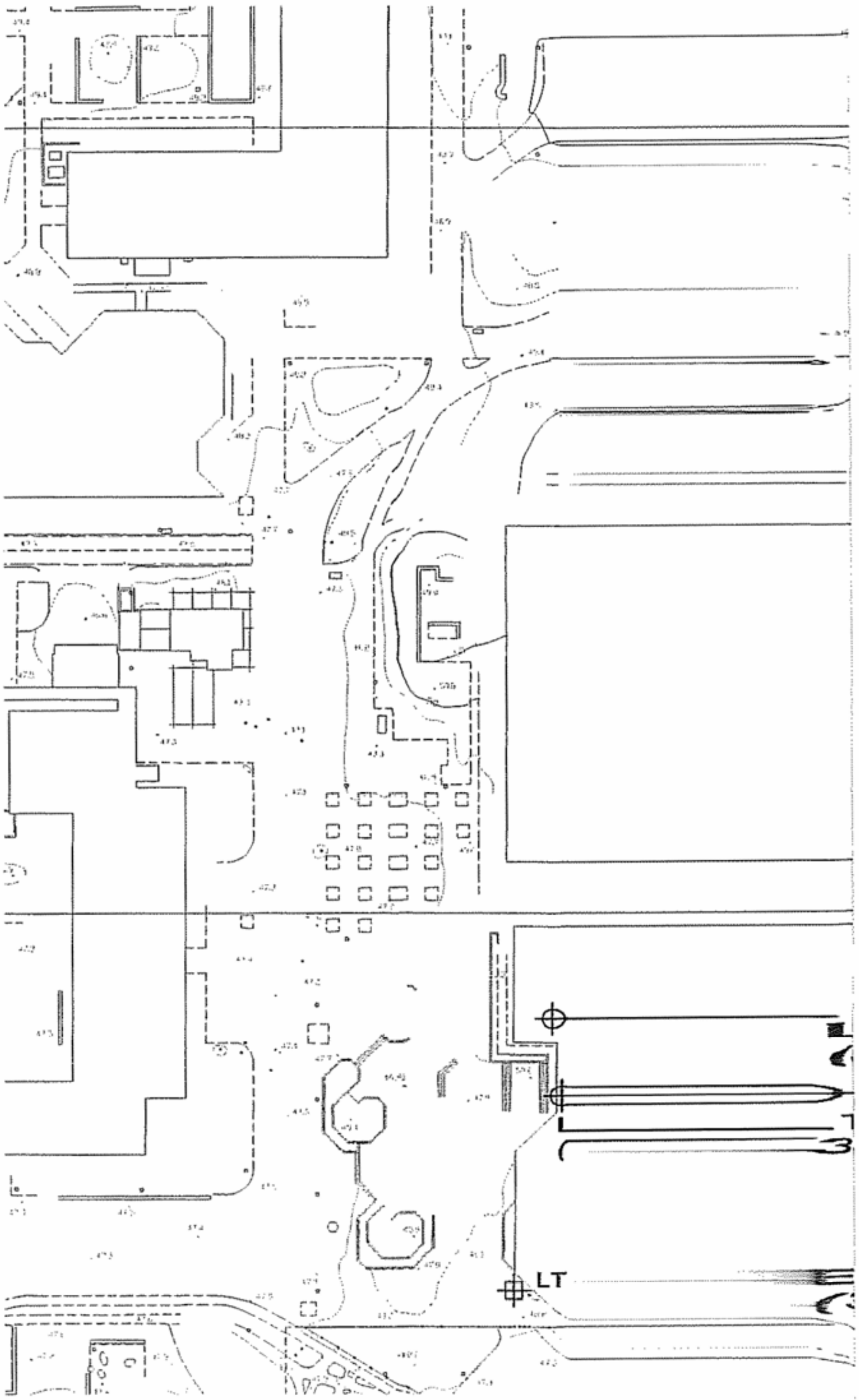
VICINITY MAP

Davidson Library Addition

University of California Santa Barbara

PLATE 1

14.11.10



LEGEND

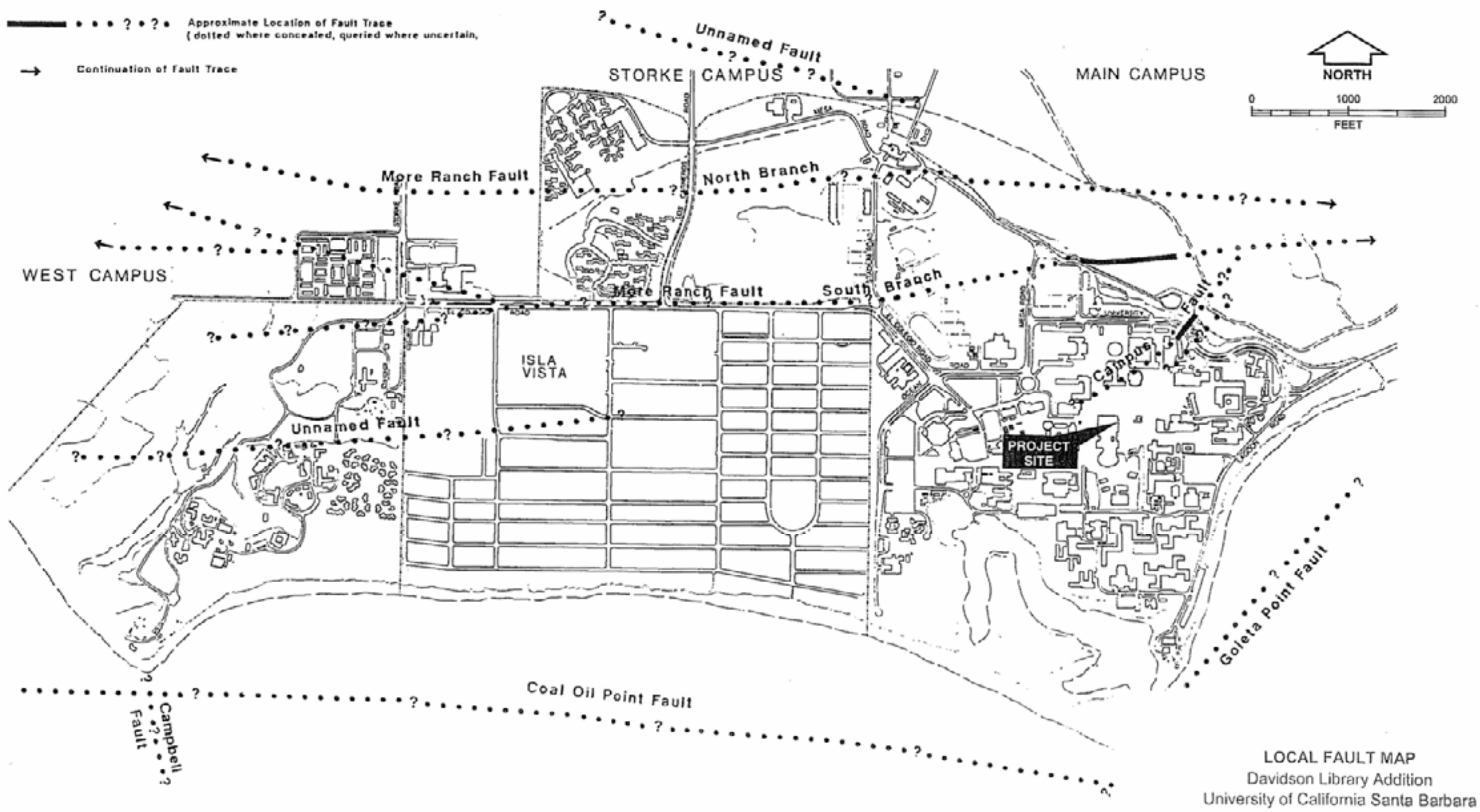
B-1	Approximate Boring Location
CPT-1	Approximate CPT Location
KIM75-1	Approximate Boring Location by Kenneth I. Mullen Engineers (1975)
LTE75-1	Approximate Boring Location by L.T. Evans (1975)
LTE73-1	Approximate Boring Location by L.T. Evans (1973)
LTE64-1	Approximate Boring Location by L.T. Evans (1964)
LTE52-2	Approximate Boring Location by L.T. Evans (1952)
(33)	Approximate Elevation of Sisquoc Formation
	Approximate Location of Proposed Building
A A'	Cross Section Location

NORTH

0 100 200
FEET

SUBSURFACE EXPLORATION LOCATION PLAN

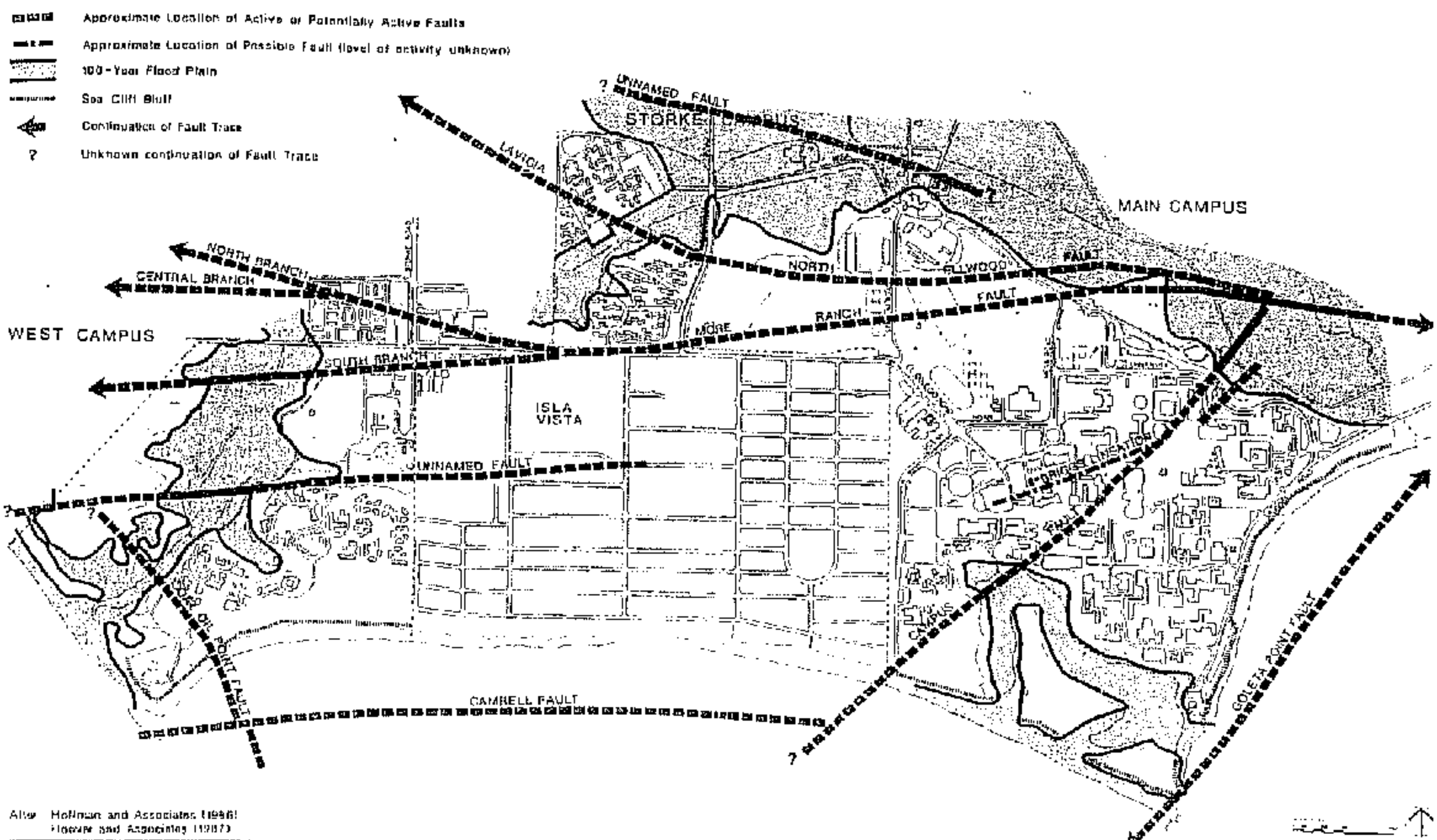
Davidson Library Addition
University of California Santa Barbara



LOCAL FAULT MAP
Davidson Library Addition
University of California Santa Barbara

Modified from K-C (1990b)

PLATE 3



ACTIVE OR POTENTIALLY ACTIVE FAULTS AND HYDROLOGIC FEATURES
Figure 4.2

UCSB FAULT MAP

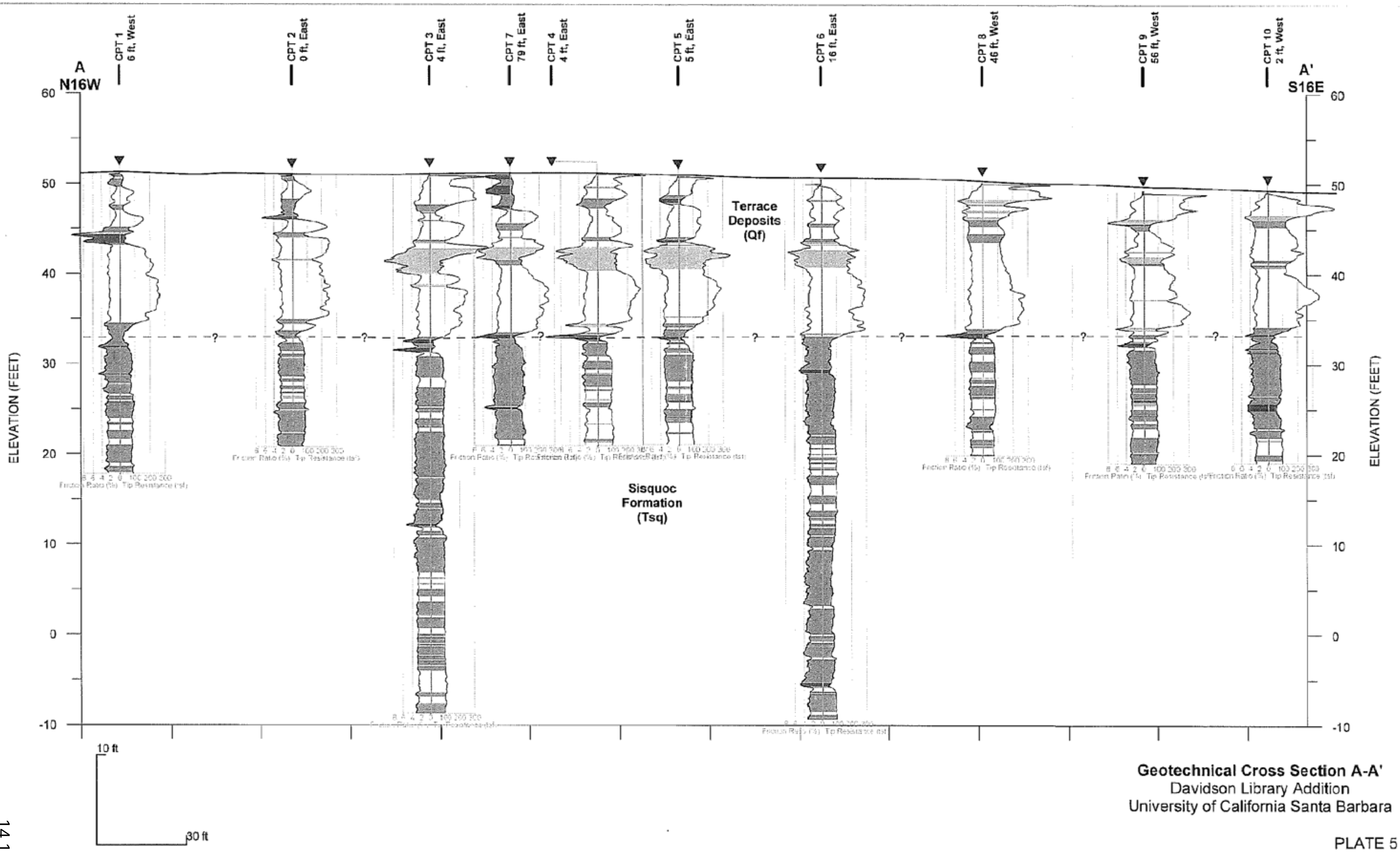
Davidson Library Addition
University of California Santa Barbara

DOCUMENTS

PLATE 4

December 2003
Project No. 3064.027

FUGRO



Geotechnical Cross Section A-A'
Davidson Library Addition
University of California Santa Barbara

PLATE 5

14.11.14

SUBSURFACE EXPLORATION

SUBSURFACE EXPLORATION

CPT Soundings

The cone penetration testing services were provided by Fugro Geosciences of Santa Fe Springs. The cone penetration test (CPT) contractor used a truck-mounted CPT rig to advance the 10 CPT's to depths of about 25 to 60 feet below the existing ground surface. The approximate locations of the CPT soundings are shown on Plate 2.

