The following Motions and Documents were considered by the GFC Facilities Development Committee at its April 25, 2013 meeting:

Agenda Title: **Students' Union Building (SUB): Lower Level Renovation – Design Development Report**

APPROVED MOTION: THAT the GFC Facilities Development Committee approve, under delegated authority from General Faculties Council and on the recommendation of Planning and Project Delivery, the proposed Students' Union Building: Lower Level Renovation – Design Development Report, as set forth in Attachment 2, as the basis for further engineering and development of contract documents.

Final Item: **4**

Agenda Title: **Appendix XIX: South Campus Long Range Development Plan Amendment 2013**

APPROVED MOTION: THAT the GFC Facilities Development Committee recommends to the Board of Governors, on the recommendation of Planning and Project Delivery, the proposed Appendix XIX: South Campus Long Range Development Plan Amendment 2013, as set forth in Attachment 2, as the basis for further planning; and recommends to the Board of Governors the concurrent rescission of 'Section 6.2' of the Long Range Development Plan 2002.

Final Recommended Item: **5**

FINAL Item No. 4

OUTLINE OF ISSUE

Agenda Title: **Students' Union Building (SUB): Lower Level Renovation – Design Development Report**

Motion: THAT the GFC Facilities Development Committee approve, under delegated authority from General Faculties Council and on the recommendation of Planning and Project Delivery, the proposed Students' Union Building: Lower Level Renovation – Design Development Report, as set forth in Attachment 2, as the basis for further engineering and development of contract documents.

Item

Action Requested	☒Approval ☐Recommendation ☐Discussion/Advice ☐Information
Proposed by	Ben Louie, University Architect, Facilities and Operations; Andy Cheema, Vice-President (Operations and Finance), Students' Union
Presenters	Ben Louie, University Architect, Facilities and Operations; Andy Cheema, Vice-President (Operations and Finance), Students' Union; Stephen Boyd, Principal, Dialog
Subject	Students' Union Building (SUB): Lower Level Renovation – Design Development Report

Details

Responsibility	Vice-President (Facilities and Operations)
The Purpose of the Proposal is (please be specific)	To approve the Students' Union Building (SUB): Addition and Renovation – Schematic Design Report which expands student engagement activity, improves provision of student services, and enhances the long term viability of SUB.
The Impact of the Proposal is	To renovate the lower level of SUB to increase and improve the student services and club space; create additional meeting rooms for student groups; increase study, relaxation, and social space while contributing positively to create an inviting and engaging south face to the buildng, and providing an active and vibrant exterior outdoor patio which ties to the long-term plan of the campus pathway system.
Replaces/Revises (eg, policies, resolutions)	N/A
Timeline/Implementation Date	Working drawings and contract documents will proceed immediately following with the estimated construction timeline from May, 2013 to August, 2014.
Estimated Cost	N/A
Sources of Funding	N/A
Notes	N/A

Alignment/Compliance

Alignment with Guiding Documents	Academic Plan (*Dare to Deliver*); Long Range Development Plan; Deferred Maintenance Master Plan; Comprehensive Institutional Plan; Students' Union 2011 Strategic Plan
Compliance with Legislation, Policy and/or Procedure Relevant to the Proposal (please quote legislation and include identifying section numbers)	1. ***Post-Secondary Learning Act* (*PSLA*)**: The *PSLA* gives GFC responsibility, subject to the authority of the Board of Governors, over academic affairs (Section 26(1)) and provides that GFC may make recommendations to the Board of Governors on a building program and related matters (Section 26(1) (o)). Section 18(1) of the PSLA give the Board of Governors the authority to make any bylaws "appropriate for the management, government and control of the university buildings and land." Section 19 of the *Act* requires that the Board "consider the recommendations of the general faculties council, if any, on matters of

	academic import prior to providing for (a) the support and maintenance of the university, (b) the betterment of existing buildings, (c) the construction of any new buildings the board considers necessary for the purposes of the university [and] (d) the furnishing and equipping of the existing and newly erected buildings [.] […]" Section 67(1) of the *Act* governs the terms under which university land may be leased. 2. **GFC Facilities Development Committee (FDC) Terms of Reference – Section 3. Mandate of the Committee**: "[…] 2. Delegation of Authority Notwithstanding anything to the contrary in the terms of reference above, the Board of Governors and General Faculties Council have delegated to the Facilities Development Committee the following powers and authority: **A. Facilities** **1. To approve proposed General Space Programmes (Programs) for academic units.** 2. (i) To approve proposals concerning the design and use of all new facilities and the repurposing of existing facilities and to routinely report these decisions for information to the Board of Governors. (ii) In considering such proposals, GFC FDC may provide advice, upon request, to the Provost and Vice-President (Academic), Vice-President (Facilities and Operations), and/or the University Architect (or their respective delegates) on the siting of such facilities. (GFC SEP 29 2003) **B. Other Matters** The Chair of FDC will bring forward to FDC items where the Office of the Provost and Vice-President (Academic) and/or the Office of the Vice-President (Facilities and Operations), in consultation with other units or officers of the University, is seeking the advice of the Committee. […]" 3. **UAPPOL Space *Management Policy and Space Management Procedure*:** The respective roles of GFC FDC and the Vice-President (Facilities and Operations) with regard to institutional space management are set out in this Board-approved Policy and attendant Procedure. To access this policy suite on line, go to: www.uappol.ualberta.ca.

Routing (Include meeting dates)

Consultative Route (parties who have seen the proposal and in what capacity)	• Students' Union Referendum – March 8, 2012; • Students' Union Building Lower Level Renovation Feasibility Study (GFC Facilities Development Committee; for discussion) – April 26, 2012; • Students' Union Road Show – November 27 – 30, 2012; • Students' Union Open House – December 4, 2012; • Students' Union Building Renovation Steering Committee (endorsement of Schematic Design Report) – December 13, 2012; • Students' Union Council (for information) – January 8, 2013

FINAL Item No. 4

Approval Route (Governance) (including meeting dates)	GFC Facilities Development Committee (Students' Union Building: Addition and Renovation - Schematic Design Report; for approval) – December 20, 2012; GFC Facilities Development Committee (Students' Union Building (SUB): Lower Level Renovation – Design Development Report; for approval) – April 25, 2013
Final Approver	GFC Facilities Development Committee

Attachments:

1. Attachment 1 (pages 1 – 2) – Briefing Note
2. Attachment 2 (pages 1 – 78) – Students' Union Building: Addition and Renovation – Design Development Report

Prepared by: Ben Louie, University Architect, Office of the University Architect, Planning and Project Delivery, Facilities and Operations, ben.louie@ualberta.ca

Students' Union Building: Lower Level Renovation Design Development Report

Attachment 1

Background

"One simply cannot have a vibrant campus community without a strong student community and culture. The heartbeat of that student community is the student centre", from The Role of Student Centres, Students' Union Building Renovation Project Report submitted to Facilities Development Committee on April 12, 2012.

The Students' Union Building (SUB) itself has been renovated and expanded as enrolment has grown and needs changed. SUB remains a contemporary and vibrant part of the campus mosaic and is the foremost hub of service and social life on campus.

Over the last few years, needs for additional, better quality space of various types have grown as evidenced in the completion of the 2010 General Space Program. The Students' Union has also committed itself to a series of strategic initiatives, aligned with the University's own strategic documents that require a reconsideration of how space is utilized in SUB. The Students' Union has explored and discussed a wide range of potential solutions to these demands and needs with the University, from expansion opportunities to reconfigurations of the existing building.

After determining that a full expansion to accommodate program needs would not be possible at this time, the Students' Union turned its attention to what could be done to ameliorate the critical space issues identified in the 2010 General Space Program. The Students' Union began reviewing other alternatives to improve utilization of space, and to create the kinds of space required by its strategic initiatives, within the general footprint of the building and its immediate environs. It was also necessary to assess what these changes might cost, so that the affordability of any project could be assessed. The Students' Union elected to conduct a feasibility study to address these questions.

Based on the Feasibility Study, Students' Council approved a referendum for a $9.00 per term fee for Students' Union facility development. The referendum passed in March 2012. Over the summer and fall of 2012, the Students' Union has met with stakeholders and worked with DIALOG to create this Schematic Design Report.

Issues

The Students' Union has established three key goals for this project:

- Expand student engagement activity on campus;
- Improve provision of student services; and,
- Enhance the long-term viability of Students' Union Building.

These goals are tightly aligned with the Students' Union's 2011 Strategic Plan and its engagement goal, in particular, is in direct alignment with the Dare to Discover Academic Plan. The project is aligned with the Long Range Development Plan of the University, and its derivative sector plans. SUB is located in Sector 3 (Long Range Development Plan 2002, Sector Plan 3 & 4 December 2004).

In terms of physical space, the project presents net increases to common spaces – lounges and bookable spaces and maximizing utilization of program space through shared use. Greater use of open-plan workspaces and an improvement in circulation efficiency will make better use of existing square footage within the Student Services area. Extensive discussions with the Bookstore have identified their space needs as fundamentally seasonal, and the design has been developed to accommodate dedicated Bookstore usage of some common space during high demand periods which has allowed for a substantial reduction in their space allocation.

The existing main entrance on the south side of SUB is removed to accommodate the atrium and the lower plaza. A new Main Level entrance is provided on the east side of the atrium adjacent to the existing covered walkway in the southeast corner. This entrance has doors facing east along the walkway and south towards the Van Vliet Centre. The quiet lounge that previously occupied this space is relocated to the lower level. This entrance serves pedestrian traffic using 89th Avenue east of SUB and the Van Vliet Centre. This redevelopment will facilitate abundant natural light and improve the quality of social space. In addition, an exterior plaza is provided to support student social activities and special occasions.

Recommendation

THAT the GFC Facilities Development Committee approve, under delegated authority from General Faculties Council and on the recommendation of Planning and Project Delivery, the proposed Students' Union Building: Lower Level Renovation – Design Development Report (as set forth in Attachment 2) as the basis for further engineering and development of contract documents.

UNIVERSITY OF ALBERTA

Students' Union Building: Addition and Renovation

DESIGN DEVELOPMENT REPORT

Project No. 01257E0200 I 2013.04.09

DIALOG®

Table of Contents

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1. INTRODUCTION

1.1 Purpose of the Report

This report documents the Design Development Phase for the redevelopment of the Students' Union Building Addition and Renovation. Design development refines the building design presented in the Schematic Design Phase through the development of architectural details and material selection. Engineering systems are refined and quantified. Preliminary structural engineering drawings illustrate the concrete foundation and steel framing system. Preliminary mechanical and electrical drawings illustrate major system components. Design development sets the direction for continued refinement and development of the design going into the preparation of Contract Documents.

The design team continued to meet with stakeholder groups and the Steering Committee to confirm user requirements, review design updates and confirm overall project direction. The Steering Committee was expanded to include representatives from the University Facilities and Operations and the University Bookstore.

DIALOG's architectural and engineering teams continue to confirm existing conditions through the review of existing drawings, on-site visits and meetings with the University's operations staff. The design recommendations provided in this report are based on the information gathered in this process and the proposed design solution.

1.2 Acknowledgements

The Students' Union Building Addition and Renovation 2012 was prepared by DIALOG in consultation with the Students' Union and University of Alberta representatives and the Students' Union Project Manager R.C. Steffes Management Ltd. The valuable contribution of these participants is acknowledged and greatly appreciated.

Students' Union Project Steering Committee

Students' Union Executive Committee Members
Andy Cheema, Vice President (Operations & Finance)
Saadiq Sumar, Vice President (Student Life)

Members of Students' Council
Eric Bellinger, Councillor (Faculty of Nursing)
Kevin Smith, Councillor (Faculty of Education)
Lyndon Crone, Councillor (Faculty of Engineering)
Josh Le, Councillor (Faculty of Business)

Dean of Students
Dr. Frank Robinson, Vice Provost and Dean of Students
Cheryl Luchkow, Assistant Dean of Students
Rob Washburn, Supervisor, Information Technology

University Facilities and Operations
Ben Louie, University Architect, P & PD
Keith Hollands, Associate Director, Design and Technical Services, P & PD
Rick Mercier, Project Manager, P &PD, PMO

Stakeholders
Keith Schmiedl, Director (University Bookstore)

Students' Union Management
Marc Dumouchel, General Manager
Margriet Tilroe-West, Senior Manager (Facilities & Operations)

Project Management
Russell Steffes, R.C. Steffes Management Ltd.

Consultants
Rob Swart, Principal (DIALOG)
Stephen Boyd, Principal (DIALOG)

Project Support Staff
Zach Fentiman, SUB Renovation Project Coordinator

Design Subcommittee

Andy Cheema, Students' Union Vice President (Operations & Finance)
Marc Dumouchel, General Manager of the Students' Union
Jane Lee, Senior Manager (Student Services)
Margriet Tilroe-West, Senior Manager (Facilities & Operations)
Russell Steffes, R.C. Steffes Management Ltd. Project Management
Rob Swart, Principal (DIALOG)
Stephen Boyd, Principal (DIALOG)

DIALOG Project Team

Rob Swart, Architect
Stephen Boyd, Architect
Darin Harding, Intern Architect
Ryan Renihan, Structural Engineer
Grant Kidd, Mechanical Engineer
Dianna Williamson, Mechanical Engineer
Larry Meszaros, Electrical Engineer

1.3 Project Methodology

The Students' Union completed a feasibility study in January of 2012, which subsequently led to a referendum providing funding for this renovation project. Work on program issues and Schematic Design began in May 2012. The Schematic Design Report was complete in December 2012 with the final report approved by the Facilities Development Committee (FDC) on December 21, 2012

The Students' Union wanted the process followed in the development of this project to manifest the Students' Union's core values. To that end, the Students' Union has sought to create a design process that is inclusive of all stakeholders, respectful and mindful of stakeholder and user priorities, and collaborative in character.

Overall guidance of the project rests with a Project Steering Committee, with the detailed design/consultation process overseen by a Design Subcommittee of that Steering Committee. The Dean of Students and Facilities and Operations each provided representation to the Steering Committee, and have been active participants at the Design Subcommittee level as well.

On February 1, the Students' Union hosted an interim design development presentation to the University of Alberta Facilities and Operations Group. Feedback from that presentation and subsequent reviews have been incorporated into this report.

Interior layout refinements were made in consultation with stakeholders. This process is essentially complete and the floor plans will be fixed very early in the Contract Documentation stage.

In terms of project management and architectural work, the Students' Union is working with Russell Steffes as the Project Management consultant, and with DIALOG as the project Architect. Russell was the Project Manager on the 1993 renovation and 2002 expansion projects. He knows the facility and Students' Union needs, and has a demonstrated record of success. Russell has worked with the Students' Union on the Feasibillity study, and is up-to-speed on the project.

DIALOG was originally selected by the Students' Union to assist in developing the Feasibillity study after a competitive RFP process. DIALOG has University of Alberta alumni working on the project, and is receiving advice on the project from the Vancouver lead of the new UBC SUB, another DIALOG project.

The University Architect's Office has also provided essential and timely feedback during the drafting of the Design Development Report.

2. OVERVIEW

2.1 History of SUB

The Students' Union Building was constructed as a collaborative project between the Students' Union and the University in 1967, gaining national recognition in TIME magazine as an innovative approach to meeting the needs of a growing campus.

The productive collaboration between the Students' Union and the University that began with building SUB has continued through to today, and has been a driver of a level of cooperation between students and administration in the provision of student services that is unmatched in Canada.

The building itself has been renovated and expanded as enrolment has grown and needs changed. SUB remains a contemporary and vibrant part of the campus mosaic and is the foremost hub of service and social life on campus.

This continued vibrancy did not occur by accident, but rather as the result of conscious choices made by the University and the Students' Union to maintain and upgrade the building as the needs of the campus have evolved. Since 1993, SUB has undergone two major renovations and one expansion, which together have resulted in greatly increased usage, the cementing of SUB as a key meeting point for the entire University community, and enhanced service provision through the creation of a 'one-stop' facility for most non-academic student services.

Table 1: Summary of Prior Projects

Year	Major Areas Affected	Project Synopsis	Lead	Approx. Cost
1993	Main Level, Lower Level	Creation of food court, relocation of Student Union services	Students' Union	$2.2 million (1993 $) $3.2 million (2012 $)
1996	2nd Floor	Centralization of University Student Services (USS)	University	$2.8 million (1996 $) $3.8 million (2012 $)
2002	Infill of courtyard	Creation of additional USS and social space	Students' Union	$6.9 million (2002 $) $8.3 million (2012 $)

Student enrolment continues to grow, increasing from 26,749 FTE in 2000 to 34,923 in 2012 (*2002-03 Data Book*; *2012 Institutional Fact Sheet*). Enrolment growth is expected to continue for the foreseeable future.

2.2 2012 Renovation Project Background

SUB remains a solid, well-run and heavily-used facility that, in some ways, is a victim of its own success.

Over the last few years, demands for more and better quality space of various types have been identified through the 2010 General Space Program for SUB. The Students' Union has also committed itself to a series of strategic initiatives, aligned with the University's own strategic documents that require a reconsideration of how space is utilized in SUB.

The Students' Union has explored and discussed a wide range of potential solutions to these demands and needs with the University, from expansion opportunities to reconfigurations of the existing building. Immediate expansion of the building, the Students' Union's initially-preferred option, was not found to be currently feasible, though it remains a possibility in the longer term.

After determining that expansion would not be possible at this time, the Students' Union turned its attention to what could be done to ameliorate the space issues identified in the General Space Program. The Students' Union began reviewing other alternatives to improve utilization of space, and to create the kinds of space required by its strategic initiatives, within the general footprint of the building and its immediate environs. It was also critical to assess what these changes might cost, so that the affordability of any project could be assessed. The Students' Union elected to conduct a feasibility study to address these questions.

To do this analysis, the Students' Union retained the services of the project manager who managed the 1993 renovation and the 2002 expansion as a consultant. DIALOG was selected as the consultant on the feasibility study. The costs of the Feasibility study were borne by the Students' Union through an allocation from capital reserve funds.

After several months of consultations and discussions with stakeholders, the team completed a formal feasibility study. This defined the general parameters of a renovation that would address many of the issues the Students' Union was seeking to resolve, and provided an estimate of the financial scale of such a project.

Based on the feasibility study, Students' Council approved a referendum for a $9 per term fee for Students' Union facility development. The referendum passed in March 2012.

Over the summer and fall of 2012, the Students' Union has met with stakeholders and worked with DIALOG to create this Design Development Report.

2.3 Project Goals

The Students' Union has established three key goals for this project:

- Expand student engagement activity on campus;
- Improve provision of student services; and
- Enhance the long-term viability of SUB.

These goals are tightly aligned with the Students' Union's 2011 Strategic Plan and its engagement goal, in particular, is in direct alignment with the Dare to Discover Academic Plan.

2.4 Expand Student Engagement Activities

The Students' Union, in its conduct of business, strives to provide students with an experience of engaged involvement that demonstrates the power of individuals, working together, to promote real change. In this, we directly align with the University's thematic goal of creating better citizens.

True engagement, the driver of both student success and long-term connection to the institution, requires both curricular and extracurricular components. Cultivating the extracurricular component of engagement is, in the Students' Union's view, one of its key responsibilities, a duty under the PSLA, and the most effective way for it to support the University's academic plan and to create the kinds of school bonds upon which long-term alumni support rests.

With that in mind, a key program driver of this renovation project is the question of how we can adapt the building to foster greater student engagement. In our vision, this entails creating the spaces and facilities required to allow students to come together: social and study space, as well as much-improved facilities to support our over 400 student groups.

A key part of this vision includes the creation of an involvement centre that connects students with volunteer and student group opportunities, works with the University to promote the many academically-oriented involvement options available to students, and provides information on involvement in University and Students' Union governance.

2.5 Improve Service Provision

A key goal of the renovation is to improve service provision. In planning this project, considerable attention has been paid to the interplay of space design and operational impacts, with an eye to both improve efficiency and effectiveness.

The renovation will improve service provision by:

- Creation of a Student Involvement Centre, as noted above;
- Providing easier access and improved visibility to Students' Union-operated services;
- Intelligent co-location of services to generate efficiencies, increased collaboration, and improved integration;
- Interior design centered around collaborative workspace concepts and greater use of open workspaces – fewer hallways and doors, more spaces designed for impromptu meetings and discussions; and
- The addition of select retail and/or personal care services.

2.6 Enhance the Long-Term Viability of SUB

SUB, as a key facility on campus, needs to be kept current and relevant if it is to fulfill the college union role. This renovation project is intended to address current weak spots in how the building has been stacked and developed over time.

SUB also plays a key role in the long-term financial viability and operational capability of the Students' Union. From providing consistent, significant long-term business and lease revenue to ensuring that there are unique programming capacities that both the Students' Union and student groups can use, SUB plays a central role in the Students' Union's daily activities.

In order to ensure the continued ability of the facility to meet changing campus needs, there are a number of specific design priorities that this project is intended to address:

- Improved utilization of existing space.
- Improve the quality of the space. Currently the Student Groups and Services are located in a "rabbit's warren" of small offices and shared work spaces.
- Improved permeability of the building to foot traffic, including direct access to the Lower Level, and improve circulation. Developing cohesive, more walking-friendly frontage will help draw people into the building and create an active front door.
- Improved visibility of, and access to, Lower Level operations. The Lower Level is underutilized and, while not hard to access, is somewhat hidden. There are no clear sightlines into the Lower Level, and access points are not always obvious to building users. Access to and visibility of the Lower Level will greatly increase the usefulness of Lower Level space and increase usage of the building.
- Introduction of natural light into the Lower Level, particularly in areas where student social activities occur. Natural light, particularly in winter months improves the quality of social spaces and is generally more attractive than space that receives no natural light.
- Reconfiguration of select tower floors and allocation of space to meet emerging needs and better align with the General Space Program.
- Provide additional space to accommodate immediate needs that cannot be met through redevelopment and improved utilization alone.

2.7 Referendum Requirements

In addition to the primary goals, the renovation must meet certain criteria laid out in the funding referendum, specifically:

- Minimize the environmental footprint of Students' Union operations;
- Increase and improve the student services and club space;
- Create more meeting rooms for student groups;
- Increase study, relaxation, and social space; and
- Alignment to University Strategy and Planning.

2.8 Dare to Discover

The Students' Union's engagement-related goals for the renovation are in alignment with and in direct support of three of the four Dare to Discover cornerstones:

- Talented People: Specifically, supporting leadership development and diversity. The 'involvement centre' idea is also akin, conceptually, to the principles behind welcome centres.
- Learning, Discovery, and Citizenship: The Students' Union's focus on supporting student groups, and providing additional related services and leadership programming, is an effort to create the best possible leadership and citizenship experiences for our students. This is what the Students' Union, in the abstract, is about. It is a key driver in our engagement efforts.
- Connecting Communities: Global and local engagement are outcomes of the increased effort to support the incredibly diverse range of student groups and activities that this renovation represents. The renovation also seeks to develop more of the kind of social spaces that foster interaction and a sense of community.

2.9 Long-Range Development and Sector Planning

The project aligns with the Long Range Development Plan of the University, and its derivative sector plans. The Students' Union Building is located in Sector 3 (LRDP 2002, Sector Plan 3&4 Dec. 2004) and serves as a primary interior node. The proposed redevelopment of the south of SUB seeks to contribute to elements of the sector vision, notably:

- Developing new, and reinforcing existing, pathways (both interior and exterior) within a hierarchy that creates: distinct zones for pedestrian and/or vehicular access and movement; ease of way-finding; desirable Campus character development; and appropriate interfaces with other University Sectors and neighbourhoods.
- Introducing pedestrian pathway, node and landmark enhancements that promote interaction, animation, interpretation, accessibility, way-finding, and activity within a safe, secure, attractive and pedestrian-scaled environment.
- Implementation of the principles of sustainability, wellness, flexibility, adaptability, manageability, safety, and universal accessibility (including a strategic servicing strategy) in the design and development of Sector buildings, pathways and open space.

- Development of strong and meaningful visual and physical connections between interior and exterior spaces that define and enrich public space, create focal and activity points, and enhance way-finding.

It is important to note that, while the LRDP provides for SUB to grow to the west and southwest, this development relieves the pressure for a true expansion of the Students' Union Building for five to ten years. The proposed renovation allows for the redevelopment of the Lower Level, which has become overly compartmentalized and challenging to navigate for building users. In essence, the addition of a "front porch" allows the Students' Union to channel and reproduce the Building's current strengths in order to unlock the potential of its less-effective space inventory. Further, it is intended to serve as a more welcoming face, aligning with the Students' Union Building's mandate as a welcoming, "living room" on campus.

2.10 SUB Space Program

A General Space Program (GSP) for SUB was developed in 2010, and identified a number of areas for improvement or expansion. Given the current constraints on expansion, it is impossible to address all the needs identified in the GSP, but this project does seek to address many of the core concerns. It should also be noted that the GSP is a tool to quantify space needs but as these are constantly changing, it becomes a starting point for initiating the design process.

In addressing the needs identified in the GSP, the project has implemented two key strategies for making better use of existing space: increasing space efficiency through operational changes that reduce per-person and circulation requirements; and re-thinking whether particular space needs are occasional/seasonal or constant.

In terms of physical space, the project presents significant net increases to common spaces – lounges and bookable spaces – and small increases to the usable space allocated to Students' Union services and student groups.

CJSR and the Chaplains Association will experience some small losses in net space, which are to be mitigated by policy regarding bookable spaces that essentially replaces desired dedicated space with shared space. An example of this is studio space; the Gateway, CJSR, and select Students' Union departments have indicated that one of their needs is for space suitable for audio and video production. This need will be met by equipping one of the bookable spaces with appropriate acoustic measures and technical infrastructure.

The common theme in how this project is approaching the needs identified in the GSP is the idea of space efficiency. For example, with student services, greater use of open-plan workspaces and an improvement in circulation efficiency will greatly help make better use existing square footage.

Extensive discussions with the Bookstore have identified their space needs as fundamentally seasonal. In order to improve overall space utilization and accommodate additional programming, the design reduced Bookstore space but makes allowances for Bookstore usage of some common space during rush periods.

3. ARCHITECTURAL DESIGN

3.1 Site Analysis

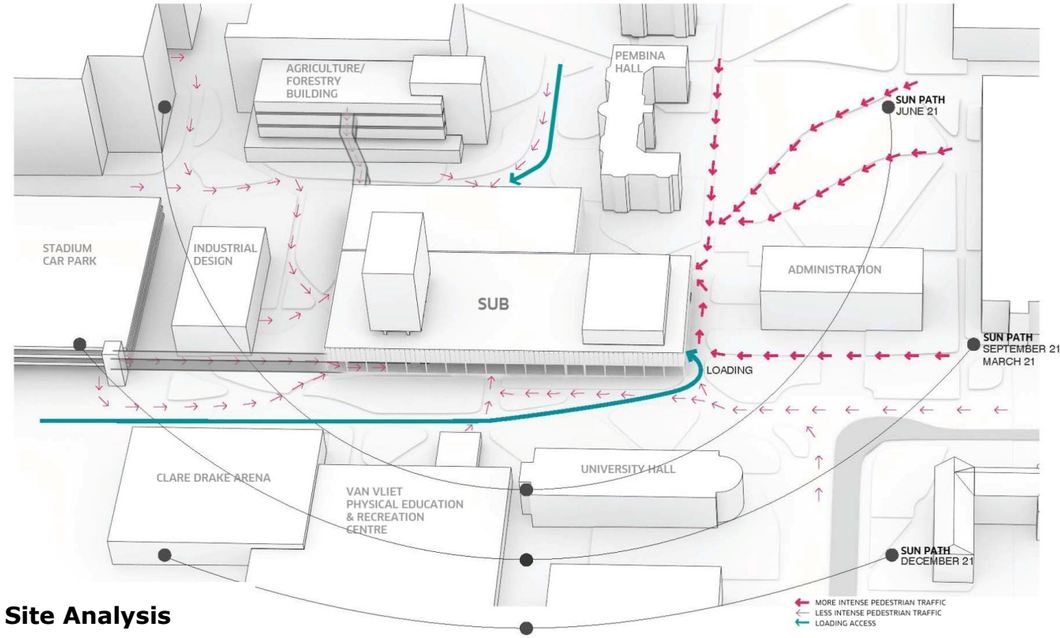
3.1.1 Site Context

The Students' Union Building (SUB) is located on the north side of 89th Avenue between the Administration Building to the east and the Industrial Design Studio to the West. Other buildings adjacent to SUB include:

- Van Vliet Centre (VVC) and University Hall - on the south side of 89th Avenue
- Pembina Hall and the Agriculture Forestry Centre to the North

The topography on the north and east side of SUB is generally flat and aligns with the Main Level elevation. On the south side, 89th Avenue starts to slope down on the east side of SUB dropping approximately four metres in elevation at the west end of the site.

Between 114th Street and the entrance to the Stadium Car Park, 89th Avenue is configured as a well landscaped pedestrian bicycle mall with an asphalt path approximately 9m wide. This path also provided service vehicle access to the Horowitz theatre loading dock on the east side of SUB and DATS access to the Steadward Centre within the VVC. A restricted vehicle access road on the north side of SUB provides access to the existing loading dock.



Site Analysis

3.1.2 Existing Building Entrances

SUB is served by seven entrances of which five are primary pedestrian entrances:

- South Entrance off of 89th Avenue immediately north of the VVC
- North East Entrance with access to the Alumni Walk and the Central Quad
- New Exit Stair Entrance with access to Pembina Hall and Central Quad
- North West Level 2 pedestrian bridge to the Agriculture Forestry Centre
- Level 1 west entrance to the Stadium Car park pedestrian bridge and the outdoor stair down to 89 Avenue

The north entrances providing access to the Quad and the Engineering precinct experience the highest pedestrian volumes as most of the other academic buildings on campus are located north or north east of SUB. The west entrance experiences pedestrian traffic from the Windsor Park residential area, the student residences and the Stadium Car Park. The south entrance is used primarily by students accessing the VVC and the Health Sciences Precinct south of 87 Avenue.