As the cone is hydraulically advanced into the ground, the soil materials encountered provide resistance to pushing. The resistance at the tip of the cone and on the shaft of the cone compresses the strain gauges in the tip and sleeve of the cone. The measured resistance at the tip and the drag, or friction encountered by the sleeve is continuously recorded. Upon completion of cone penetrometer testing, the recorded measurements are correlated to soil behavior type and soil characteristics.

Logs of CPT soundings providing tip, sleeve, and friction ratio measurements together with interpreted soil material types are provided on Plates A-1 through A-10 - Log of CPT. A chart relating CPT data to soil type is provided on Plate A-11 - CPT Correlation Chart.

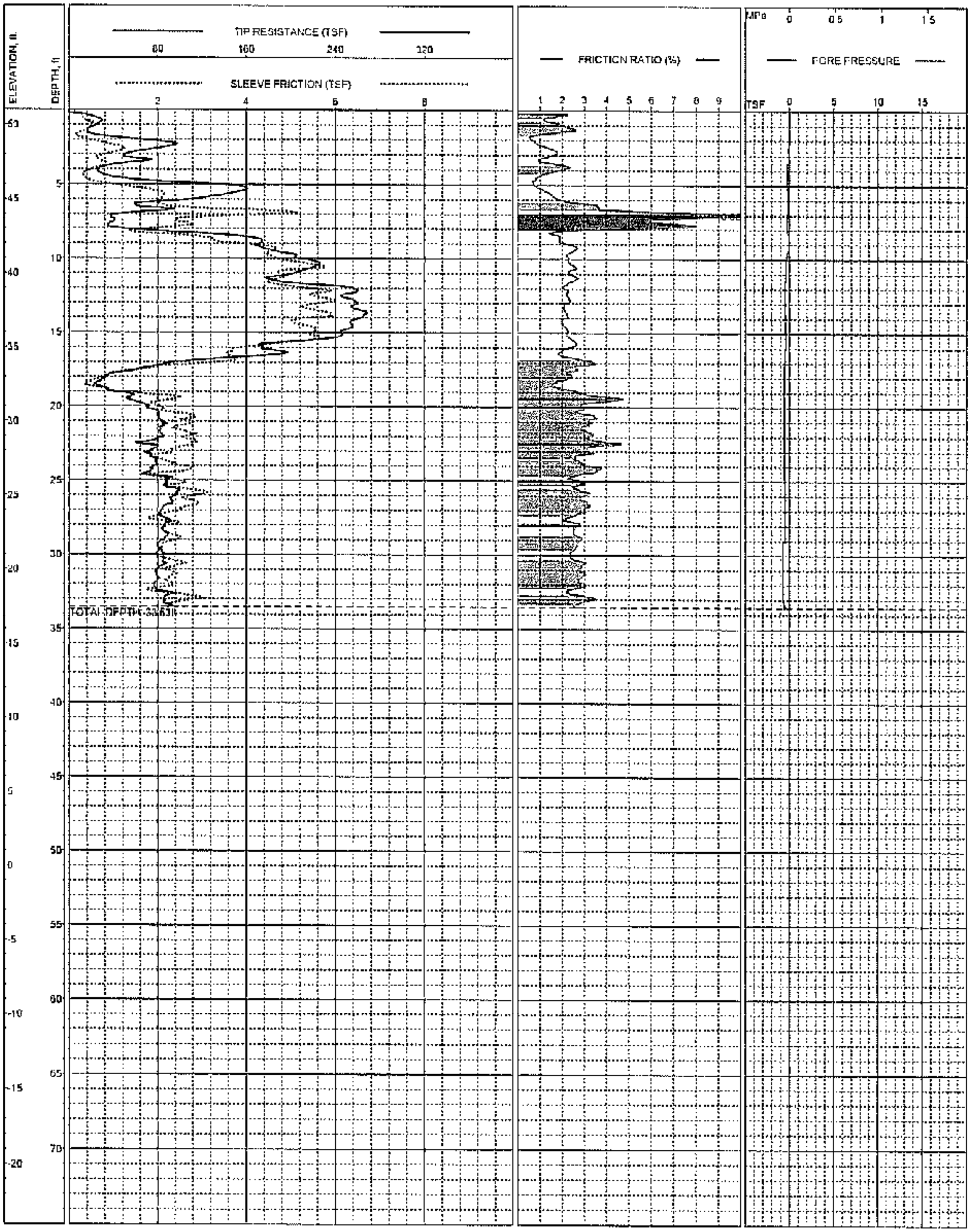
Soil Borings

Drilling work was performed by S/G Drilling of Lompoc, California. The drill holes were advanced with a truck-mounted CME 75 hollow-stem auger drill to depths of about 15 feet to 25 feet below the ground surface. The approximate locations of the drill holes are shown on Plate 2.

The drill holes were sampled using a 2-inch outside diameter standard penetration test (SPT) split spoon sampler, and a 3-inch outside diameter modified California split spoon sampler. The split spoon samplers were driven into the materials at the bottom of the borehole using a 140-pound automatic trip hammer with a 30-inch drop. The blow count is the number of blows from the hammer that were needed to drive the sampler one foot, after the sampler is seated 6 inches into the material at the bottom of the hole. Blow counts obtained using the SPT sampler are referred to as N-values (an approximate equivalent N-value can be estimated from the modified California sampler by dividing the blow count by 1.6). Bulk samples were collected from drill cuttings retrieved from the auger flights. Upon completion the drill holes were backfilled with excavated soil.

Logs of the drill holes are provided on Plates A-12 through A-16. A legend to the terms and symbols used on the drill hole logs is provided on Plate A-17. The logs represent the interpretation of field logs and tests, interpolation between samples, and the results of laboratory observation and tests. The stratification lines are approximate boundaries between soil types; the transitions can be gradational.

PROJECT NO	3064.027	COORDINATES	E6527.7235 N7327.3806 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 1	GROUND ELEVATION	51 ft (MSL)	TESTDATE	10/20/2003



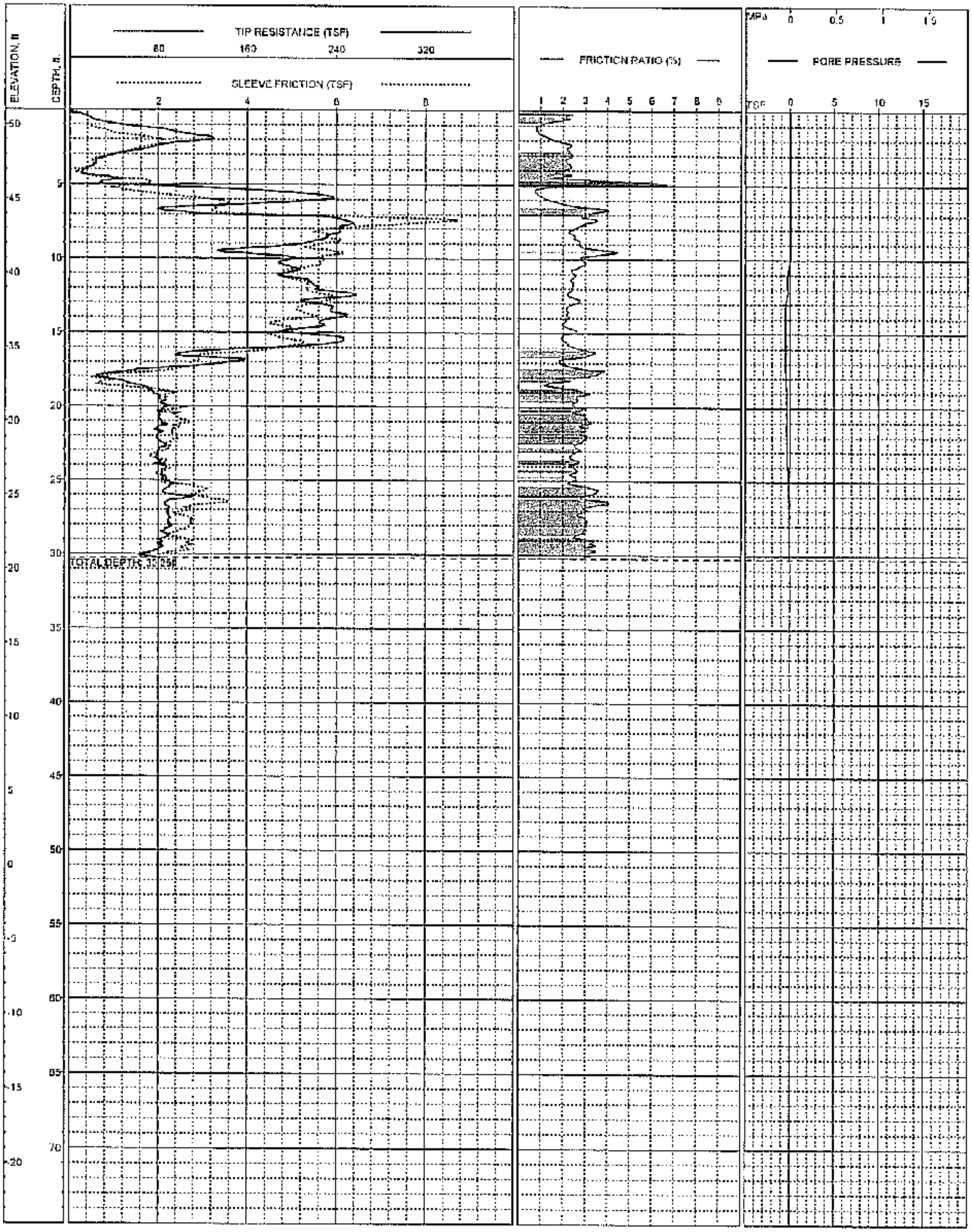
LOG OF CPT 1

Davidson Library Addition
University of California Santa Barbara

Report Date 11/24/2003

PLATE A-1

PROJECT NO	3064.027	COORDINATES	E6549.4333 N7273.7465 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 2	GROUND ELEVATION	51 ft (MSL)	TESTDATE	10/20/2003



LOG OF CPT 2

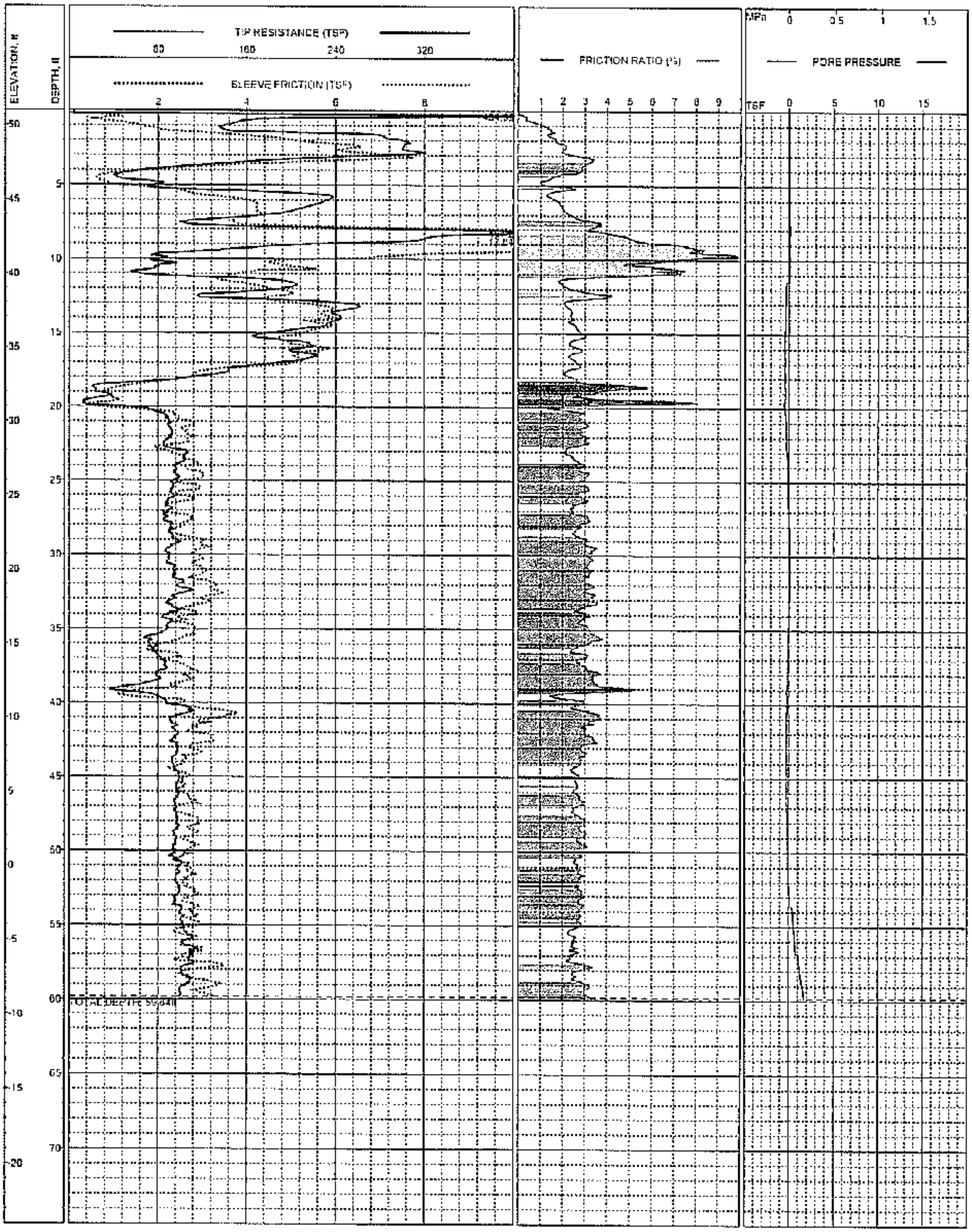
Davidson Library Addition
University of California Santa Barbara

Report Date: 11/24/2003

PLATE A-2

14.11.18

PROJECT NO	3064.027	COORDINATES	E6565.9395 N7230.8213 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 3	GROUND ELEVATION	51 ft (MSL)	TESTDATE	10/20/2003