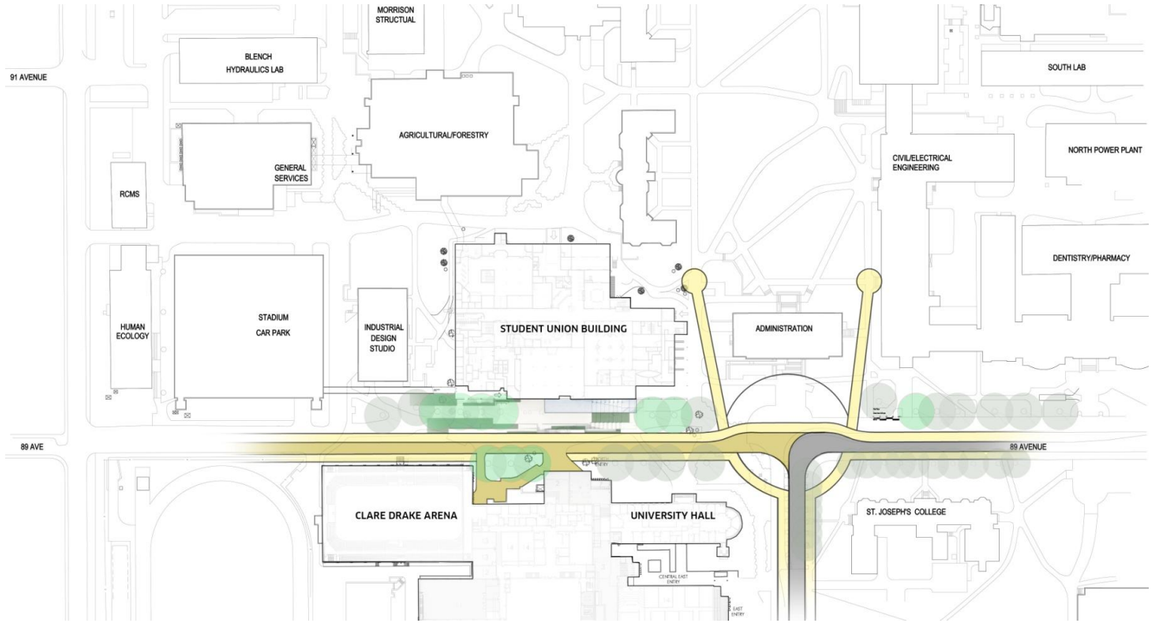
3.1.3 University of Alberta Planning Context

The 2012 Addition and Renovation Project is designed to conform to the University of Alberta's Long Range Development Plan and in particular the Sector 3 Plan in which it is located. The Sector Plan defines 89th Avenue as:

> *"A major pedestrian spine that should be enhanced in its surfacing, landscaping and activity areas. Sufficient distance should be maintained to this pathway to enhance sunlight penetration, landscaped verges, space that does not feel confined, and some views from the pathway to nearby and some distant facilities. The pathway should engender a sense of continuity, anticipation, and integrity, without further encroachment or constraint from facilities... Consideration should be given to developing exterior nodes to the northeast and south of the building to increase the outdoor potentials for student/staff passive activities."*

(University of Alberta Long Range Development Plan: Sector Plans 3 and 4, Prepared by Gibbs and Brown Landscape Architects 2004, Page 113)

This project is designed to reinforce 89th Avenue as a major, landscaped pedestrian spine and to create a node on the south side of SUB that provides inviting and engaging spaces for student/staff social activities.



89th Avenue Pedestrian Spine

3.2 Preliminary Project Description

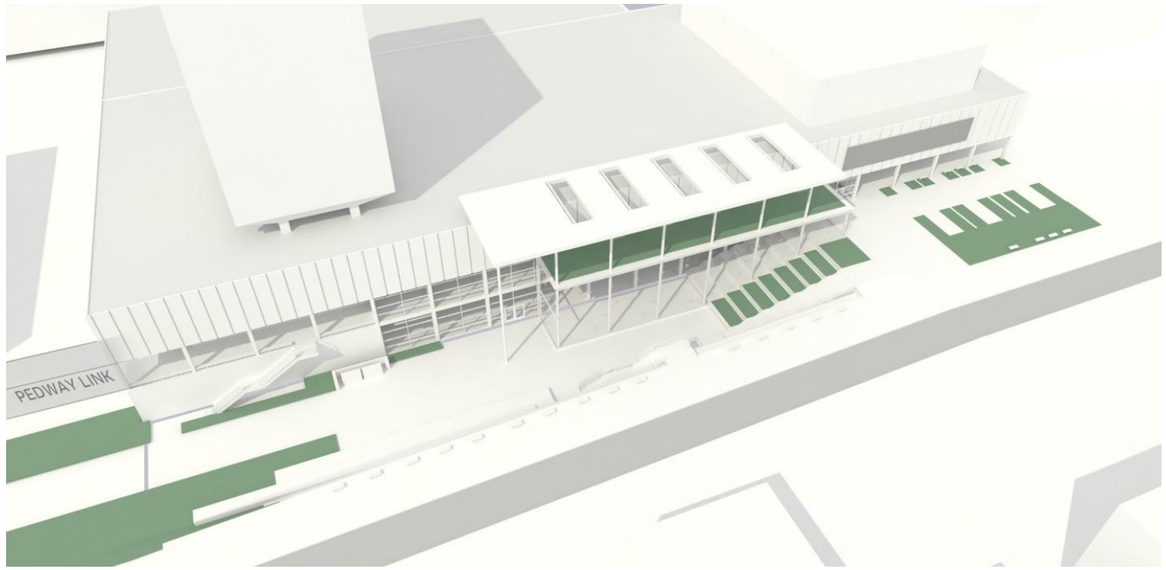
3.2.1 Overview

The architectural and interior design themes established in concept design and schematic design phases are continued and refined in Design Development. The Lower Forecourt and interconnected atrium space on the south side of the building are maintained and further refined to more effectively integrate SUB into the University's Sector Plan and to more effectively integrate Lower Level and Main Level activities.

3.2.2 Atrium

A two storey glazed atrium, 6m wide by 33m long and encompassing the Lower Level and the Main Level, is added onto the south side of the SUB. The primary purpose of the atrium is to provide a visual and spatial connection between the Lower Level and the Main Level; it is not required for program space. The atrium is constructed in a new Lower forecourt, to provide for daylight penetration into the lower level and to make the Lower Level and the activities it accommodates more visible from the street.

At the existing south perimeter of the Lower Level, the existing concrete planter is removed and the foundation wall between the building's structural column grid is removed to connect the Lower Level to the atrium. The remaining structure is reinforced to accommodate the existing building loads (see Section 4.0 Structural).



Aerial view showing the Lower Plaza, landscaped terrace, atrium and entry canopy.

The east 15m of the atrium accommodates a tiered floor area that provides a transition from the Main Level to the Lower Level. Seven tiers, each 2,000mm deep by 600mm high and 6,000mm wide provide a natural area in which students can lounge and view activities on both the Lower and Main Level levels. A staircase approximately 2m wide is incorporated into the tiers, providing access between the two floors and to each tier. In the lower forecourt, concrete tiers with landscaped surfaces match the tiers in the atrium. These matched tiers, separated only by the atrium glazing reinforces the role of the atrium as a transition between the indoors and the out of doors.

The three perimeter walls of the atrium will be glazed with triple pane "spider" glass to maximize the building's transparency while still providing for improved energy performance. A fritted pattern with approximately 30% opacity is applied to the glazing to moderate solar height gain during the summer and provides visual interest and texture to the façade while still permitting a high degree of transparency. The frit pattern commences approximately 2 metres above grade providing the building's occupants with an unobstructed view from the grade level.

The atrium roof is aligned with the atrium perimeter to enhance the overall simplicity of the atrium massing. The atrium roof is approximately 300mm below the second level. The atrium roof will be designed to accommodate a green roof at some point in time in the future but will not be installed as part of this project. The atrium ceiling is designed to align with the existing Main Level ceiling to provide for a more seamless transition between the two. With regards to maintenance, both interior and exterior windows can be cleaned by genie lifts or window washers on bosun's chairs, particularly where the tiers occur. Ceiling mounted fixtures can be accessed by a genie lift and over the tiered area, by a "zoom boom".

Atrium looking east towards the tiers.

3.2.3 Lower Plaza

A lower plaza aligned with the Lower Level, extends along the south face of SUB from the east side of the atrium approximately 25m beyond the west end of SUB were it meets the existing building grade. The plaza extends 7.5m beyond the existing atrium face into 89th Avenue. The east side of the Plaza has seven landscaped tiers that cascade down from the street level to the Lower Level plaza. These are identical in size to the interior tiers described in 3.2.2. The exterior tiers are designed to accommodate hardy ground cover that can withstand student seating. A low head underground sprinkler system is contemplated for these tiers.

Tiered retaining walls on the south side of the plaza provide a transition from the lower plaza level to 89th Avenue. These retaining walls incorporate crenellated concrete seating and a landscaped terrace that is 500mm below the main level. The seating is equipped with anti skateboarding inserts as approved by the University of Alberta. A glazed guard is provided at this level in conformance with the building code. As this terrace is less than 600mm below the main street level, a guard is not required at street level. This enhances the visibility of the lower plaza and Main Level by providing a more unobstructed view from street level.

Precast concrete seating is provided just south of this retaining wall. The seating is spaced to provide accessibility around the seats and enhance the lower plaza's visibility from 89th Avenue. The space between the seats is sized to prohibit the passage of vehicles and provides a protected location for street lighting. The top of the precast concrete seating is provided with anti-skateboarding inserts as approved by the University of Alberta.

An entry stair providing access from street level to the lower plaza is located along this retaining wall. The stair is located so that it forms part of a convenient pedestrian pathway from the VVC to SUB's Lower Level entrance off the plaza.

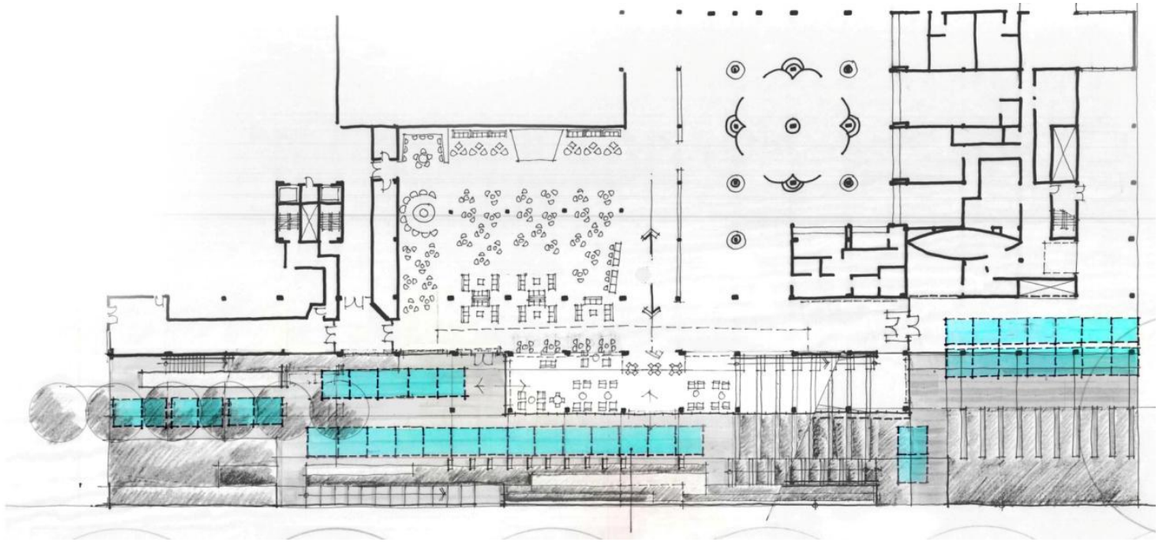
During Design Development the surrounding grades were surveyed and it was determined that the lower plaza cannot be drained to the west. A civil engineer has been engaged to determine the best approach to drain the lower plaza of rain and meltwater. This work is further referenced in Section 6: Mechanical Design.

View of Lower Plaza looking east.

The lower plaza is intended to accommodate student social activities and special occasions such as farmers' markets and flea markets, pancake breakfasts, and performances by individuals and small troupes. In this respect it is expected to function as the node identified in the Sector Plan. Services including natural gas outlets for a mobile gas barbeque and, weather proof electrical outlets are provided to support these activities.

The lower plaza and upper pedestrian paths are designed to accommodate genie lifts, zoom booms, trucks and snow removal equipment. Snow removal from the lower plaza and the street level can be undertaken with machines. Snow removal at the steps leading to the lower plaza will be done by hand.

Over the long term the lower plaza will be integrated into the University's plan described in 3.1.3. As this addition and renovation project will be completed prior to the University's project commencing, the road south of SUB is realigned in two locations to accommodate the lower plaza while still providing pedestrian and restricted vehicle access from 116th St. to the east side of SUB and the Administration Building. The DATS drop off area south of SUB is maintained. The west entrance to the Lower Level will be transitioned to the existing landscaped area and road north of the Industrial Arts building.

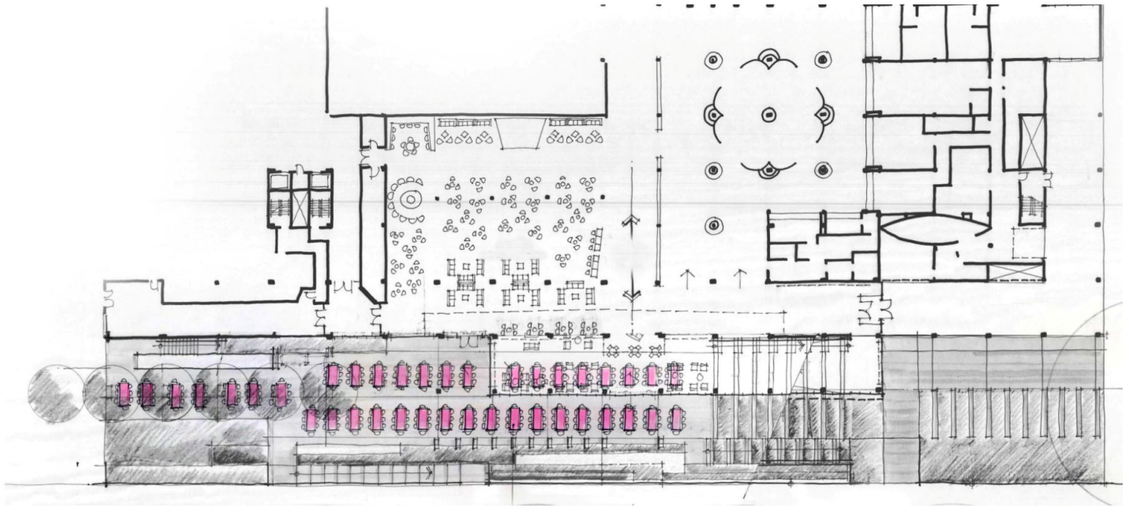


Lower Plaza Farmers' Market layout.

3.2.4 Entrances and Openings

The existing main entrance on the south side of SUB is removed to accommodate the atrium and the lower plaza. A new Main Level entrance is provided on the east side of the atrium adjacent to the existing covered walkway in the southeast corner. This entrance has doors facing east along the walkway and south towards the VVC. The quiet lounge that previously occupied this space is relocated to the Lower Level. This entrance serves pedestrian traffic using 89th Avenue east of SUB and the VVC.

On the Lower Level a new entrance opening onto the lower plaza is located immediately west of the atrium. This entrance provides access from the Lower Level to the VVC via the plaza stair case or west along 89th Avenue via the lower plaza.



Lower Plaza – Pancake Breakfast layout.

The entrances will be designed and detailed to the satisfaction of the University Architect so that they maintain the intent of the original building design, are inviting and easily identified and can be easily maintained. The Students' Union will maintain the outdoor areas within 3m of each entrance.

A new stair in the building's south west corner provides access from level 1 to 89th Avenue west of SUB.

Glazed overhead doors are provided on the west side of the atrium at the Lower Level and the south side of the atrium on the Main Level adjacent to the new entrance. These doors can be opened on special occasions during clement weather to facilitate student social activities that span indoors and outdoors. They will be interlocked with the building's mechanical system.

A concern associated with openings to the outdoors is the possibility of increased dust accumulation and insect, bird and rodent infestation. A number of facilities in Edmonton operate with similar doors including: Save on Foods, restaurants on Whyte Avenue and the new Holes facility in St. Albert. It is anticipated that the controlled use of similar wall openings can be operationally accommodated by the Students' Union.

3.2.5 Entrance Canopy

A slotted entry canopy extending beyond the 2nd Floor roof gives the new addition a more significant presence, celebrates the new addition and entry plaza as a node and engages the Lower Level plaza entrance. The canopy slots allow for the play of light and shadow on the building's façade increasing visual interest and making the overall design composition more dynamic.

View from 89th Avenue towards the Lower Plaza and the Lower Level Entrance.

3.3 Program Spaces

3.3.1 Student Services

Students' Union Services

Two "collections" of student services adjacent to one another are located on the Lower Level. This will allow current operational requirements to be met, while also allowing for modest program expansion of 47 m^2 (506 ft^2). This increase addresses some of the need identified in the 2010 General Space Program and reflects ex-post needs assessments (e.g. Co-curricular Record Coordinator.) The spaces maintain separate offices for senior staff, and include open-plan spaces for associate director and coordinator level staff members. Utilization of open space work environments for student services allows the Students' Union to stem expansion needs, by utilizing the space it currently controls more efficiently.

The north services "collection" is proposed to hold the Centre for Student Development, Orientation, Sustain SU, and Safewalk. The key feature and similarity of these services is the use of a volunteer component for service delivery. The proposed space plan allows for an appropriate shared volunteer muster/staging zone, a staff/volunteer servery, and adjacent meeting spaces. The separable, lockable servery will serve the needs of service staff and volunteers and also function as the home base for the SustainSU reusable dish program. The servery will be not be public, but would have the flexibility to be used for private bookings (e.g. potlucks) and for temporary storage of food product during events taking place in the exterior plaza. The servery would be equipped with a sink, sanitizer unit, microwave, refrigerator and freezer. The only program element in this category not being considered for inclusion is the SustainSU Bike Library project. Discussions regarding its location are proceeding.

The south services "collection" is proposed to hold the administrative components of both Infolink and Student Group Services. Again, in this collection, the Students' Union seeks to implement an open space concept, while maintaining private offices for service management. The combination of these two services allows the Students' Union to implement a "Student Involvement Centre" front desk jointly staffed by employees of Infolink and Student Group Services. Queuing ability is considered for this area, as it is anticipated to serve as a U-Pass distribution point. This area also requires secure space for cash processing and exam registry functions.

Both "collections" allow for the services to maintain a highly visible and accessible storefront. Visibility and the "desire for an address" represents a major need identified in the 2010 General Space Program.

In conjunction with the improvements to student group spaces addressed in a subsequent section, the proposed program allows for the following 2012 Renovation Referendum criterion to be met: "The goal of the renovation shall be to increase and improve the student services and club space."

Student Governance

The Students' Union proposes that the Dean of Students Office assumes control of Students' Union controlled spaces on the 4th Floor (currently programmed as meeting rooms and a private office) and the Students' Union assumes control of Dean of Students controlled spaces on the 6th Floor. It is expected that spaces on the 4th Floor would be reconfigured to meet functional requirements of the Office of the Dean of Students, is included in the project budget, and has the support in principle of Office of the Dean of Students. The 6th Floor is proposed to serve as the primary hub for non-executive student governance operations.

Student Governance includes the Students' Union's elections office (currently occupying part of the 3rd Floor); Discover Governance (occupying an office couplet on the Lower Level). The program is achieved with a combination of private offices, bookable meeting rooms, informal, public meeting spaces, and open-concept workspaces. Furthermore, the adjacencies of these departments will allow for a more productive work environment, and meets targets established in both the 2010 General Space Program and subsequent needs assessments.

SU Health & Dental Plan

The studentcare.net/works ("SU Health and Dental Plan") office currently occupies space in the Lower Level and will be relocated to the 6th Floor. Program elements included are anticipated to be identical to the current configuration (i.e.: small reception and seating area with front desk, along with a separate private space to accommodate administrative functions.

Student Group Spaces

The Students' Union believes in the vital contributions of student groups to forming a well rounded, vibrant, and creative campus community, and endeavors to support the coordinators and members of these groups by providing spaces that give student groups an "address" and visibility. (Note that the administrative component of Student Group Services proper is discussed in the previous section.)

In conjunction with the improvements to the student services spaces addressed previously, the proposed program allows for the following 2012 Renovation Referendum criterion to be met: "The goal of the renovation shall be to increase and improve the student services and club space."

Currently some offices are used for storage/administration on the 6th Floor. The 2010 General Space Program expects provision of proper storage facilities (e.g. designated storage rooms, lockers, and mailboxes) will reduce the demand for private office spaces, and allow these spaces to be better distributed for their intended/program use. In order to achieve this, it is proposed that all student group office spaces are proposed to be co-located on the Lower Level, and dedicated storage/lockers/mailboxes provided.

3.3.2 Common Space

Common spaces – those parts of the building available to be enjoyed by all members of the University community – activate the building and showcase its personality and its amenities. Lounges, hallways and plaza space work together as a system that links together each functional area while behaving as a canvas for the users that converge within it. Collectively, these interstitial spaces encourage SUB's role as a living room on campus – a destination for people, especially students, to gather, learn and relax in a dynamic, community environment.

The proposed design provides a substantial increase in common space, including a new Lower Level lounge and atrium, an adjacent outdoor plaza and added circulation.

The Lower Level lounge is inspired by the successful and heavily used great room on the Main Level. The lounge will extend from the atrium, including the indoor terrace, towards the Bookstore, and will offer high quality day-lit space. Over 200 new seats will serve customers of renewed retail spaces as well as function as overflow from the Main Level food court during peak hours. Added capacity reflects the expectation that the renovation will draw more traffic into SUB, and the addition of natural light in the Lower Level is itself expected to be an attractive feature. Through its adjacency to services and student group space, the lounge is expected to enhance visibility of these operations and in turn promote student engagement.

Two new entrances are added to the building – one at the southwest into the Lower Level and one at the southeast into the Main Level, replacing the current south entrance. The southeast entrance displaces an existing quiet room, known colloquially as the "nap room." A similar space is added near the aforementioned southeast entrance.

Lower Level common space extends beyond the south curtain wall into an open outdoor plaza. This space, which occupies 580m2 or 6,240 square feet, is a key feature of the redeveloped south face, adding functionality, presence and penetrability to the building. The plaza may serve as passive common space with seating and radiant heat, weather dependent. The plaza may also serve as an active programmable venue. Potential uses include farmers' markets, outdoor yoga, theatre, concerts, barbeques and pancake breakfasts. These uses require provision of power, sound amplification and gas in later design.

3.3.3 Events and Meeting Space

All but two of the Students' Union's existing bookable meeting rooms are located in the tower – the exceptions are the Lower Level Meeting Room and the Student Group Services meeting room. These rooms serve the needs of Students' Union departments and Student Groups and are available from time to time for booking by other user groups.

In addition to the Lower Level meeting rooms, there is currently one bookable meeting room on the 3rd floor, four on the 4th and one on the 6th. These rooms lack appropriate audiovisual functionality, and the smaller rooms are overly narrow, resulting in increased wear and tear and reduced user comfort.

This proposal transfers the 4th floor meeting space to the Dean of Students office and deletes the remainder, replacing them with ten bookable meeting rooms in three locations: one on the 6th floor, one adjacent to student group and student services offices, and eight located in a bank on the north end of the Lower Level. The first will serve student governance functions, especially committees of Students' Council. The second will be reserved for the use of student services staff and student group

members. The cluster of meeting rooms will create a versatile meeting, event and conference facility to serve the needs of internal, University and community users. These latter rooms will be fully equipped, and one meeting room pod will be adaptable into a single larger space.

Overall, this represents an increase from 8 to 10 bookable meeting rooms and to 426 m^2 (4,685 ft^2) of bookable meeting and event space, and meets the expanded need envisioned as resulting from expanded student group-related activities.

The plan also anticipates the possible use of one of these spaces as a multi-purpose, studio-style facility appropriate for audio and video production.

3.3.4 Retail Space

Bookstore

The University Bookstore is a key anchor in SUB and is a hybrid of leased space and University controlled space. The renovation proposes that 270m^2 (2,906 square feet) of Lower Level space currently leased to the Bookstore be repurposed towards the goals of the renovation. While this will require some internal reorganization within the store, this creates an opportunity to improve the Lower Level storefront. The corridor immediately adjacent to the south boundary of the bookstore will be reserved to accommodate tills and queuing during the highest volume weeks in fall and winter.

SUBprint

SUBprint is a full service printing facility offering a comprehensive range of products. In addition to producing the vast majority of custom courseware at the University, SUBprint offers retail services to members of the University and surrounding community. A forefront location in the Lower Level will facilitate a shift to higher emphasis in the retail arena, a strategic priority for the business.

The proposal increases SUBprint space slightly, and maintains access to the Bookstore and the freight elevator.

SUBtitles

SUBtitles primarily sells used textbooks on consignment and also offers eco-friendly products and general merchandise. We propose converting the space it occupies into offices and meeting rooms and merging the existing business with SUBmart on the Main Level. The SUBmart-SUBtitles combination has previously operated successfully and a return to this model adds assignable square footage to the project scope. Textbook consignment will continue and other product lines will be consolidated with those of SUBmart, where work is currently being done to increase product density and remove low-turnover products.

Added Commercial Retail Units

Two to three new commercial retail units are envisioned – one is to be a food and beverage operation and the other is yet to be determined, with the possibility of a kiosk also under examination. The food and beverage operation will have limited cooking facilities and will not provide for an exhaust canopy. This will allow a diversification of the services provided by the building while buffering the financial impact of the project and contributing to the operating costs of the building. The units are given a direct interface with lounge space to maximize their commercial viability and convenience for building occupants. The inclusion of retail space contributes to our intent to reproduce the success of the Main Level atmosphere on the Lower Level.

3.3.5 Other SUB Tenants

University Chaplains

The Chaplaincy unit is proposed to relocate from its current home on the Lower Level to the 3rd Floor (the spaces are currently allocated to Students' Union Elections and Students' Union Technical Support, both being relocated to the 6th Floor and Lower Level, respectively). The program is achieved with the inclusion of a meeting room, two private office/consult spaces, a small kitchenette, and a large meditation space equipped with separate ablution facilities. While the intended space does address immediate concerns, notably with respect to ablution facilities, it is not intended to solve the issue of peak-period prayer space demands identified in the 2010 General Space Program. Currently, peak-period Muslim prayer services are being accommodated in the Van Vliet Centre.

CJSR

CJSR FM 88.5 will retain its address on the Lower Level, but is reduced slightly in area in order to allow for a larger allocation space for the adjacent student group offices hub. While the 2010 General Space Program anticipates a need for additional space, ex-post needs and program assessments/consultations have confirmed that a reduction in contiguous space is feasible.

Building Services

The mission of Students' Union building services is to provide a welcoming environment for students and staff by maintaining a clean, well run building with a variety of businesses, services, and relaxation opportunities.

In order to meet this mission, adequate storage spaces for equipment must be provided. The renovation proposal maintains current storage allocations, which are sufficient to be able to provide the excellent level of custodial and maintenance services enjoyed by building users to date.

Additional washroom space is provided as part of the project, including a gender-neutral family washroom.

Students' Union technical support is proposed to move adjacent to the meeting room cluster in the northeast corner of the Lower Level. Power and network requirements are considered for this space. This allocation will meet the long identified needs for their program, notably with regard to temperature and power requirements for equipment.

Table 2: Functional Space Analysis

Function	Component	Current Location	NASM	Proposed Location	NASM	Notes
Student Services	**All components**		**376**		**520**	
	Students' Union Services	*Lower Level*	298	Lower Level	345	*Bike Library excluded*
	Student Governance	*Lower Level*	47	6th Floor	152	
	Health and Dental Plan	*Lower Level*	31	6th Floor	23	
Student Group Spaces	**Group Offices**	**Lower Level and 6th Floors**	**277**	**Lower Level**	**323**	
Common Space	**Study, social and relaxation space**	**Main and Lower Level**	**246**	**Lower Level**	**704**	*Includes Quiet Lounge*
Event & Meeting Space		**Lower Level and 6th Floors**	**280**	**Lower Level**	**426**	
Retail Spaces	**All components**		**3562**		**3211**	
	Bookstore	Main and Lower Levels	3086	*Main and Lower Levels*	2816	
	SUBprint	Lower Level	211	Lower Level	219	
	SUBtitles	Lower Level	266	Main	0	*Merged with SUBmart*
	Added Retail	Lower Level	0		119	
Other Tenants	**All components**		**352**		**299**	
	University Chaplains	Lower Level	182	3rd Floor	133	
	CJSR	Lower Level	170	Lower Level	166	
Building Services	**All components**		**17**		**25**	
	Storage and service	No changes				
	Technical Services	3rd Floor	17	Lower Level	25	

Current Net Assignable Square Metres based on actual usage. Excludes circulation space.

Legend

NASM = Net Assignable Square Meters

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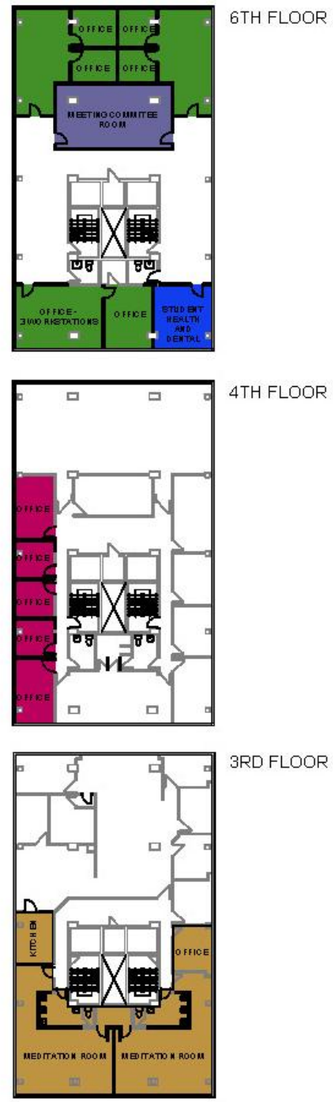
LOWER LEVELS



TOWER LEVELS

FUNCTIONAL SPACE LOCATIONS

3.4 Exterior Construction Assemblies

The materials and construction assemblies selected for this project reinforce the classic modern lines inherent in the existing structure and provide for a durable, energy efficient building envelope of "institutional quality".

3.4.1 Typical Exterior Construction Assemblies

Roof Assemblies

R1 Atrium Roof

- Gravel Ballast
- Roof Barrier/Slip Sheet
- RSI 5.26 Board Insulation
- Roof Membrane [Fully adhered EPDM]
- 16mm Gypsum Sheathing
- Structural Steel Roof Deck and Framing

R2 Canopy Roof

- Gravel Ballast
- Roof Barrier/Slip Sheet
- Roof Membrane [Fully adhered EPDM]
- 16mm Gypsum Sheathing
- Structural Steel Roof Deck and Framing

Glazing Systems

G1 Atrium Enclosure

- Triple Glazed Sealed Units with Thermally Enhanced Spacers
- Stainless Steel 'Spider' Connection
- Intermediate Laminate Glass Finn

G2 Infill Glazing

- Double Glazed Sealed Units with Thermally Enhanced Spacers
- Thermally Enhanced Aluminum Curtain Wall Frame

Foundation Cladding

- 100mm Cast in Place Architectural Reinforced Concrete Cladding
- 75mm Board Insulation
- Air/Vapour Membrane
- Existing Concrete Foundation Wall

Column and Beam Cladding

- 100mm Architectural Precast Concrete Cladding
- Air Space
- 40mm Board Insulation
- Air/Vapour Membrane
- Existing Concrete Column or Beam

Upper Canopy Fascia and Soffit

- Prefinished Composite Aluminum Panel System – Vented
- Engineered Steel Stud Framing System - Galvanized

3.4.2 Glazing Detail at the Terrace and Lower Plaza

The glazing detail at the exterior/ interior tiers is designed to minimize a complex step pattern at the glazing and enhance the visual experience of the tiers extending from the exterior into the building's interior. In order to simplify the glazing installation, a thermally broken recessed slope in has been introduced between the building's interior and exterior. This slope is stepped at the glazing joints to minimize complex glass shapes. The recessed slope is 200mm wide on each side of the glazing to ensure the slot can be easily flushed and the glass panels easily accessed. It is vertically offset between the interior and exterior to eliminate the potential for infiltration. A glycol heating loop is provided in the slot and around the trench drain at the bottom of the steps to prevent freezing and provide for free flowing rain and melt water.

Pilkington Planar triple glazing or a similar comparable product is specified for the atrium glazing. The laminated tempered glass assemblies used in this product offer superior impact resistance when compared to conventional curtain wall glazing systems. The glass will not break when subject to normal conditions and moderate to heavy force impact.

3.5 Interior Finishes

Generally the interiors will be completed to an institutional level of quality. The following table provides a general list of materials and finishes that will be incorporated into the new interiors.

Table 3: Interior Design Finishes

Description	Floors/ Base	Walls	Borrowed Lights/Doors	Ceilings
Lower Level				
Student Lounge Space	P-CT-PC	GB	N/A	ACT/ GB
Work/ Project Rooms	SV/ R	GB/MW	WD/ MF	ACT
Meeting Rooms/ Offices	CPT/R	GB/MW	WD/ MF	
Retail Spaces	NIC	GB	NIC	NIC
Level 3 and Level 6	CPT/R	GB	WD/ MF	ACT

Legend

P-CT	Porcelain- Ceramic Tile floor and base (Slip resistant)	PC	Polished Concrete
		WD	Wood Doors
SV	Sheet Vinyl	MW	Mobile walls between meeting rooms
R	Rubber Base		
GB	Gypsum Bd. Painted	MF	Metal Frames
ACT	Acoustic Ceiling Tile	NIC	Note in Contract
CPT	Carpet Tile		

Enhanced finishes and detailing that includes materials such as porcelain tile, wood paneling and integrated seating is provided in the main student space on the Lower Level. The tiered seating area and the atrium floor will be finished with polished concrete.

3.6 Building Code Review

The purpose of this building code review is to review and determine changes to fire, life safety and plumbing on the Lower Level and to identify the additional measures, if any, required to accommodate the proposed design within the existing building, particularly the interconnection between the Main Level and the Lower Level. The Authority Having Jurisdiction is the University of Alberta which in turn has contracted The Inspections Group Inc. to achieve compliance. The applicable building code is the 2006 Alberta Building Code. This review is based on the understanding that the renovations undertaken in 1993 and 2002 significantly upgraded the fire and life safety measures. In those renovations, a new exit stair compliant to current standards was added to the east side of the facility. The existing open stair, north of the existing elevator core, that serves the Lower Level, Main and 2nd Floors was separated from the remainder of the floor areas it serves and an exit corridor to the exterior was established.

3.6.1 Lower Level

Table 4 lists the Lower Level occupied areas and the occupant load associated with each area as determined under ABC 3.1.17.1. In practice these occupant loads will rarely, if ever, be attained. Table 5 lists the exits that serve the Lower Level, their width and the exiting capacity listed as persons. This table demonstrates that the exiting capacity provided in this table exceeds the calculated occupant load provided in Table 4.

Table 6 provides the minimum number of water closets required. For the purpose of calculating water closet requirements ABC Table 7.2.2.6.B has been applied to the new occupant load.

Table 4: Lower Level Occupant Load

Description	Area (SM)	Area/ Person	Total Occupancy (people)
Office	583.0	9.3	63
Retail	2001.2	3.7	541
Meeting Rooms	431.0	1.85	233
Lounge Areas	733.5	1.85	396
Service	2209.0	46	48
Net Building Area	5957.7		1281
Gross Building Area	6651.0		

Table 5: Lower Level Exiting Requirements			
Description	**Width (mm)**	**Width / Person (mm)**	**Total Exiting Capacity (People)**
Lower Level Entrance	2700	6.1	443
N.E. Stair	2100	8.0	263
North Stair	940	9.2	102
West Stair	2400	8.0	300
Tower Stairs	1880	9.2	204
Total Exiting Capacity			1312

Table 6: Lower Level Plumbing Facilities			
Gender	**No. of People**	**Fixtures Required**	**Fixtures to be Provided**
Males	640	8	8
Females	640	10	11
Family Washroom		0	1

In terms of new water closets over existing, this represents a 120% increase for females and a 33% increase for males. It also provides new barrier free fixtures and 2 ablution [foot wash] sinks for both genders, and a non gender "family washroom" equipped with change table.

Interconnected Floor Space

When the existing light wells were roofed over in 2002, what had been an exterior area became interior space. These spaces are now classified as interconnected floor spaces under the terms of the building code. Interconnected floor spaces that only connect two floors do not require any onerous measures, particularly as the existing glass windows provide for a smoke separation.

With this design, however, three floors become interconnected: the Lower Level, the Main Level and the 2nd Floor. Three storey interconnected floors require more stringent and costly measures including: mechanically vented smoke control systems, the creation of areas of protection or additional exists from all floor areas.

The least costly approach is to provide new sprinkler lines with individual sprinkler heads at each 2nd Floor window in the existing light wells. The Authority Having Jurisdiction has accepted the introduction of sprinklers in conformance with Standata 06-BCV-010 "Sprinkler-Protected Glazing in Fire-Resistant Wall Assemblies."

3.7 Construction Sequence

This section briefly describes the approach and phasing to the construction of this project including interior renovations and the new addition.

The first phase of construction is anticipated to include minor renovations on Floors Three, Four and Six so that the functions so identified in Table 2 can be relocated from the Lower Level prior to construction commencing on that level. During this phase, which is expected to occur between May and August of 2013, demolition for the Lower Plaza and the atrium foundations will commence. The balance of the work including the construction of the superstructure and the interior fit up is anticipated to commence in July of 2013 and be completed by the 3rd quarter 2014.

The Lower Level interior fit out will occur in three phases. The first phase includes the student groups on the west side of the floor and modifications to the bookstore's lower level, the second phase includes the balance of the floor south of the bookstore, and the third phase includes the meeting rooms in the northeast corner. SUBprint will remain operational in its existing location until the end of the second phase and will be moved to its new location prior to commencing the third phase.

On the Main Level the areas that will be affected by construction are the quiet lounge; the existing south perimeter adjacent to the new addition, including the front entrance; and the opening in the floor adjacent to the bookstore. A horizontal dust hoarding will be provided at the opening. The quiet lounge will not be temporarily located elsewhere during construction. A construction hoarding offset approximately 2m will be provided adjacent to the south perimeter. During the construction period the west pedestrian entrance to the Stadium Parkade walkway will be maintained and a temporary emergency exit through the former quiet room will be provided.

On the Lower Level a construction hoarding will be provided in the Bookstore and in CJSR's space. CJSR will also be provided with a temporary access to the west stair in the tower core. Student Groups and Student Services will be temporarily decanted from the Lower Level to other areas in SUB. The new SUBprint space will be completed before the existing area is demolished so that decanting this function is not necessary.

The excavation of the lower plaza level requires shoring to maintain continued access along the 89 Ave. ROW south of SUB. This will accommodate, access to loading facilities for SUB and the Administration Building, the PAW and University Hall construction project sites, and DATs access to the Steadward Centre.

3.8 Sustainability

The Students' Union is committed to incorporating sustainable design into the 2012 Addition and Renovation. A specific project goal of the March 2012 referendum is: "*Minimize the environmental footprint of Students' Union operations.*" There are a number of nationally and internationally recognized standards against which sustainable projects can be benchmarked. These include LEED-CI [Commercial Interiors], "Green Globes" and its affiliated Canadian program administered through the Building Owners and Managers Association "BOMA Best". In general these programs focus on the following key areas:

- Reduced energy and water consumption
- Reduced emissions and effluent
- Increased recycled content
- Reduced waste in both initial construction and continued operations
- Improved indoor environmental quality in terms of air quality, thermal comfort, and minimized glare
- Increased natural daylighting
- Improved energy management systems

In order to maximize the construction budget, it was agreed that this project would not include a formal registration and certification process incorporating one of these standards but that the principles these programs embody would be incorporated into the project where feasible. The sustainable features incorporated into this project include:

- Energy Management Strategies designed to reduce overall energy consumption including natural ventilation to reduce summer cooling, radiant heating to produce effective warmth close to the user, and radiant cooling to reuse chilled water that may not be fully utilized in the building, improving power plant chiller operation and efficiency. Upgrades to air handling units include addition of variable speed operation of the fans to reduce air volumes and fan power at partial loads.
- Maximizes daylight penetration into the Main and Lower Levels in the student activity areas.
- Daylight/ occupancy sensors to control the use of electric lighting during daylight hours and when spaces are not occupied.
- Energy efficient lighting and outdoor lighting that is night sky friendly.
- Enhance building envelope for the atrium. The options that are being explored here include: triple glazing, frameless glazing to reduce perimeter heat transfer; low 'e' coatings; gas filled cavities and ceramic frits to reduce solar heat gain.
- High albedo roof finish to reduce solar heat gain.
- New washroom facilities in the Lower Level equipped with low flow fixtures, hands free operation and high efficiency hand dryers instead of paper towels.
- Maximizing the use of materials that are recycled, locally sourced or sustainably produced.
- Avoiding the use of any materials that emit volatile organic chemicals (VOC's).
- Diverting construction waste to recycling facilities and programs

In addition to these measures the Students' Union is contemplating a number of operational changes incorporating zero or minimal waste systems. These include:

- Mechanical strategies to reduce heat loss through food court/kitchen exhaust.
- Reduce the amount of disposal materials used in food court operations.
- Provide sustainable, environmentally-friendly housekeeping products and practices.
- Implement an education/feedback program that inform students and helps them gauge the extent to which their choices are sustainable.
- Continue programs developed through Sustain Students' Union.

4. LANDSCAPE DESIGN

The landscape schematic design developed here is consistent with the Schematic Design Plan. This plan will be further refined in consultation with the Students' Union and the University of Alberta and will be presented in detail to FDC at a later date.

The intent in the overall landscape design is to connect as seamlessly as possible with the environs, and to do so in a way which respects the long-term landscape planning for the University. This means taking into consideration the eventual extension of the 89th Avenue promenade and SUB's interface with surrounding buildings, particularly the PAW Centre.

The Lower Plaza and landscape treatment is developed as an extension of the Lower Level. The Lower Plaza area has a stairway to the east along with tiered landscape levels to the east end which brings the Lower Level up to the Main level. The west end slopes out, back to existing grade.

There is approximately a four metres elevation change between the 89th Avenue access road across the front of the building and the lower Plaza level. The grade change is taken up with three grade changes. The grade changes are developed as sloping planters.

The planters themselves are filled with decorative flowering shrubs and perennial grasses. Accent locations are left within the planters for color by annual plantings.

The face of the building is proposed with a planter concept as well, protecting the glass façade. Mass plantings of flowering shrubs will fill the planter beds.

An area is set aside for the placement of a couple of BBQ's with gas connections to complement the functions in the courtyard area.

Within the floor plan of the Plaza there is a row of deciduous trees, (Brandon Elm proposed) to carry through the existing formal tree planting that exists to the east along 89 Avenue.

The six tiers grade change on the east side of the Plaza is proposed with drought tolerant fine fescue sod overplanted with micro clover. Micro clover does not grow very tall, is very fine in texture, requires minimum cutting, can take heavy abuse, and fixes nitrogen back into the soil, fertilizing the fescue grasses.

Pedestrian activity on the terraces is encouraged and this combination of grasses should withstand the pedestrian use.

The Plaza surface treatment is proposed with some banding of a slight color or texture change. The bands are proposed with a rectangular paver stone to compliment the contemporary, clean lines of the building and glass atrium. The pattern lines would be further developed as a permeable paver to introduce water back into the soil and enhance the watering of the Plaza trees.

Simple stainless steel inserts within the Plaza concrete are also proposed to provide anchor points for tents or table shades, umbrellas that would occur during registration, breakfast or market garden events.

A drip irrigation system such as "Netafim" tubing, is proposed for on top of the shrub bed soil, just below the bark mulch bed cover. These tubes drip water by gallons per hours so the water supply requirement is very low. This system conceals the lines, does not waste water, and can operate 24 hours if required. The same can be done within the turf tiered terraces as the lines are placed at the 150 – 200mm depth, bottom of the topsoil, and then pulse operated to feed water to the roots of the grass from below.

The overall Landscape Design is a clean and simple treatment. Broad brush strokes of mass shrub plantings, in concert with the simple and clean lines of the architecture.

5. STRUCTURAL DESIGN

5.1 Introduction

The purpose of the Structural Design Development Report for the proposed Students' Union Building is to:

- Present the schemes considered for the structural systems of the facility and make recommendations based on comparisons,
- Provide the architectural, mechanical, and electrical consultants with information that will allow the design of the facility to progress, and
- Provide the Construction Manager and Cost Consultant with information for project costing.

This report contains a summary of the structural design criteria, a description of structural components and should be read in conjunction with reports prepared by the other design disciplines.

The structural information presented is under development and will be revised and supplemented to satisfy functional and architectural requirements, to accommodate the needs of the mechanical and electrical disciplines, and meet cost objectives as the project proceeds.

5.1.1 Structural Selection Criteria

In selecting structural systems for the facility as the design develops, the following will be considered:

- **Safety** Design loads have been selected that are appropriate for the use and occupancy of the building. The structural systems will be designed to provide safe use for staff and visitors.
- **Integration of Building Systems** The configuration of the structural members and lateral load resisting elements will be coordinated closely with the mechanical and electrical systems to provide an efficient and compact integrated building system.
- **Adaptability** Over the years, the needs of the Students' Union Building tenants will potentially change and the interior building layout will need to be modified. The structural systems chosen will allow for future changes to the building layout.
- **Value For Money** Preference will be given to structural systems that provide economy for the project as a whole, taking into account the interdependence of costs between the architectural, structural, mechanical, and electrical system.
- **Durability and Long-Term Maintenance Costs** Structural materials will be selected that are robust and durable to reduce ongoing maintenance costs, particularly in areas exposed to public view.
- **Vibration and Noise Control** Preference will be given to framing and floor systems that limit vibration. Systems minimizing noise transmission will be given preference over systems that do not.
- **Structural Serviceability** The potential for excessive structural deflections or movements will be carefully evaluated and controlled to within limiting values.
- **Appearance** Exposed structural systems are intended to form part of the architectural approach to the design. Careful consideration will be given to the appearance of the structure in these areas.

5.2 Design Criteria

5.2.1 Codes

Structural systems for the facility will be designed in accordance with the Alberta Building Code 2006 and the NBC Structural Commentaries (Part 4 of Division B).

Structural components and materials will be proportioned in accordance with the requirements of the following codes:

- CSA A23.1-09/A23.2-09 Concrete Materials and Methods of Concrete Construction/ Methods of Test for Concrete
- CSA A23.3-04 Design of Concrete Structures
- CAN/CSA S16-09 Limit States Design of Steel Structures

5.2.2 Design Gravity Loads

Ground floor and roof areas will be designed for the following gravity loads:

Basement and Main Floor Areas:

- Live — General Assembly Areas — 4.8 kN/m2
  Corridors / Stairs — 4.8 kN/m^2
- Superimposed dead (finishes) 0.25 kN/m2
- Concentrated live
  Typical Floor — 9 kN

Low Roof:

- Live
  Roof — *4.8 kN/m^2

** Low roof structure rated for assembly loading to allow for potential future access*

- Superimposed dead
  Ceilings and Services — 0.50 kN/m^2
  Extensive Green Roof Allowance — **3.0 kN/m^2

*** Low roof structure rated for potential future addition of 150 mm thick extensive green roof **or** 150 mm gravel covering on un-occupied inverted roof*

- Basic Snow and Rain
  (plus snow drifting and rain ponding) — 1.5 kN/m^2

High Roof:

- Live — 1.0 kN/m2
- Basic Snow and Rain
  (plus snow drifting and rain ponding) — 1.5 kN/m^2
- Superimposed dead, typical — 0.5 kN/m^2

The superimposed dead loads noted above include allowances for weights of ceilings, services and other finishes.

The Code requires that an Importance Category be assigned to the structure based on the intended use and occupancy as shown in Alberta Building Code Table 4.1.2.1 (see below). The Students' Union Building will be designed assuming that the building is of "Normal Importance", being classified as a building not likely to be used as a post-disaster shelter and not containing hazardous substances in large quantities.

Table 4.1.2.1: Importance Categories for Buildings
Forming Part of Sentence 4.1.2.1.(3)

Use and Occupancy	Importance Category
Buildings that represent a low direct or indirect hazard to human life in the event of failure, including: • Low human-occupancy *buildings*, where it can be shown that collapse is not likely to cause injury or other serious consequences • Minor storage *buildings*	Low(1)
All *buildings* except those listed in Importance Categories Low, High and Post-disaster	Normal
Buildings that are likely to be used as post-disaster shelters, including *buildings* whose primary use is: • As an elementary, middle or secondary school • As a community centre Manufacturing and storage facilities containing toxic, explosive or other hazardous substances in sufficient quantities to be dangerous to the public if released(1)	High

Post-disaster buildings are *buildings* that are essential to the provision of services in the event of a disaster, and include:
• Hospitals, emergency treatment facilities and blood banks
• Telephone exchanges
• Power generating stations and electrical substations
• Control centres for air, land and marine transportation
• Public water treatment and storage facilities, and pumping stations
• Sewage treatment facilities and *buildings* having critical national defence functions
• *Buildings* of the following types, unless exempted from this designation by the *authority having jurisdiction*(2)
  ○ Emergency response facilities
  ○ Fire, rescue and police stations, and housing for vehicles, aircraft or boats used for such purposes
  ○ Communications facilities, including radio and television stations
	Post-disaster

5.2.3 Lateral Loads from Wind and Earthquake

Lateral loads for the building are typically transferred back into the existing structure. Lateral load resisting elements to facilitate this transfer, will be designed using the following parameters:

Wind:

- Reference velocity pressure, 1 in 50 probability of being exceeded in any one year — 0.45 kN/m^2
- Importance factor for ultimate limit state — 1.00 (Normal Importance)

Earthquake:

- 5% damped spectral response acceleration, expressed as a ratio to gravitational acceleration

Period, T (s)	Spectral Acceleration $S_a(T)$
0.2	0.12
0.5	0.06
1.0	0.02
2.0	0.01

- Importance Factor — 1.0
- Structural configuration — Regular
- Site class — D
- Seismic Force Resisting System

- Structural steel, conventional construction
  - Ductility-related force modification factor — 1.5
  - Overstrength-related force modification factor — 1.3

5.2.4 Deflections

Horizontal components of the structure generally deflect downward as a result of gravity loads. Excessive vertical deflections can create concerns, including cracking or crushing of non-structural components, lack of fit for doors and windows, out-of-plumb walls, and water ponding.

Structural members will be sized to limit deflections that occur after the attachment of non-structural components, including deflections due to live or snow load. Live load deflection limits used in the design are tabulated below in Table 1, expressed as either an absolute value or as a ratio of span length:

Table 1 : Live Load Deflection Limits	
General Structural Steel Roof Members	
Perimeter, smaller of	20 mm 1:480
Interior	1:300

Long span beams and girders will be cambered by an amount equal to the anticipated dead load deflection of the member. The intent is for the structural members to be relatively flat and level in the long-term under dead loads and to improve the aesthetic appearance of the structure where exposed. The project specifications provide guidance for construction tolerances to prevent the risk of "built in" slopes and skewed members.

5.2.5 Vibration

Due the nature of the proposed building, there are no suspended internal structural steel floors for which vibration due to walking excitement and human activity is an issue. Also, roof structures are also typically not analyzed for this type of vibration as the vibrations are not felt by occupants sensitive to these movements.

5.2.6 Fire Rating

Structural fire rating is not required for single storey steel structures that support only a roof (no intermediate floors or mezzanines) in accordance with current standards.

5.3 Construction Materials

5.3.1 Material Strengths

The following materials are proposed for the construction of the Students' Union Building:

- Concrete, conforming to CSA-A23.1-09, made with Type HS cement as summarized in **Table 2**:

Table 2: Concrete Strength and Exposure Class

Application	28 day strength (MPa)	Exposure Class
Concrete Piles	30	S3
Grade Beams (Ext. / Int.)	35/30	C1/N
Slabs on grade (Ext. / Int.)	32/25	C2/N
Masonry Core Fills	20	N

- Grade 400 deformed bar reinforcing steel conforming to CAN/CSA-G30.18-09
- Structural steel conforming to CAN/CSA-G40.20/G40.21-04, grade 350W for W-shapes and hollow structural sections, grade 300W for other structural shapes and plate
- Metal decking conforming to the requirements of CAN/CSA-S136-07

5.4 Geotechnical Issues and Foundations

5.4.1 Geotechnical Investigations, Environmental Investigations and Reports

A geotechnical report has been prepared by Thurber Engineering Ltd. entitled "Proposed Students' Union Building Addition - Desktop Geotechnical Evaluation" dated September 24, 2012. An addendum technical memorandum has also been prepared to provide further clarification dated September 26, 2012. These reports have been reviewed and findings are summarized in the following sections.

The typical soil profile at the site is thought to consist of surficial fill overlying galciolacustrine clay and silt layers overlying glacial clay till overlying re-worked sand and gravel overlying bedrock. Groundwater on the site is identified as being below 4.9 m below ground level.

5.4.2 Foundations and Grade Beams

Foundation Options

The recommended foundation systems presented in the geotechnical report are cast-in-place concrete piles, continuous flight auger (CFA) piles and steel helical piles. Strip or spread foundations have been found unsuitable for in-situ ground conditions.

Cast-In-Place Concrete Piles – Cast-in-place concrete piles are installed by augering to a pre-determined depth, withdrawing the auger, placing reinforcement and filling with concrete. Soils at the site are prone to collapse, therefore steel casing of all piles is anticipated. The pile resists vertical loads through skin friction between the pile and the soil. Cast-in-place concrete piles are very common in Alberta and require a lesser degree of skilled labour when compared to other foundation options noted below.

Continuous Flight Auger (CFA) Concrete Piles – CFA piles are installed by augering to a pre-determined depth and pumping concrete through the central stem of the auger while it is withdrawn from the hole. These piles are generally suitable through poor quality soils with the potential to collapse with traditional auguring. The resulting pile resists vertical loads through skin friction between the pile and the soil. The installation of these piles requires a skilled rig operator to prevent soil collapse or even de-compression of the ground due to over-augering. 400mm or 600mm diameter piles are typically preferred and 25 m is a generally accepted maximum depth. It should be noted that there are a limited amount of contractors able to perform this type of work, resulting in a potential for higher costs.

Steel Helical Piles (Screw Piles) – Helical piles consist of circular steel plates (helices) welded to a central hollow steel tube. A specialist rig is used to auger the pile into the ground, typically to a pre-determined depth unless otherwise specified (on-site resistance monitoring). Screw piles resist vertical loads through direct bearing of the helix plates on the soil.

Foundation Recommendations

Having reviewed the proposed solutions, we would recommend that the CFA piles and traditional cast-in-place concrete piles both be considered as foundation solutions for the proposed building. The option of using screw piles has been considered and would not be recommended in this case.

Screw piles have been historically used for lighter loads and for structures less sensitive to settlements and movements. There is a deficiency in information regarding the long-term performance of this pile type and its long-term settlements. Due to this, the fact that they are supported on un-even soil stratas across the site, and the potential corrosion of the helices, we would suggest these be disregarded as a foundation alternative.

Due to the CFA piles and cast-in-place concrete piles being both viable solutions, we propose preparing foundation drawings showing pile diameter and depth. Drawings will indicate that both installation methods are feasible and acceptable to the consultant, allowing the contractor to select their preferred and most cost effective solution. The drawing would also include a performance specification, limitations on suitable systems and design criteria.

A pile supported concrete grade beam will be provided around the entire building perimeter to support loads from the envelope. Void form is required below all grade beams to resist forces from frost heave and clay swelling.

The proposed foundation layout can be found on drawing S2.0.

5.4.3 Concrete Floor Slabs

Main floor slab will be constructed as a combination of grade supported slabs and suspended structural slabs on grade. New slabs at the basement level will be 150mm thick normally reinforced slab on grade.

Slabs forming part of the raking stair and platform system at the east side of the addition will be formed using structural slab on grade supported by grade beams and piles. This is recommended over a slab on grade solution due to anticipated poorer quality of soils at higher levels.

The atrium slabs will contain in-floor heating pipes which will be cast into the concrete. Coordination will be a consideration in executing this work properly. Details will be developed in close coordination with the mechanical engineering team to promote a functional and constructible design.

The geotechnical report identifies zones of high plastic clays which are prone to swelling and shrinking in response to variations in moisture content. Slab movements of up to 30mm are predicted. Due to architectural restrictions, slabs will be tied in at all perimeter grade beams, with additional reinforcement provided to control cracking in the case of the above movements being realized.

The proposed main floor structural layout can be found on drawing S2.02.

5.4.4 Landscaping Structure

The proposed architectural vision for the landscaped area to the south of the addition includes a significant amount of concrete structures including slabs, retaining walls, stairs and planters.

Al external slabs at the existing basement level which do not form part of the earth retaining system will be 125 mm thick normally reinforced slab on grade. Slabs will be sloped away from the addition structure towards area drains.
In order to accommodate the final grading arrangement at the site, retaining walls are required along the south perimeter of the building. These retaining walls will effectively replace the existing foundation walls in separating the road grade from the basement level.

A traditional concrete retaining wall system is being used and consists of a vertical reinforced concrete wall designed to cantilever from the base. The base structure will consist of a continuous concrete structural slab on grade approximately 3m wide. The structural slab will restrain the wall against overturning, and will act as a support for planters and stairs.

Soil retention systems will be designed using an appropriate lateral loading to represent the in-situ soils and heavy traffic loads from the adjacent road. During construction of the retaining walls, the proximity to the adjacent 89 Avenue should be closely considered. Temporary shoring may be required and should observe appropriate deflection limits in order to avoid damage to road structures and buried services.

The stepped platforms and stairs outside the south-east corner of the addition will be formed with reinforced concrete. Raking concrete beams will form the edges of the exterior structure with concrete beams and slabs spanning between these supports to form the individual platforms. All platforms and stairs will be supported on piles to prevent excessive movement and to reduce the amount of cracking. The exterior concrete retaining walls will be isolated at the interface with the interior structure to prevent thermal bridging.

5.5 Superstructure

5.5.1 Existing Building Structural Systems

Existing drawings prepared by B. W. Brooker Engineering Ltd., dated September, 1965 have been reviewed. Information on subsequent refurbishments and renovations were not available for review. No inspections of the existing building have been performed at this time.

The existing building consists of a 2 storey concrete frame on a single level basement. A central tower structure rises from the centre of this lower structure, but does not interface with the proposed development and is therefore outside the scope.

The framing system at the main, second and roof levels consist primarily of concrete joists spanning between concrete girders. The girders are supported by concrete columns and, in less frequent cases, by concrete shear walls and foundation walls. Building columns are typically on a 6.1m x 6.1m grid and are supported by concrete piles below basement level. Foundation walls are also supported on concrete piles. It is not clear from the drawings what type of concrete pile construction was used.

The Lower Level floor consists of a concrete slab on grade of varying thicknesses ranging from 125mm to 150mm. At the interface with the addition, the basement slab is recessed 175mm, presumably due to a historical usage of this space. As part of the refurbishment, a 175mm concrete topping will be installed to bring this up to a common basement level.
Stability for the building is presumed to be provided by the concrete shear walls, which typically form stair and elevator core walls within the building. Perimeter foundation walls could also form part of this system although this is not anticipated. This will need to be further investigated during the contract documents phase to determine if the proposed alterations to these walls have any effect on the lateral load resisting system.

Loads resulting from snow, wind and rain ponding on the new and existing structures will be assessed on each roof level. Snow drift loads may exert lateral pressures on the existing building at the low roof level. We anticipate that the drifting will be minimal and that the wall system will be well capable of withstanding these loads. At the new canopy roof level, no new snow drifts are anticipated as there are no new vertical faces for the snow to drift against. The addition of the canopy may slightly change some snow load patterns, but is not anticipated to adversely affect the existing structure or subject it to loads for which it was not designed.

The proposed superstructure layout and details can be found on drawings S2.03, S3.01 and S5.01.

5.5.2 Lateral Load Resisting System

It is anticipated that lateral stability of the addition will be provided by the lateral load resisting system of the existing building. All lateral loads will be transferred to the existing building without the use of traditional braced frames. Moment frames will be used to transfer lateral loads from the new high roof structure down to the existing concrete roof structure.

Lateral loads from wind and earthquake will be transferred through the roofs using the diaphragm action of the steel decking. The deck and the respective deck joints will be designed to transfer the lateral loads through the plane of the roof to the moment frames or to the existing structure.

5.6 Costing

In determining overall building cost estimates from the information presented in this report and on the drawings, appropriate allowances should be made for atypical geometry, heavily loaded areas, and special framing required to suit the functional requirements of the other disciplines.

Cost estimates should include allowances for the following:

- The forming of mechanical and electrical rooms and openings/sumps on the basement floor, including pads, curbs and so forth
- Special framing around mechanical and electrical shafts and risers
- Cast-in supports and pockets for exterior cladding, glazing, mechanical equipment/louvers
- Exterior structures such as retaining walls, planters, walks, curbs, and so forth not detailed on structural drawings
- Exterior structural slabs, aprons and canopies adjacent to entries
- Potential increased pile depths due to unanticipated soil conditions
- Penetrations for mechanical and electrical services
- Sloped roof steel at 2%
- Fall Arrest posts
- Complexities associated with installing in-floor heating tubes in structural and non-structural slabs on grade
- Shoring required at the excavation so that 89th Avenue remains open during construction
- Roof access ladders/stairs

5.7 Closure

The structural systems for the Students' Union Building have been developed to be functional, economical, and responsive to the architectural requirements for the building within a framework of environmental sustainability.

In the Design Development phase, the emphasis of the structural work has been on developing the structural design criteria, developing framing systems and coordinating closely with the design team and the client. As work progresses through the contract documents phase, we will continue to work closely with the client, the project manager, and the rest of the design team to improve and refine the design of the building.

6. MECHANICAL DESIGN

6.1 Summary

This section outlines the Mechanical Design for the new University of Alberta Students' Union Building (SUB). Mechanical systems have been further developed during Design Development based on updated architectural drawings and meetings with both the Students' Union and University of Alberta Facility and Operations Staff. Investigations of the existing systems and ceiling space continue and will be ongoing during working drawings.

6.1.1 Code and Code-Referenced Standards

The following are applicable codes, and standards that are referenced by those codes. The requirements of these codes and standards will be met by the mechanical design.

- Alberta Building Code – 2006
- Alberta Fire Code – 2006
- ANSI/ASHRAE 62.1- 2010; Ventilation for Acceptable Indoor Air Quality
- NFPA 10-07; Standard for Portable Fire Extinguishers
- NFPA 13-07; Standard for the Installation of Sprinkler Systems
- NFPA 14-03; Standard for the Installation of Standpipe and Hose Systems

6.1.2 Standards and Guidelines

The following publications are accepted standards and guidelines of good engineering practice. These recommendations contained in these standards will generally be adhered to in the mechanical design.

- ANSI/ASHRAE 55-1982 Thermal Environmental Conditions for Human Occupancy.

6.1.3 Design Criteria and Standards

Heating and cooling load calculations are based on the 2006 Alberta Building Code and ASHRAE Handbook of Fundamentals.