LOG OF CPT 3

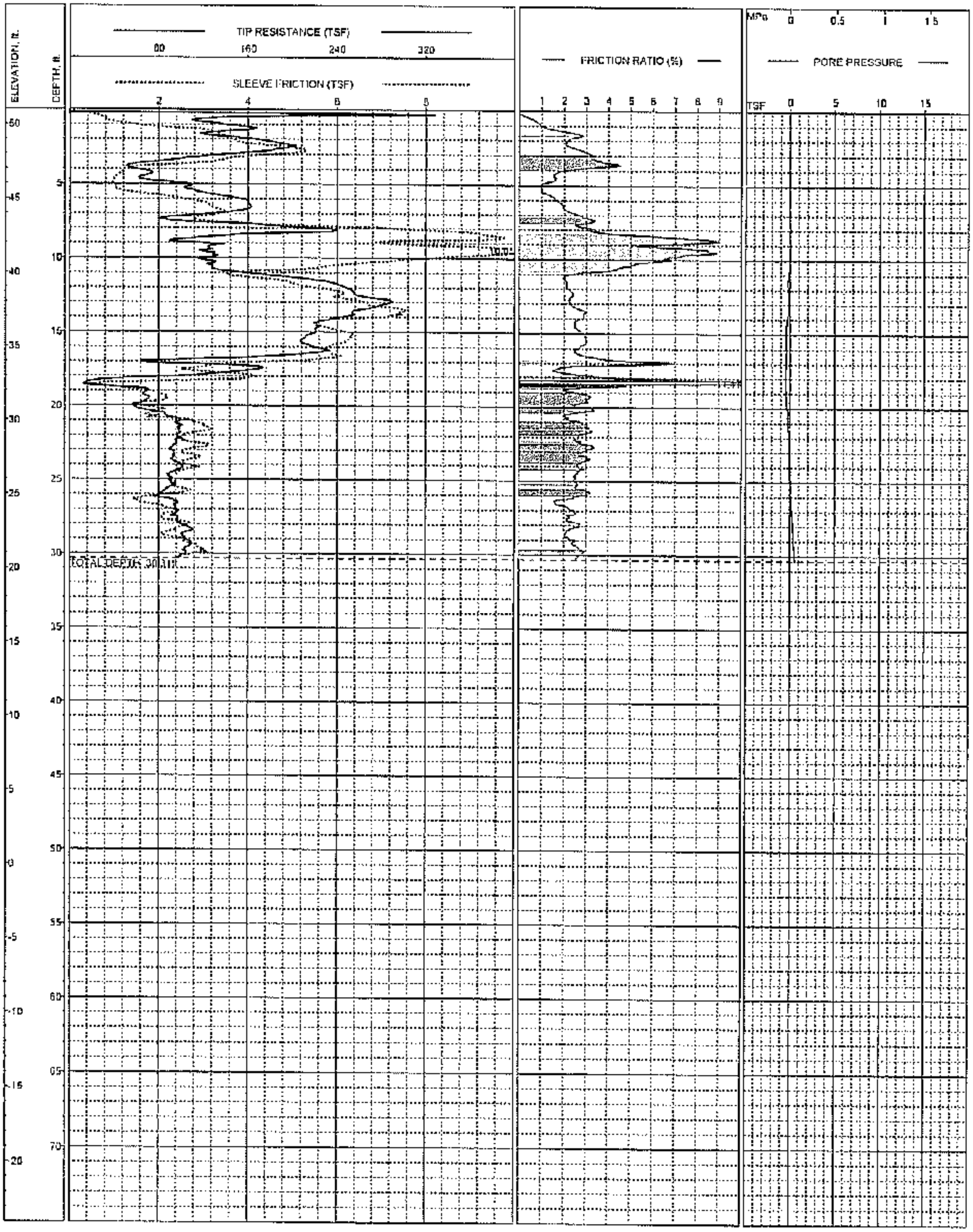
Davidson Library Addition
University of California Santa Barbara

Report Date: 11/24/2003

PLATE A-3

14.11.19

PROJECT NO	3064.027	COORDINATES	E6575.8500 N7190.9031 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 4	GROUND ELEVATION	51 ft (MSL)	TESTDATE	10/20/2003



LOG OF CPT 4

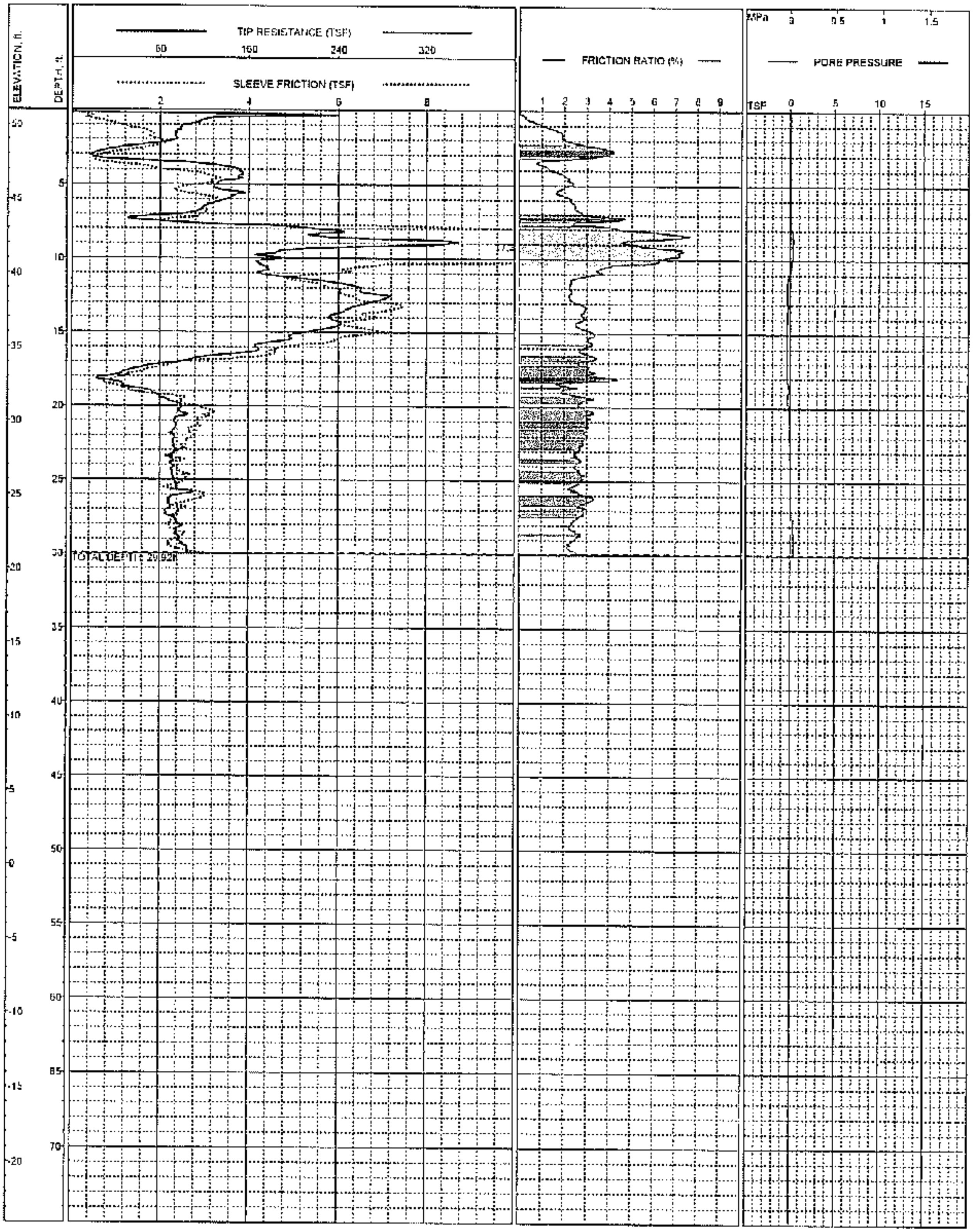
Davidson Library Addition
University of California Santa Barbara

Report Date: 11/24/2003

PLATE A-4

14.11.20

PROJECT NO	3064.027	COORDINATES	E6509.9517 N7150.9971 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 5	GROUND ELEVATION	51 ft (MSL)	TESTDATE	10/20/2003



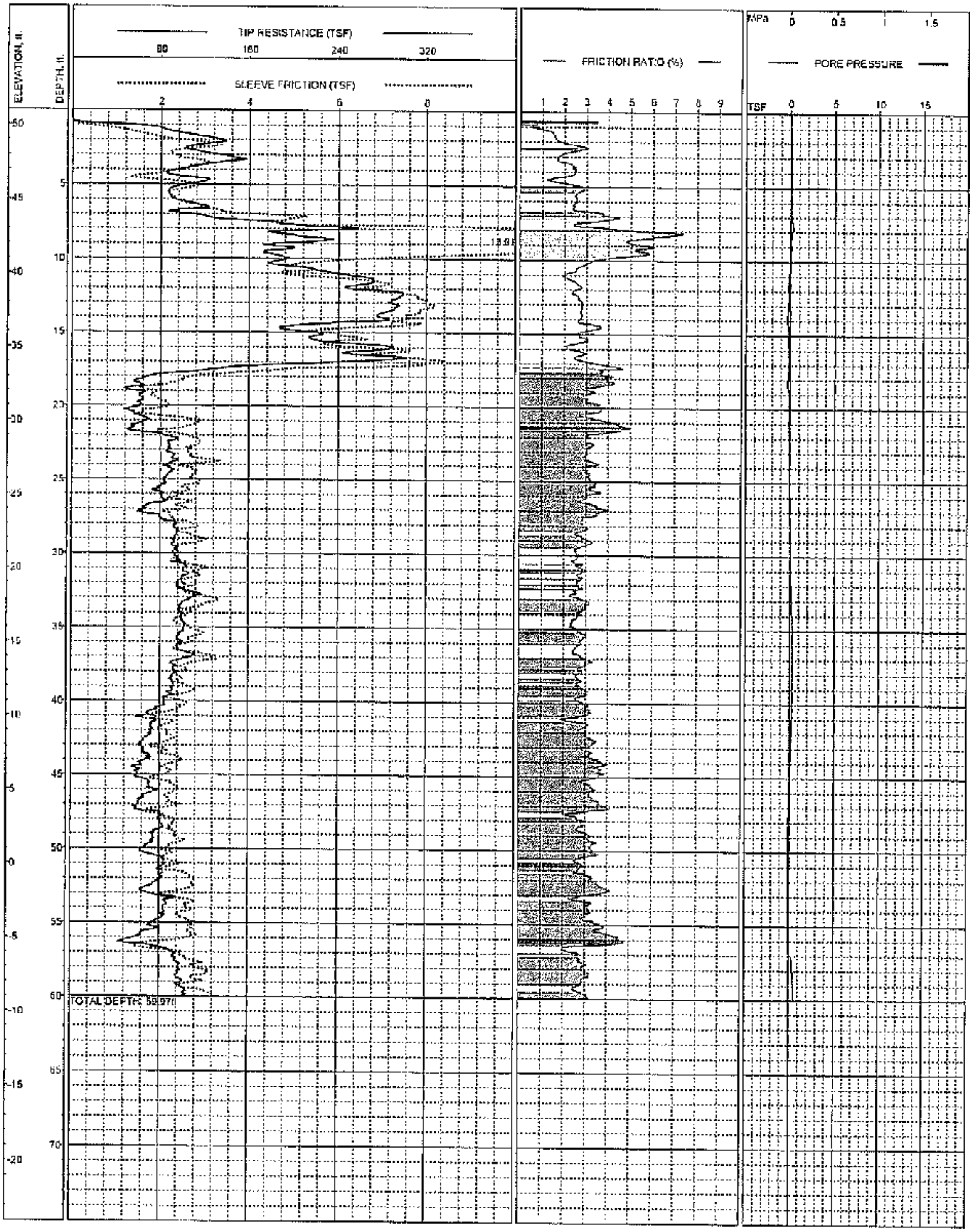
LOG OF CPT 5

Davidson Library Addition
University of California Santa Barbara

Report Date 11/24/2003

14.11.21

PROJECT NO	3064.027	COORDINATES	E6613.7788 N7108.2907 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 6	GROUND ELEVATION	51 ft (MSL)	TESTDATE	10/20/2003



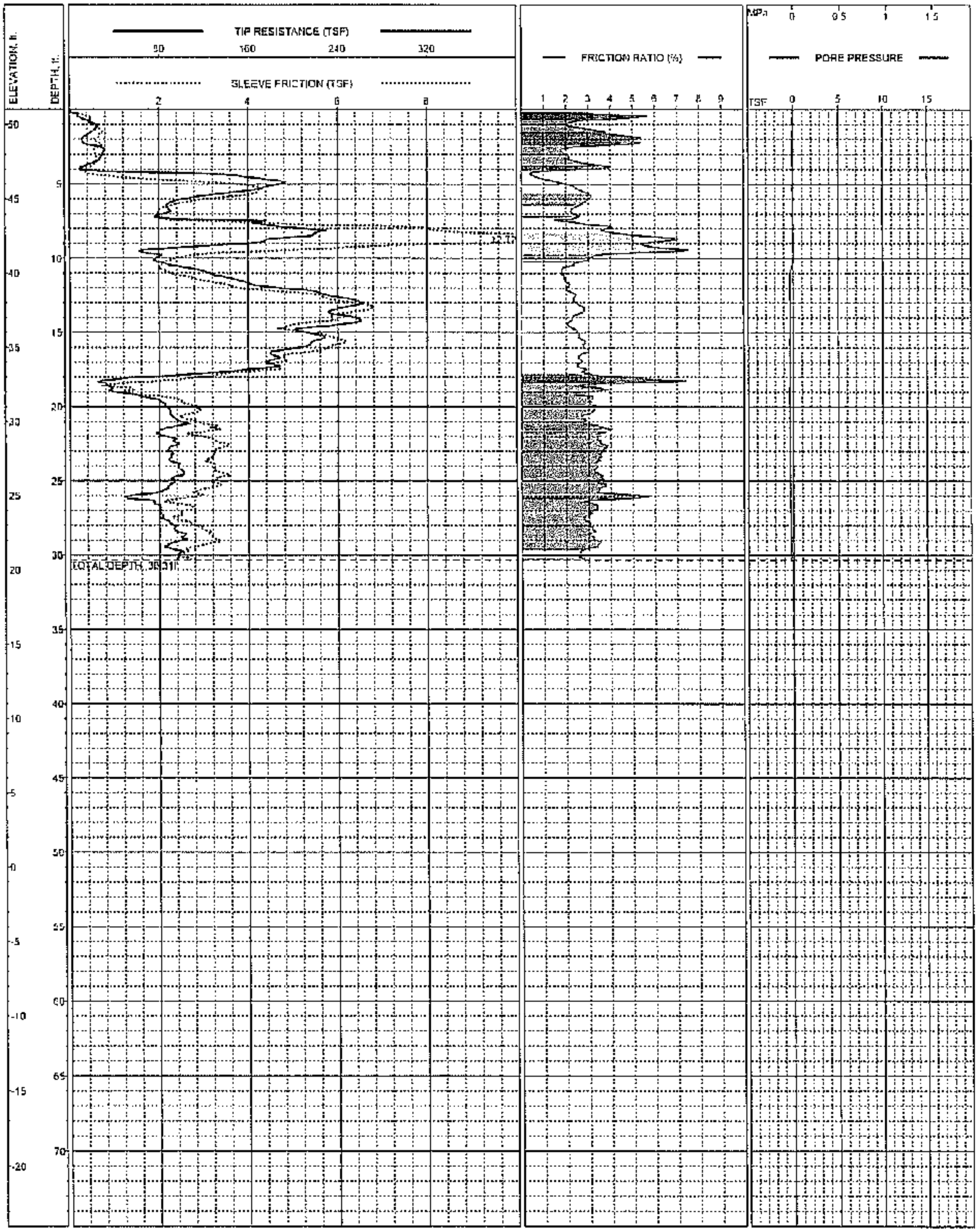
LOG OF CPT 6

Davidson Library Addition
University of California Santa Barbara

Report Date 11/24/2003

14.11.22

PROJECT NO	3064.027	COORDINATES	E6644.9008 N7225.162 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 7	GROUND ELEVATION	51 ft (MSL)	TEST DATE	10/20/2003