The design conditions for the spaces within the main floor and Lower Level will be:

Winter:	Outdoor Temp:	-34°C DB; Elevation: 645 m
	Indoor Temp:	19°C to 23°C DB (fixed setpoint in common areas)
	Indoor Humidity:	25% RH above 0°C
	Indoor Humidity:	17% RH below 0°C
Summer:	Outdoor Temp:	28°C DB/19°C WB; Elevation: 645 m
	Indoor Temp:	19°C to 23°C DB (fixed setpoint in common areas)
	Indoor Humidity:	25% RH Maximum

Outdoor Air: Outdoor air requirements for ventilation will be based on the most stringent requirements of ASHRAE 62.1 – 2010. The mechanical design will accommodate the ventilation and cooling required for code occupancy expected in each space.

The design conditions for the proposed Atrium will be:

Winter:	Outdoor Temp:	-34°C DB; Elevation: 645 m
	Indoor Temp:	19°C to 23°C DB (fixed setpoint in common areas)
	Indoor Humidity:	25% RH above 0°C
	Indoor Humidity:	17% RH below 0°C
Summer:	Outdoor Temp:	28°C DB/19°C WB; Elevation: 645 m
	Indoor Temp:	19°C to 23°C DB (fixed setpoint in common areas).
	Indoor Humidity:	25% RH minimum, maximum below 60% RH (dehumidification not provided)

Outdoor Air: Outdoor air requirements for ventilation will be based on the most stringent requirements of ASHRAE 62.1 – 2010. The mechanical design will accommodate the ventilation and cooling required for code occupancy expected in each space.

The outside air requirements for the atrium and Lower Level area will be based on the maximum allowable occupancy of the Lower Level spaces, current maximum occupancy is 1,281 people.

The SUB building air systems are controlled centrally and operate from 7 am to 11 pm.

6.2 Plumbing Revisions

6.2.1 Pipe Rack Revisions

The desired ceiling height is 3,150 mm in the Lower Level adjacent to the atrium to maximize light penetration. An existing pipe rack interferes with this ceiling height, and retaining the pipe rack would require a large bulkhead with the underside 2,684 mm above the floor. This will create a major obstruction to the light penetration from the atrium. Relocation of the piping rack will involve demolition of approximately 25m of existing pipe rack and re-routing to a higher elevation. The relocation of the piping rack will allow the ceiling space to be increased by approximately 466 mm. The relocation of these lines for a higher ceiling space will be a major coordination item since very large piping is involved. There are two 200 mm chilled water supply and return pipes, a 200 mm sprinkler line, all the heating and domestic water lines for the tower, and a large storm and sanitary line.

The piping demolition will include asbestos abatement and a major shut down for SUB as some of the lines serve the upper floors and tower. Each pipe will have to be researched, the impact to SUB operations determined, and a shut-down scheduled. University of Alberta staff will have to be engaged to perform all drain and refill of existing systems. Adequate drains and air vents will have to be incorporated if the pipes are not self-venting, particularly if the piping creates a high point. The relocation work will have to be performed during the summer to minimize disruption to the tower, and minimize risk to the building in cold weather. The new routing has been designed to minimize the amount of work that must be done. Several of these existing pipes have also been determined to be redundant such as drinking water recirculation and can simply be demolished.

6.2.2 Domestic Water

Existing domestic water will be modified to suit the new washroom layout and new retail food areas in the Lower Level. The washrooms are being upgraded to meet increased occupancy loads therefore main domestic line capacities will be confirmed. The drinking water lines from the mechanical room have been decommissioned and will be demolished. Tenant domestic water connections will be provided.

6.2.3 Storm Drainage

The atrium addition will add to the net roof area of the Students' Union Building. Water collecting on the top canopy will be directed to the existing roof with scuppers and splash pads. Standard roof drains will be added to collect any rain that collects on the lower canopy. Drainage will be connected to the existing storm system in the main floor ceiling space and connected to the nearest riser. Existing rooftop drain and rainwater leader capacities will be confirmed during the contract document phase. The existing as-built drawings and storm lines were evaluated and the results were inconclusive, a detailed roof survey will be required when the roof is cleared of snow.

An existing 250mm storm main leaves the Lower Level on the SW corner approximately 1,200mm above the Lower Level slab level. A civil site survey of existing manholes was performed during Design Development to determine the invert location of this storm main. However, the survey was inconclusive since the existing branch line could not be located in the street manhole. The storm line was traced through the existing building as-built drawings and this storm line must connect to one of these manholes, most likely the manhole referred to as Manhole #2. This manhole has a connection point that could lead to the building, this is currently being confirmed by a locator survey.

The shallow storm manhole invert will require re-routing of this existing storm main due to the lower elevation of the final plaza elevation. The storm drainage from the plaza cannot be drained overland directly to the lower roadway grade. Therefore, the storm drainage from the plaza will need to be controlled by area drains. Two area drains will provide some redundancy in case one drain becomes blocked, and an overland drain relief line is being investigated. Separate leads will be provided for each area drain and a frost box if the required cover cannot be maintained. The intent at this time is to re-route the existing 250mm storm main and the new area drains to a manhole down the hill to provide the required cover. The Civil consultant is currently investigating these requirements and working to alleviate concerns about flooding of the plaza.

It is assumed that the existing Lower Level has weeping tile and new weeping tile will be extended around the new perimeter atrium behind the retaining wall.

6.2.4 Plumbing Fixtures

The existing Lower Level washrooms are being upgraded to provide additional plumbing fixture counts. This will require a complete new layout of the washrooms, so all plumbing fixtures in the Lower Level washroom will be replaced with new high efficiency water conserving fixtures.

Water closets will typically be wall hung with in-wall carriers, flush valves type, with infrared sensors c/w manual override. There will be three water closets in the men's washrooms and 11 water closets in the women's washrooms. Urinals to be flush valve type, high efficiency, infrared sensors c/w manual override, with approximately four urinals installed. Urinals will require a cleanout directly above the urinal with a 150 x 150mm stainless steel access plate with security screws. New lavatories will be wall hung with in-wall carriers, with a single handle manual fixture. There will be approximately 10 new lavatories in the Lower Level washrooms. All infrared fixtures will be hard wired.

Tenant water connections will be provided in the retail spaces for potential plumbing fixtures.

6.2.5 Sanitary Drainage

Existing under-slab sanitary drainage will be modified to suit revised plumbing fixture locations in the revised Lower Level washroom layout. Inverts and slopes will be confirmed, but the new washrooms are in approximately the same location and no problems are foreseen. The main sanitary line exits the building on the north east side of the building. A line running along the south wall in the Lower Level ceiling space will be adjusted to fit within the new proposed bulkhead.

A 100mm underground sanitary connection will be provided for the new tenant spaces for future sink connections.

6.3 Central Heating System

6.3.1 Primary Source

Existing steam to hot water heat exchangers provide hot water for radiation, force flows, and unit heaters. Reheat coils will be added to the variable air volume boxes in the Lower Level to provide minimum air volumes in the space and supplementary heating where required. The capacity of the existing Lower Level hot water and reheat heat exchangers is to be verified during detailed design, but currently an upgraded heat exchanger is anticipated. The heat exchanger will be increased in size if required and will not be doubled up, this will allow use of existing control infrastructure.

There are existing radiant panels along the main floor overlooking the atrium. These will be deleted where there is no longer a perimeter zone. Radiant panels adjacent to the perimeter will continue to provide comfort to students.

Zoned hot water radiant tubing is proposed for the new atrium slab on grade at the Lower Level and in the tiered interior seating. The nature of the atrium space precludes a concern about re-zoning or re-purposing this area, therefore the atrium slab is suitable for an in-floor radiant system. The in-floor radiant heating in the interior seating will increase the appeal of the stairs to become a student gathering area in the winter months by improving thermal comfort. The radiant system was separated into two zones, one for the main lower slab and one for the tiered interior seating. This will allow control of each zone separately and prevent overheated or overcooled seating areas.

There are overhead doors in both ends of the new atrium space that may allow additional air leakage. The design and selection of the overhead doors will provide a low leakage design with a better R-value. The radiant floor loops will utilize a variable temperature, constant volume design to keep hot water flow moving within the slab to minimize the risk for freeze-up. In addition, radiant floor loops will be kept away from door openings. This will allow the use of hot water instead of glycol. The heating slab temperature will be controlled to prevent discomfort, typically no greater than 29.4°C.

Pumps and controls for the radiant slab system will be provided in the mechanical room. The existing MCC panel is being replaced and moved, freeing up space along the south west wall of the mechanical room for this equipment. The new Atrium slab will also require below grade insulation and slab edge insulation to allow the radiant heating to operate efficiently.

Perimeter radiation is proposed along the perimeter walls of the atrium for supplemental heat. Radiant fin piping will be installed in a 4" high free-standing enclosure between the columns. Warm air will rise by convection preventing frost and aiding to cover envelope losses. Adequate supplemental radiation will be provided to keep the atrium space warm without utilizing the air systems.

The proposed mechanical system supplying the radiant slab will be circuited as shown in the mechanical schematic drawing. The proposed system will take advantage of lower supply temperatures needed for the radiant slabs by using hot water return mains. This will allow the use of existing primary heating pumps without increasing the existing pump size.

6.3.2 Glazing Study

A glazing study was performed to determine the impact of double glazing, triple glazing, and triple glazing with PV cells and/or frit on the energy use. The following is a comparison for heating:

Glazing Option	Annual Heating Load	% Saved	Peak Heating Load
Double-Glazing	453 MMBH	-	173 MBH
Triple-Glazing	408 MMBH	10%	158 MBH
Triple-Glazing PV or Frit	397 MMBH	12%	158 MBH

The triple glazing provides more efficient heating performance due to the increased R-value. The interior surface temperature of the triple glazed product will also provide a warmer surface and reduced undesirable radiant cooling effect. The net energy savings will be about $350-400 per year for the triple glazing option, which unfortunately is not a substantial savings.

6.3.3 Vestibule and Overhead Door Heating

Local vestibule cabinet heaters or air curtains will be provided to offset infiltration heating loads through the new entry vestibules at both the main floor and in the Lower Level. If the heating units have to be located above the vestibule ceiling, the potential use of horizontal discharge ducts will be evaluated to provide better distribution. The overhead doors will have additional local heat, and the intent is to provide a well sealed overhead door type that will only be opened during warm weather events.

6.4 Cooling System

6.4.1 Glazing Study

A glazing study was performed to determine the impact of double glazing, triple glazing, and triple glazing with PV cells and/or frit on the energy use. The following is a comparison for cooling:

Glazing Option	Annual Cooling Load	% Saved	Peak Cooling Load
Double-Glazing	139 MMBH	-	195 MBH/ 9570 cfm
Triple-Glazing	127 MMBH	9%	178 MBH/ 8760 cfm
Triple-Glazing PV or Frit	106 MMBH	24%	137 MBH/ 6726 cfm

The triple glazing provides more efficient cooling performance due to the increased shading coefficient, but more savings are attributable due to shading of the glazing by the frit. The fritting option could also be applied to the double-glazed option, this would provide substantial savings in cooling load as well. The net energy savings will be about $600-650 per year for the triple glazing option. The fritting of the glazing provides a substantial decrease in cooling load that is typically reflected in a smaller air handling unit, smaller chiller, and reduced terminal unit and diffuser sizing. However, the majority of these costs cannot be saved due to the use of existing air handling units.

6.4.2 Building Distribution

Chilled water for the University of Alberta Students' Union Building (SUB) is supplied by the University of Alberta Central Plant. There is sufficient capacity in the chilled water system and air handling systems to accommodate the new cooling loads.

The new atrium is substantially constructed with glazing and is facing South. This creates a high cooling load in the new atrium and it was desired to lower the net solar load in the space. The use of external shading devices, imbedded shading solar PV panels, and fritting was investigated for the impact on the cooling load. It was determined that approximately 30% coverage of fritted glazing will be added to the glass to reduce solar heat gain and to provide some glare control.

The existing linear slot diffusers that run along the current south perimeter wall on the main floor will remain and assist with cooling of both the main floor and the atrium. The slots will be adjusted to change the distribution pattern into this space.

6.5 Ventilation System

6.5.1 Air Supply – General Description

The Lower Level space being renovated is currently served by two air handling units, designated as the Curling Unit and the Bowling Unit. Additional air handling units serve other basements spaces as well. Constant volume boxes with reheat coils were installed on a few branches during the club offices renovations. Variable air volumes terminal units were installed in a couple of areas; however the main unit fan was not upgraded with variable speed control. When the VAV boxes reduce the air volume to a space, the system pressure changes and air is redirected into adjacent spaces. The VAV boxes provide more control but don't reduce fan energy.

All constant volume boxes will be replaced with VAV terminal units in the Lower Level and zone control will be provided. A separate project being done by the University includes adding VFD's to the majority of the existing air handling unit fans. The static pressure sensor for VFD control will have to be located in the ductwork and wired back to the controller for the VFD.

The load calculation model was utilized to determine the energy and cost saving potential associated with upgrading the existing constant air volume (CAV) systems with a variable air volume (VAV) system. The existing building is served by two (2) CAV units with total capacity of 17,597 l/s (37,300 cfm) that supply a constant volume of air to all spaces throughout the year.

The air volume supplied to each specific room is calculated based on peak heating/cooling load, and is maintained constant during the operation of HVAC system. The supply air needs to be initially cooled to 12.8 C (55 F) and distributed within the building, and then is reheated to desired supply temperate depending on instantaneous room loads. This requires year round supply of peak load-dominated air volume even during off-peak hours at which a lower volume of air could meet the loads and provide comfortable indoor conditions. A VAV system, however, could reduce the air volume so that zone-level re-heating of air is minimized. Reducing the total air flow would also decrease the cooling coil load as well as fan energy.

Whole building energy simulation indicates the Lower Level area and the atrium require 8,983 l/s (19,112 cfm) to meet the loads with a VAV system while a CAV system would require a total capacity of 14,098 l/s (29,871 cfm) to maintain comfortable indoor conditions. The existing CAV system, however, is currently running at 17,597 l/s (37,300 cfm) which is significantly higher than what is required. The table below compares the energy and cost associated with three different scenarios:

- CAV system to run at full capacity of 37,300 cfm (existing condition)
- CAV system to run at reduced capacity of 29,871 cfm which requires balancing of the unit
- CAV system to be utilized with variable speed drives to act as a VAV running at 19,112 cfm at peak condition

	Heating energy (MWh)	Percent saved (%)	Cooling energy (MWh)	Percent saved (%)	Fan energy (MWh)	Percent saved (%)	Annual energy cost ($)	Percent saved (%)
Scenario 1 (base case)	899	-	78	-	92	-	40,232	-
Scenario 2	565	37%	33	58%	64	30%	25,162	37%
Scenario 3	320	64%	27	65%	52	43%	16,002	60%

- Utility rates used in the calculations are obtained from University of Alberta district plant and are as follows:
  - Steam at $20.88/1000 kg which corresponds to 3.2 ¢/kWh
  - Chilled water at $0.34/m3 which corresponds to 4.2 ¢/kWh
  - Electricity at 8.9 ¢/kWh (ENMAX)
  - Operating hours for the air handling units of 7 am – 11 pm.

- The results show that balancing the existing CAV system to run at a lower capacity would save about $15,000 per year. Utilizing variable speed drives would result in an additional $9,000 saving per year.

- Assumptions:
  The indoor conditions are maintained between 19°C and 23°C
  Outdoor ventilation air is supplied at a rate required by ASHRAE 62.1-2010
  Outdoor conditions based on Alberta Building Code 2006

A bulkhead is being added along the gridline A to allow for air to be distributed through linear grilles into both the atrium and the open Lower Level space. At times when the overhead doors are open, cross ventilation will occur and the VAV box serving the atrium will be turned off for energy savings. The interior VAV boxes will continue to operate to serve their respective zones.

6.5.2 Air Supply Equipment

Two units serving the renovated basement area have been studied – the Curling/Club offices with a capacity of 10,613 L/s (22,500 cfm) and the Bowling/Games unit with a capacity of 6984 L/s (14,800 cfm). These units currently have chilled water cooling coils, humidification sections, and roll filters. The Curling unit was upgraded with a new cooling coil in 2008. A common mixed air plenum serves all eight units in the basement mechanical room. A May 2011 report by ReLumen Engineering noted that the mixing dampers for all air handling units should be replaced to provide better mixing conditions, particularly if the common outside air/return air duct is revised to outside air only. All of the existing air handling units have been upgraded with new outside air and return air dampers.

6.5.3 Air Supply Unit Replacement

Two units serving the renovated Lower Level area have been studied – the Curling/Club Office and Bowling/Games Unit. It was found during Design Development that several components have already been upgraded to a greater extent than previously assumed. The university is replacing the main MCC panel and adding VFD's to most of the air handling unit fans. The Bowling and Curling unit are among those changed and will be able to support a full variable volume system with the new VAV boxes. The return air and outdoor air dampers on all units have also been replaced. The cooling coils on the Curling unit have also been replaced. Therefore, the existing air handling units can be utilized to service the new SUB upgrade with the retrofits completed to date. Further upgrades to the main air handling units can be performed in the future when required.

6.5.4 Natural Ventilation

It was determined during design development that the original concept of natural ventilation was less viable due to the reduced height of the atrium space. Therefore, the concept of openable vents at low and high levels was abandoned. However, there is still a possibility to use natural ventilation by utilizing the two overhead doors, which will provided a substantial natural cross-flow draft. The intent would be to provide a digital contact to each overhead door to confirm opening. This signal would disable cooling to the area and allow natural ventilation and air movement to cool the space.

6.5.5 Existing Relief Louver

The west exhaust louver on the south wall of SUB was investigated during schematic design to see if it could be partially covered. The louver was found to be completely inactive and all the exhaust for the building exits through the east exhaust louver. The building operator noted that the building is now short of relief air capacity in full economizer mode. The reduced volume operation of the new VAV units will assist in relieving excess pressure.

6.5.6 Air Supply and Cooling – Tower Building

The scope of work in the existing tower building is small in nature and the mechanical upgrades will consist of a tenant retrofit. This will involve moving existing HVAC zones and sprinkler heads as required to suit the new layout. A separate study was conducted to determine the scope of potential overall upgrades for the Tower induction units, but the cost associated with these upgrades is outside the scope of this project.

6.5.7 Humidification

Direct injection steam humidifiers are installed in the existing air handling units. SUB Print requires a humidity level of 30-60% for its equipment and print quality, a supplemental in-space humidifier will be provided for this space.

6.6 Fire Protection and Life Safety Protection

Sprinkler coverage will be required at the top of the atrium. New horizontal sidewall sprinkler heads will be installed at a high level in the atrium in lieu of pendant heads at the very top, this may require a code variance. The sprinkler heads can meet the extended distance. Sprinklers within the Lower Level will be adjusted as required to suit the new layout.

Hand held extinguishers will be provided throughout in compliance with NFPA 10 and local authorities.

All ducts and piping passing through a fire separation will be provided with fire stopping in accordance with the building code. Any ducts passing through a fire-rated wall will be provided with an approved fire damper.

It was noted during a site visit that the fire department's Siamese connection was located in the corner of the bay adjacent to the proposed new main entrance. This may need to be adjusted based on architectural design.

The interconnection of the floor spaces only consist of the Lower Level and the main floor, so dedicated smoke exhaust will not be required. The second floor interconnection will be isolated from the main floor by a fire rating and sprinkler heads at the glazing.

6.7 Control Systems

6.7.1 General

An extension of direct digital control (DDC) building management system (BMS) will control and monitor all mechanical equipment and will provide zone HVAC control. Currently SUB is equipped with an Invensys automatic control system, the original RCMS system and Honeywell Tritium server.

It is intended that the terminal boxes in the zone, and new radiant cooling and heating equipment be upgraded to DDC control. All leftover control pneumatics within the space shall be identified. The existing air handling units use an in-house system which can have points added to them for any new controls. A new end of duct pressure sensor will need to be added to each unit to control variable speed drive speed. All mechanical room control shall utilize the original RCMS system.

Space temperature control will be provided through terminal controllers, electronic room temperature sensors, and electronic reheat and heating control valves.

Standalone remote control panels will operate and monitor major mechanical equipment.
All field devices including valve and damper actuators, room temperature controllers, and HVAC system and equipment control and monitoring devices will be electronic.

7. ELECTRICAL DESIGN

7.1 General Description

This report outlines the proposed power distribution, lighting, fire alarm and communication systems for the proposed Students' Union Building (SUB) Renovation. The electrical capacities and systems described in this report are based on our interpretation of the program requirements developed to date.

The electrical system design will be in accordance with the requirements of the Canadian Electrical Code, the Canadian Standards Association, the Illuminating Engineering Society (IES), regulations of the local inspection authorities having jurisdiction, and University of Alberta requirements.

All new electrical construction shall be complementary to the SUB base building design and more recent upgrading/renovation methods. The standard of work is to be equal or better than that of the building. Any additions and/or changes to the existing systems are to be made using equipment identical to that already used in the SUB.

The electrical systems work shall include but not necessarily be limited to the following:

- **Power Service and Distribution**

- Power service to the renovation area from the existing SUB network
- Normal power distribution (120/208V) equipment
- Emergency power distribution equipment
- Wiring and connection of all mechanical equipment
- Power wiring to all architectural systems including hand dryers, power assisted doors, etc

- **Lighting**

- Renovated area lighting including emergency and exit lighting
- Renovated area lighting control
- Exterior plaza lighting
- Street lighting

- **Fire Alarm Devices and Verification**

- In conjunction with proposed University fire alarm system upgrade program

- **Data and Communications**

- Conduit and cable tray infrastructure and structured network cabling for telephone and high-speed internet
- Multimedia television distribution
- Conduit, cable tray and/or wireway system for distribution of data, internet, and telephone
- Meeting rooms' data, telephone, and multimedia infrastructure
- Wireless communication

- **Communications and Security**

- Security and access control
- CCTV

- **Architectural, Structural and Mechanical Coordination**

- **O & M Manuals**

7.2 Sustainability

Through the electrical design, there are several contributions that can be made to the sustainable design of the facility. The most noticeable will be the incorporation of occupancy controls to turn lights off when the space is unoccupied. Daylighting will be incorporated into the lighting design, where available, utilizing controls to minimize or eliminate electric lighting when sufficient daylighting exists to illuminate the space.

Exterior lighting will be designed to comply with dark sky standards.

Low-power lighting, primarily T-8 fluorescent, will help contribute to the overall reduction in energy usage, while proper switching and lighting control contributes to the controllability of systems, along with providing improved building operation.

7.3 Power

7.3.1 Power Distribution – Normal-Power Panels

(refer to a partial normal-power single line following)

General Intent and Notes

The intent with respect to power distribution in the renovation area is to re-use existing circuits where possible. There are panels on the periphery of the area, in the Mechanical Room, and in the Electrical Vault. The panels' locations, existing breakers, and spare capacity, when combined, appear to make the re-use concept workable, the only caveat being obsolescence of the panels (and, therefore, lack of supply of new breakers for them).

The labelling of panels and CDP's throughout the building appears to be a mixture of single-letter alphabetical and the more logical ordinal-number/floor-level nomenclature. There appears to be duplication of some panel designations, which leads to confusion without forensic-level study. We intend to rationalize this nomenclature scheme during this project, at least in the Lower Level, especially since we intend to have all receptacles labelled by panel and circuit. The University has indicated that this is its intention also, and will provide panel-identification information.

There will be some 600-volt work to be done in the Mechanical Room, most of which will involve connecting new motors that will be replacing existing ones.

Existing Panels' Re-use and Required New Panels

The new SUBprint area will require a panel to replace its existing north-end 42-circuit **Panel H**. While Mechanical-room **Panels B1D and B1DA** are back-to-back with SUBprint's new area, they have only a few spare breakers between them, so will find application to SUBprint only by exception. The directory of **Panel F** (southwest corner of Mechanical Room) shows it largely connected to what will become the Meeting Room area. It could be considered for SUBprint's new panel, pending the disposition of Panel H (Meeting Rooms or new north-end IT Technical room).

The existing SUBprint area, in addition to Panel H, has an original **Panel B1C** that will have to be relocated or have its circuits taken on by other panels. Of particular note is that it has a 100A breaker feeding an **unnamed 30-circuit panel in 012A**, a distant office in the south side of the Bookstore, north of the west stairs. Examination of the panel in 012A revealed 17 circuits used, including a 60-amp 3-pole breaker. Therefore, it is likely that this panel will need reconnection, presumably from relocated Panel B1C, with a certain amount of pre-planning in case it powers important outlets in the Bookstore. It has no directory, so breaker-by-breaker testing will be required to determine what it feeds.

Panel K, a 42-circuit panel beneath the west stairs, appears to be perfectly suited to handle the area's northwest lineup of student offices, and possibly beyond.

Panel B1A (42-circuit), fed from **CDP 1D2**, is in Janitor's Room 006. It also has circuits going into the west area and into the central area, so what Panel K cannot cover due to circuit count or recommended distance, B1A will handle.

- B1A's directory shows only one spare breaker space, but also shows the use of 10 mini-breakers, giving it a distribution of 46 circuits. B1A appears to have a companion 42-circuit **Panel B1B**, fed from **CDP 1D4** in the Mechanical Penthouse. B1B's 2003 directory shows all but four breaker spaces used, with eight of them having mini-breakers, plus a 70A3P breaker, giving it effectively 48 used circuits plus four spaces. B1B's directory gives no indication of breaker disposition. We do not recommend using circuit-splitting mini-breakers.

  If B1A is insufficient to power north Student Common and the east-west main corridor to the west stairs (particularly lighting), Panels B1D and B1DA should certainly be able to contribute circuits. These two do not have completed directories.

The new Technical Room (data-switches and servers) and an adjacent technician's workroom will require a new panel, size to be determined. Possibly, nearby **Panel H**, discussed previously, can serve the new room. Panel H will be relocated either to the new Technical Room or a few metres south into the new east-west corridor in order to serve the meeting rooms.

CDP **1D1** has a spare 200A breaker, which will be used supply the central retail area. It also has a 200A breaker ostensibly serving "Ceramics" in a room B150, unknown at this time.

Panels F and **G** are in the southwest corner of the Mechanical Room. Panel F's directory shows it largely connected to what will become the Meeting Room area. It could also be considered for SUBprint's new panel.

Panel F's directory also indicates that it feeds a new panel (named **SU1)** in the Bookstore's Microstore, an area that will be demolished and be replaced with the Reception and Workstation area. Panel SU1 is currently located on a column in the north centre of this new area, and would be moved to one of the new walls. Its feeder conduit would be extended to the new location, and its feeder conductors re-pulled.

Panel G (42-circuit) in the main serves rooms and offices that will disappear, so most of its circuits are available for new disposition. Its location makes it a prime candidate for supplying the new atrium and plaza lighting and power.

There is also a **CDP SDP2** outside the Electrical Vault that ostensibly feeds a Panel B, near the east stairs, and **Panels F** and **H**, previously mentioned. **Panel B** no longer exists, so its 200A breaker in SDP2 may become available for use if needed.

7.3.2 Power Distribution – Emergency-Power

Panel M1Z (main floor by elevator) supplies emergency lights for the entire building except for those in the electrical vault, mechanical room, and the chaplains' area. Its Lower Level lighting circuits should cover the new configuration.

Panel B1Y (Electrical vault) powers the emergency lights in the electrical vault, mechanical room, and the chaplains' area, as well as the fire alarm panel, generator battery charger, and sundry other receptacles and devices. The panel has spaces, so it can pick up any emergency lights not covered by M1Z.

7.3.3 Power Distribution – Feeder and Branch Conductors

All building wiring, unless noted otherwise, will be 98% conductivity copper with minimum 600 volt insulation. Branch circuit wiring will use #12 AWG as the minimum size conductor. Wiring for data receptacles will have a dedicated ground and neutral wire per circuit. General convenience receptacles and lighting circuits can utilize shared ground and neutral wires. Shared neutrals are to be minimum #10 AWG. Ground wires to be minimum #12 AWG.

7.3.4 Power Distribution – Receptacles

General

Every attempt will be made to colour-coordinate receptacles with wall finishes. Plates will be commercial-grade (nylon). 5-20R configuration ("t-slot") receptacles will be installed. The minimum 12AWG conductors specified for all circuits give the user the ability to refit to the heavier-amperage receptacles at any time. Receptacles' plates' tops are to be 12 in./300mm above finished floor. This permits access to the receptacle (in most cases) even if a desk is placed directly in front of it.

Meeting Rooms

In the meeting rooms, there will be receptacles on all active walls, in floor-boxes, and at SmartBoard/video-monitor-height locations (@ 1800mm+/- above finished floor), with provisions for ceiling-mounted projector where requested. The large meeting room will have 2 floor-box locations preparatory for a long conference table or other special use. In most cases, each meeting room will have one circuit dedicated to it; the large meeting room will have three circuits.

SUBprint

As mentioned before, a new panel dedicated to SUBprint will be provided. Receptacle locations are to be determined, pending SUBprint's machines' layout.

Offices

The west cluster of offices will generally have receptacles on each wall, with a single circuit per office, except for the large one, which will have two circuits. Each circuit will have a dedicated neutral.

The four-workstation island clusters will have one receptacle per workstation, with the two receptacles sharing a single dedicated-neutral circuit.

The central, reception-area offices will each have a single dedicated-neutral circuit serving three non-door-wall receptacles.

Technical Room and Technician's Work Room

Receptacle types and locations in the Workroom will be discussed with the user.

In the Technical Room:

- For rack-mounted equipment, receptacles are commonly installed on the bottom or side of the cable tray that spans the tops of the racks, are of the amperage configuration required, and are often twist-lock type. Vertical or horizontal orientation of these receptacles, and any associated strain-relief, needs to be decided during design.
- The racks contain power bars or power-distribution units (PDU's) sized to accommodate the loads, and with plugs to match the cable-tray-mounted receptacles.

Corridors and Open Spaces

Pending any specific requests, the intent is to provide housekeeping receptacles located at convenient locations and space intervals.

In the Student Common area, pedestal-mounted receptacles will be provided for laptop and tablet charging. Three circuits should be sufficient.

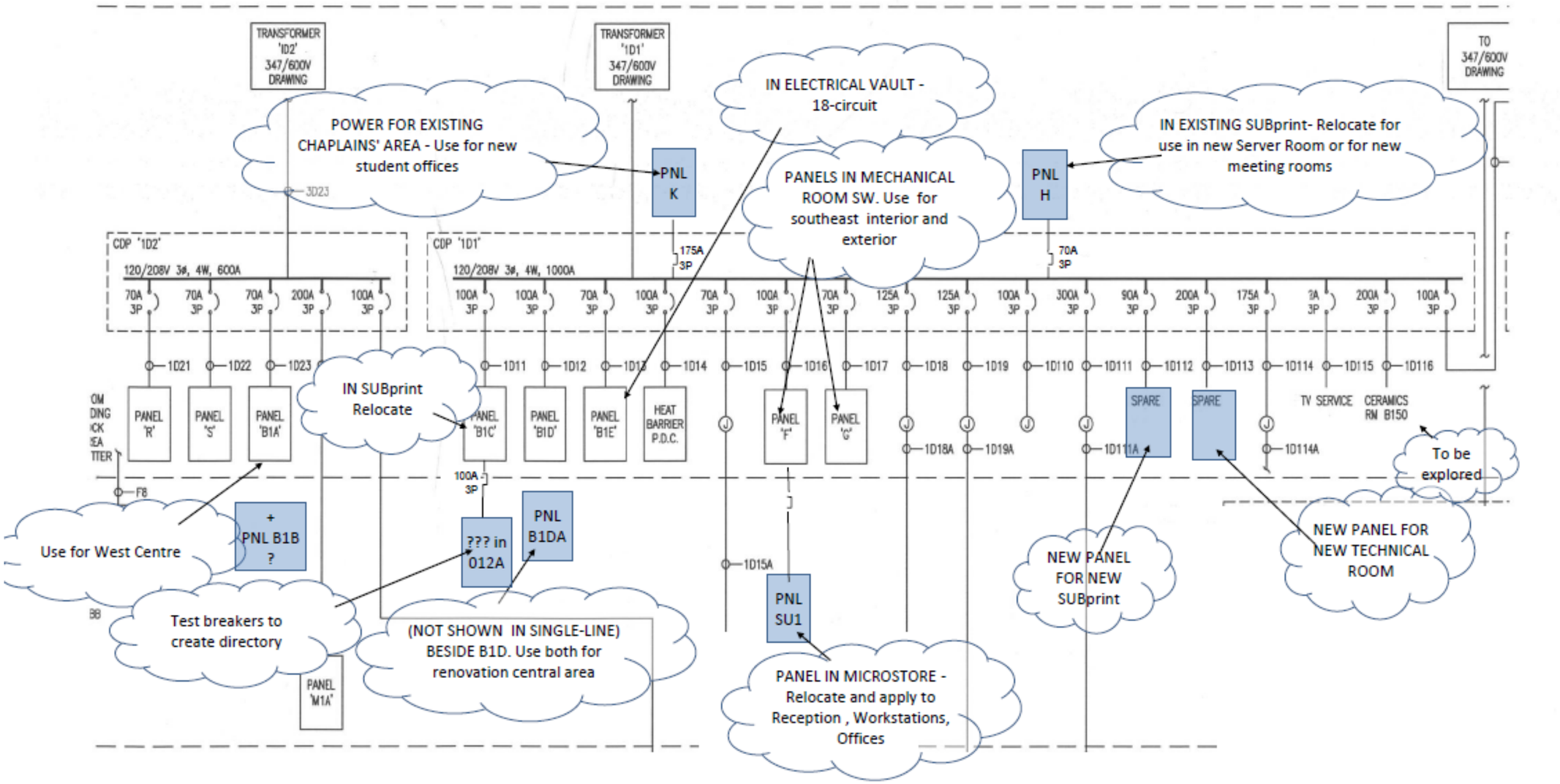
Atrium

The seating risers will each be fitted with two receptacles, again intended for laptop and tablet charging. Again, three circuits will suffice.

There are to be two multimedia points for presentation to audiences on the seating risers. They are to be located along the atrium south wall next to the two columns at the Lower Floor level.

Exterior – Plaza and Planters

Weatherproof receptacles at normal height will be provided along planter walls, primarily. Additionally, outlet(s) will be provided near the north-wall barbecue location.



LOWER LEVEL 120/208V NORMAL-POWER DISTRIBUTION
PROPOSED CHANGES

7.4 Lighting

7.4.1 Lighting Design Parameters and Criteria

Factors for consideration during lighting design include:

- Visual task
- Luminous Environment
- Illuminance
- Luminance
- Energy - consciousness
- Controls

7.4.2 Recommended Lamps

Lamps used will be dependent on the luminaire type, with T8 fluorescents (colour temperature 4100°K) being the preferred standard. LED-equipped luminaires will be provided in special cases, such as where architecturally-selected luminaires come equipped with LED lamps. Where possible, the luminaires will have screw-in lamp sockets for easy replacement of the LED lamps.

7.4.3 Lighting Controls

With increased energy prices one of the main design objectives for this project is energy management. One of the ways to meet this objective is through the use of lighting controls. These control systems assist in maintaining adequate light levels for each specific area and task, whilst providing sufficient flexibility to allow for future changes and offering a means of reducing energy consumption.

A low-voltage lighting control system (Douglas™ as an example) will be provided for the lower-level renovated areas. This will enable the deployment of a considered mixture of manual switching, occupancy sensing, and daylight-harvesting. Where applicable, multi-lamp luminaires will be used in order to provide manual and automatic multi-level lighting. Local dimming will be used only where absolutely necessary, and then only with proven dimming ballasts and compatible controllers

Rooms and areas of intermittent occupancy (washrooms, for example) will be provided with occupancy sensors for lighting control. The sensors will be dual-technology (passive infrared (PIR) and microphonic), and will be set for approximately 30-minute HOLD-ON time to prevent ballasts from premature aging due to frequent switching.

At the newly-glazed south side, to provide energy savings, the lights will be progressively zone-controlled with photo sensors connected to the central lighting control system.

In further-in open areas luminaires will be controlled together and organized into control zones. All the luminaires in a control zone will be locally switched together and are regulated by the central lighting control system.

For the meeting rooms:

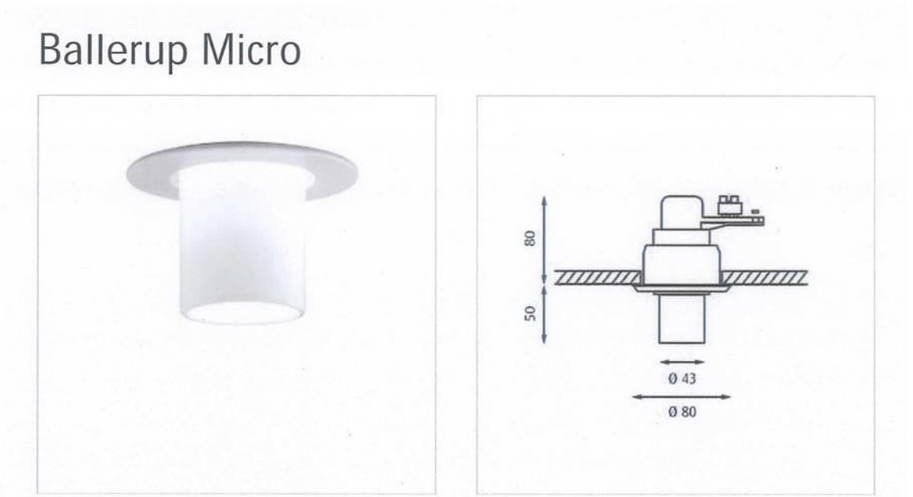
The three-way partitionable meeting space will have a master lighting control and satellite controls with multi-level switching and pot-light dimming for the different configurations this space can take on.

The larger meeting rooms will have typical perimeter + centre zoning of their lights as part of their controls, in addition to multimedia-type zoning.

7.4.4 Interior Lighting

Student Common

The perimeter of this area will be cove-lit. The rest of the ceiling will have semi-recessed luminaires that will also illuminate the ceiling, the intent being to give the space an overall brighter appearance. A possible example is shown below.



Meeting Rooms

Luminaires will be multi-level-lighting 4-foot fluorescents, with dimmable pot lights as a perimeter lighting option for the largest meeting room. The fluorescents will be zoned to provide back-end-only lighting during video presentations.

Student Offices, and Reception-Perimeter Offices

Will typically be lit 1' x 4' multi-level recessed fluorescents.

Reception, Workstation Area

Suspended direct/indirect luminaires will be used in this area.

Hallways, Corridors – North (meeting-room) and West (student offices)

Will typically have 4-foot fluorescents.

East-West Hallway north of Reception, Workstation Area

The wide hallway leading to the west will have LED cove lighting and ceiling pot lights or the semi-recessed luminaire type designated for the Student Common area, since the two areas do flow together.

7.4.5 Exterior Lighting

Street Lighting

Existing street lamps will be relocated, and any additional matching ones required will be sourced from the University stock of those replaced by the new University-standard Lumark Ridgeview LED models.

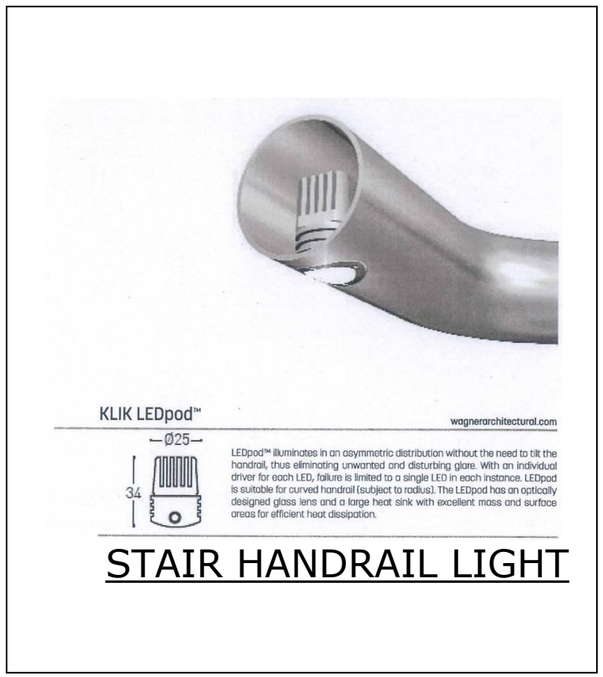
Plaza Lighting

The exterior sunken plaza is considered a program space, intended to host events for which there may be specific lighting needs. The Students' Union will control and maintain the lighting in this area. Final selection and placement of plaza lighting solutions shall be done jointly by the university and the Students' Union.

Exterior Stairs' Lighting

The stair handrails will have internally-mounted asymmetrical-distribution LED/driver units ("LEDpods") illuminating the stair steps.

They are an award-winning design by Klik Systems, Australia, noted for their ease of installation and replacement, but remaining theft-proof at the same time. They have been specified for the shared-use-pathway rails alongside the new City of Edmonton Walterdale Bridge.

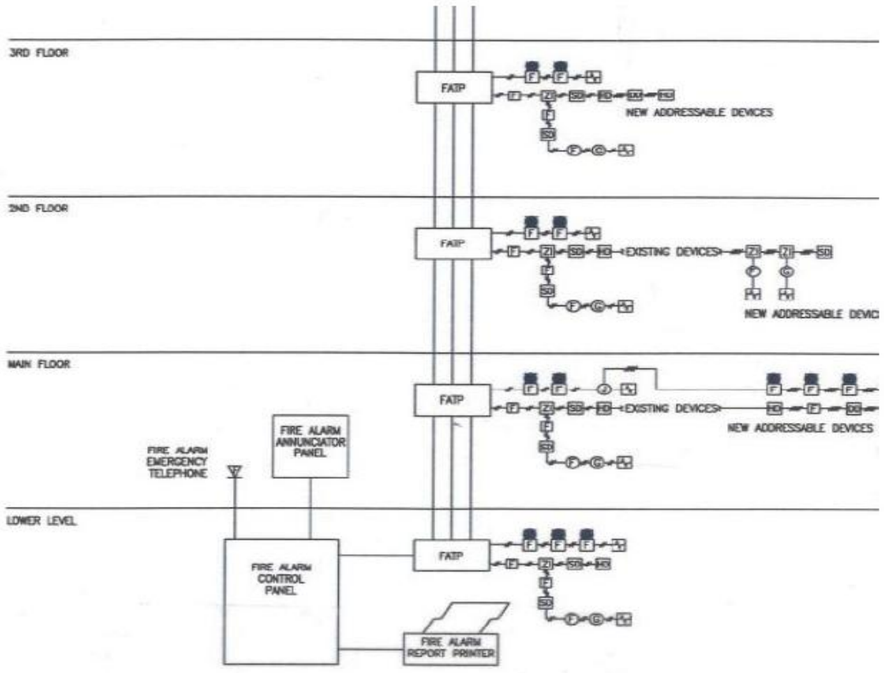


STAIR HANDRAIL LIGHT

7.5 Fire Alarm System

The existing SUB fire alarm system will be reconfigured to suit the new Lower Level spaces, using existing devices, of which there are more than needed, given the disappearance of corridors and rooms.

The renovation will incorporate additional infrastructure required to support a new fire alarm upgrade to be undertaken by the University in the future. This includes conduit between the lower level's existing control panel location and the new main level control/annunciator panel location at the main level south front door. Final scope will be coordinated and approved by Facilities and Operations and the Students' Union.



SUB Partial Fire Alarm Riser , from May 2003 As-Built Drawing

7.6 Security and Monitoring Systems

Access Control and Door Monitoring

The west student offices require card readers, electric strikes, and door-position/door-locked status monitoring. Other perimeter and interior access control positions, and tie-in provisions will be coordinated with the University.

CCTV Cameras

Existing cameras are analog type. New cameras will be of IP-based digital technology. Discussion will be required as to whether there is to be edge storage at the cameras or simply central storage, the degree of acuity of image, day-night vision technology, intrusion detection, and other intelligent video applications. Camera locations, interior and exterior, and connections to Campus Security will be coordinated with Campus Security, as will interoperability between the access control/monitoring provisions and the CCTV

7.7 Information/Communications Technology

New Technical (Main Terminal) Room

Existing main terminal room 0-30C is in the demolition area. As mentioned previously, its location is moving to the north end of the Lower Level, between the Bookstore and the existing SUBprint area. It will house switches and servers. Its power supply will be the normal-power distribution system. Any uninterruptible power required by the components is outside the scope of this project.

Local Copper Data Cable Distribution

A cable tray will originate in the new Technical Room, head south down the corridor, and then west to service the student office area. Conduits from the data outlets in rooms will spill into the cable tray.

A minimum of three (3) Category 6 UTP FT6-rated copper cables will be run from the new Technical room and other data switch locations to voice/data outlets in offices.
The island workstations in the Reception area will be fed via conduits in the new floor-levelling concrete slab.

Backbone Cable to Remote Locations

Various other locations in the Lower Level and throughout the building are currently connected to 0-30C. They will be fibre-backbone reconnected to the new room. There is apparently very little or no existing wireway of any sort from 0-30C to these locations. A combination of cable tray and dedicated conduits will be provided to form true wireway connectivity to these locations.

Wireless Infrastructure

There are Wireless Access Points (WAP's positioned throughout the subject space. Determination of adequate coverage of the renovated space, from both anticipated load and spacing aspects, will be made in coordination with the University's Academic Information & Communication Technologies (AICT) group.

Telephone

All telephone horizontal cabling will be the minimum Category 6 from the Technical room to the voice outlets. It will be terminated on a separate patch panel in the data switch rack, from which it can either become part of the data network or be patched over to termination blocks on the wall backboard.

Multimedia

Power-and-data locations for video displays have been designated throughout the space. In the atrium, two floor-box locations are planned for presentations to assemblies seated on the risers to main level.

In the meeting rooms, it is intended to have floor boxes in each room, along with higher wall power and data outlets for smart boards.

The above outlet points' signal cables will be connected back to a head-end room located near the northeast corner at the east end of the north hallway.

8. APPENDIX A – DRAWING INDEX

ARCHITECTURAL

A1.02 Site Plan

A2.01 Level 0 Floor Plan
A2.02 Level 1 Floor Plan
A2.04 Large Scale Level 0 Floor Plan
A2.05 Tower Floors Construction Plans
A3.01 Level 0 – North Reflected Ceiling Plan
A3.02 Level 0 – South Reflected Ceiling Plan
A4.01 Exterior Elevations and Building Sections
A4.02 Building Sections

ELECTRICAL

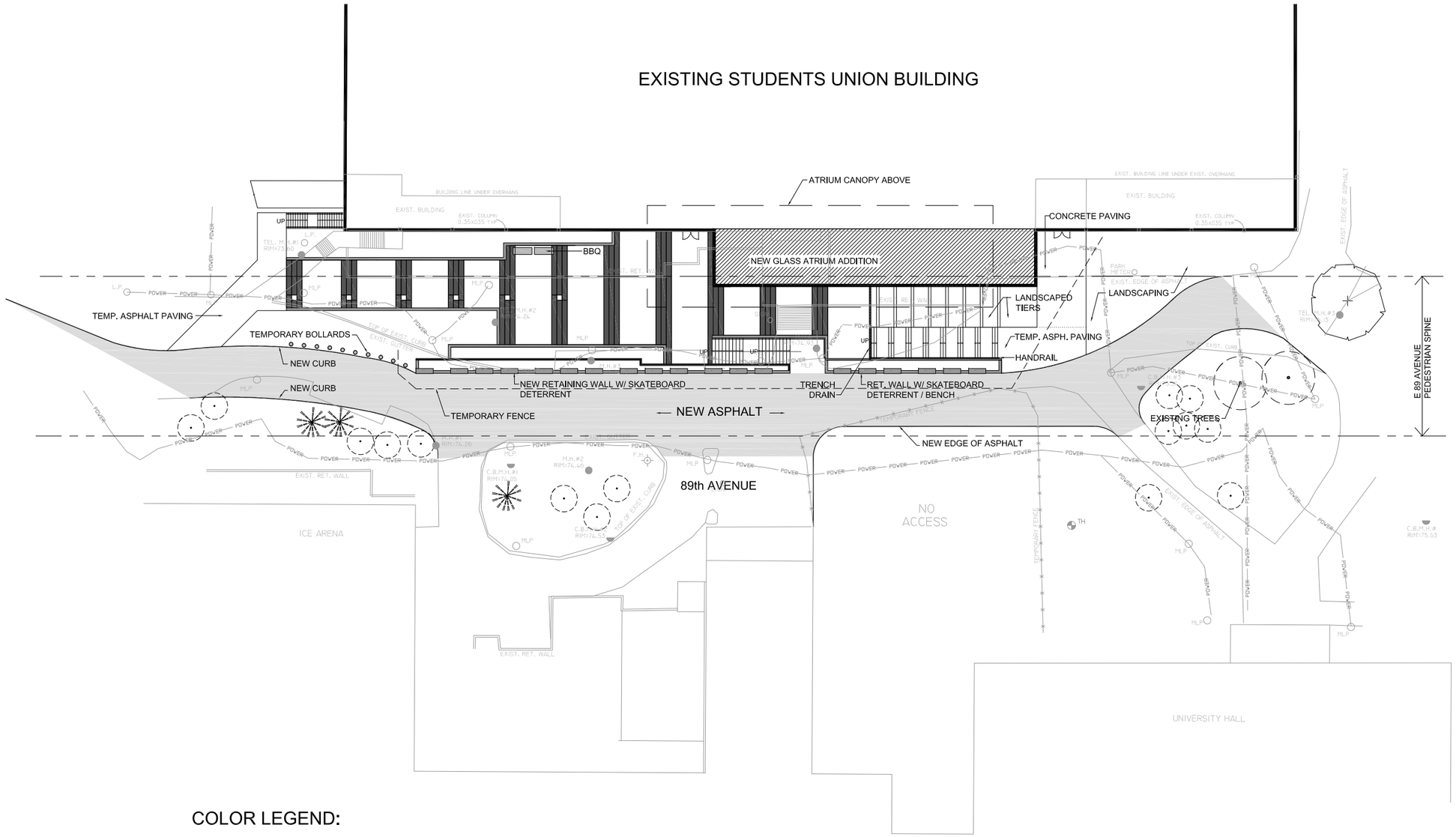
E0.01 Electrical Legend
E0.02 Site Demolition
E0.03 Lower Level Demolition
E0.04 Main level Demolition
E0.05 Tower Floors' Demolition
E1.01 Site Plan
E2.01 Lower Level Lighting
E2.02 Lower Level Power
E2.03 Lower Level Communications
E2.04 Lower Level Fire Alarm
E2.05 (Reserved)
E2.06 Main Level Power
E2.07 (Reserved)
E2.08 Main Level Fire Alarm
E2.09 Tower Floors' Lighting
E2.10 Tower Floors' Power & Systems
E4.01 Risers and Schedules
E6.01 Details

MECHANICAL

M1 Large Scale Mechanical Plan
M2 Schematic and Piping Plan
M3 Ventilation Demo
M4 Ventilation Plan

STRUCTURAL

S0.01 General Notes
S0.02 Typical Details Sheet 1 of 2
S0.03 Typical Details Sheet 2 of 2
S0.10 Loading Diagrams
S0.50 3D View
S2.01 Pile/Footing Plan
S2.02 Basement Framing Plan
S2.03 Main Floor Framing Plan
S2.04 Roof Framing Plan
S4.01 Substructure Sections & Details
S4.02 Substructure Sections & Details
S4.03 Substructure Sections & Details



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Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
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Revision

Letter	Date	By	Description

Faculty/Department: STUDENTS' UNION BUILDING

ADDITION AND RENOVATION

Client Approval Date:

Dwg Title: **SITE PLAN**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number: XXX## | Work Order Number: #####

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Plot Date: 12/02/2013 11:37:49 AM | Revision: A

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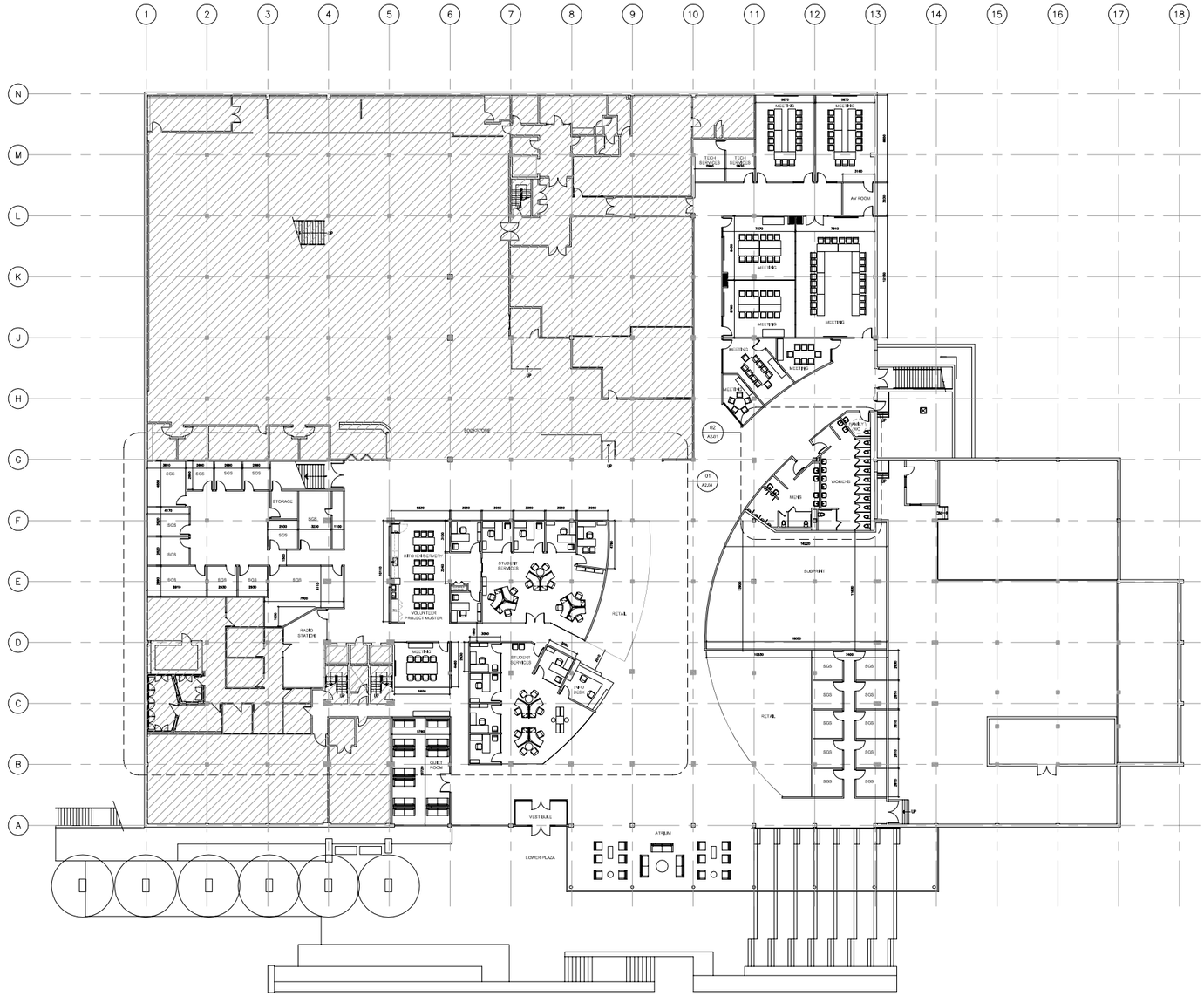

01 A2.01 LEVEL 0 FLOOR PLAN

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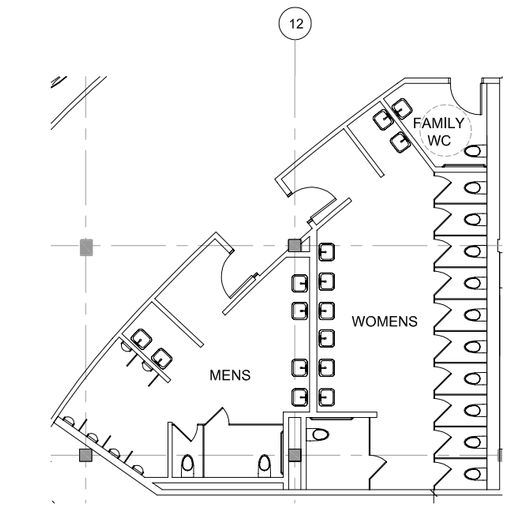

01 A2.01 LARGE SCALE WASHROOM FLOOR PLAN - LEVEL 0

SCALE: 1:50

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TYPICAL INTERIOR PARTITIONS

TYPICAL OFFICE PARTITION - STC 45?
16mm GYPSUM BOARD
92mm STUDS, 610 O/C AT 405mm O/C.
BATT INSULATION TO FULL DEPTH OF STUD
16mm GYPSUM BOARD

TYPICAL MEETING ROOM PARTITION - STC 55
2 LAYERS 16mm GYPSUM BOARD
92mm STUDS, 610 O/C AT 405mm O/C.
BATT INSULATION TO FULL DEPTH OF STUD
2 LAYERS 16mm GYPSUM BOARD

TYPICAL PARTITION - STC 45
16mm GYPSUM BOARD
92mm STUDS, 610 O/C AT 405mm O/C.
16mm GYPSUM BOARD

TYPICAL CHEM / HEAT FIRE RATED PARTITION - STC 45
DIRECT MOUNTING RESILIENT BAR, 16/610
16mm FIBRE RATED GYPSUM BOARD
152mm STUDS, 610 O/C AT 405mm O/C.
MINERAL FIBRE INSULATION TO FULL DEPTH OF STUD
16mm FIBRE RATED GYPSUM BOARD

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Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

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Dwg Title **LEVEL 0 FLOOR PLAN**

Building **STUDENTS' UNION BUILDING #54400**

Job Number XXX## | Work Order Number #####

Arch ☐ Mech ☐ Elect ☐ Struct ☐ | Drawn By **Author**

Plot Date **15/02/2013** | Issue **A** | Revision

Sheet | University Dwg Num

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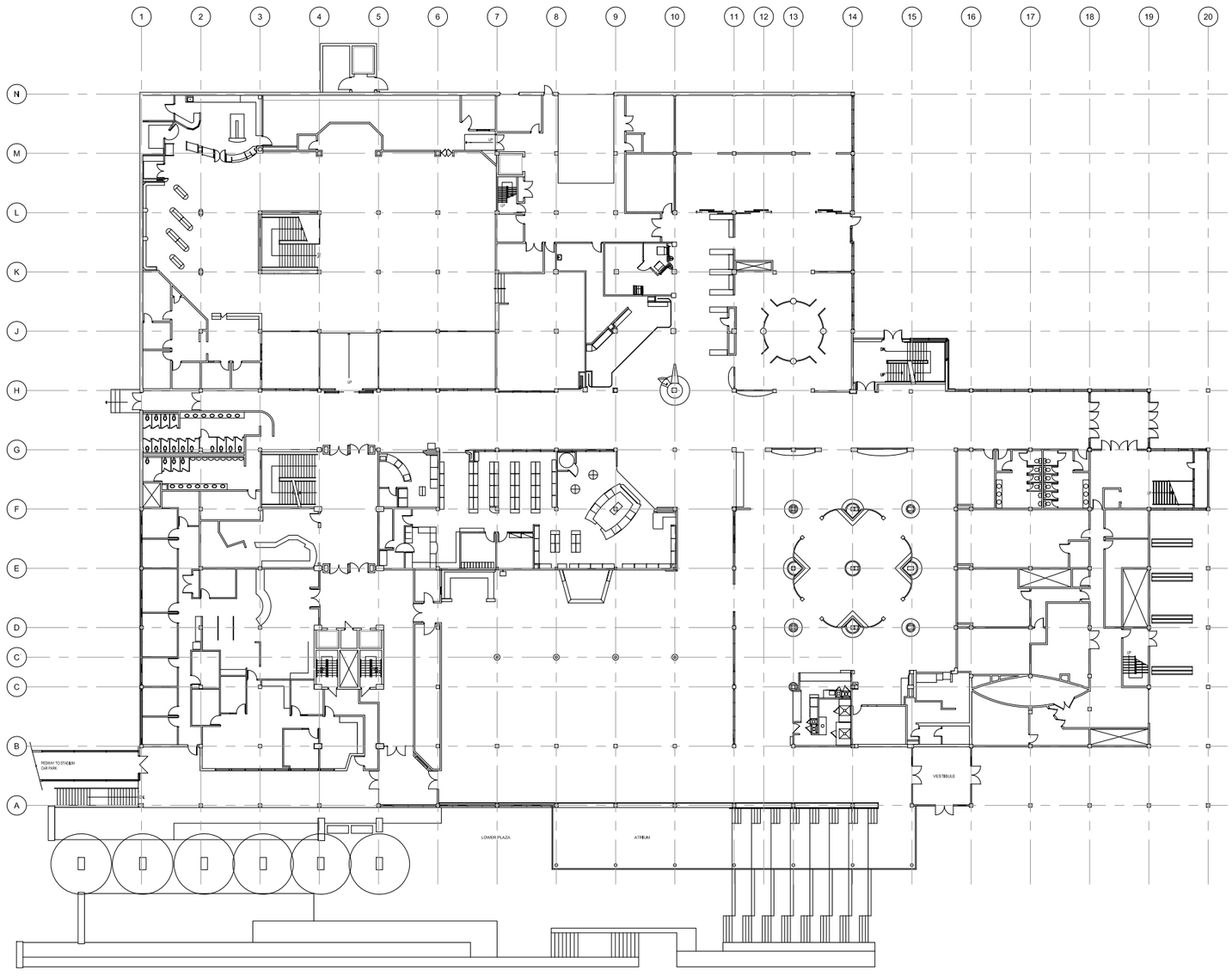

01 A2.02 LEVEL 1 FLOOR PLAN

SCALE: 1:150

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TYPICAL INTERIOR PARTITIONS

TYPICAL OFFICE PARTITION - STC 45N
ONE LAYER 16mm GYPSUM BOARD
92mm STEEL STUD AT 405mm O.C.
BATT INSULATION TO FULL DEPTH OF STUD
16mm GYPSUM BOARD

TYPICAL MEETING ROOM PARTITION - STC 55
2 LAYERS 16mm GYPSUM BOARD
92mm STEEL STUD AT 405mm O.C.
BATT INSULATION TO FULL DEPTH OF STUD
2 LAYERS 16mm GYPSUM BOARD