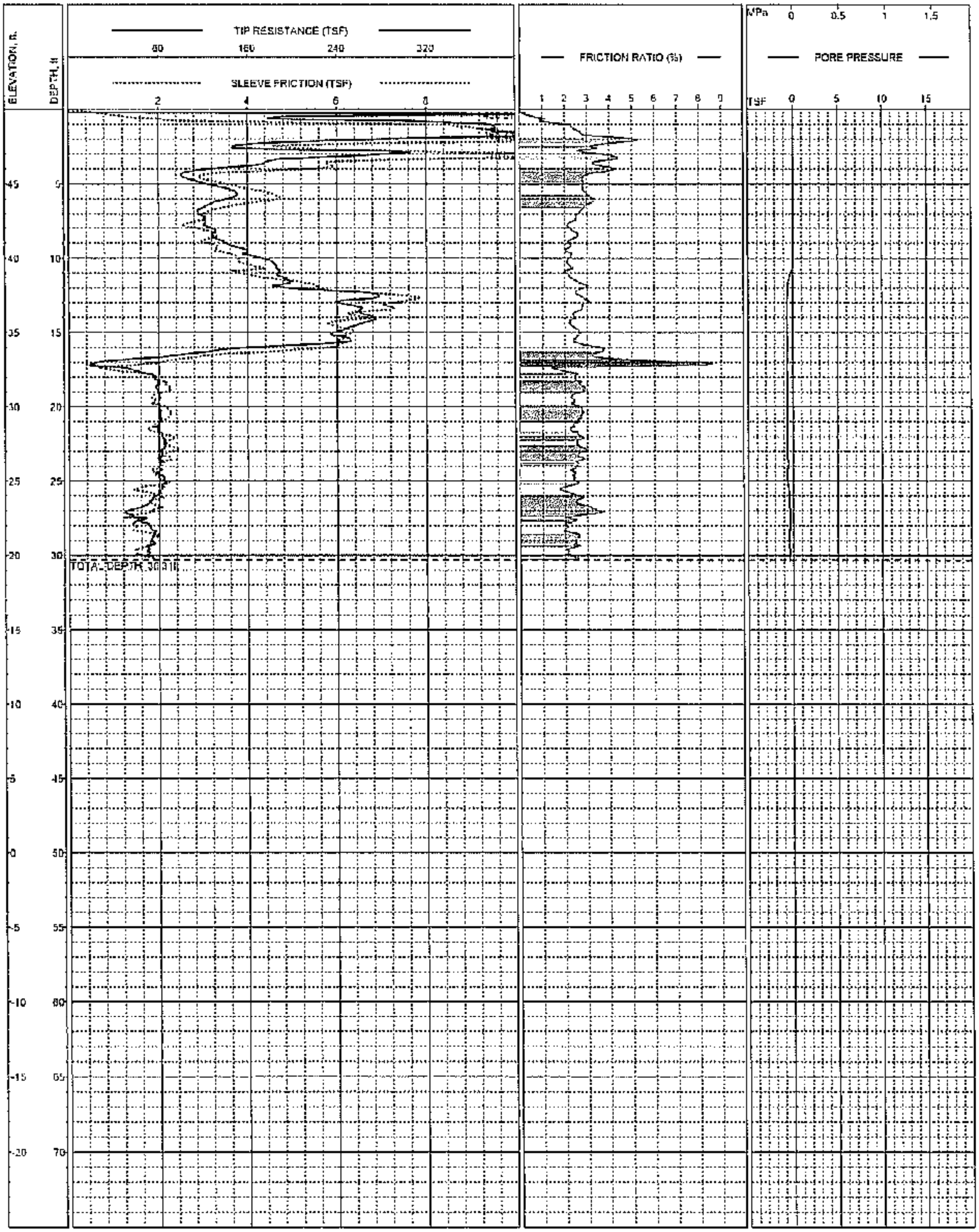
LOG OF CPT 7

Davidson Library Addition
University of California Santa Barbara

Report Date 11/24/2003

14.11.23

PROJECT NO	3064 027	COORDINATES	E6568 3435 N7030 1487 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 8	GROUND ELEVATION	50 ft (MSL)	TESTDATE	10/20/2003



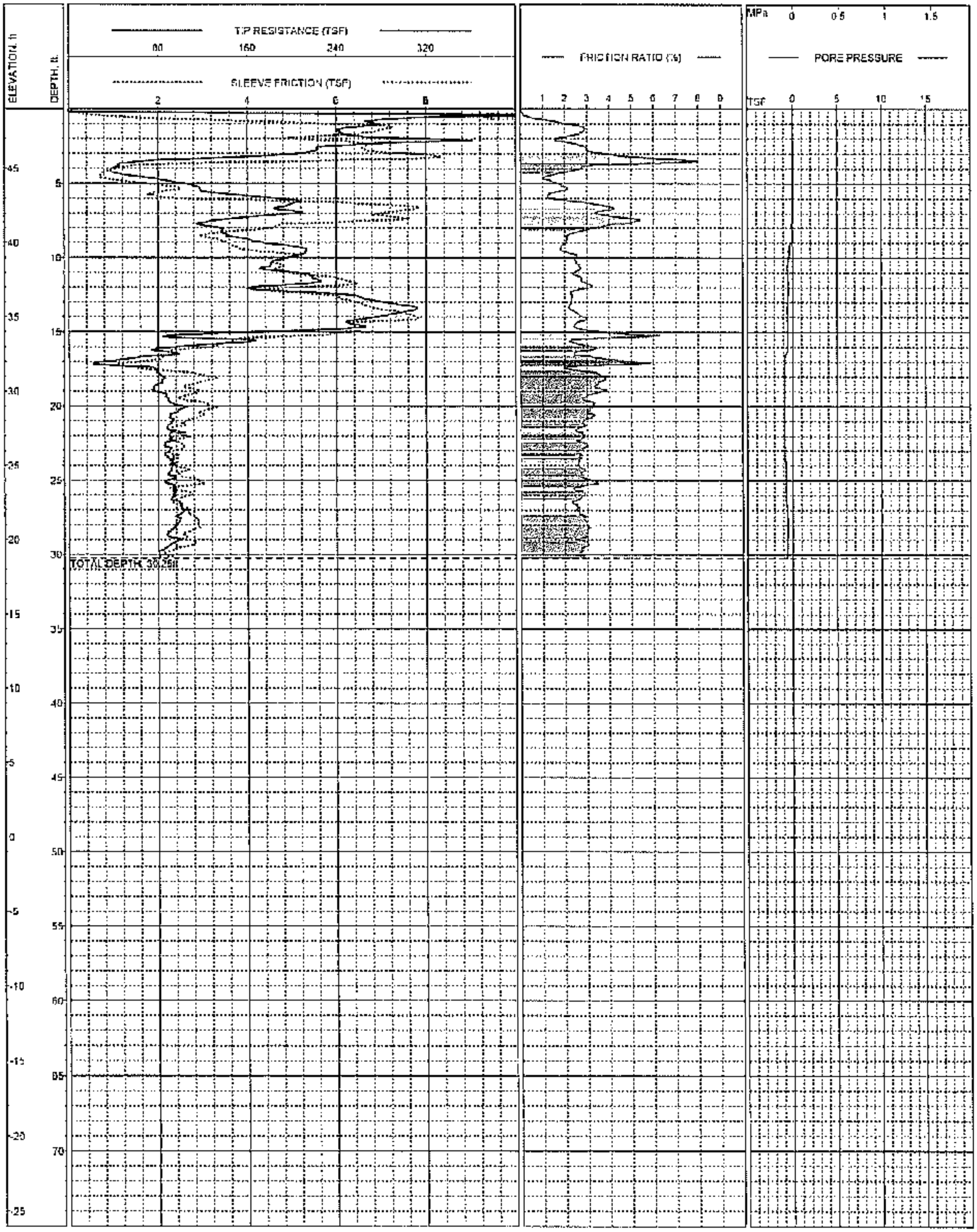
LOG OF CPT 8

Davidson Library Addition
University of California Santa Barbara

Report Date 11/24/2003

14.11.24

PROJECT NO	3064.027	COORDINATES	E6573.5998 N5984.4789 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 9	GROUND ELEVATION	49 ft (MSL)	TESTDATE	10/20/2003



LOG OF CPT 9

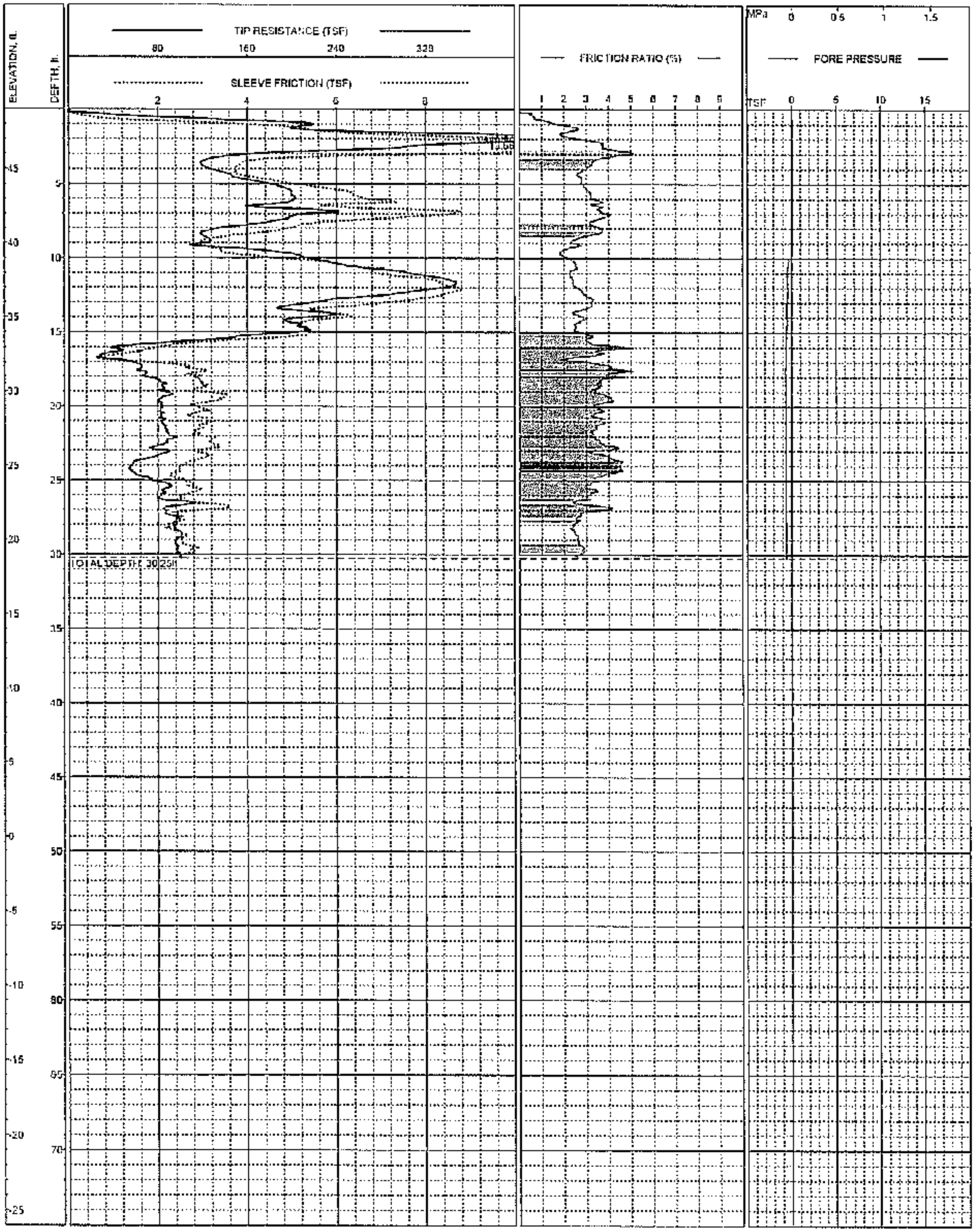
Davidson Library Addition
University of California Santa Barbara

Report Date: 11/24/2003

PLATE A-9

14.11.25

PROJECT NO	3064.027	COORDINATES	E6635.8125 N5959.1725 (UCSB Local Coordinates)	VEHICLE	Fugro Geosciences
SOUNDING	CPT 10	GROUND ELEVATION	49 ft (MSL)	TESTDATE	10/20/2003

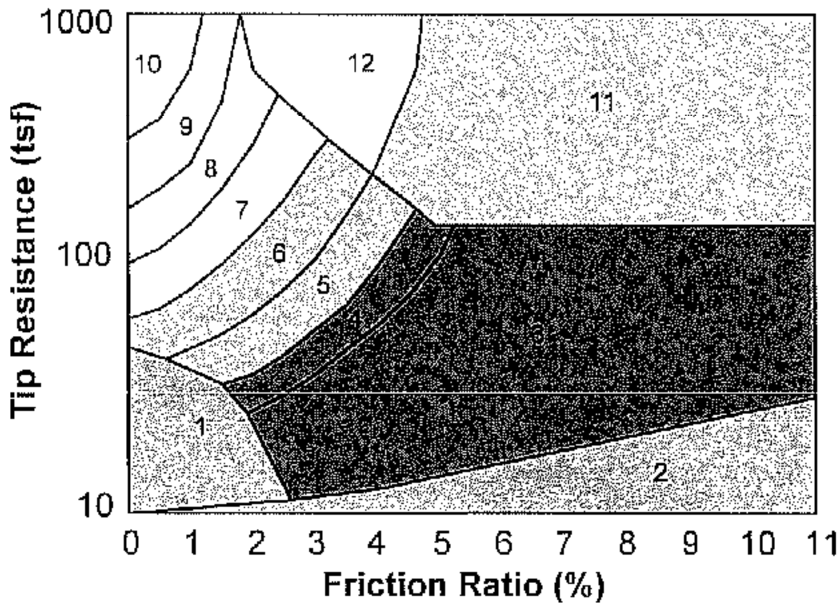


LOG OF CPT 10

Davidson Library Addition
University of California Santa Barbara

Report Date: 11/24/2003

14.11.26



Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay	CH
4	Silty Clay to Clay	CL-CH
5	Clayey Silt to Silty Clay	MH-CL
6	Sandy Silt to Clayey Silt	ML-MH
7	Silty Sand to Sandy Silt	SM-ML
8	Sand to Silty Sand	SM-SP
9	Sand	SW-SP
10	Gravelly Sand to Sand	SW-GW
11	Very Stiff Fine-grained *	CH-CL
12	Sand to Clayey Sand *	SC-SM

*overconsolidated or cemented

CPT CORRELATION CHART
(Robertson and Campanella, 1984)

CPT Correlation Chart
Davidson Library Addition
University of California Santa Barbara

FUGRO

LOCATION: N 6,579 E 7,066

SURFACE EL: 51 ft +/- (rel. Local UCSB datum)

SAMPLE NO.	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
		TERRACE DEPOSITS (Qt) Silty Fine SAND (SM): medium dense, pale yellowish brown, moist							
1	31								
		- with dark yellowish orange mottling, at 3'							
2	(23)		106	100	5	30			
3	24	- mottled dark yellowish orange, dark yellowish brown, and light olive gray			15	19			
4	(22)								
		- moderate brown grading to dusky brown, wet, at 15'							
		- resampled with SPT to recover sample							
5	20				52		73	30	
		SISQUOC FORMATION (Tsq) Clayey SILTSTONE (Rx): moderately weathered, poorly indurated, olive gray, moist							
		- hard drilling, below ~19'							
6 7	(44)		98	62	59				u 8.0

ELEVATION, ft: 50, 48, 46, 44, 42, 40, 38, 36, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12

DEPTH, ft: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 22.5 ft
DEPTH TO WATER: 12.8 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: October 21, 2003

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling
LOGGED BY: G S Denlinger
CHECKED BY: G S Denlinger

LOG OF BORING NO. B-1
Davidson Library Addition
Santa Barbara, California

BORING LOG VENTURA [illegible]

LOCATION: N 6,721 E 7,113

SURFACE EL: 50.5 ft +/- (rel. Local UCSB datum)