TYPICAL PARTITION - STC 45
16mm GYPSUM BOARD
92mm STEEL STUD AT 405mm O.C.
16mm GYPSUM BOARD

TYPICAL ONE(1) HOUR FIRE RATED PARTITION - STC 45
ONE(1) HOUR FIRE RESISTANCE RATED
16mm FIRE RATED GYPSUM BOARD
152mm STEEL STUD AT 405mm O.C.
MINERAL FIBRE INSULATION TO FULL DEPTH OF STUD
16mm FIRE RATED GYPSUM BOARD

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Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

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Dwg Title: **LEVEL 1 FLOOR PLAN**

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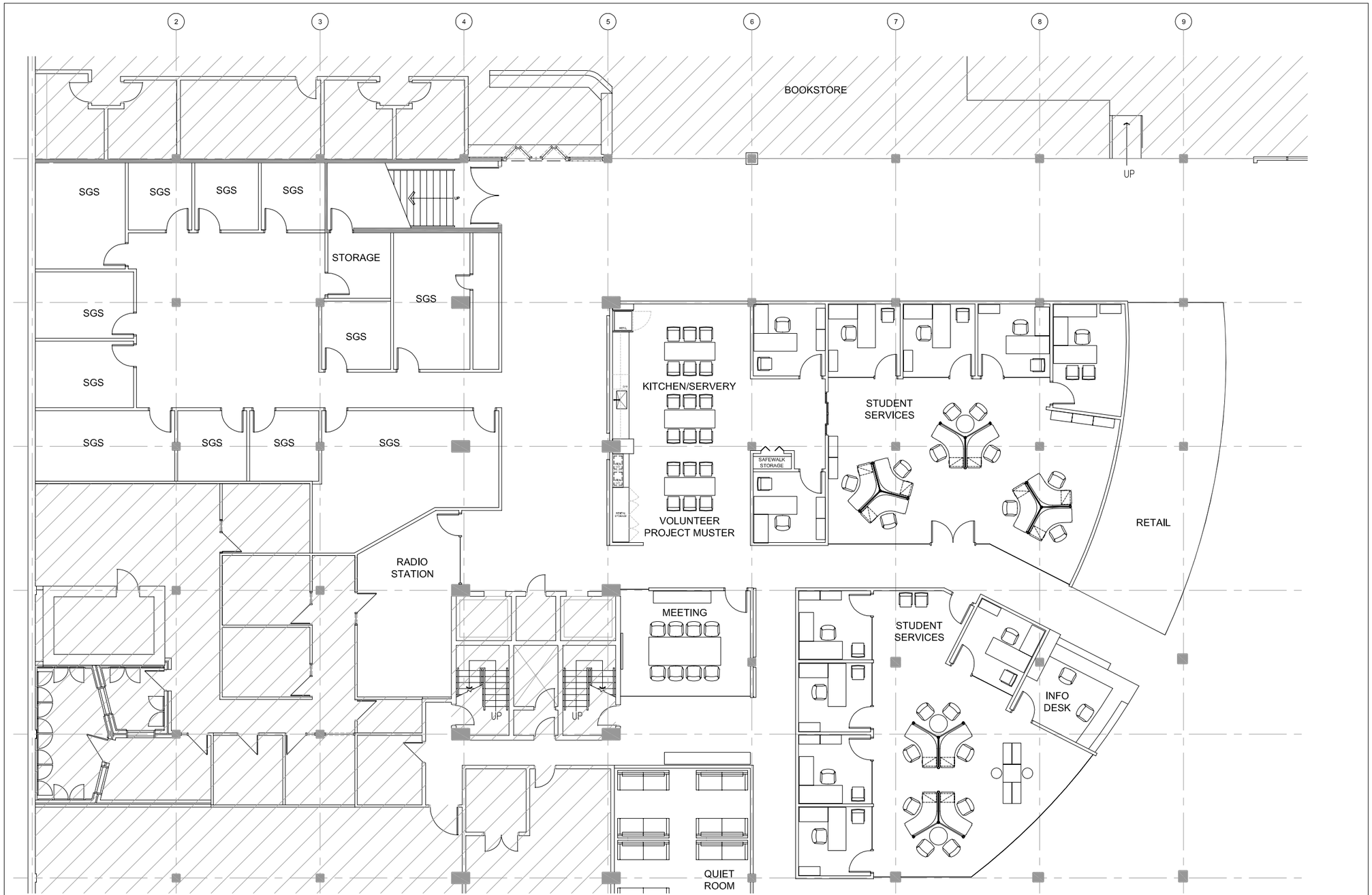

01 A2,04 LARGE SCALE FLOOR PLAN - LEVEL 0

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Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

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Dwg Title: **LARGE SCALE LEVEL 0 FLOOR PLAN**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number	XXX##	Work Order Number	#####
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Plot Date	15/02/2013	Issue	A
Sheet		University Dwg Num	

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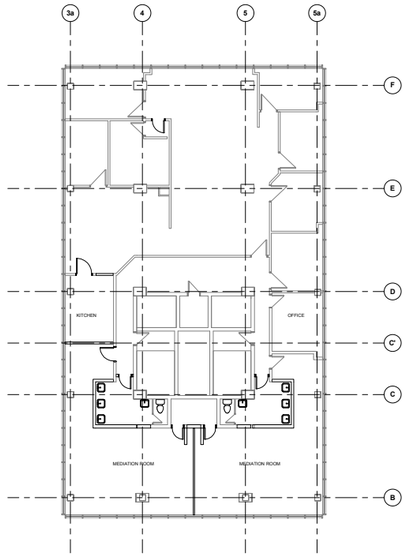
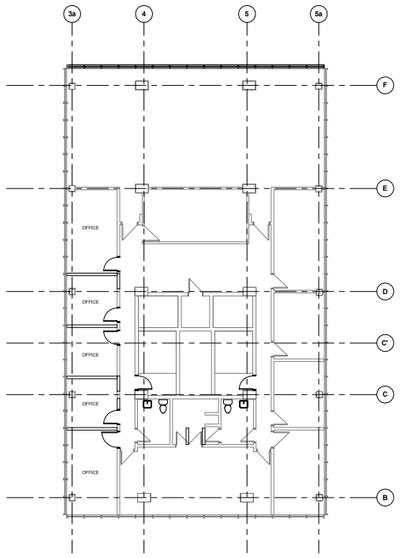


PROJECT NORTH

1 A2.05 **LEVEL 3 - CONSTRUCTION PLAN**

1 : 100



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2 A2.05 **LEVEL 4 - CONSTRUCTION PLAN**

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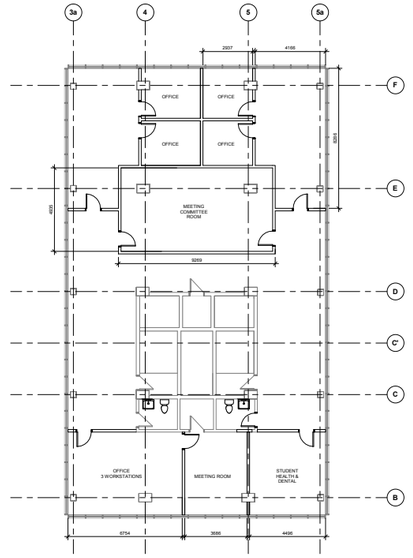

PROJECT NORTH

3 A2.05 **LEVEL 6 - CONSTRUCTION PLAN**

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TYPICAL INTERIOR PARTITIONS

TYPICAL OFFICE PARTITION - STC 45
16mm GYPSUM BOARD
92mm STEEL STUD AT 405mm O.C.
BATT INSULATION TO FULL DEPTH OF STUD
16mm GYPSUM BOARD

TYPICAL MEETING ROOM PARTITION - STC 55
2 LAYERS 16mm GYPSUM BOARD
92mm STEEL STUD AT 405mm O.C.
BATT INSULATION TO FULL DEPTH OF STUD
2 LAYERS 16mm GYPSUM BOARD

TYPICAL PARTITION - STC 45
16mm GYPSUM BOARD
92mm STEEL STUD AT 405mm O.C.
16mm GYPSUM BOARD

TYPICAL ONE(1) HOUR FIRE RATED PARTITION STC 45
MAINTHEIN FIRE RESISTANCE RATED
16mm FIRE RATED GYPSUM BOARD
152mm STEEL STUD AT 405mm O.C.
MINERAL FIBRE INSULATION TO FULL DEPTH OF STUD
16mm FIRE RATED GYPSUM BOARD

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Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **TOWER FLOORS CONSTRUCTION PLANS**

Building **STUDENTS' UNION BUILDING #54400**

Job Number **XXX##** | Work Order Number **#####**

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Plot Date **04/03/2013 4:20:14 PM** | Issue **A** | Revision

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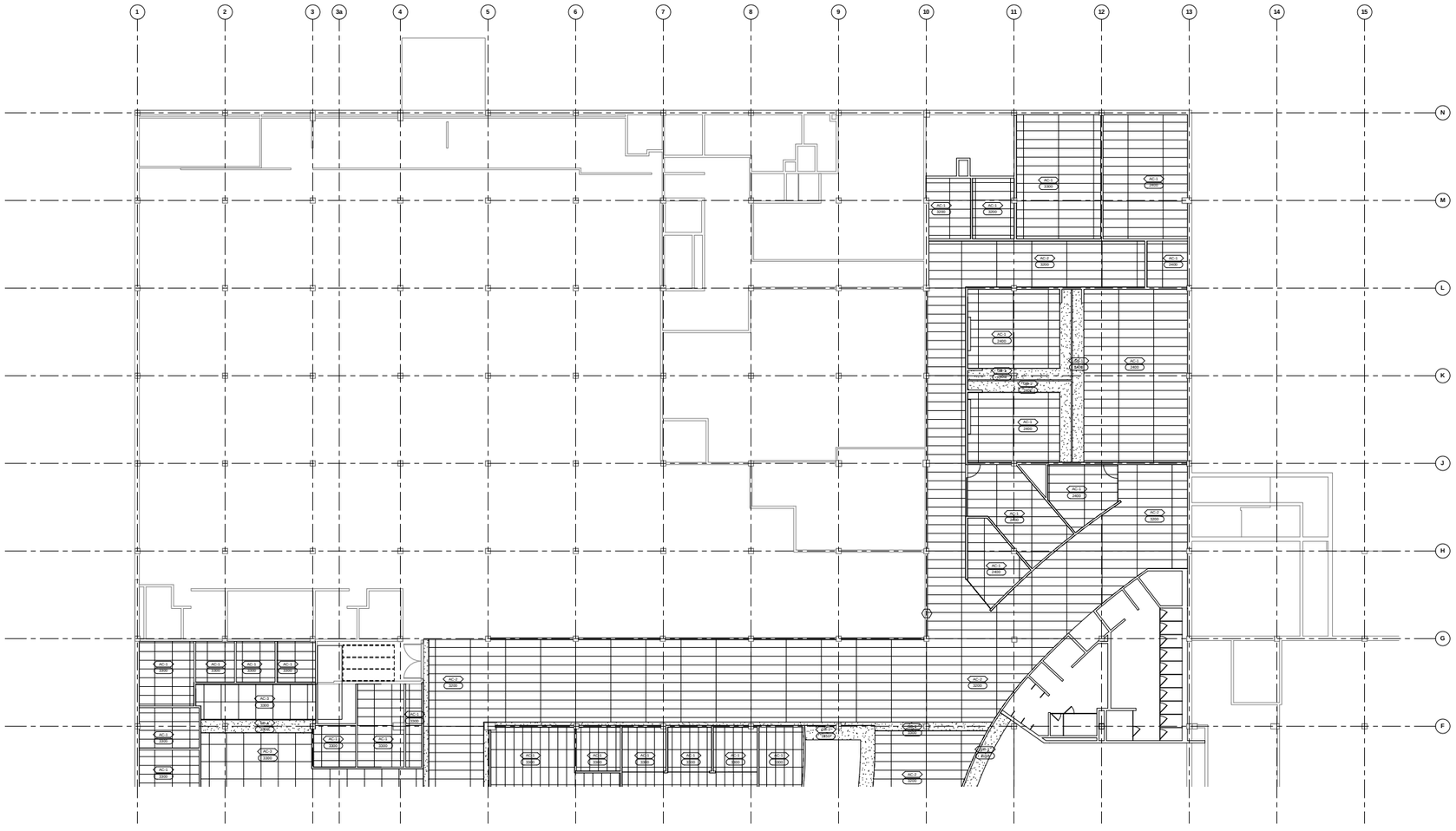

PROJECT NORTH

1 A3.01 **LEVEL 0 - NORTH REFLECTED CEILING PLAN**

1 : 100

CEILING TYPES

AC-1	610x1220mm ACOUSTICAL CEILING PANEL IN SUSPENDED T-BAR
AC-2	625x1245mm ACOUSTICAL CEILING PANEL IN SUSPENDED T-BAR
AC-3	1219x1220mm ACOUSTICAL CEILING PANEL IN SUSPENDED T-BAR
GB-1	TYPE 1 - SUSPENDED GYPSUM BOARD CEILING

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Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

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Dwg Title: **LEVEL 0 - NORTH REFLECTED CEILING PLAN**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number	XXX##	Work Order Number	#####
Arch ☐ Mech ■ Elect ■ Struct ■		Drawn By	Author
Plot Date	04/04/2013 5:10:58 PM	Issue	A
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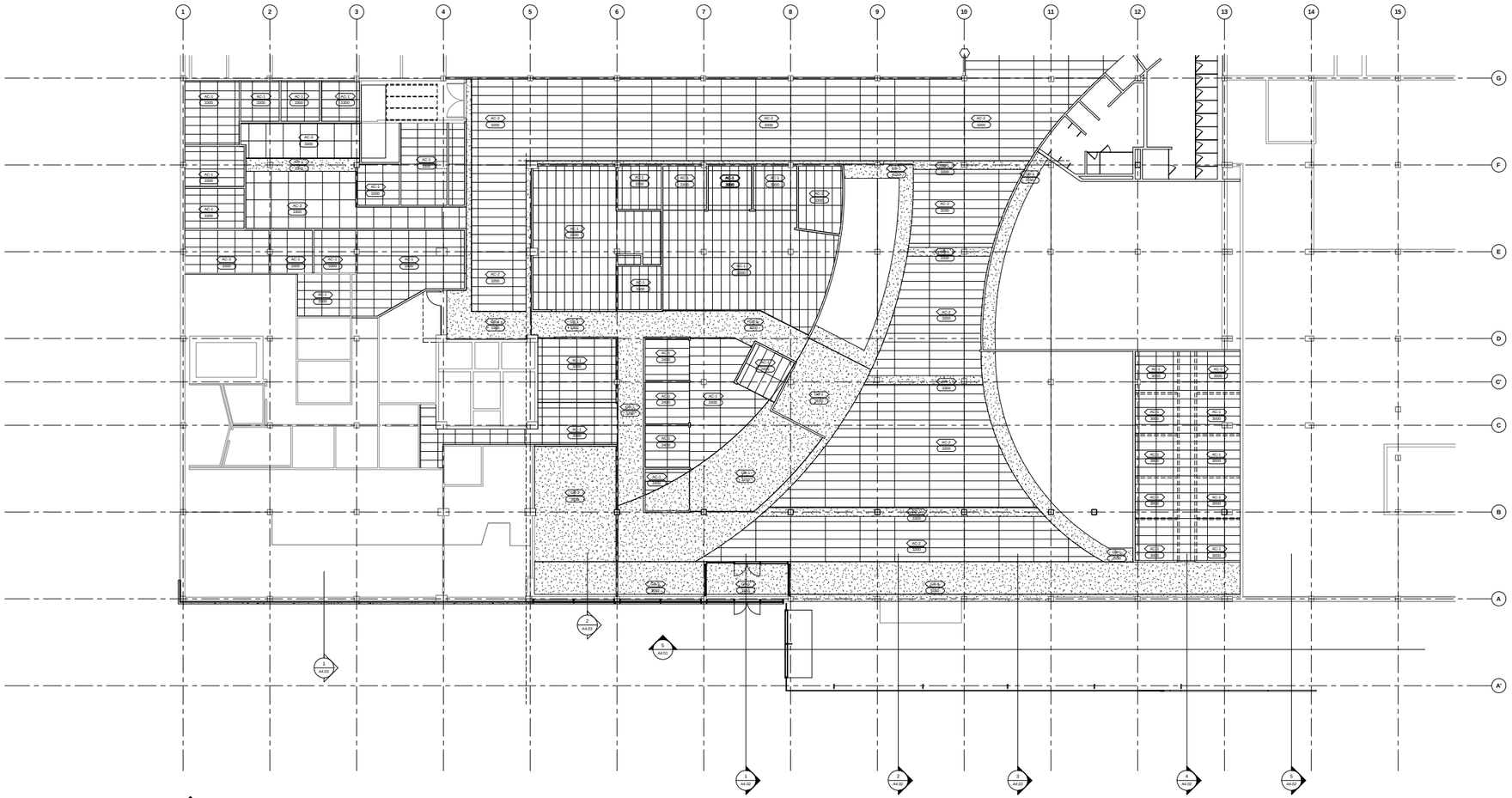

1 A3.02 **LEVEL 0 - SOUTH REFLECTED CEILING PLAN**

1 : 100

PROJECT NORTH

CEILING TYPES

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AC-2	610x2440mm ACOUSTICAL CEILING PANEL IN SUSPENDED T-BAR
AC-3	1220x1220mm ACOUSTICAL CEILING PANEL IN SUSPENDED T-BAR
GB-1	TYPE 1 - SUSPENDED GYPSUM BOARD CEILING

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Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

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Dwg Title: **LEVEL 0 - SOUTH REFLECTED CEILING PLAN**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number: XXX## | Work Order Number: #####

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Plot Date: **04/04/2013 5:10:59 PM** | Issue: **A** | Revision:

Sheet | University Dwg Num:

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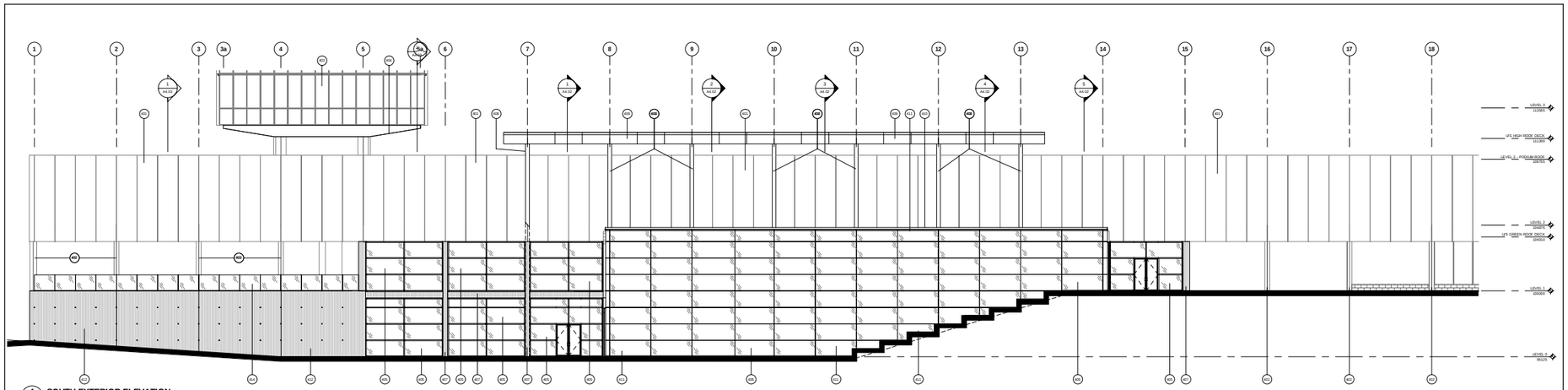
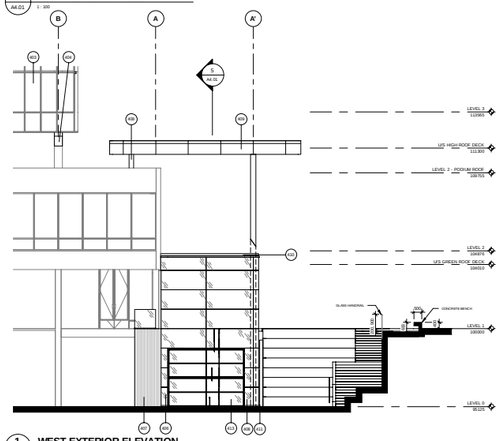
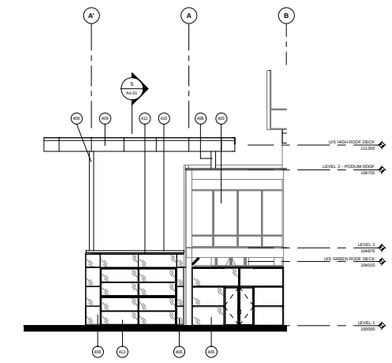


4 SOUTH EXTERIOR ELEVATION
A4.01 1 : 100



1 WEST EXTERIOR ELEVATION
A4.01 1 : 100 Back Ref: 1 / A2.01



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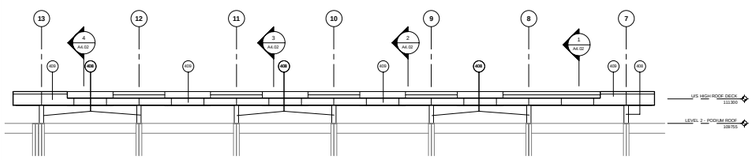
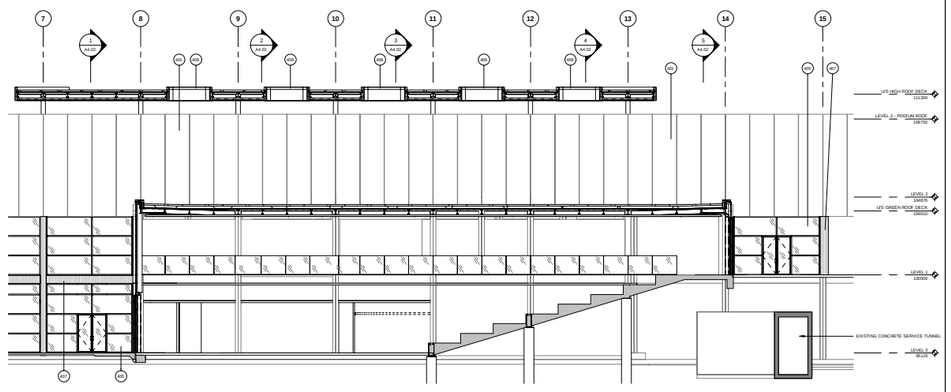
A4.01 1 : 100 Back Ref: 2 / A2.01



2 PARTIAL NORTH EXTERIOR ELEVATION
A4.01 1 : 100 Back Ref: /

Keynote Legend	
Key Value	Keynote Text
401	EXISTING PRE-CAST CONCRETE PANELS
402	EXISTING STRUCTURAL CONCRETE COLUMN
403	EXISTING GLAZED ALUMINUM CURTAIN WALL
404	EXISTING CONCRETE STRUCTURE
405	TRIPLE SEALED GLAZING UNIT IN PRE-FINISHED THERMALLY ENHANCED ALUMINUM CURTAIN WALL
406	TRIPLE SEALED GLAZING UNIT IN CUSTOM STAINLESS STEEL SPIDER CONNECTION
407	CUSTOM BOARDFORM PRECAST CONCRETE PANEL
408	STRUCTURAL STEEL COLUMN, PAINTED
409	PRE-FINISHED COMPOSITE ALUMINUM PANEL SYSTEM
410	PRE-FINISHED ALUMINUM FLASHING
411	CUSTOM STAINLESS STEEL DRAINABLE GLAZING CHANNEL
412	SITE CAST REINFORCED BOARDFORM CONCRETE CLADDING
413	DOUBLE GLAZED ALUMINUM VERTICAL BI-FOLD DOOR
414	HEAT STRENGTHENED LAMINATED GLASS BALLUSTER WITH CUSTOM STAINLESS STEEL HANDRAIL
D201	REMOVE DOOR, FRAME AND HARDWARE
D204	REMOVE PARTITION OR PORTION OF PARTITION AS DIMENSIONED
D217	RETAIN EXISTING STRUCTURE AS INDICATED
D222	RETAIN EXISTING DOOR AS INDICATED



5 BUILDING SECTION 6
A4.01 1 : 100

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PLANNING AND INFRASTRUCTURE
TECHNICAL SERVICES
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Edmonton, Alberta T6G 2H1

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C			
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Revision

Letter	Date	By	Description

Faculty/Department: **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title: **EXTERIOR ELEVATIONS AND BUILDING SECTIONS**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number XXX## | Work Order Number #####

Arch ☐ Mech ■ Elect ■ Struct ■ | Drawn By: Author

Plot Date: **04/04/2013 3:35:06 PM** | Issue: **A** | Revision

Sheet | University Dwg Num

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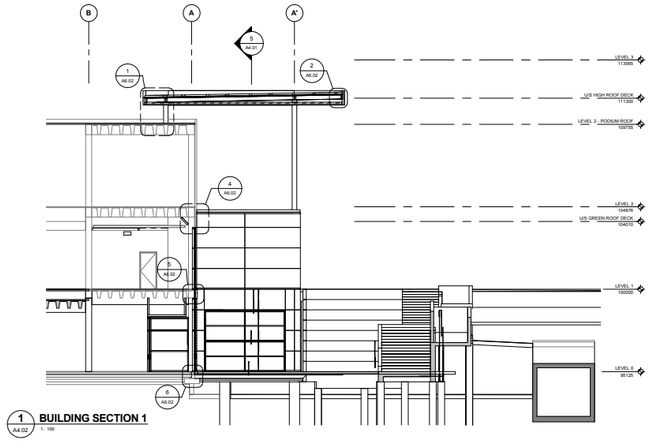
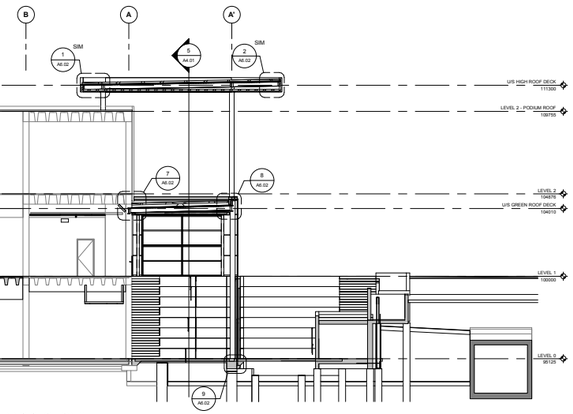


1 A4.02 **BUILDING SECTION 1**
1 : 100



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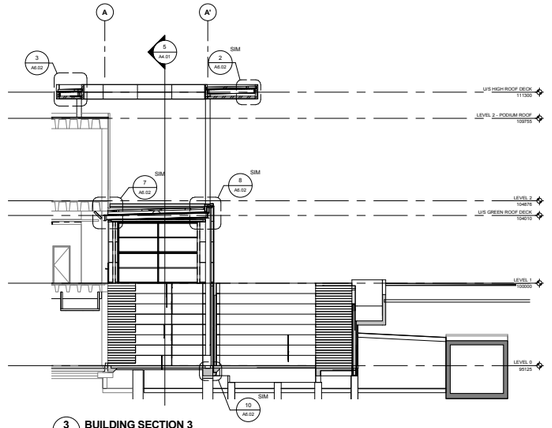

3 A4.02 **BUILDING SECTION 3**
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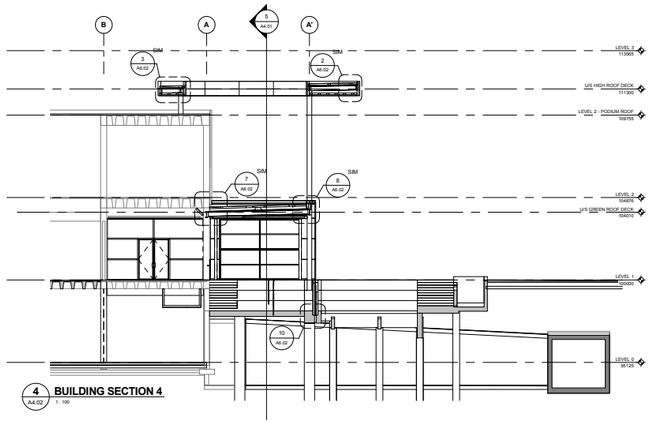

4 A4.02 **BUILDING SECTION 4**
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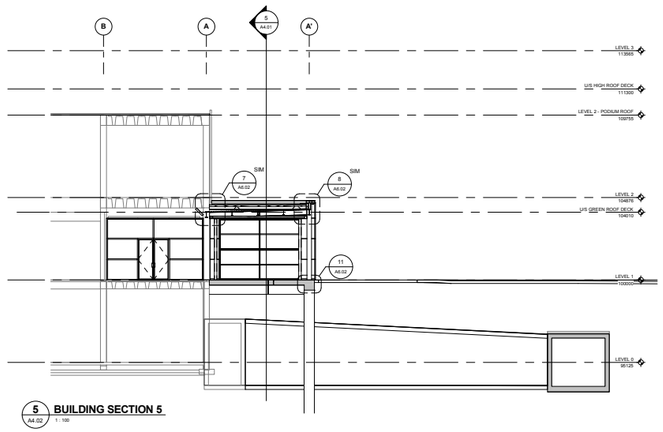

5 A4.02 **BUILDING SECTIONS 5**
1 : 100

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Faculty/Department **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **BUILDING SECTIONS**

Building **STUDENTS' UNION BUILDING #54400**

Job Number **XXX##** Work Order Number **#####**

Arch ☐ Mech ■ Elect ■ Strct ■ Drawn By **Author**

Plot Date **15/02/2013 3:33:52 PM** Issue **A** Revision

Sheet University Dwg Num

01257E02000 **A4.02**

GENERAL NOTES

1. READ THE STRUCTURAL DRAWINGS IN CONJUNCTION WITH THE SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS.
2. OPENINGS AND SLEEVES SHOWN ARE LOCATED AND DIMENSIONED FOR DETAILING PURPOSES ONLY. THE EXACT SIZES AND LOCATIONS MUST BE COORDINATED WITH THE CONSULTANT AND TRADES DURING CONSTRUCTION.
3. REFER TO THE ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS FOR LOCATIONS AND DIMENSIONS OF OPENINGS AND SLEEVES NOT SHOWN ON THE STRUCTURAL DRAWINGS. REPORT ANY DISCREPANCIES TO THE CONSULTANT AND OBTAIN INSTRUCTIONS PRIOR TO PROCEEDING WITH THE WORK.
4. REFER TO THE ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS FOR THE LOCATION OF PITS, EQUIPMENT BASES, SLUMPS, DEPRESSIONS, GROOVES, CURBS, CHAMFERS, AND SLABS NOT SHOWN ON THE STRUCTURAL DRAWINGS.
5. THE STRUCTURAL DRAWINGS ARE FOR THE COMPLETED PROJECT. THE CONSTRUCTION MANAGER IS RESPONSIBLE FOR THE SAFETY OF WORKERS AND THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION. IN PARTICULAR, THE RESPONSIBILITY CONCERNING THE SAFETY OF WORKERS AND STRUCTURES DURING ALL DEMOLITION WORK IS ASSUMED BY THE CONSTRUCTION MANAGER. REPORT ANY POTENTIAL RISKS TO THE CONSULTANT AND OBTAIN INSTRUCTIONS PRIOR TO PROCEEDING WITH THE WORK. CONSTRUCTION LOADS SHALL NOT EXCEED THE LOADS TABULATED IN THE DESIGN NOTES.
6. MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE ALBERTA BUILDING CODE 2006.

EXISTING STRUCTURE NOTES

1. THE STRUCTURAL DESIGN IS BASED UPON INFORMATION SHOWN ON THE RECORD DRAWINGS FOR THE EXISTING BUILDINGS AND ON LIMITED VISUAL OBSERVATIONS ON SITE.
2. REPORT TO THE CONSULTANT DISCREPANCIES THAT HAVE THE POTENTIAL TO AFFECT THE WORK AND OBTAIN INSTRUCTION PRIOR TO PROCEEDING.
3. SURVEY EXISTING STRUCTURE TO CONFIRM EXISTING STRUCTURAL DIMENSIONS, ELEVATIONS AND LOCATIONS PRIOR TO COMMENCEMENT OF WORK.

DESIGN NOTES

1. LOADS SHOWN ON DRAWINGS

.1 UNLESS NOTED OTHERWISE, SPECIFIED LOADS ARE SHOWN ON THE DRAWINGS.

2. IMPORTANCE CATEGORY

IMPORTANCE CATEGORY	NORMAL

3. LATERAL LOADS FROM WIND AND EARTHQUAKE

.1 WIND LOADS

REFERENCE VELOCITY PRESSURE (q1/50)	0.45 kPa
INTERNAL PRESSURE CATEGORY	2
IMPORTANCE FACTOR	1.0 (ULS) 0.75 (SLS)

.2 EARTHQUAKE LOADS

Sa(0.2)	0.12
Sa(0.5)	0.06
Sa(1.0)	0.02
Sa(2.0)	0.01
PGA	0.06
FOUNDATION SITE CLASS	D
Rd	1.5
Ro	1.3
IMPORTANCE FACTOR	1.0

4. SPECIFIED LOADS FOR FLOOR AND ROOF DESIGN

.1 REFER TO S0.10 FOR LOADING DIAGRAMS FOR SNOW, WIND & RAIN.

.2 BASEMENT & MAIN FLOOR ADDITION

LIVE	4.8 kPa
SUPERIMPOSED DEAD	0.25 kPa
CONCENTRATED LIVE	9 kN

.3 LOW ROOF

LIVE	4.8 kPa *
SUPERIMPOSED DEAD, CEILINGS & SERVICES ALLOWANCE	0.25 kPa
SOIL OR GRAVEL	3.0 kPa **
BASIC SNOW & RAIN (PLUS DRIFTING & PONDING)	1.46 kPa

.4 HIGH ROOF

LIVE	1.0 kPa
SUPERIMPOSED DEAD	0.5 kPa
BASIC SNOW & RAIN (PLUS DRIFTING & PONDING)	1.46 kPa

* LOW ROOF STRUCTURE RATED FOR POTENTIAL FUTURE ACCESSIBILITY & ASSEMBLY.

** LOW ROOF STRUCTURE DESIGNED FOR POTENTIAL FUTURE EXTENSIVE GREEN ROOF **OR** CURRENTLY ENVISAGED 150mm GRAVEL ON INVERTED ROOF ASSEMBLY.

5. RAIN LOADS ON ROOFS

.1 LOADS FROM THE ACCUMULATION OF WATER ON ROOFS DURING A ONE DAY RAIN (1/50) OF 97 mm WERE DETERMINED FROM CONSIDERATION OF ROOF SLOPES AND PARAPET HEIGHT, ASSUMING THAT RAIN LEADERS ARE ACCIDENTALLY PLUGGED. REFER TO S0.10 FOR LOADING DIAGRAMS.

6. WALL CLADDING LOADS

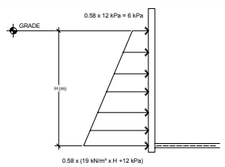
.1 SPECIFIED DEAD LOAD FROM WALL CLADDING

GLASS ONLY	1.0 kPa
LIGHTWEIGHT METAL PANELS	0.4 kPa

7. GEOTECHNICAL NOTES

.1 A GEOTECHNICAL REPORT HAS BEEN PREPARED BY THURBER ENGINEERING LTD. TITLED "PROPOSED STUDENTS UNION BUILDING ADDITION DESKTOP GEOTECHNICAL EVALUATION" DATED SEPTEMBER 24, 2012. ADDITIONAL RECOMMENDATIONS/ADDENDA HAVE ALSO BEEN PREPARED DATED SEPTEMBER 26, 2012

.2 BACKFILL RETAINING WALL WITH WELL COMPACTED GRAVEL, SAND OR WELL COMPACTED CLAY (COMPACTED IN 300mm LIFTS TO 95% STANDARD PROCTOR DENSITY) USED WITH DRAINAGE BOARD ATTACHED TO THE WALL. LATERAL SOIL PRESSURES ON FOUNDATION WALLS, INCLUDING SURCHARGE ARE:



.3 FOUNDATION WALLS ARE DESIGNED ASSUMING THAT AN EFFECTIVE DRAINAGE SYSTEM FOR SOIL IS PROVIDED BEHIND THE WALLS.

.4 RETAINING WALLS ARE DESIGNED AS A COMPLETE SYSTEM INTEGRAL WITH THE ADJACENT HORIZONTAL SLABS, GRADE BEAMS AND PILES. DO NOT BACKFILL UNTIL THESE ADJACENT STRUCTURES ARE CONSTRUCTED AND HAVE GAINED THE SPECIFIED STRENGTH.

.5 REFER TO S1.01 FOR GEOTECHNICAL NOTES RELATED TO PILE FOUNDATIONS.

CONCRETE NOTES

1. CAST-IN-PLACE CONCRETE

.1 CONCRETE: CONFORM TO CSA A23.1-09, NORMAL WEIGHT, MEETING THE FOLLOWING REQUIREMENTS UNLESS NOTED OTHERWISE:

CLASS OF CONCRETE	CLASS OF EXPOSURE	MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS (MPa)	NOMINAL MAX. SIZE OF AGGREGATE (mm)	AIR CONTENT (%)	MAXIMUM WATER/ CEMENTING MATERIALS RATIO
EXTERIOR CONCRETE					
PILES	S-3	30	20	4-7	0.50
PILE CAPS	S-3	30	20	4-7	0.50
EXTERIOR STRUCTURAL SLABS & BEAMS	C-1	35	20	5-8	0.40
RETAINING WALLS	C-1/S-3	35	20	5-8	0.40
SITE CONCRETE (NON-STRUCTURAL INCLUDING SLAB ON GRADE	C-2	32	20	5-8	0.45
ARCHITECTURAL CONCRETE CLADDING	C-2	32	14	5-8	0.45
INTERIOR CONCRETE					
SLABS ON GRADE & TOPPING SLABS (NON-STRUCTURAL)	N	25	20	-	0.50
SLABS, STRUCT. SLAB ON GRADE, AND BEAMS	N	30	20	-	0.50
MASONRY CORE FILLS	N	20	10	-	-

.2 FLY ASH CONTENT SHALL NOT EXCEED 40% OF TOTAL CEMENTITIOUS MATERIALS FOR VERTICAL ELEMENTS AND 25% FOR HORIZONTAL ELEMENTS. FLY ASH CONTENT NOT TO EXCEED 6% FOR POLISHED CONCRETE SLABS. REFER TO ARCHITECTURAL DRAWINGS FOR EXTENT.

.3 ADMIXTURES CONTAINING CALCIUM CHLORIDE ARE NOT PERMITTED.

.4 SUPERPLASTICIZING ADMIXTURE IS PERMITTED TO ALLOW PUMPING OR IMPROVE SURFACE FINISHING OF CONCRETE.

.5 FOR FLOOR SLABS, DESIGN THE CONCRETE MIXTURE WITH AGGREGATE GRADING AND WATER-TO-CEMENTING MATERIALS RATIO THAT MINIMIZE SHRINKAGE.

.6 REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR CONCRETE FINISH REQUIREMENTS.

2 REINFORCING

.1 REINFORCING STEEL: BILLET STEEL CONFORMING TO CAN/CSA-G30.18-09, GRADE 400. USE GRADE 400W WHERE WELDING IS NOTED OR REQUIRED.

.2 BENDING, CUTTING AND PLACING OF REINFORCING STEEL SHALL CONFORM TO CAN/CSA A23.1-09 AND CAN/CSA A23.3-04(R2010).

.3 WELDING SHALL CONFORM TO CSA W186-M1990(R2007).

.4 REINFORCE SLABS ON GRADE, INCLUDING SIDEWALKS, WITH WWR152x152-MW34.9 x MW34.9 UNLESS OTHER REINFORCEMENT IS SHOWN.

3 REINFORCED CONCRETE WORK

.1 REINFORCED CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF CAN/CSA-A23.1-09.

.2 CONCRETE COVER TO REINFORCING STEEL SHALL CONFORM TO THE APPLICABLE REQUIREMENT LISTED BELOW THAT RESULTS IN THE GREATEST AMOUNT OF COVER:

CONCRETE CAST AGAINST EARTH	75 mm
CONCRETE CAST IN FORMS BUT EXPOSED TO EARTH OR WEATHER	
-SLABS EXPOSED TO DEICING CHEMICALS	
-TOP BARS	60 mm
-BOTTOM BARS	40 mm
-OTHER SLABS	
-TOP BARS	40 mm
-BOTTOM BARS	40 mm
-BEAM STIRRUPS, GIRDER STIRRUPS, COLUMN TIES	40 mm
-WALLS	40 mm
CONCRETE NOT EXPOSED TO WEATHER AND NOT IN CONTACT WITH EARTH	
-SLAB BOTTOM REINFORCING -2h OR LESS FIRE RESISTANCE RATING	25 mm
-SLAB TOP REINFORCING	
-TYPICAL	25 mm
-FOR PARKADE SLABS	40 mm
-BEAMS, GIRDERS, COLUMNS (TO TIES), STIRRUPS	30 mm
-WALLS EXPOSED TO FIRE ON BOTH SIDES (VERTICAL REINFORCING)	50 mm
-OTHER WALLS	25 mm

.3 UNLESS NOTED OTHERWISE, PROVIDE DOWELS OF THE SAME SIZE, NUMBER AND SPACING WHERE REINFORCING IS SPLICED.

.4 SUBMIT TO THE CONSULTANT FOR REVIEW THE LOCATION OF ALL CONSTRUCTION JOINTS NOT SHOWN ON THE DRAWINGS.

.5 HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE MADE IN BEAMS UNLESS SHOWN ON THE DRAWINGS.

.6 SUBMIT TO THE CONSULTANT FOR REVIEW THE LOCATIONS OF ALL SLEEVES AND OPENINGS NOT SHOWN ON THE DRAWINGS. THE CONSULTANT WILL PROVIDE STRUCTURAL DETAILS AS REQUIRED FOR SLEEVES AND OPENINGS.

.7 SLEEVES SHALL NOT BE PLACED HORIZONTALLY ALONG OR VERTICALLY THROUGH BEAMS UNLESS AUTHORIZED BY THE CONSULTANT.

.8 UNLESS NOTED OTHERWISE ON PLANS, PROVIDE THE FOLLOWING CAMBERS: BEAMS, GIRDERS, AND SLABS (SPANS GREATER THAN 6 m): SPAN/600

.9 CAMBER BOTH THE UNDERSIDE AND THE TOP OF THE CONCRETE IN A PARABOLIC PROFILE SO THAT THE STRUCTURAL THICKNESS SHOWN ON THE DRAWING IS MAINTAINED.

.10 HORIZONTAL CONSTRUCTION JOINTS IN FOUNDATION WALLS ARE NOT PERMITTED EXCEPT WHERE SHOWN ON DRAWINGS OR WHERE AUTHORIZED BY THE CONSULTANT.

.11 ALL REINFORCEMENT EMBEDDED WITH ADHESIVE SHALL GET SUFFICIENT EMBEDMENT TO DEVELOP THE FULL CAPACITY OF THE EMBEDDED BAR U.N.O.

.12 EPOXY ADHESIVE SYSTEM:

TWO COMPONENT, INJECTABLE ADHESIVE SPECIFICALLY MANUFACTURED FOR USE IN INSTALLING ANCHORS INTO EXISTING CONCRETE.

ACCEPTABLE MATERIALS: HILTI CANADA LTD., HIT HY-150 (MAX)

4 CONCRETE FORMWORK

.1 FORMWORK: CONFORM TO CAN/CSA-S269.3-M92(R2008).

.2 PROVIDE 100 THICK VOID FORM UNDER ALL GRADE BEAMS, PILE CAPS, STRUCTURAL SLABS ON GRADE AND WHERE SHOWN.

.3 VOID FORM MATERIALS:

TYPE 'A' EXPANDED POLYSTYRENE COMPRESSIBLE FILL MATERIAL FOR USE UNDER WALLS AND GRADE BEAMS.
6 mm MIN. HARD BOARD OVER CRUSHABLE BIODEGRADABLE FILLER OF SUFFICIENT STRENGTH TO SUPPORT THE SLAB CONCRETE AND CONSTRUCTION LOAD UNTIL THE CONCRETE HAS CURED. FOR USE UNDER STRUCTURAL SLABS ON GRADE

TYPE 'B'

.4 REFER TO ARCHITECTURAL DRAWINGS FOR CHAMFERS ON CORNERS OF COLUMNS, BEAMS AND WALLS. USE 20x20 FORMED CHAMFERS ON EXPOSED CORNERS UNLESS CHAMFERS OF OTHER SIZES ARE SHOWN ON DRAWINGS. REFER ALSO TO SPECIFICATION.

STEEL NOTES

1 STRUCTURAL STEEL

.1 DESIGN, FABRICATE, AND ERECT STRUCTURAL STEEL IN ACCORDANCE WITH CAN/CSA-S16-09 AND THE CISC CODE OF STANDARD PRACTICE FOR STRUCTURAL STEEL.

.2 MATERIAL REQUIREMENTS

- W SHAPES:	CAN/CSA-G40.20/G40.21-04 GRADE 350W OR ASTM A992/A992M-06A GRADE 50
- WWF SHAPES:	CAN/CSA-G40.20/G40.21-04 GRADE 350W
- HSS SECTIONS (SQUARE OR RECTANGULAR):	CAN/CSA-G40.20/G40.21-04 GRADE 350W CLASS C
- HSS SECTIONS (CIRCULAR):	ASTM A500
- OTHER STRUCTURAL SHAPES AND PLATES:	CAN/CSA-G40.20/G40.21-04 GRADE 300W
- BOLTS:	ASTM A325
- HEADED STUD ANCHORS:	ASTM A108 TENSILE STRENGTH 414 MPa
- ANCHOR RODS:	ASTM F1554 GRADE 55
- SHOP PRIMER AND FIELD TOUCHUP PRIMER:	REFER TO SPECIFICATION

.3 DESIGN CONNECTIONS IN ACCORDANCE WITH CAN/CSA-S16-09. DESIGN BRACE CONNECTIONS, SO DESIGNATED, FOR THE LOADS SHOWN ON THE DRAWINGS. USE A MINIMUM OF 2 BOLTS IN EACH BOLTED CONNECTION.

.4 WELDING SHALL CONFORM TO CSA W59-03(R2008) AND BE DONE WITH MATCHING ELECTRODES.

.5 GROUT UNDER COLUMNS SHALL BE NON-SHRINK, NON-STAIN AND PLACED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. THE MINIMUM COMPRESSIVE STRENGTH OF GROUT SHALL BE 35 MPa AT 4 DAYS.

.6 PROVIDE 10 mm DIAMETER WEEP HOLES AT THE TOPS AND BOTTOMS OF HSS COLUMNS.

.7 REFER TO SPECIFICATION FOR REQUIREMENTS FOR STAIRS, LADDERS, HANDRAILS, AND PLATFORMS NOT DETAILED ON THE STRUCTURAL DRAWINGS.

.8 PROVIDE SUPPORT FOR STEEL DECK AT ALL STEEL COLUMN PENETRATIONS.

.9 STEELWORK FINISHING IN ACCORDANCE WITH ARCHITECT'S DETAILS. NOTE AESS-3 IN SOME LOCATIONS.

2 STEEL DECKING

.1 DESIGN, FABRICATE AND ERECT STEEL DECKING IN ACCORDANCE WITH CAN/CSA-S136-07.

.2 WELDING SHALL CONFORM TO CSA W59-03(R2008).

.3 USE DECK OF A DEPTH AND MINIMUM BASE STEEL THICKNESS AS SHOWN ON DRAWINGS. INCREASE THICKNESS IF NECESSARY TO SUPPORT THE LOADS SPECIFIED. MAXIMUM LIVE OR SNOW LOAD DEFLECTION SHALL BE SPAN/360.

.4 DECK UNITS SHALL BE CONTINUOUS OVER AT LEAST 3 SPANS WHERE STRUCTURAL FRAMING PERMITS.

.5 THE STEEL DECKS ON THIS PROJECT ACTS AS A DIAPHRAGM FOR THE DISTRIBUTION OF LATERA FORCES TO THE LATERAL LOAD RESISTING ELEMENTS. UNLESS NOTED OTHERWISE ON THE DRAWINGS, FASTEN THE DECK TO ALL SUPPORTING STEEL AS FOLLOWS:

ROOF DECK:

-19mm DIA PUDDLE WELDS @ MAX 305 o/c SUPPORT FASTENING
AND BUTTON PUNCHES @ MAX 305 o/c SIDE LAP FASTENING

.6 SHEET STEEL SHALL CONFORM TO ASTM A653, GRADE A STRUCTURAL QUALITY GRADE 230. GALVANIZED WITH ZINC COATING OF Z#75 AS DESIGNATED BY ASTM A653M U.N.O.

CONSTRUCTION TOLERANCES

1. CONCRETE

.1 UNLESS NOTED OTHERWISE, TOLERANCES SHALL COMPLY WITH REQUIREMENTS OF CAN/CSA-A23.1-09 AND CAN/CSA-S16-09

2. STEEL

.1 UNLESS NOTED OTHERWISE, TOLERANCES SHALL COMPLY WITH REQUIREMENTS OF CAN/CSA-S16-09

SYMBOLS

Ø	DIAMETER
□	SQUARE
@	AT
L	STEEL ANGLE
	SLAB SPAN DIRECTION
	BOTTOM REINFORCING BAR
	TOP REINFORCING BAR
15MC	DENOTES 15M EPOXY COATED BAR
C10M1000	DENOTES 10M BAR OF LENGTH 1000 mm PLUS THE STANDARD HOOK FOR A 10M BAR
10M1000 U-BAR	DENOTES 10M U-BAR WITH 1000mm LONG LEGS
1000	LENGTH TO TIE IN WITH BARS E/F OF MEMBER U.N.O.

LEGEND

XX	UNIFORM ELEVATION OF TO BEAM/JOIST WITH RESPECT TO SPECIFIED ELEVATION ON PLAN
XX	SPOT ELEVATION OF U/S STEEL DECK WITH RESPECT TO SPECIFIED ELEVATION ON PLAN
	SLAB DEPRESSION FOR FLOOR DRAIN
25	MIDSPAN UPWARD BEAM CAMBER

ABBREVIATIONS

ALT.	ALTERNATING	LLV	LONG LEG VERTICAL
A.F.F.	ABOVE FINISHED FLOOR	LSH	LONG SIDE HORIZONTAL
ARCH.	ARCHITECTURAL	MAX.	MAXIMUM
BOT.	BOTTOM	MECH.	MECHANICAL
BTWN.	BETWEEN	MC	MOMENT CONNECTION
BLL	BOTTOM LOWER LAYER	MIN.	MINIMUM
BML	BOTTOM MIDDLE LAYER	MIR.	MIRRORED
BUL	BOTTOM UPPER LAYER	N.T.S.	NOT TO SCALE
CANT.	CANTILEVER	O/A	OVERALL
c/c	CENTRE-TO-CENTRE	o/o	OUT-TO-OUT
C/L	CENTRELINE	OWSJ	OPEN WEB STEEL JOIST
COL	COLUMN	R/W	REINFORCED WITH
CONC.	CONCRETE	R.E.	RIGHT END
CONN.	CONNECTION	REINF.	REINFORCING
CONT.	CONTINUOUS	REM.	REMAINDER
C/W	COMPLETE WITH	REV.	REVERSED
DIA.	DIAMETER	RHE	RIGHT HAND END
DO	DITTO	SCHED.	SCHEDULE
DN.	DOWN	SDL.	SUPERIMPOSED DEAD LOAD
DP.	DEEP	SIM.	SIMILAR
DWG.	DRAWING	S.P.M.D.D.	STANDARD PROCTOR MAXIMUM DRY DENSITY
EE	EACH END		
E/F	EACH FACE	STGD.	STAGGERED
ELECT.	ELECTRICAL	STRUCT.	STRUCTURAL
ELEV.	ELEVATION	TEMP.	TEMPERATURE
E/W	EACH WAY	T&B	TOP AND BOTTOM
FDN.	FOUNDATION	T/O	TOP OF
GL	GRIDLINE	TYP.	TYPICAL
H.E.E.	HOOKED EACH END	TLL	TOP LOWER LAYER
H.E.F.	HORIZONTAL EACH F.FACE	TML	TOP MIDDLE LAYER
HORZ.	HORIZONTAL	TUL	TOP UPPER LAYER
INT.	INTEGRITY STEEL	U.N.O.	UNLESS NOTED OTHERWISE
L.E.	LEFT END	U/S	UNDERSIDE
LHE	LEFT HAND END	V.E.F.	VERTICAL EACH FACE
LL	LIVE LOAD	VERT.	VERTICAL
LG.	LONG	W/	WITH
LLBB	LONG LEG BACK TO BACK	W.P.	WORK POINT
LLH	LONG LEG HORIZONTAL		

MINIMUM SLAB REINFORCEMENT TABLE

SLAB THICKNESS (mm)	INTERIOR SLABS (As = .002xAg)	EXTERIOR SLABS (As = .0025xAg)
≤ 100	10M @ 450	10M @ 400
100 - 125	10M @ 400	10M @ 320
126 - 150	10M @ 330	10M @ 265
151 - 175	10M @ 285	10M @ 225
176 - 200	10M @ 250	10M @ 400 (T&B)
201 - 250	10M @ 400 (T&B)	10M @ 320 (T&B)
251 - 300	10M @ 325 (T&B)	10M @ 265 (T&B)

TABLE NOTES:
.1 PROVIDE MINIMUM REINFORCING EACH WAY IN SLABS AND TOPPINGS WITHOUT SPECIFIED REINFORCING.
.2 PROVIDE MINIMUM REINFORCEMENT PERPENDICULAR TO PRINCIPAL REINFORCEMENT IN ALL SLABS. PLACE ALTERNATING TOP AND BOTTOM WHERE TOP REINFORCING SPECIFIED.

MINIMUM WALL REINFORCEMENT TABLE

WALL THICKNESS (mm)	DIRECTION	REINFORCEMENT
150	HORIZONTAL	10M @ 330 1-LAYER
	VERTICAL	10M @ 450 1-LAYER
175	HORIZONTAL	10M @ 285 1-LAYER
	VERTICAL	10M @ 380 1-LAYER
200	HORIZONTAL	10M @ 250 1-LAYER
	VERTICAL	10M @ 330 1-LAYER
250	HORIZONTAL	10M @ 400 EACH FACE
	VERTICAL	15M @ 500 EACH FACE
300	HORIZONTAL	10M @ 330 EACH FACE
	VERTICAL	10M @ 450 EACH FACE
350	HORIZONTAL	10M @ 285 EACH FACE
	VERTICAL	10M @ 380 EACH FACE
400	HORIZONTAL	10M @ 250 EACH FACE
	VERTICAL	10M @ 330 EACH FACE

TABLE NOTES:
.1 PROVIDE MINIMUM REINFORCING IN WALLS WITHOUT SPECIFIED REINFORCING.
.2 PLACE 2-15M AT TOP AND 2-20M AT BOTTOM OF EACH WALL UNLESS SHOWN OTHERWISE.
.3 HORIZONTAL $A_{s\,min}$ = 0.002Ag VERTICAL $A_{s\,min}$ = 0.0015Ag

SLAB, BEAM, AND WALL HORIZONTAL EMBEDMENT AND LAP SPLICE LENGTHS

BAR SIZE	TENSION EMBEDMENT				TENSION LAP SPLICE				COMPRESSION EMBEDMENT				COMPRESSION LAP SPLICE			
	25 MPa	30 MPa	35 MPa	40 MPa	25 MPa	30 MPa	35 MPa	40 MPa	25 MPa	30 MPa	35 MPa	40 MPa	25 MPa	30 MPa	35 MPa	40 MPa
10M	400	350	350	300	500	450	450	400	200	200	200	200	300	300	300	300
15M	600	550	500	450	750	700	650	600	300	300	300	300	450	450	450	450
20M	750	700	650	600	1000	900	850	800	400	400	400	400	600	600	600	600
25M	1200	1100	1000	950	1550	1400	1300	1250	500	450	450	450	750	750	750	750
30M	1450	1300	1200	1150	1850	1700	1550	1450	600	550	550	550	900	900	900	900
35M	1650	1500	1400	1300	2150	1950	1800	1700	700	650	650	650	1050	1050	1050	1050

COLUMN, ZONE, AND WALL VERTICAL EMBEDMENT AND LAP SPLICE LENGTHS

BAR SIZE	TENSION EMBEDMENT				TENSION LAP SPLICE				COMPRESSION EMBEDMENT				COMPRESSION LAP SPLICE			
	25 MPa	30 MPa	35 MPa	40 MPa	25 MPa	30 MPa	35 MPa	40 MPa	25 MPa	30 MPa	35 MPa	40 MPa	25 MPa	30 MPa	35 MPa	40 MPa
10M	300	300	250	250	400	350	350	300	200	200	200	200	300	300	300	300
15M	450	400	400	350	600	550	500	450	300	300	300	300	450	450	450	450
20M	600	550	500	500	750	700	650	600	400	400	400	400	600	600	600	600
25M	900	850	800	750	1200	1100	1000	950	500	450	450	450	750	750	750	750
30M	1100	1000	950	900	1450	1300	1200	1150	600	550	550	550	900	900	900	900
35M	1300	1200	1100	1000	1650	1500	1400	1300	700	650	650	650	1050	1050	1050	1050

TABLE NOTES:
.1 BASED ON CSA A23.3-04.
.2 COLUMN & BEAM BARS ENCLOSED BY MINIMUM STIRRUPS OR TIES U.N.O.
.3 CLEAR COVER AT LEAST 1.0 x BAR DIAMETER.
.4 CLEAR SPACING AT LEAST 1.4 x BAR DIAMETER.
.5 INCREASE LENGTHS TO 1.31 x LISTED LENGTH FOR EPOXY COATED REINFORCING.
.6 WHERE BARS OF DIFFERENT DIAMETERS ARE LAPPED, PROVIDE LAP LENGTH IN ACCORDANCE WITH SMALLER BAR DIAMETER.

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **GENERAL NOTES**

Building **STUDENTS' UNION BUILDING #54400**

Job Number XXX## | Work Order Number #####

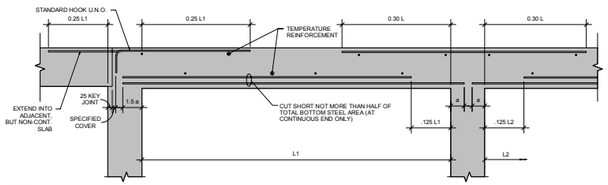
Arch ☐ Mech ☐ Elect ☐ Strct ■ | Drawn By JS

Plot Date 12/03/2013 11:49:12 AM | Issue A | Revision

Sheet | University Dwg Num

01257E02000 | S0.01

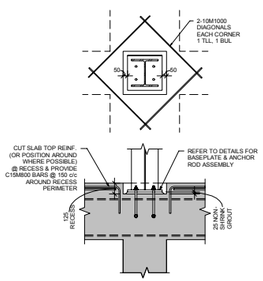
ONE-WAY SLAB REINFORCING — CF01



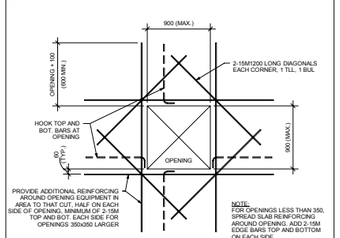
NOTES:

1. "L" IS THE GREATER OF L1 AND L2.
2. "S" IS THE STIRRUP SPACING.
3. "a" EQUALS 10 BAR DIAMETERS BUT NOT LESS THAN 150 mm.
4. WHERE ONE-WAY SLABS SPAN PARALLEL TO INTEGRAL BEAMS OR WALLS, PROVIDE 15M @ 400 TOP PERPENDICULAR TO SPAN PROJECTING 1300 EACH SIDE OR 1300 ONE SIDE AND A STANDARD HOOK INTO EDGE BEAM OR EDGE WALL UNLESS NOTED OTHERWISE.
5. PROVIDE TEMPERATURE REINFORCEMENT PERPENDICULAR TO PRINCIPAL REINFORCEMENT IN ACCORDANCE WITH MINIMUM SLAB REINFORCEMENT TABLE UNLESS NOTED OTHERWISE.
6. USE TENSION LAP SPLICES FOR TEMPERATURE REINFORCING. STAGGER SPLICES.
7. PLACE TEMPERATURE REINFORCEMENT ALTERNATELY TOP AND BOTTOM WHERE PRINCIPAL SLAB REINFORCEMENT CONSISTS OF TOP AND BOTTOM BARS.
8. BOTTOM TEMPERATURE REINFORCEMENT TO EXTEND "a" INTO SUPPORTS.

REINFORCING FOR COLUMN BASEPLATE RECESSES — CF03

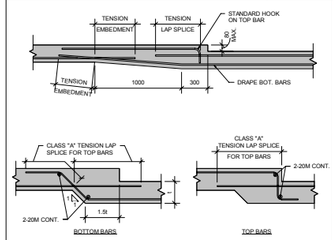


REINFORCING FOR OPENINGS IN SLABS — CF04



NOTE:
FOR OPENINGS LESS THAN 350, SPREAD SLAB REINFORCING AROUND OPENING. ADD 2-15M EDGE BARS TOP AND BOTTOM ON EACH SIDE.

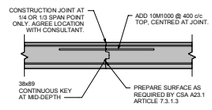
BAR SPLICING AT STEPS IN SLAB — CF05



STEPS OVER 75mm UP TO AND INCLUDING "I-50"

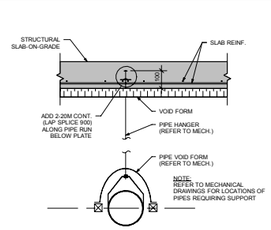
NOTE: THESE DETAILS GOVERN U.N.O. ON PLAN

STRUCTURAL SLAB CONSTRUCTION JOINT DETAILS — CF06



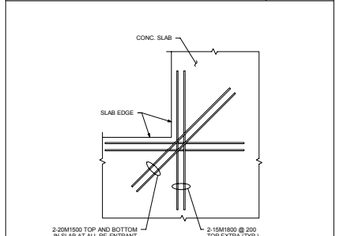
NOTE:
EXTEND TOP AND BOTTOM REINFORCEMENT THROUGH JOINT FOR THE FULL LENGTH SHOWN ON PLAN OR IN STANDARD DETAILS.