ELEVATION, ft	DEPTH, ft	SAMPLE NO.	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
50				**TERRACE DEPOSITS (Qt)** Silty Fine SAND (SM): medium dense, pale yellowish brown, dry to slightly moist, slightly clayey							
48	2	1	(20)		110	98	12				
				- dark yellowish orange mottling, at 3'							
46	4	2	5	- pale yellowish brown, at 4'							
44	6			- moist to very moist, at ~5.5'							
		3	(59)	- clayey fine sand (SC) layer, medium dense, plastic, pale yellowish brown, very moist, 7' to 7.5'	127	103	23	37			
42	8	4		- silty fine sand (SM), dense, mottled dark yellowish orange and pale yellowish brown, moist, slightly clayey	130	110	18				
40	10										
38	12	5	32	- dark yellowish orange grading to yellowish gray, wet, at 12'							
36	14										
34	16	6	(41)	- medium dense, olive gray, with numerous shell fragments, at 17.5'	120	93	30				
32	18	7	(57)	**SISQUOC FORMATION (Tsq)** Clayey SILTSTONE (Rx): poorly indurated, moderately weathered, olive gray, moist	100	61	65				
30	20										
28	22										
26	24	8 9	(56)		97	59	64				u 6.6
24	26										
22	28										
20	30										
18	32										
16	34										
14	36										
12	38										

This log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 25.5 ft
DEPTH TO WATER: 14.0 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: October 21, 2003

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling
LOGGED BY: G S Denlinger
CHECKED BY: G S Denlinger

LOG OF BORING NO. B-2

Davidson Library Addition
Santa Barbara, California

FUGRO

LOCATION: N 6,635 E 7,167

SURFACE EL: 51 ft +/- (rel. Local UCSB datum)

ELEVATION, ft	DEPTH, ft	SAMPLE NO.	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
50	2	1 2	6	**ARTIFICIAL FILL (af)** Silty Fine SAND (SM): medium dense, pale yellowish brown, moist, with minor clay pockets							
48–46	4	3	(16)	**TERRACE DEPOSITS (Qt)** Silty Fine SAND (SM): medium dense, moderate yellowish brown, moist	110	99	11				
44–42	6–8	4	52	- pale yellowish brown, at 7' - very dense, yellowish gray and moderate yellow, at 7.5'							
40–38	10–12	5	(35)	- medium dense, light olive gray, wet, at 11'	124	100	24				
36	14			- 14.5' to water after augers pulled							
34–32	16–18	6 7	(18)	- wet, olive gray, with numerous shell fragments, at 17' **SISQUOC FORMATION (Tsq)** Clayey SILTSTONE (Rx): poorly indurated, extremely to moderately weathered, light olive gray, contact in Sample 6 - slow drilling, below ~20'	107 98	63 57	69 73		108	54	
26	24	8 9	(55)		98	59	66				u 7.0
22–20	30	10 11	(74)	- effective refusal to drilling, at about 30'	102	61	68				

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 30.5 ft
DEPTH TO WATER: 14.5 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: October 22, 2003

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling
LOGGED BY: G S Denlinger
CHECKED BY: G S Denlinger

LOG OF BORING NO. B-3

Davidson Library Addition
Santa Barbara, California

BORING LOG VENTURA [illegible]

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	LOCATION: N 6,595 E 7,230 SURFACE EL: 51.5 ft +/- (rel. Local UCSB datum) MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
50	2		1		6	**TERRACE DEPOSITS (Qt)** Silty SAND (SM): medium dense, medium grayish brown, slightly moist, thin layer of asphalt concrete pavement at ground surface							
48	4		2		(42)		128	116	10				
46	6					- becoming dense, mottled brown to grayish brown							
44	8		3		(86)		127	114	12				
42	10					- dense, dark grayish blue, wet, with shell fragments							
40	12		4		23				22	19			
38	14												
36	16					**SISQUOC FORMATION (Tsq)** Clayey SILTSTONE (Rx): poorly indurated, moderately weathered, olive gray, moist							
34	18		5		7								
32	20		6		26								
30	22												
28	24												
26	26												
24	28												
22	30												
20	32												
18	34												
16	36												
14	38												
12													

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 20.5 ft
DEPTH TO WATER: 14.5 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: October 22, 2003

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling
LOGGED BY: R Slayman
CHECKED BY: G S Denlinger

LOG OF BORING NO. B-4
Davidson Library Addition
Santa Barbara, California

BORING LOG VENTURA [illegible]

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	LOCATION: N 6,571 E 6,978 SURFACE EL: 49 ft +/- (rel. Local UCSB datum) MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
48						**TERRACE DEPOSITS (Qt)** Silty SAND (SM): medium dense, mottled medium grayish brown and brown, slightly moist							
46	2		1		(35)		124	112	10				
44	4		2		20								
42	6		3		21								
40	8												
38	10												
36	12				(40)								
34	14		4		(27)	- olive gray to dusky brown, shell fragments, wet, at 14'	120	90	34	21			
32	16		5		31	**SISQUOC FORMATION (Tsq)** SILTSTONE (Rx): poorly indurated, moderately weathered, olive gray, moist							
30	18		6		27								
28	20												
26	22												
24	24												
22	26												
20	28												
18	30												
16	32												
14	34												
12	36												
10	38												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 20.5 ft
DEPTH TO WATER: 14.5 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: October 22, 2003

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling
LOGGED BY: R Slayman
CHECKED BY: G S Denlinger

LOG OF BORING NO. B-5

Davidson Library Addition
Santa Barbara, California

ELEVATION, ft	DEPTH, ft
-12	2
-14	4
-16	6
-18	8
-20	10
-22	12
-24	14
-26	16
-28	18
-30	20
-32	22
-34	24
-36	26
-38	28
-40	30
-42	32
-44	34
-46	36
-48	38

LOCATION: The drill hole location referencing local landmarks or coordinates

SURFACE EL: Using local, MSL, MLLW or other datum

SAMPLE NO.	BLOW COUNT / REC"/DRIVE"	MATERIAL DESCRIPTION	
1	25	Well graded GRAVEL (GW)	COARSE GRAINED
2	(25)	Poorly graded GRAVEL (GP)	COARSE GRAINED
		Well graded SAND (SW)	COARSE GRAINED
3	(25)	Poorly graded SAND (SP)	COARSE GRAINED
4	(25)	Silty SAND (SM)	COARSE GRAINED
5	18"/ 30"	Clayey SAND (SC)	COARSE GRAINED
		Silty, Clayey SAND (SC-SM)	COARSE GRAINED
6		Elastic SILT (MH)	FINE GRAINED
7		SILT (ML)	FINE GRAINED
8	20"/ 24"	Silty CLAY (CL-ML)	FINE GRAINED
9	(25)	Fat CLAY (CH)	FINE GRAINED
		Lean CLAY (CL)	FINE GRAINED
10	30"/ 30"	CONGLOMERATE	ROCK
11	20"/ 24"	SANDSTONE	ROCK
12		SILTSTONE	ROCK
13		MUDSTONE	ROCK
		CLAYSTONE	ROCK
		SHALE	ROCK
		IGNEOUS	ROCK
		Paving and/or Base Materials	

General Notes

Soil Texture Symbol

Sloped line in symbol column indicates transitional boundary

Samplers and sampler dimensions (unless otherwise noted in report text) are as follows:

Symbol for:

1. SPT Sampler, driven 1-3/8" ID, 2" OD
2. CA Liner Sampler, driven 2-3/8" ID, 3" OD
3. CA Liner Sampler, disturbed 2-3/8" ID, 3" OD
4. Thin-walled Tube, pushed 2-7/8" ID, 3" OD
5. Bulk Bag Sample (from cuttings)
6. CA Liner Sampler, Bagged
7. Hand Auger Sample
8. CME Core Sample
9. Pitcher Sample
10. Lexan Sample
11. Vibracore Sample
12. No Sample Recovered
13. Sonic Soil Core Sample

Sampler Driving Resistance

Number of blows with 140 lb. hammer, falling 30" to drive sampler 1 ft. after seating sampler 6"; for example,

Blows/ft	Description
25	25 blows drove sampler 12" after initial 6" of seating
86/11"	After driving sampler the initial 6" of seating, 36 blows drove sampler through the second 6" interval, and 50 blows drove the sampler 5" into the third interval
50/6"	50 blows drove sampler 6" after initial 6" of seating
Ref/3"	50 blows drove sampler 3" during initial 6" seating interval

Blow counts for California Liner Sampler shown in ( )

Length of sample symbol approximates recovery length

Classification of Soils per ASTM D2487 or D2488

Geologic Formation noted in bold font at the top of interpreted interval

Strength Legend

- Q = Unconfined Compression
- u = Unconsolidated Undrained Triaxial
- t = Torvane
- p = Pocket Penetrometer
- m = Miniature Vane

Water Level Symbols

- ∇ Initial or perched water level
- ▼ Final ground water level
- ∿ Seepages encountered

Rock Quality Designation (RQD) is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.

KEY TO TERMS & SYMBOLS USED ON LOGS

PLATE A-17

OPINION OF PROBABLE COST

15.0

SUMMARY

Davis Langdon developed two Opinions of Probable Cost (OPC) based on Schemes A and B.

OPC for Scheme A, dated August 29th, 2008 was developed based on a project that consists of a new laboratory building of approximately 79,000 GSF, together with a site development of approximately 80,000 GSF. Program areas include research laboratories and associated support areas, offices, administrative support spaces and a 100 seat lecture hall. The Detailed Project Program Cost Plan for this scheme is $49,479,000.

Scheme A provides an all inclusive program as identified in Section 4.0.. The main architectural features include an atrium lobby located immediately adjacent to the primary building entrance, open to 4 stories above with a skylight; a partial basement with a dedicated elevator provides access to future buildings. The site development includes the removal of an existing building, site clearance, utility improvements, and improvements to vehicular roadways, pedestrian and bike paths, and landscape and irrigation improvements. The exterior cladding assumes a combination of stone veneer, metal panels and cement plaster with a combination of punched windows and curtain wall. Building systems have been designed to exceed by 30% the energy performance required by Title 24; HVAC system includes a smoke evacuation system and has chillers, pumps and boilers located on the roof; the ventilation system will be re-circulated for all office and general areas and 100% exhaust is provided for the laboratory and support areas. Plumbing systems include vacuum and compressed air system and an RO water system with deionizers and circulating pumps. The electrical systems includes a 750 KW emergency power generator that will support the laboratory HVAC exhaust system. A main switchboard, transformer and a complete distribution system are included.

OPC for Scheme B, dated September 8th, 2008 was developed based on a laboratory building of approximately 69,000 gross square feet, with development of a site of approximately 80,000 gross square feet. Program areas in this scheme are reduced as reflected in Section 4.0. The Detailed Project Program Cost Plan for this scheme is $44,549,000.

Scheme B OPC includes 4 alternates to be considered, depending on budget availability and construction costs at time of bidding. They have been identified as follows:

1. Shell auditorium 2,096 SF
2. Delete auditorium from program 2,096 SF
3. Improve building efficiency to 58% which results in a decrease of approximately 4,000 GSF
4. Reduce material quality in all systems by 2%

Note: Items 1 and 2 above are not cumulative.

SUMMARY (continued)

Scheme B provides reduced program area as identified in Section 4.0. The main architectural features in Scheme B include an atrium lobby open to the second and to the fourth floor only, with a skylight above; a smoke evacuation system will not be required. All exterior cladding assumptions for Scheme A are retained in this scheme. The partial basement and site development also remain the same. The building systems will continue to exceed by 30% the energy performance required by Title 24; all systems and infrastructure design and quality remain the same as Scheme A, except the capacities are proportionally reduced to meet the program.

OPCs for Schemes A and B incorporate anticipated LEED silver equivalent design performance.

Both schemes assume an anticipated construction start date of June 2010.

SCHEME A

DETAILED PROJECT PROGRAM
COST PLAN

for

Bioengineering Building
University of California, Santa Barbara
Santa Barbara, California

DAVIS LANGDON

August 29, 2008

DETAILED PROJECT PROGRAM COST PLAN

for

Bioengineering Building
University of California, Santa Barbara
Santa Barbara, California

RBB Architects, Inc.
10980 Wilshire Boulevard
Los Angeles, California 90024

Tel: (310) 473-3555
Fax: (310) 312-3646

August 29, 2008

DAVIS LANGDON
301 Arizona Avenue
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CONTENTS

BASIS OF COST PLAN

Cost Plan Prepared From	Dated	Received
Site and Floor Plans	Undated	08/20/08
Building Program	08/28/08	08/28/08
Site Requirements	08/21/08	08/21/08
Landscape Design Narrative	Undated	08/20/08
Structural Design Narrative	Undated	08/21/08
MEP Design Narrative	Aug 2008	08/20/08
Room Data Sheets	08/19/08	08/20/08

Discussions with the Project Architect and Engineers

Conditions of Construction

The pricing is based on the following general conditions of construction

A start date of June 2010

A construction period of 18 months

The general contract will be competitively bid with qualified general and main subcontractors

There will not be small business set aside requirements

The contractor will be required to pay prevailing wages

There are no phasing requirements

The general contractor will have full access to the site during normal working hours

INCLUSIONS

The project consists of a new laboratory building of approximately 79,000 gross square feet, together with development of a site of approximately 80,000 gross square feet. Program areas include research laboratories and associated support areas, offices and administrative support spaces, and a 100 seat lecture hall.

This Cost Plan includes the following assumptions for building systems:

Foundations include overexcavation and backfill with imported fill to a depth of 36" under the building, conventional wall and column footings, elevator pits and an allowance for work associated with the existing utility tunnel.

The building structure includes a reinforced concrete frame with reinforced concrete shear walls and concrete slab on grade. Allowances are included for stepped floor construction and long-span ceiling structure at the lecture hall, mechanical equipment pads, and miscellaneous metals and support framing.

Exterior cladding includes steel stud framing, batt insulation, exterior sheathing and vapor barrier, allowance for exterior cladding materials (stone, metal panels, cement plaster), gypsum board lining with paint finish to inside face of exterior wall, aluminum framed insulated glass windows and curtainwall (30% of exterior wall area), aluminum glazed entry doors, steel exit doors, overhead doors, and allowances for canopies, sunscreens and miscellaneous architectural detailing, cement plaster soffits, and mechanical equipment screen walls at the roof.

Roofing and waterproofing includes waterproofing to elevator pits and retaining walls, membrane roofing over rigid insulation, flashings, metal parapet caps and miscellaneous sheetmetal work, skylight, and miscellaneous caulking and sealants.

Interior partitions includes metal stud partitions with batt insulation and painted gypsum board linings, interior glazing, metal balustrades, and wood doors in hollow metal frames.

Interior finishes includes allowances for floor, wall and ceiling finishes, with an allowance for special finishes at lecture hall, lobby and public areas.

Function equipment includes toilet partitions and fixed restroom accessories, interior signage, fire extinguisher cabinets and window blinds, shelving and millwork, built-in cabinets and countertops, and projection screens. Special use equipment includes chemical fume hoods and biosafety cabinets (BSL-3 suite only), cold/warm rooms, and miscellaneous laboratory accessories including snorkels, gas outlets and cup sinks, and fixed seating at the lecture hall.

Vertical transportation includes fire exit stairs (2), architectural stair (1), metal access ladders, one hydraulic passenger elevator and one traction freight elevator.

INCLUSIONS

Plumbing includes sanitary and institutional fixtures (installation and local connection only), floor drains, hose bibs, water heating equipment, laboratory process generation equipment and distribution pipework, including air, vacuum, industrial hot and cold water, DI water, special gases, acid waste and test port, gas and roof drainage.

Heating, Ventilating & Air Conditioning includes chilling and heating, pipework distribution including heated hot, chilled, steam and condensate return, air handling units, fan-coil units and terminal boxes. Air distribution and return, including laboratory exhaust ventilation, building management and laboratory pressurization controls and general ventilation.

Electrical includes normal power generation and distribution, emergency power, machine and equipment and user convenience power, lighting, telephone/data, MATV and audio/visual (conduit and cable), complete fire alarm system and allowance for security.

Fire protection includes a complete automatic wet sprinkler system.

Site preparation includes removal of existing buildings and structures and general site clearing and rough grading.

Site development includes an allowance for vehicular and pedestrian paving, steps and ramps, landscaping and irrigation, trees, site walls and structures, storm drainage and site lighting, site signage and furniture.

Site utilities include relocation Works regarding - chilled water, domestic and fire water, sewer, gas, normal power and telecommunications/signals connections to (E) infrastructure.

The Cost Plan assumes a LEED silver equivalent design.

INCLUSIONS

BIDDING PROCESS - MARKET CONDITIONS

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated. The mark-ups cover the costs of field overhead, home office overhead and profit and range from 15% to 25% of the cost for a particular item of work.

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors, with a minimum of 3 bidders for all items of subcontracted work and 3-4 general contractor bids. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since Davis Langdon has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents Davis Langdon's best judgement as professional construction consultant familiar with the construction industry. However, Davis Langdon cannot and does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.

EXCLUSIONS

Design, testing, inspection or construction management fees

Architectural and design fees

Scope change and post contract contingencies

Assessments, taxes, finance, legal and development charges

Environmental impact mitigation

Builder's risk, project wrap-up and other owner provided insurance program

Cost escalation beyond a start date of June 2010

Owner supplied and installed furniture, fixtures and equipment

Loose furniture and equipment except as specifically identified

Hazardous material handling, disposal and abatement

Compression of schedule, premium or shift work, and restrictions on the contractor's working hours

Site utility connection charges and fees

FM-200

Fire pump

Booster pump - domestic water

Sump pump and elevator pit drainage

'Grey' water

Independent 3rd Party Mechanical and Electrical Commissioning

Humidification

UPS - By Owner

Clocks

Telephone/data 'active' equipment - including hubs, routers, LAN, servers, switches, PBX and the like

Public address/paging

OVERALL SUMMARY

	Gross Floor Area	$ / SF	$x1,000
Building	78,000 SF	589.40	45,973
Sitework			3,506
TOTAL Building & Sitework Construction	*June 2010*		*49,479*

Please refer to the Inclusions and Exclusions sections of this report

BUILDING AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
Level 1	19,000		
Level 2	19,000		
Level 3	19,000		
Level 4	18,000		
Penthouse	3,000		
SUBTOTAL, Enclosed Area		78,000	
Covered area	Incl.		
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			78,000

Control Quantities

				Ratio to Gross Area
Number of stories (x1,000), not including penthouse		4	EA	0.051
Gross Area		78,000	SF	1.000
Enclosed Area		78,000	SF	1.000
Footprint Area		20,000	SF	0.256
Volume		1,170,000	CF	15.000
Gross Wall Area		50,700	SF	0.650
Finished Wall Area		50,700	SF	0.650
Windows or Glazing Area	30.00%	15,210	SF	0.195
Roof Area - Flat		20,000	SF	0.256
Roof Area - Total		20,000	SF	0.256
Finished Area		78,000	SF	1.000
Plumbing (x 1,000)		75	EA	0.962
HVAC		90,000	CFM	1.154
Electrical Load (x 1,000)		2,000	kVA	25.641
Total Site Area		80,000	SF	1.026
Finished Site Area		60,000	SF	0.769

BUILDING COMPONENT SUMMARY

		Gross Area: 78,000 SF	
		$/SF	$x1,000
1. Foundations		10.63	829
2. Vertical Structure		21.69	1,692
3. Floor & Roof Structures		35.37	2,759
4. Exterior Cladding		59.16	4,614
5. Roofing, Waterproofing & Skylights		6.24	487
Shell (1-5)		133.09	10,381
6. Interior Partitions, Doors & Glazing		32.00	2,496
7. Floor, Wall & Ceiling Finishes		12.08	942
Interiors (6-7)		44.08	3,438
8. Function Equipment & Specialties		32.35	2,523
9. Stairs & Vertical Transportation		9.29	725
Equipment & Vertical Transportation (8-9)		41.64	3,248
10. Plumbing Systems		38.90	3,034
11. Heating, Ventilating & Air Conditioning		83.86	6,541
12. Electric Lighting, Power & Communications		58.79	4,585
13. Fire Protection Systems		7.50	585
Mechanical & Electrical (10-13)		189.05	14,746
Total Building Construction (1-13)		407.86	31,813
14. Site Preparation & Demolition		0.00	0
15. Site Paving, Structures & Landscaping		0.00	0
16. Utilities on Site		0.00	0
Total Site Construction (14-16)		0.00	0
TOTAL BUILDING & SITE (1-16)		407.86	31,813
General Conditions	12.00%	48.95	3,818
Contractor's Overhead & Profit or Fee	4.00%	18.27	1,425
PLANNED CONSTRUCTION COST	*August 2008*	475.08	37,056
Contingency for Development of Design	12.00%	57.01	4,447
Escalation to Start Date (June 2010)	10.77%	57.31	4,470
RECOMMENDED BUDGET	*June 2010*	589.40	45,973

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
Excavation				
Excavate and remove existing soils, average 36" deep	2,444	CY	30.00	73,320
Fill				
Imported engineered fill, average 36" deep	2,444	CY	35.00	85,540
Reinforced concrete including excavation				
Conventional wall and column footings	20,000	SF	30.00	600,000
Elevator pit	2	EA	10,000.00	20,000
Miscellaneous				
Work associated with existing utility tunnel - foundation design premium, stair/elevator access	1	LS	50,000.00	50,000
				828,860
2. Vertical Structure				
Columns and pilasters				
Reinforced concrete columns	78,000	SF	5.00	390,000
Retaining walls				
Reinforced concrete walls at tunnel level, 12" thick	2,400	SF	55.00	132,000
Shear bracing				
Reinforced concrete shear walls	78,000	SF	15.00	1,170,000
				1,692,000
3. Floor and Roof Structure				
Floor at lowest level				
Reinforced concrete slab on grade	20,000	SF	9.00	180,000
Extra for stepped floor at lecture hall	2,000	SF	15.00	30,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Suspended floors				
Reinforced concrete flat slab, 16" thick	58,000	SF	30.00	1,740,000
Extra for long span design over lecture hall	2,600	SF	15.00	39,000
Flat roofs				
Reinforced concrete flat slab, 14" thick	20,000	SF	28.00	560,000
Miscellaneous				
Mechanical equipment pads	1	LS	15,000.00	15,000
Miscellaneous metals and support framing	78,000	SF	2.50	195,000
				2,759,000

4. Exterior Cladding

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Wall framing, furring and insulation				
Steel stud framing, batt insulation, exterior sheathing, vapor barrier	35,490	SF	20.00	709,800
Applied exterior finishes				
Stone veneer, metal panels, cement plaster	35,490	SF	55.00	1,951,950
Interior finish to exterior walls				
Gypsum board with paint finish	35,490	SF	5.00	177,450
Windows, glazing and louvers				
Aluminum framed insulated glass, low E finish				
Punched windows	10,647	SF	60.00	638,820
Curtainwall	4,563	SF	100.00	456,300
Metal louver panels	1	LS	25,000.00	25,000
Exterior doors, frames and hardware				
Aluminum glazed entry doors	1	LS	50,000.00	50,000
Steel exit doors and frames	1	LS	15,000.00	15,000
Overhead doors at loading dock	1	LS	10,000.00	10,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Fascias, bands, screens and trim				
Canopies, sunscreens, miscellaneous architectural detailing	1	LS	500,000.00	500,000
Soffits				
Cement plaster	1	LS	20,000.00	20,000
Balustrades, parapets and roof screens				
Metal guardrails at loading dock	1	LS	10,000.00	10,000
Mechanical equipment screen walls	1	LS	50,000.00	50,000
				4,614,320

5. Roofing, Waterproofing & Skylights

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Waterproofing				
Elevator pits	2	EA	1,500.00	3,000
Retaining walls	2,400	SF	10.00	24,000
Insulation				
Rigid insulation under roofing	20,000	SF	4.50	90,000
Roofing				
Membrane roofing (sarnafil)	20,000	SF	10.00	200,000
Roof or deck traffic surfaces				
Walkway pads	1	LS	5,000.00	5,000
Roofing upstands and sheetmetal				
Membrane flashings, metal parapet caps, miscellaneous sheetmetal work	1	LS	40,000.00	40,000
Roof lights				
Skylight	1	LS	50,000.00	50,000
Caulking and sealants				
Miscellaneous caulking and sealants	1	LS	75,000.00	75,000
				487,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
6. Interior Partitions, Doors & Glazing				
Partitions and doors				
Metal stud partitions with batt insulation and painted gypsum board linings, interior glazing, metal balustrades, wood doors in hollow metal frames	78,000	SF	32.00	2,496,000
				2,496,000
7. Floor, Wall & Ceiling Finishes				
Floor, wall and ceiling finishes				
Research laboratories - rubber tile floors, painted walls, exposed ceilings with paint finish	19,184	SF	9.00	172,656
Shared laboratory support - rubber tile floors, painted walls, exposed ceilings with paint finish	5,456	SF	9.00	49,104
Administration - carpet, painted walls, acoustic tile ceilings	18,314	SF	12.00	219,768
Non-assignable space - vinyl tile/sealed concrete floors, painted walls, acoustic tile ceilings	35,046	SF	10.00	350,460
Miscellaneous				
Special finishes - lecture hall, main lobby, public areas	1	LS	150,000.00	150,000
				941,988
8. Function Equipment & Specialties				
General building equipment				
Toilet partitions and fixed restroom accessories, interior signage, fire extinguisher cabinets, window blinds	78,000	SF	3.50	273,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Shelving and millwork				
Fixed storage shelving, mop racks, architectural millwork	1	LS	15,000.00	15,000
Cabinets and countertops				
Built-in cabinets and countertops				
Research laboratories	19,184	SF	45.00	863,280
Shared laboratory support	5,456	SF	30.00	163,680
Administration	18,314	SF	2.50	45,785
Non-administration space	3,661	SF	2.50	9,153
Light control and vision equipment				
Audio visual equipment - screens only	1	LS	25,000.00	25,000
Special use equipment				
Chemical fume hood, 5'-0"	36	EA	10,000.00	360,000
Biological safety cabinet, 6'-0"	6	EA	15,000.00	90,000
Autoclave, 20" x 20" x 38"	9	EA		OFOI
Cold / warm rooms	6	EA	75,000.00	450,000
Freezer rooms - standard wall and ceiling construction	4	EA	10,000.00	40,000
Miscellaneous laboratory equipment including snorkels, cup sinks, drying racks, gas outlets	24,640	SF	5.00	123,200
Fixed seating at lecture hall	100	EA	400.00	40,000
Miscellaneous fixed equipment	1	LS	25,000.00	25,000
				2,523,098

9. Stairs & Vertical Transportation

Staircase flights, floor to floor				
Fire exit stair	8	FLT	25,000.00	200,000
Architectural stair	3	FLT	40,000.00	120,000
Steps and ladders				
Metal access ladders	1	LS	5,000.00	5,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Elevators				
Hydraulic				
Passenger, 4-stop	1	EA	125,000.00	125,000
Traction				
Freight, 6-stop	1	EA	275,000.00	275,000
				725,000

10. Plumbing Systems

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Sanitary fixtures and local connection pipework - low flow type (allow)	75	EA	2,000.00	150,000
Institutional fixtures - local connection and installation only (provided by laboratory equipment supplier)				
Including laboratory, cup sinks and emergency eyewash	25,144	SF	2.50	62,860
Sanitary waste, vent and service pipework				
Floor/trench drains and sinks, < = 6" (6/level)	32	EA	3,500.00	112,000
Hose bibs, 3/4"	1	LS	15,000.00	15,000
Rough-in sanitary fixtures, including waste, vent and domestic service pipework	75	EA	3,750.00	281,250
Reduced pressure backflow preventers, < = 6"	1	LS	15,500.00	15,500
Mechanical make-up systems	1	LS	7,500.00	7,500
Water treatment, storage and circulation				
Domestic hot water generation - 75 gallon storage, 110 deg F	1	EA	17,500.00	17,500
Industrial hot water generation - 75 gallon storage, 120 deg F	1	EA	22,500.00	22,500
Circulatory pumps, 1/2 hp	2	EA	1,250.00	2,500
Laboratory service equipment				
Duplex lubricated air compressor with regenerative air dryer, 15 hp	1	LS	67,500.00	67,500
Vacuum pump, duplex (liquid ring pump), receiver, valves, muffler and controls - exhaust	1	LS	57,500.00	57,500

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
RO/DI - including sand filters, water softening, RO water system, pumps and deionizers	1	LS	200,000.00	200,000
Laboratory service piping, valves and insulation				
Including vacuum, air, laboratory gas, RO/DI, industrial hot and cold water, potable water, special cylinder gases, fume hood connections, accessories, monitors, valves, filters and specialties	25,144	SF	55.00	1,382,920
Laboratory waste and vent	25,144	SF	16.50	414,876
Natural gas				
Pipework, fittings, < = 3"	200	LF	85.00	17,000
Seismic shut-off	1	LS	10,000.00	10,000
Valves and specialties	1	LS	15,500.00	15,500
Surface water drainages and pipework, < 8"	24	EA	5,500.00	132,000
Test purge and sterilize	400	HR	125.00	50,000
				3,033,906

<u>11. Heating, Ventilation & Air Conditioning</u>

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Heat generation and chilling equipment				
Chilling				
Packaged chillers with 410a refrigerant - E Pak technologies, 150 tons	2	EA	137,500.00	275,000
Process equipment cooling - heat exchanger/pumps (skid-mounted)	1	LS	100,000.00	100,000
Chemical water treatment systems	1	LS	25,500.00	25,500
Heating				
Parker heating hot water boilers - 1,100 mbth, gas-fired	2	EA	32,500.00	65,000
Steam generator re sterilizers, 2washers & dryers	1	LS	50,000.00	50,000
Chemical pot feeder	1	LS	12,500.00	12,500

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Thermal storage and circulation				
Including steam/condensate, chilled & heating hot water circulatory equipment, variable speed drives and vibration isolation	78,000	SF	2.00	156,000
Piping, fittings, valves and insulation				
Chilled, heated hot water, steam and condensate drainage	78,000	SF	12.00	936,000
Radiant heating				
Perimeter radiant heating	1	LS	50,000.00	50,000
Air handing equipment				
Air handling units, (2) supply/return fans, cooling and heating, air filters, variable speed control, seismic isolation - sound attenuated				
Laboratory/HEPA filtration, 100% outside air, VAV, return fan	60,000	CFM	7.50	450,000
Offices, supply and return fans, economizer, cooling coil	30,000	CFM	5.50	165,000
Fan-coil units, 24 hour service, chilled water coiled type	8	EA	3,500.00	28,000
Server cooling	1	LS	50,000.00	50,000
Terminal boxes (1/600 SF)	90	EA	875.00	78,750
Stair pressuriztion supply air fans with filters	10,000	CFM	1.50	15,000
Air distribution and return				
Galvanized sheet metal ductwork	145,000	LB	10.00	1,450,000
Specialty fumehood exhaust ductwork, stainless steel, type 316 - fumehood to point of dilution with general laboratory ductwork & BSL-3 only	20,000	LB	18.50	370,000
Flexible ductwork	3,000	LF	9.50	28,500
Dampers, volume	600	EA	75.00	45,000
Dampers. smoke/fire	1	LS	150,000.00	150,000
Insulation	100,000	SF	3.00	300,000
Sound attenuation - supply and return	90,000	CFM	0.35	31,500
Diffusers, registers and grilles	78,000	SF	2.00	156,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Controls and instrumentation - Johnson Controls				
Direct digital energy management system - allow	400	Pts	1,500.00	600,000
Laboratory controls, variable air volume	25,144	SF	25.00	628,600
Test and balance air systems	800	HR	125.00	100,000
LEED Commissioning	400	HR	125.00	50,000
Unit ventilation/exhaust fans				
Laboratory, 30,000 cfm, CV - Strobic type	2	EA	82,500.00	165,000
General	1	LS	10,000.00	10,000
				6,541,350

12. Electrical Lighting, Power & Communication

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Main service and distribution				
Including main switchboard, metering, surge suppression, motor control, 277/120 V distribution boards, transformers, bus duct, feeder conduit and cable	2,000	kVA	325.00	650,000
Emergency power				
Emergency power generator - including day tank, 277/120 V distribution equipment and feeders	750	KW	775.00	581,250
UPS				by owner
Machine and equipment power				
Connections and switches, including conduit and cable				
Elevators	1	LS	15,000.00	15,000
Mechanical equipment - allow				
50 - 20 hp	6	EA	3,500.00	21,000
20 - 10 hp	12	EA	2,750.00	33,000
< 5 hp	24	EA	1,250.00	30,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Miscellaneous connections, < 100 A - including loading dock, audio-visual, specialty, security, power hardware, fire alarm, BMS and telephone/data equipment power	1	LS	125,000.00	125,000
User convenience power				
Panelboard breakers, 120 V	252	EA	85.00	21,420
Feeder conduit and cable	600	LF	45.00	27,000
Wire mold/receptacles, including conduit and cable (1/65 SF)	1,200	EA	300.00	360,000
Lighting				
Panelboard breakers, 277 V	630	EA	115.00	72,450
Feeder conduit and cable	1,500	LF	45.00	67,500
Fixtures/switching, including conduit and cable	78,000	SF	13.00	1,014,000
Lighting and power specialties				
Grounding	1	LS	15,000.00	15,000
Lighting control - LV relay energy management	1	LS	37,500.00	37,500
Daylight dimming	1	LS	50,000.00	50,000
Cable tray	1,200	LF	65.00	78,000
Telephone and communications				
Telephone/data				
Telephone/data outlets, including conduit and cable (1/120 SF)	750	EA	875.00	656,250
IDF/MDF rough-in	4	EA	15,000.00	60,000
Building backbone - fiber/copper	1	LS	55,000.00	55,000
MATV, including conduit only	1	LS	15,000.00	15,000
Audiovisual - conduit and cable	1	LS	150,000.00	150,000
Alarm and security				
Fire alarm systems	78,000	SF	4.50	351,000
Security - perimeter intrusion and lab suite entry doors	1	LS	100,000.00	100,000
				4,585,370

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
13. Fire Protection Systems				
Automatic wet sprinkler system - complete	78,000	SF	7.50	585,000
				585,000
14. Site Preparation & Building Demolition				
				0
15. Site Paving, Structures & Landscaping				
				0
16. Utilities on Site				
				0

SITEWORK COMPONENT SUMMARY

	Gross Area:	80,000 SF	
		$/SF	$x1,000
14. Site Preparation & Demolition		2.81	225
15. Site Paving, Structures & Landscaping		15.00	1,200
16. Utilities on Site		12.52	1,001
TOTAL BUILDING & SITE (1-16)		30.33	2,426
General Conditions	12.00%	3.64	291
Contractor's Overhead & Profit or Fee	4.00%	1.36	109
PLANNED CONSTRUCTION COST	*August 2008*	35.33	2,826
Contingency for Development of Design	12.00%	4.24	339
Escalation to Start Date (June 2010)	10.77%	4.26	341
RECOMMENDED BUDGET	*June 2010*	43.83	3,506

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
14. Site Preparation & Building Demolition				
Demolition				
Remove existing buildings and site structures	1	LS	25,000.00	25,000
Site clearing and grading				
General site clearing and rough grading	80,000	SF	2.50	200,000
				225,000
15. Site Paving, Structures & Landscaping				
Paving and landscaping				
Site paving and landscaping including concrete paving, steps and ramps, landscaping and irrigation, trees, site walls and structures, storm drainage and site lighting, site signage and furniture	60,000	SF	20.00	1,200,000
				1,200,000
16. Utilities on Site				
Mechanical				
Water mains, domestic and fire				
Domestic and fire water, < = 6"	611	LF	75.00	45,825
Metering	1	LS	12,500.00	12,500
Valves and specialties	1	LS	20,000.00	20,000
Connections to existing	1	LS	10,000.00	10,000
Sewer				
Underground pipework, 6"	246	LF	100.00	24,600
Manholes	2	EA	7,800.00	15,600
Connections to existing	1	LS	10,000.00	10,000
Natural gas				
Underground pipework, fittings, < = 2"	464	LF	55.00	25,520
Metering	1	LS	10,000.00	10,000
Valves and specialties	1	LS	10,000.00	10,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Connections to existing	1	LS	10,000.00	10,000
Central chilling				
Chilled water pipework, fittings, 6"	474	LF	200.00	94,800
Valves and specialties	1	LS	25,500.00	25,500
Connections to existing campus loop infra-structure	1	LS	20,000.00	20,000
Electrical				
Replace EMH 2-111 8' x 8' x 8', including grounding	1	EA	15,000.00	15,000
Switchgear, 15 kV				
S & C Vista Series 6-way switch	1	EA	37,500.00	37,500
12 x 6 switch vault	1	EA	17,500.00	17,500
12.47kV/277/480 V pad mounted transformer - liquid filled	1	EA	47,500.00	47,500
Mains power feeder conduit and cable, (6) 5"	300	LF	375.00	112,500
Extend 15 kV cables				
New switch position #2 - SW 572	500	LF	175.00	87,500
New switch position #1 - SW 408	800	LF	175.00	140,000
Connections to existing switches	2	EA	10,000.00	20,000
Telecommunications/signals - fiber optic/cabling	1,300	LF	55.00	71,500
Inter-connections between HV switchgear	1	LS	50,000.00	50,000
Trade demolition				
Including removal of the following systems				
12.47 kV distribution	800	LF	45.00	36,000
Fiber-optic cabling	800	LF	10.00	8,000
Cold water	330	LF	20.00	6,600
Sewer	450	LF	25.00	11,250
Chilled water	140	LF	45.00	6,300
				1,001,495

SCHEME B

DETAILED PROJECT PROGRAM
COST PLAN

for

Bioengineering Building (Scheme E)
University of California, Santa Barbara
Santa Barbara, California

DAVIS LANGDON

September 8, 2008

DETAILED PROJECT PROGRAM COST PLAN

for

Bioengineering Building (Scheme E)
University of California, Santa Barbara
Santa Barbara, California

RBB Architects, Inc.
10980 Wilshire Boulevard
Los Angeles, California 90024

Tel: (310) 473-3555
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September 8, 2008

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CONTENTS

BASIS OF COST PLAN

Cost Plan Prepared From	Dated	Received
Site and Floor Plans	Undated	08/20/08
Building Program	08/28/08	08/28/08
Site Requirements	08/21/08	08/21/08
Landscape Design Narrative	Undated	08/20/08
Structural Design Narrative	Undated	08/21/08
MEP Design Narrative	Aug 2008	08/20/08
Room Data Sheets	08/19/08	08/20/08
Discussions with the Project Architect and Engineers		

Conditions of Construction

The pricing is based on the following general conditions of construction

A start date of June 2010

A construction period of 18 months

The general contract will be competitively bid with qualified general and main subcontractors

There will not be small business set aside requirements

The contractor will be required to pay prevailing wages

There are no phasing requirements

The general contractor will have full access to the site during normal working hours

INCLUSIONS

The project consists of a new laboratory building of approximately 69,000 gross square feet, together with development of a site of approximately 80,000 gross square feet. Program areas include research laboratories and associated support areas, offices and administrative support spaces, and a 100 seat lecture hall.

This Cost Plan includes the following assumptions for building systems:

Foundations include overexcavation and backfill with imported fill to a depth of 36" under the building, conventional wall and column footings, elevator pits and an allowance for work associated with the existing utility tunnel.

The building structure includes a reinforced concrete frame with reinforced concrete shear walls and concrete slab on grade. Allowances are included for stepped floor construction and long-span ceiling structure at the lecture hall, mechanical equipment pads, and miscellaneous metals and support framing.

Exterior cladding includes steel stud framing, batt insulation, exterior sheathing and vapor barrier, allowance for exterior cladding materials (stone, metal panels, cement plaster), gypsum board lining with paint finish to inside face of exterior wall, aluminum framed insulated glass windows and curtainwall (30% of exterior wall area), aluminum glazed entry doors, steel exit doors, overhead doors, and allowances for canopies, sunscreens and miscellaneous architectural detailing, cement plaster soffits, and mechanical equipment screen walls at the roof.

Roofing and waterproofing includes waterproofing to elevator pits and retaining walls, membrane roofing over rigid insulation, flashings, metal parapet caps and miscellaneous sheetmetal work, skylight, and miscellaneous caulking and sealants.

Interior partitions includes metal stud partitions with batt insulation and painted gypsum board linings, interior glazing, metal balustrades, and wood doors in hollow metal frames.

Interior finishes includes allowances for floor, wall and ceiling finishes, with an allowance for special finishes at lecture hall, lobby and public areas.

Function equipment includes toilet partitions and fixed restroom accessories, interior signage, fire extinguisher cabinets and window blinds, shelving and millwork, built-in cabinets and countertops, and projection screens. Special use equipment includes chemical fume hoods and biosafety cabinets (BSL-3 suite only), cold/warm rooms, and miscellaneous laboratory accessories including snorkels, gas outlets and cup sinks, and fixed seating at the lecture hall.

Vertical transportation includes fire exit stairs (2), architectural stair (1), metal access ladders, one hydraulic passenger elevator and one traction freight elevator.

INCLUSIONS

Plumbing includes sanitary and institutional fixtures (installation and local connection only), floor drains, hose bibs, water heating equipment, laboratory process generation equipment and distribution pipework, including air, vacuum, industrial hot and cold water, DI water, special gases, acid waste and test port, gas and roof drainage.

Heating, Ventilating & Air Conditioning includes chilling and heating, pipework distribution including heated hot, chilled, steam and condensate return, air handling units, fan-coil units and terminal boxes. Air distribution and return, including laboratory exhaust ventilation, building management and laboratory pressurization controls and general ventilation.

Electrical includes normal power generation and distribution, emergency power, machine and equipment and user convenience power, lighting, telephone/data, MATV and audio/visual (conduit and cable), complete fire alarm system and allowance for security.

Fire protection includes a complete automatic wet sprinkler system.

Site preparation includes removal of existing buildings and structures and general site clearing and rough grading.

Site development includes an allowance for vehicular and pedestrian paving, steps and ramps, landscaping and irrigation, trees, site walls and structures, storm drainage and site lighting, site signage and furniture.

Site utilities include relocation Works regarding - chilled water, domestic and fire water, sewer, gas, normal power and telecommunications/signals connections to (E) infrastructure.

The Cost Plan assumes a LEED silver equivalent design.

INCLUSIONS

BIDDING PROCESS - MARKET CONDITIONS

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated. The mark-ups cover the costs of field overhead, home office overhead and profit and range from 15% to 25% of the cost for a particular item of work.

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors, with a minimum of 3 bidders for all items of subcontracted work and 3-4 general contractor bids. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since Davis Langdon has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents Davis Langdon's best judgement as professional construction consultant familiar with the construction industry. However, Davis Langdon cannot and does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.

EXCLUSIONS

Design, testing, inspection or construction management fees

Architectural and design fees

Scope change and post contract contingencies

Assessments, taxes, finance, legal and development charges

Environmental impact mitigation

Builder's risk, project wrap-up and other owner provided insurance program

Cost escalation beyond a start date of June 2010

Owner supplied and installed furniture, fixtures and equipment

Loose furniture and equipment except as specifically identified

Hazardous material handling, disposal and abatement

Compression of schedule, premium or shift work, and restrictions on the contractor's working hours

Site utility connection charges and fees

FM-200

Fire pump

Booster pump - domestic water

Sump pump and elevator pit drainage

'Grey' water

Independent 3rd Party Mechanical and Electrical Commissioning

Humidification

UPS - By Owner

Clocks

Telephone/data 'active' equipment - including hubs, routers, LAN, servers, switches, PBX and the like

Public address/paging

OVERALL SUMMARY

	Gross Floor Area	$ / SF	$x1,000
Building	69,000 SF	589.92	40,704
Sitework			3,845
TOTAL Building & Sitework Construction	*June 2010*		*44,549*

Alternates

1. Shell auditorium	2,096 SF	(300.00)	(629)
2. Delete auditorium from program	2,096 SF	(500.00)	(1,048)
3. Improve building effeciency to 58%	4,000 SF	(200.00)	(800)
4. Reduce material quality in all systems by 2%			(891)

Note: Items 1 and 2 above are not cumulative

Please refer to the Inclusions and Exclusions sections of this report

BUILDING AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
Level 1	18,000		
Level 2	17,000		
Level 3	17,000		
Level 4	16,000		
Penthouse	1,000		
SUBTOTAL, Enclosed Area		69,000	
Covered area	Incl.		
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			69,000

Control Quantities

				Ratio to Gross Area
Number of stories (x1,000), not including penthouse		4	EA	0.058
Gross Area		69,000	SF	1.000
Enclosed Area		69,000	SF	1.000
Footprint Area		18,000	SF	0.261
Volume		1,035,000	CF	15.000
Gross Wall Area		44,850	SF	0.650
Finished Wall Area		44,850	SF	0.650
Windows or Glazing Area	30.00%	13,455	SF	0.195
Roof Area - Flat		18,000	SF	0.261
Roof Area - Total		18,000	SF	0.261
Finished Area		69,000	SF	1.000
Plumbing (x 1,000)		72	EA	1.043
HVAC		65,700	CFM	0.952
Electrical Load (x 1,000)		1,500	kVA	21.739
Total Site Area		80,000	SF	1.159
Finished Site Area		62,000	SF	0.899

BUILDING COMPONENT SUMMARY

Gross Area: 69,000 SF

			$/SF	$x1,000
1.	Foundations		10.91	753
2.	Vertical Structure		21.91	1,512
3.	Floor & Roof Structures		35.54	2,453
4.	Exterior Cladding		59.43	4,100
5.	Roofing, Waterproofing & Skylights		6.57	453
Shell (1-5)			134.36	9,271
6.	Interior Partitions, Doors & Glazing		32.00	2,208
7.	Floor, Wall & Ceiling Finishes		12.37	853
Interiors (6-7)			44.37	3,061
8.	Function Equipment & Specialties		33.27	2,295
9.	Stairs & Vertical Transportation		10.51	725
Equipment & Vertical Transportation (8-9)			43.77	3,020
10.	Plumbing Systems		38.28	2,641
11.	Heating, Ventilating & Air Conditioning		82.46	5,689
12.	Electric Lighting, Power & Communications		58.07	4,007
13.	Fire Protection Systems		7.50	518
Mechanical & Electrical (10-13)			186.31	12,856
Total Building Construction (1-13)			408.82	28,208
14.	Site Preparation & Demolition		0.00	0
15.	Site Paving, Structures & Landscaping		0.00	0
16.	Utilities on Site		0.00	0
Total Site Construction (14-16)			0.00	0
TOTAL BUILDING & SITE (1-16)			408.82	28,208
	General Conditions	12.00%	49.06	3,385
	Contractor's Overhead & Profit or Fee	4.00%	18.32	1,264
PLANNED CONSTRUCTION COST		*September 2008*	476.19	32,857
	Contingency for Development of Design	12.00%	57.14	3,943
	Escalation to Start Date (June 2010)	10.61%	56.58	3,904
RECOMMENDED BUDGET		*June 2010*	589.92	40,704

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
Excavation				
Excavate and remove existing soils, average 36" deep	2,200	CY	30.00	66,000
Fill				
Imported engineered fill, average 36" deep	2,200	CY	35.00	77,000
Reinforced concrete including excavation				
Conventional wall and column footings	18,000	SF	30.00	540,000
Elevator pit	2	EA	10,000.00	20,000
Miscellaneous				
Work associated with existing utility tunnel - foundation design premium, stair/elevator access	1	LS	50,000.00	50,000
				753,000
2. Vertical Structure				
Columns and pilasters				
Reinforced concrete columns	69,000	SF	5.00	345,000
Retaining walls				
Reinforced concrete walls at tunnel level, 12" thick	2,400	SF	55.00	132,000
Shear bracing				
Reinforced concrete shear walls	69,000	SF	15.00	1,035,000
				1,512,000
3. Floor and Roof Structure				
Floor at lowest level				
Reinforced concrete slab on grade	18,000	SF	9.00	162,000
Extra for stepped floor at lecture hall	2,000	SF	15.00	30,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Suspended floors				
Reinforced concrete flat slab, 16" thick	51,000	SF	30.00	1,530,000
Extra for long span design over lecture hall	2,600	SF	15.00	39,000
Flat roofs				
Reinforced concrete flat slab, 14" thick	18,000	SF	28.00	504,000
Miscellaneous				
Mechanical equipment pads	1	LS	15,000.00	15,000
Miscellaneous metals and support framing	69,000	SF	2.50	172,500
				2,452,500

4. Exterior Cladding

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Wall framing, furring and insulation				
Steel stud framing, batt insulation, exterior sheathing, vapor barrier	31,395	SF	20.00	627,900
Applied exterior finishes				
Stone veneer, metal panels, cement plaster	31,395	SF	55.00	1,726,725
Interior finish to exterior walls				
Gypsum board with paint finish	31,395	SF	5.00	156,975
Windows, glazing and louvers				
Aluminum framed insulated glass, low E finish				
Punched windows	9,419	SF	60.00	565,140
Curtainwall	4,037	SF	100.00	403,700
Metal louver panels	1	LS	25,000.00	25,000
Exterior doors, frames and hardware				
Aluminum glazed entry doors	1	LS	50,000.00	50,000
Steel exit doors and frames	1	LS	15,000.00	15,000
Overhead doors at loading dock	1	LS	10,000.00	10,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Fascias, bands, screens and trim				
Canopies, sunscreens, miscellaneous architectural detailing	1	LS	450,000.00	450,000
Soffits				
Cement plaster	1	LS	20,000.00	20,000
Balustrades, parapets and roof screens				
Mechanical equipment screen walls	1	LS	50,000.00	50,000
				4,100,440

5. Roofing, Waterproofing & Skylights

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Waterproofing				
Elevator pits	2	EA	1,500.00	3,000
Retaining walls	2,400	SF	10.00	24,000
Insulation				
Rigid insulation under roofing	18,000	SF	4.50	81,000
Roofing				
Membrane roofing (sarnafil)	18,000	SF	10.00	180,000
Roof or deck traffic surfaces				
Walkway pads	1	LS	5,000.00	5,000
Roofing upstands and sheetmetal				
Membrane flashings, metal parapet caps, miscellaneous sheetmetal work	1	LS	40,000.00	40,000
Roof lights				
Skylight	1	LS	50,000.00	50,000
Caulking and sealants				
Miscellaneous caulking and sealants	1	LS	70,000.00	70,000
				453,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
6. Interior Partitions, Doors & Glazing				
Partitions and doors				
Metal stud partitions with batt insulation and painted gypsum board linings, interior glazing, metal balustrades, wood doors in hollow metal frames	69,000	SF	32.00	2,208,000
				2,208,000
7. Floor, Wall & Ceiling Finishes				
Floor, wall and ceiling finishes				
Research laboratories - rubber tile floors, painted walls, exposed ceilings with paint finish	15,225	SF	9.00	137,025
Shared laboratory support - rubber tile floors, painted walls, exposed ceilings with paint finish	5,456	SF	9.00	49,104
Administration - carpet, painted walls, acoustic tile ceilings	17,044	SF	12.00	204,528
Non-assignable space - vinyl tile/sealed concrete floors, painted walls, acoustic tile ceilings	31,275	SF	10.00	312,750
Miscellaneous				
Special finishes - lecture hall, main lobby, public areas	1	LS	150,000.00	150,000
				853,407
8. Function Equipment & Specialties				
General building equipment				
Toilet partitions and fixed restroom accessories, interior signage, fire extinguisher cabinets, window blinds	69,000	SF	3.50	241,500
Shelving and millwork				
Fixed storage shelving, mop racks, architectural millwork	1	LS	15,000.00	15,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Cabinets and countertops				
Built-in cabinets and countertops				
Research laboratories	15,225	SF	45.00	685,125
Shared laboratory support	5,456	SF	30.00	163,680
Administration	17,044	SF	2.50	42,610
Non-administration space	3,661	SF	2.50	9,153
Light control and vision equipment				
Audio visual equipment - screens only	1	LS	25,000.00	25,000
Special use equipment				
Chemical fume hood, 5'-0"	28	EA	10,000.00	280,000
Biological safety cabinet, 6'-0"	6	EA	15,000.00	90,000
Autoclave, 20" x 20" x 38"	1	EA	85,000.00	85,000
Cold / warm rooms	6	EA	75,000.00	450,000
Freezer rooms - standard wall and ceiling construction	4	EA	10,000.00	40,000
Miscellaneous laboratory equipment including snorkels, cup sinks, drying racks, gas outlets	20,681	SF	5.00	103,405
Fixed seating at lecture hall	100	EA	400.00	40,000
Miscellaneous fixed equipment	1	LS	25,000.00	25,000
				2,295,473

9. Stairs & Vertical Transportation

Staircase flights, floor to floor				
Fire exit stair	8	FLT	25,000.00	200,000
Architectural stair	3	FLT	40,000.00	120,000
Steps and ladders				
Metal access ladders	1	LS	5,000.00	5,000
Elevators				
Hydraulic				
Passenger, 4-stop	1	EA	125,000.00	125,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Traction				
Freight, 6-stop	1	EA	275,000.00	275,000
				725,000

10. Plumbing Systems

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Sanitary fixtures and local connection pipework - low flow type (allow)	72	EA	2,000.00	144,000
Institutional fixtures - local connection and installation only (provided by laboratory equipment supplier)				
Including laboratory, cup sinks and emergency eyewash	20,681	SF	2.50	51,703
Sanitary waste, vent and service pipework				
Floor/trench drains and sinks, < = 6" (6/level)	28	EA	3,500.00	98,000
Hose bibs, 3/4"	1	LS	15,000.00	15,000
Rough-in sanitary fixtures, including waste, vent and domestic service pipework	72	EA	3,750.00	270,000
Reduced pressure backflow preventers, < = 6"	1	LS	15,500.00	15,500
Mechanical make-up systems	1	LS	7,500.00	7,500
Water treatment, storage and circulation				
Domestic hot water generation - 75 gallon storage, 110 deg F	1	EA	17,500.00	17,500
Industrial hot water generation - 75 gallon storage, 120 deg F	1	EA	22,500.00	22,500
Circulatory pumps, 1/2 hp	2	EA	1,250.00	2,500
Laboratory service equipment				
Duplex lubricated air compressor with regenerative air dryer, 15 hp	1	LS	67,500.00	67,500
Vacuum pump, duplex (liquid ring pump), receiver, valves, muffler and controls - exhaust	1	LS	57,500.00	57,500
RO/DI - including sand filters, water softening, RO water system, pumps and deionizers	1	LS	180,000.00	180,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Laboratory service piping, valves and insulation				
Including vacuum, air, laboratory gas, RO/DI, industrial hot and cold water, potable water, special cylinder gases, fume hood connections, accessories, monitors, valves, filters and specialties	20,681	SF	55.00	1,137,455
Laboratory waste and vent	20,681	SF	16.50	341,237
Natural gas				
Pipework, fittings, < = 3"	200	LF	85.00	17,000
Seismic shut-off	1	LS	10,000.00	10,000
Valves and specialties	1	LS	15,500.00	15,500
Surface water drainages and pipework, < 8"	22	EA	5,500.00	121,000
Test purge and sterilize	400	HR	125.00	50,000
				2,641,394

11. Heating, Ventilation & Air Conditioning

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Heat generation and chilling equipment				
Chilling				
Packaged chillers with 410a refrigerant - E Pak technologies, 100 tons	2	EA	117,500.00	235,000
Process equipment cooling - heat exchanger/pumps (skid-mounted)	1	LS	100,000.00	100,000
Chemical water treatment systems	1	LS	25,500.00	25,500
Heating				
Parker heating hot water boilers - 810 mbth, gas-fired	2	EA	27,500.00	55,000
Steam generator re sterilizers, 2washers & dryers	1	LS	50,000.00	50,000
Chemical pot feeder	1	LS	12,500.00	12,500
Thermal storage and circulation				
Including steam/condensate, chilled & heating hot water circulatory equipment, variable speed drives and vibration isolation	69,000	SF	2.25	155,250

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Piping, fittings, valves and insulation				
Chilled, heated hot water, steam and condensate drainage	69,000	SF	12.00	828,000
Radiant heating				
Perimeter radiant heating	1	LS	35,000.00	35,000
Air handing equipment				
Air handling units, (2) supply/return fans, cooling and heating, air filters, variable speed control, seismic isolation - sound attenuated				
Laboratory/HEPA filtration, 100% outside air, VAV, return fan	40,000	CFM	7.50	300,000
Offices, supply and return fans, economizer, cooling coil	25,700	CFM	5.50	141,350
Fan-coil units, 24 hour service, chilled water coiled type	8	EA	3,500.00	28,000
Server cooling	1	LS	50,000.00	50,000
Terminal boxes (1/600 SF)	80	EA	875.00	70,000
Air distribution and return				
Galvanized sheet metal ductwork	130,000	LB	10.00	1,300,000
Specialty fumehood exhaust ductwork, stainless steel, type 316 - fumehood to point of dilution with general laboratory ductwork & BSL-3 only	16,000	LB	18.50	296,000
Flexible ductwork	2,750	LF	9.50	26,125
Dampers, volume	550	EA	75.00	41,250
Dampers, smoke/fire	1	LS	135,000.00	135,000
Insulation	87,500	SF	3.00	262,500
Sound attenuation - supply and return	65,700	CFM	0.35	22,995
Diffusers, registers and grilles	69,000	SF	2.00	138,000
Controls and instrumentation - Johnson Controls				
Direct digital energy management system - allow	380	Pts	1,500.00	570,000
Laboratory controls, variable air volume	20,681	SF	25.00	517,025
Test and balance air systems	800	HR	125.00	100,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
LEED Commissioning	400	HR	125.00	50,000
Unit ventilation/exhaust fans				
Laboratory, 20,000 cfm, CV - Strobic type	2	EA	67,500.00	135,000
General	1	LS	10,000.00	10,000
				5,689,495

12. Electrical Lighting, Power & Communication

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Main service and distribution				
Including main switchboard, metering, surge suppression, motor control, 277/120 V distribution boards, transformers, bus duct, feeder conduit and cable	1,500	kVA	375.00	562,500
Emergency power				
Emergency power generator - including 1,000 gallon belly tank, 277/120 V distribution equipment and feeders	600	KW	825.00	495,000
UPS				by owner
Machine and equipment power				
Connections and switches, including conduit and cable				
Elevators	1	LS	15,000.00	15,000
Mechanical equipment - allow				
50 - 20 hp	6	EA	3,500.00	21,000
20 - 10 hp	12	EA	2,750.00	33,000
< 5 hp	24	EA	1,250.00	30,000
Miscellaneous connections, < 100 A - including loading dock, audio-visual, specialty, security, power hardware, fire alarm, BMS and telephone/data equipment power	1	LS	115,000.00	115,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
User convenience power				
Panelboard breakers, 120 V	504	EA	85.00	42,840
Feeder conduit and cable	960	LF	45.00	43,200
Wire mold/receptacles, including conduit and cable (1/65 SF)	1,000	EA	300.00	300,000
Lighting				
Panelboard breakers, 277 V	546	EA	115.00	62,790
Feeder conduit and cable	1,040	LF	45.00	46,800
Fixtures/switching, including conduit and cable	69,000	SF	13.00	897,000
Lighting and power specialties				
Grounding	1	LS	15,000.00	15,000
Lighting control - LV relay energy management	1	LS	37,500.00	37,500
Daylight dimming	1	LS	50,000.00	50,000
Cable tray	1,000	LF	65.00	65,000
Telephone and communications				
Telephone/data				
Telephone/data outlets, including conduit and cable (1/120 SF)	600	EA	875.00	525,000
IDF/MDF rough-in	4	EA	15,000.00	60,000
Building backbone - fiber/copper	1	LS	55,000.00	55,000
MATV, including conduit only	1	LS	15,000.00	15,000
Audiovisual - conduit and cable	1	LS	140,000.00	140,000
Alarm and security				
Fire alarm systems	69,000	SF	4.50	310,500
Security - perimeter intrusion and lab suite entry doors	1	LS	70,000.00	70,000
				4,007,130

13. Fire Protection Systems

Automatic wet sprinkler system - complete	69,000	SF	7.50	517,500
				517,500

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
<u>14. Site Preparation & Building Demolition</u>				
				0
<u>15. Site Paving, Structures & Landscaping</u>				
				0
<u>16. Utilities on Site</u>				
				0

SITEWORK COMPONENT SUMMARY

		Gross Area:	80,000 SF	
			$/SF	$x1,000
14. Site Preparation & Demolition			2.81	225
15. Site Paving, Structures & Landscaping			15.50	1,240
16. Utilities on Site			15.00	1,200
TOTAL BUILDING & SITE (1-16)			33.31	2,665
General Conditions	12.00%		4.00	320
Contractor's Overhead & Profit or Fee	4.00%		1.49	119
PLANNED CONSTRUCTION COST	*September 2008*		38.80	3,104
Contingency for Development of Design	12.00%		4.65	372
Escalation to Start Date (June 2010)	10.61%		4.61	369
RECOMMENDED BUDGET	*June 2010*		48.06	3,845

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
14. Site Preparation & Building Demolition				
Demolition				
Remove existing buildings and site structures	1	LS	25,000.00	25,000
Site clearing and grading				
General site clearing and rough grading	80,000	SF	2.50	200,000
				225,000
15. Site Paving, Structures & Landscaping				
Paving and landscaping				
Site paving and landscaping including concrete paving, steps and ramps, landscaping and irrigation, trees, site walls and structures, storm drainage and site lighting, site signage and furniture	62,000	SF	20.00	1,240,000
				1,240,000
16. Utilities on Site				
Mechanical				
Water mains, domestic and fire				
Domestic and fire water, < = 6"	611	LF	75.00	45,825
Metering	1	LS	12,500.00	12,500
Valves and specialties	1	LS	20,000.00	20,000
Connections to existing	1	LS	10,000.00	10,000
Sewer				
Underground pipework, 6"	246	LF	100.00	24,600
Manholes	2	EA	7,800.00	15,600
Connections to existing	1	LS	10,000.00	10,000
Natural gas				
Underground pipework, fittings, < = 2"	464	LF	55.00	25,520
Metering	1	LS	10,000.00	10,000
Valves and specialties	1	LS	10,000.00	10,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Connections to existing	1	LS	10,000.00	10,000
Central chilling				
Chilled water pipework, fittings, 6"	474	LF	200.00	94,800
Valves and specialties	1	LS	25,500.00	25,500
Connections to existing campus loop infra-structure	1	LS	20,000.00	20,000
Electrical				
Replace EMH 2-111 8' x 8' x 8', including grounding	1	EA	15,000.00	15,000
Switchgear, 15 kV				
S & C Vista Series 6-way switch	1	EA	127,500.00	127,500
12 x 6 switch vault	1	EA	17,500.00	17,500
12.47kV/277/480 V pad mounted transformer - liquid filled	1	EA	47,500.00	47,500
Mains power feeder conduit and cable, (6) 5"	300	LF	325.00	97,500
Extend 15 kV cables				
New switch position #2 - SW 572	500	LF	175.00	87,500
New switch position #1 - SW 408	800	LF	175.00	140,000
Connections to existing switches	2	EA	10,000.00	20,000
Telecommunications/signals - fiber optic/cabling	1,300	LF	150.00	195,000
Inter-connections between HV switchgear	1	LS	50,000.00	50,000
Trade demolition				
Including removal of the following systems				
12.47 kV distribution	800	LF	45.00	36,000
Fiber-optic cabling	800	LF	10.00	8,000
Cold water	330	LF	20.00	6,600
Sewer	450	LF	25.00	11,250
Chilled water	140	LF	45.00	6,300
				1,199,995

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