PIPE SUPPORT AT STRUCTURAL SLAB ON GRADE — CF07

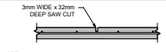


NOTE:
REFER TO MECHANICAL DRAWINGS FOR LOCATIONS OF PIPES REQUIRING SUPPORT

STRUCTURAL SLAB/TOPPING SLAB REENTRANT CORNER REINFORCING — CF08

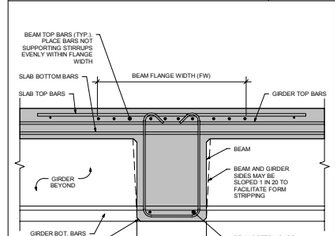


SLAB ON GRADE CONTROL JOINT — CF09

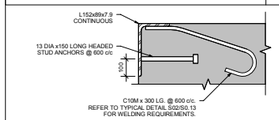


NOTE:
1. MAKE SAW CUTS WITHIN 16 HOURS AFTER CASTING.
2. MAKE JOINT CONTINUOUS TO FACE OF FOUNDATION WALLS OR COLUMNS.
3. LOCATE SAW CUTS AT 6000 MAXIMUM EACH WAY. SUBMIT PLAN LOCATIONS TO CONSULTANT FOR REVIEW AND COMMENT PRIOR TO CASTING.

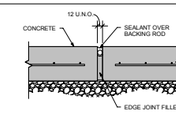
BEAM/GIRDER REINFORCING — CF17



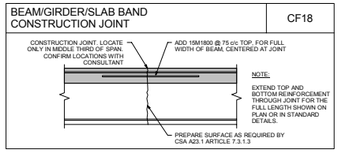
FRAME AT SLAB OPENING — CF15



SLAB ON GRADE ISOLATION JOINT — CF10

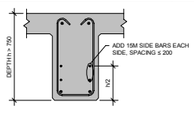


BEAM/GIRDER/SLAB BAND CONSTRUCTION JOINT — CF18

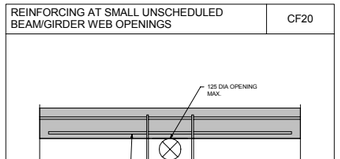


NOTE:

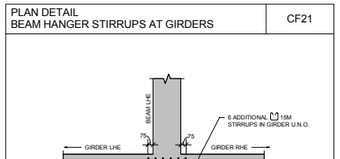
BEAM/GIRDER/SLAB BAND SIDE REINFORCEMENT — CF19



REINFORCING AT SMALL UNSCHEDULED BEAM/GIRDER WEB OPENINGS — CF20

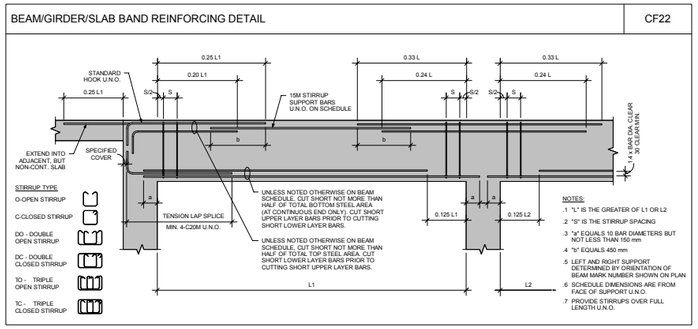


PLAN DETAIL BEAM HANGER STIRRUPS AT GIRDERS — CF21



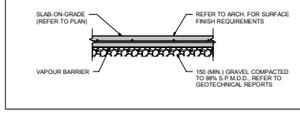
NOTES:
1. OTHER REINFORCEMENT NOT SHOWN FOR CLARITY
2. ADDITIONAL STIRRUPS NOT REQUIRED AT COLUMN LOCATIONS.

BEAM/GIRDER/SLAB BAND REINFORCING DETAIL — CF22

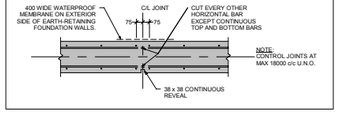


NOTES:
1. "L" IS THE GREATER OF L1 OR L2
2. "S" IS THE STIRRUP SPACING
3. "a" EQUALS 10 BAR DIAMETERS BUT NOT LESS THAN 150 mm
4. "b" EQUALS 450 mm
5. LEFT AND RIGHT SUPPORT DETERMINED BY ORIENTATION OF BEAM MARK NUMBER SHOWN ON PLAN.
6. SCHEDULE DIMENSIONS ARE FROM FACE OF SUPPORT U.N.O.
7. PROVIDE STIRRUPS OVER FULL LENGTH U.N.O.

SLAB-ON-GRADE — CF30

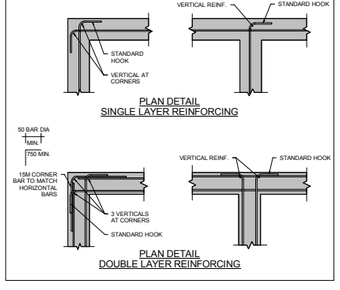


RETAINING WALL VERTICAL CONTROL JOINT — CW01

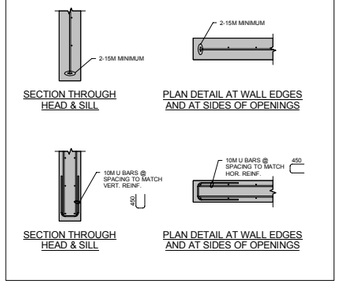


NOTE:
CONTROL JOINTS AT MAX 18000 c/c U.N.O.

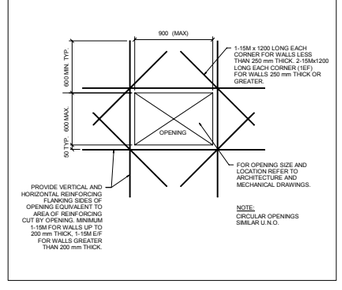
WALL AND GRADE BEAM CORNER BARS — CW04



WALL EDGE AT OPENINGS LARGER THAN 1000 — CW05

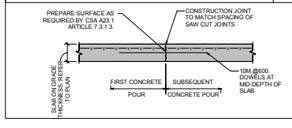


SMALL WALL OPENING REINFORCEMENT — CW06

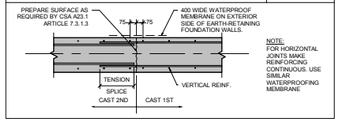


NOTE:
CIRCULAR OPENINGS SIMILAR U.N.O.

CONSTRUCTION JOINT IN SLAB-ON-GRADE — CF32



WALL VERTICAL CONSTRUCTION JOINT — CW02



NOTE:
FOR HORIZONTAL JOINTS MAKE REINFORCING CONTINUOUS. USE SIMILAR WATERPROOFING MEMBRANE

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
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D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department: **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title: **TYPICAL DETAILS SHEET 1 OF 2**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number: **XXX##** Work Order Number: **#####**

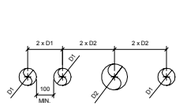
Arch ☐ Mech ☐ Elect ☐ Struct ■ Drawn By: **JS**

Plot Date: **12/03/2013 11:49:15 AM** Issue: **A** Revision

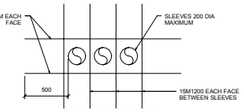
Sheet — University Dwg Num

01257E02000 **S0.02**

WALL AND SLAB REINFORCEMENT FOR SLEEVES — CW07



MINIMUM SPACING OF SLEEVES THROUGH SLABS AND WALLS

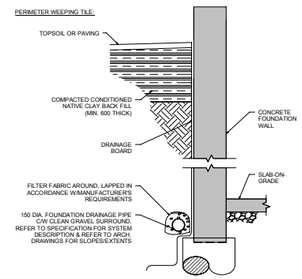


REINFORCING AROUND SLEEVES THROUGH SLABS AND WALLS

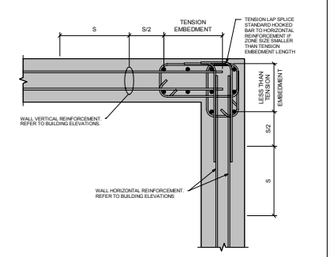
NOTES:

1. SLEEVES SHALL BE CIRCULAR UNLESS AUTHORIZED BY CONSULTANT.
2. FOR SLEEVES LARGER THAN 200 DIA, OBTAIN DIRECTION FROM CONSULTANT FOR ADDITIONAL REINFORCING REQUIRED ON A CASE-BY-CASE BASIS.
3. COORDINATE WITH CONSULTANT LAYOUT FOR ALL GROUPS OF SLEEVES CONTAINING FOUR OR MORE INDIVIDUAL SLEEVES. PROVIDE REINFORCEMENT AT GROUPS OF SLEEVES CONTAINING FOUR OR MORE INDIVIDUAL SLEEVES AS ILLUSTRATED AND PROVIDE ADDITIONAL REINFORCING ON A CASE-BY-CASE BASIS AS DIRECTED BY CONSULTANT.

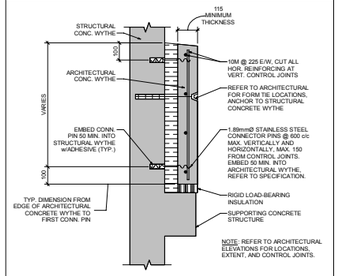
FOUNDATION DRAINAGE — CW08



WALL REINFORCEMENT AT ZONE OR COLUMN — CW09

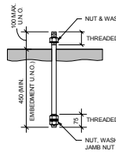


ARCHITECTURAL CONCRETE CLADDING — CW11



NOTE: REFER TO ARCHITECTURAL ELEVATIONS FOR LOCATIONS, EXTENT, AND CONTROL JOINTS.

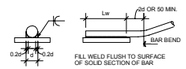
ANCHOR ROD — S01



NOTES:

1. ANCHOR RODS ASTM F1554 GRADE 55, 25 DIA x 550 LONG U.N.O.
2. NUTS HEAVY HEX STRUCTURAL
3. WASHERS 50 DIA x 3.5 THICK MIN.
4. ASSEMBLY SHALL BE GALVANIZED WHEN LOCATED OUTSIDE OF BUILDING ENVELOPE.

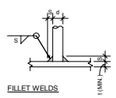
WELD DETAILS - DEFORMED BAR ANCHORS TO STEEL PLATE — S02



FLARE-BEVEL GROOVE WELDS

BAR NO.	Lw(mm)
10M	65
15M	90
20M	110
25M	140

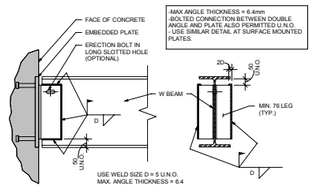
NOTE: USE E49XX ELECTRODES



FILLET WELDS

BAR NO.	S(mm)	t MIN.(mm)
10M	8	4
15M	10	6
20M	12	7
25M	16	10

W-BEAM TO EMBEDDED PLATE CONNECTION — S03



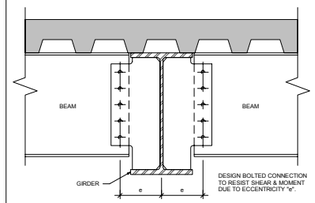
WEB FRAMING LEG WITH WELDS

OUTSTANDING LEG WITH WELDS

NOTE:
DESIGN SIMILAR BOLTED TYPE CONNECTIONS TO EMBED PLATES FOR ECCENTRICITY SPECIFIED IN S15.

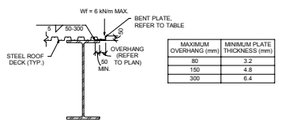
TYPICAL STEEL BEAM /GIRDER ARRANGEMENT — S15

NOTE: BEAM TO COLUMN CONNECTION SHEAR TAB DESIGNED FOR SIMILAR ECCENTRICITIES.



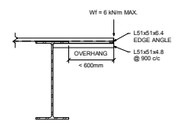
TYPICAL ROOF DECK EDGE DETAILS — S26

NOTE: PROVIDE L51x51 DECK EDGE AT ALL ROOF DECK PERIMETERS & OPENINGS U.N.O.

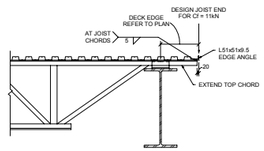


MAXIMUM OVERHANG (mm)	MINIMUM PLATE THICKNESS (mm)
80	3.2
150	4.8
300	6.4

DECK EDGE @ W-BEAM: SMALL OVERHANG

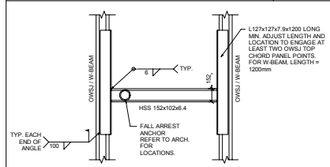


DECK EDGE @ W-BEAM: LARGE OVERHANG



DECK EDGE PERPENDICULAR TO JOIST SPAN (FOR JOIST CENTRES < 1.8m)

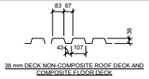
TYPICAL FALL RESTRAINT SECTION @ W-BEAM OR JOIST — S17



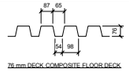
NOTES:

1. FOR CLARITY, STEEL DECK NOT SHOWN.
2. DO NOT MAKE WELDS TRANSVERSE TO JOIST CHORD OR W-BEAM. ONLY PARALLET WELDS PERMITTED
3. DESIGN OWSJ FOR ADDITIONAL 12kN REACTION AT END OF EACH ANGLE.
4. MAXIMUM HEIGHT OF FALL ARREST ANCHOR SHALL BE 500mm.

ROOF DECK AND COMPOSITE FLOOR DECK PROFILES — S06



38 mm DECK NON-COMPOSITE ROOF DECK AND COMPOSITE FLOOR DECK

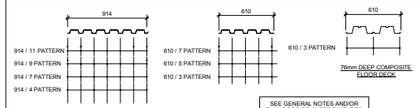


76 mm DECK COMPOSITE FLOOR DECK

NOTE:

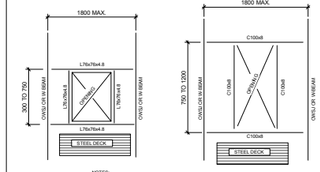
1. STRUCTURAL DESIGN IS BASED ON THESE DECK PROFILES. USE THESE PROFILES WHEREVER THE DECK IS EXPOSED TO VIEW. THE USE OF AN ALTERNATE PROFILE REQUIRES ACCEPTANCE OF CONSULTANT.

STEEL DECK DIAPHRAGM CONNECTION PATTERNS — S19



SEE GENERAL NOTES AND/OR PLANS FOR CONNECTION TYPES

OPENING THROUGH METAL ROOF DECK — S20



NOTES:

1. FRAMING FOR ROOF DECK OPENINGS SIMILAR.
2. FRAMING FOR LARGER OPENINGS SHOWN ON PLAN DRAWINGS.

STEEL SUB FRAMING

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department: **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date:

Dwg Title: **TYPICAL DETAILS SHEET 2 OF 2**

Building: **STUDENTS' UNION BUILDING #54400**

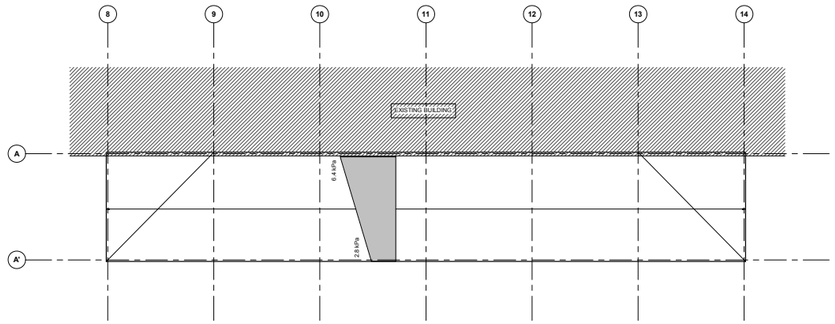
Job Number: **XXX##** | Work Order Number: **#####**

Arch ☐ Mech ☐ Elect ☐ Strct ■ | Drawn By: **JS**

Plot Date: **12/03/2013 11:49:17 AM** | Issue: **A** | Revision

Sheet | University Dwg Num

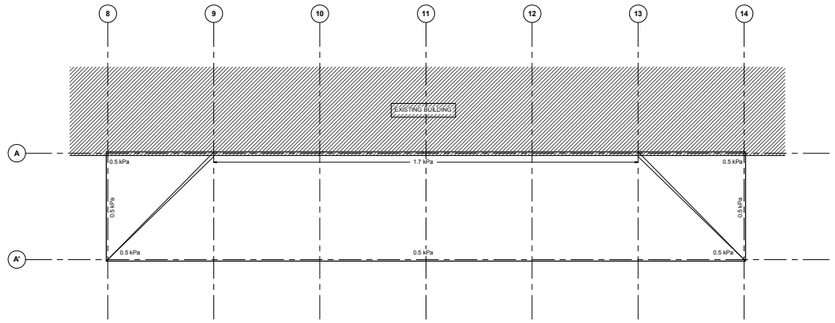
01257E02000 | **S0.03**



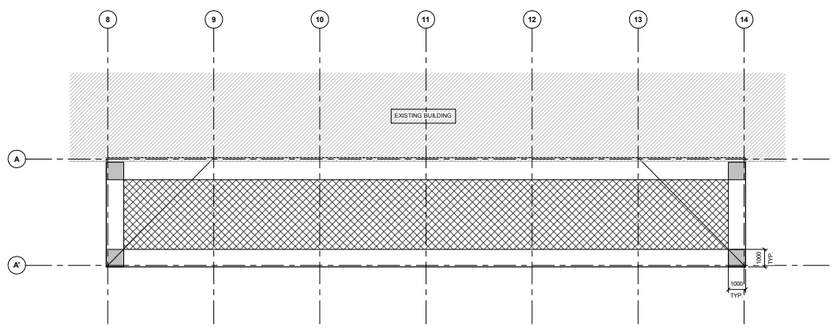
NOTES:

1. UNIFORM SPECIFIED SNOW LOADS ON ALL SURFACES = 1.45 kPa U.N.O.
2. LOADS ARE UN-FACTORED. IMPORTANCE FACTORS IN ABC 2006 TABLE 4.1.6.2. ARE NOT INCLUDED.

1 LOW ROOF SNOW LOADING DIAGRAM
S0.10 1 : 100



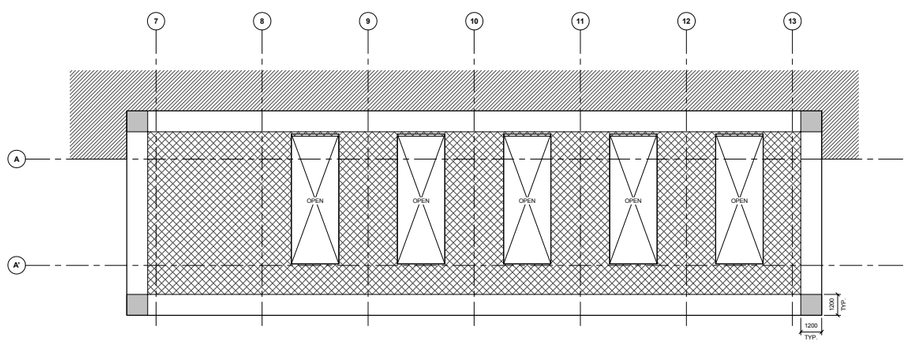
2 LOW ROOF RAIN PONDING LOADING DIAGRAM (UNFACTORED)
S0.10 1 : 100



3 LOW ROOF WIND NET UPLIFT DIAGRAM
S0.10 1 : 100

NOTES:

1. LOADS SHOWN REPRESENT NET FACTORED ULS DESIGN UPLIFT LOADS. DO NOT COMBINE WITH ANY OTHER LOADS.
2. FOR SLS DESIGN CONSIDERATIONS, INDICATED LOADS MAY BE MULTIPLIED BY 0.5 IN ACCORDANCE WITH ABC TABLE 4.1.7.1.



4 HIGH ROOF WIND NET UPLIFT DIAGRAM
S0.10 1 : 100

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Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

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Dwg Title: **LOADING DIAGRAMS**

Building: **STUDENTS' UNION BUILDING #54400**

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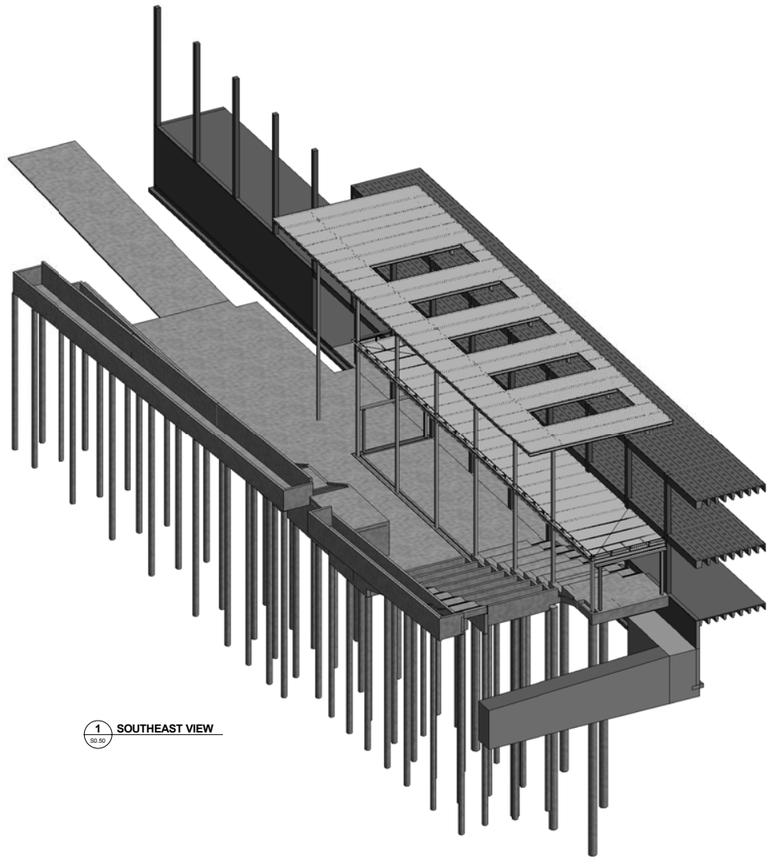
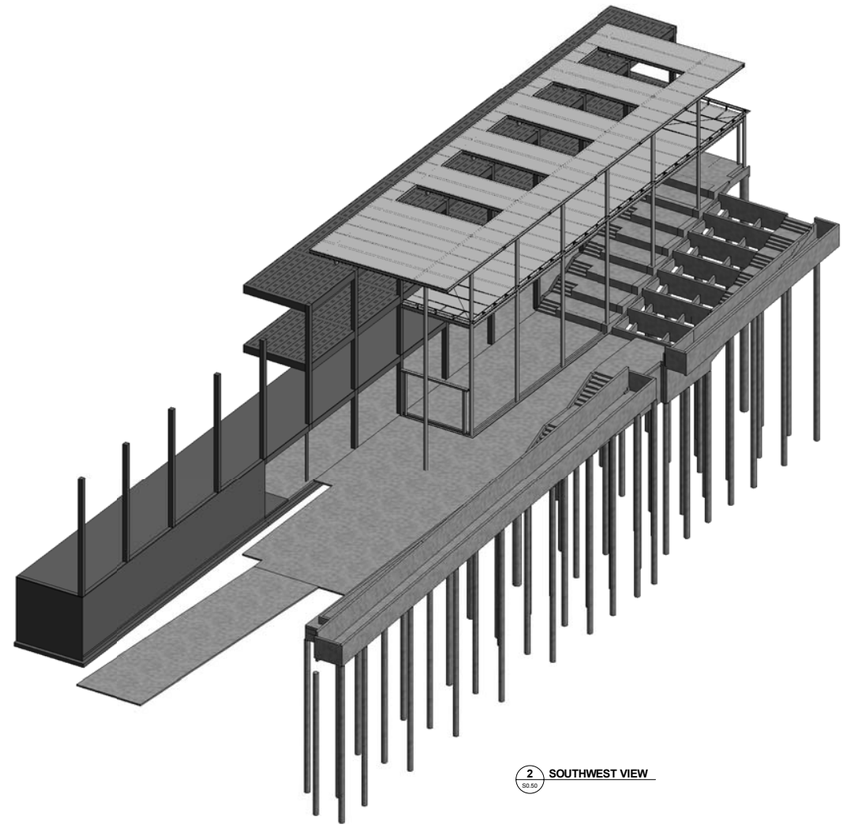
Sheet | University Dwg Num

01257E02000 **S0.10**



1 S0.50 **SOUTHEAST VIEW**



2 S0.50 **SOUTHWEST VIEW**

3D VIEWS SHOW A LIMITED AMOUNT OF INFORMATION AND IS PROVIDED ONLY TO ILLUSTRATE OVERALL CONTEXT. REFER TO DRAWINGS AND SPECIFICATIONS FOR DETAILED INFORMATION

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Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

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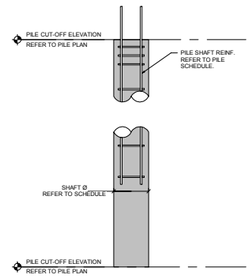
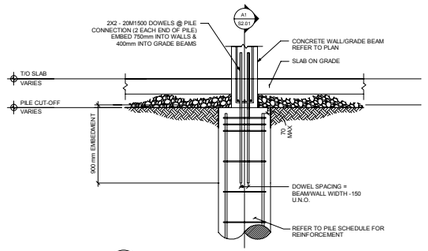
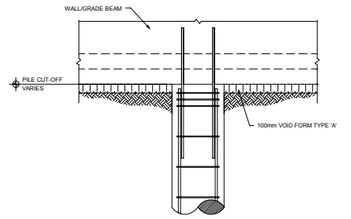
STRAIGHT SHAFT PILE — F03

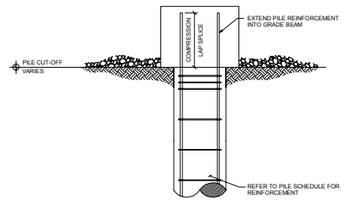




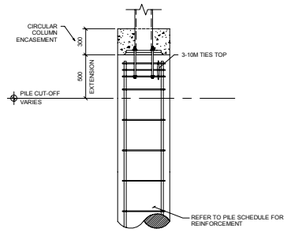
A S2.01 — **T/O PILE @ FDN. WALL / GRADE BEAM**
1 : 20



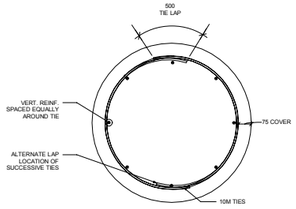
A1 S2.01 — **SECTION - T/O PILE @ FDN. WALL / GRADE BEAM**
1 : 20



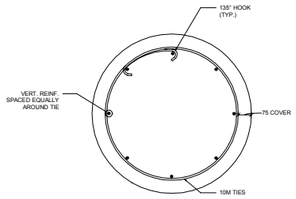
B S2.01 — **T/O PILE @ WIDER GRADE BEAM / WALL**
1 : 20



C S2.01 — **T/O PILE @ EXTERNAL COLUMN**
1 : 20



1 S2.01 — **TYPICAL PILE SHAFT SECTION**
1 : 10



5 S2.01 — **TYPICAL PILE CAP / EXTENSION SECTION**
1 : 10

NOTES: REQUIRED ADDITIONAL ALLOWANCES

DRAWINGS HAVE BEEN PREPARED TO SHOW THE STRUCTURAL INTENT WITH RESPECT TO THE PRIMARY FRAMING MEMBERS AND THE LATERAL LOAD RESISTING SYSTEM. SOME SECONDARY MISCELLANEOUS STRUCTURAL ELEMENTS ARE NOT SHOWN AT THIS STAGE. AN APPROPRIATE COST ALLOWANCE FOR THESE ITEMS SHOULD BE MADE AT THIS STAGE.

A NON-EXHAUSTIVE LIST OF THESE ELEMENTS IS AS FOLLOWS:

- THE FORMING OF MECHANICAL AND ELECTRICAL ROOMS AND OPENINGS/SUMPS ON THE BASEMENT FLOOR, INCLUDING PADS, CURBS AND SO FORTH.
- SPECIAL FRAMING AROUND MECHANICAL AND ELECTRICAL SHAFTS AND RISERS
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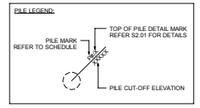
- EXTERIOR STRUCTURAL SLABS, APRONS AND CANOPIES ADJACENT TO ENTRIES
- POTENTIAL INCREASED PILE DEPTHS DUE TO UNANTICIPATED SOIL CONDITIONS
- PENETRATIONS FOR MECHANICAL AND ELECTRICAL SERVICES
- SLOPED ROOF STEEL AT 2%
- FALL ARREST POSTS
- COMPLEXITIES ASSOCIATED WITH INSTALLING IN-FLOOR HEATING TUBES IN STRUCTURAL AND NON-STRUCTURAL SLABS ON GRADE
- ROOF ACCESS LADDERS/STAIRS

PILE SCHEDULE					
Mark	PILE BASE ELEVATION (mm)	FACTORED COMPRESSIVE CAPACITY (kN)	SHAFT Ø (mm)	VERT. REINF.	TIE REINF.
P2	82000	295	406	5-15M9000	3-10M @ 75 TOP, 10M @ 340 REM.
P3	88000	170	610	5-20M9000	3-10M @ 75 TOP, 10M @ 320 REM.
P4	80000	540	610	5-20M9000	3-10M @ 75 TOP, 10M @ 320 REM.

PILE LEGEND:

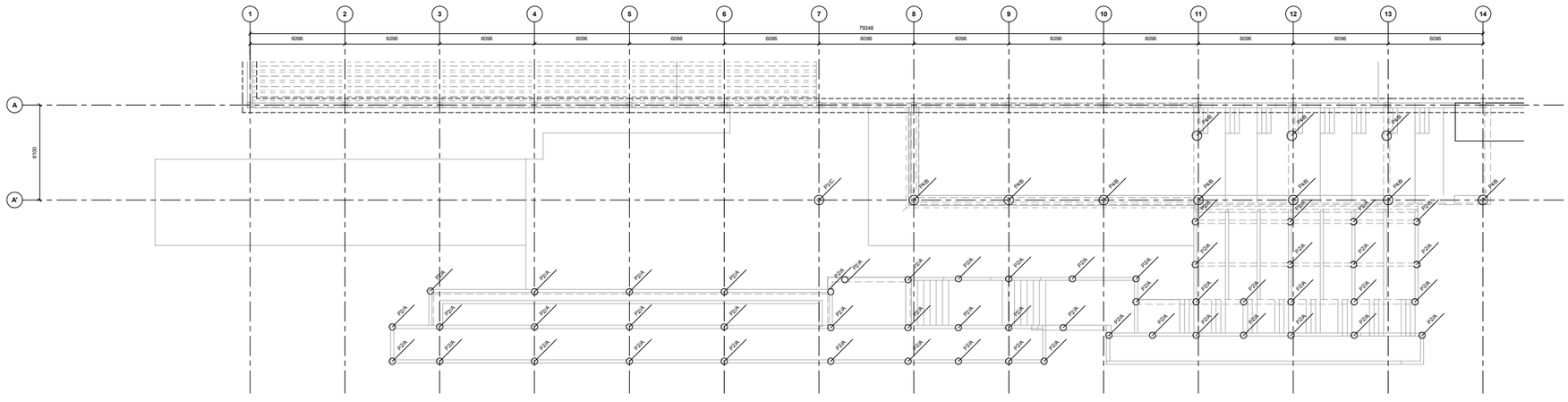


PILE NOTES:

1. BASIS FOR PILE DESIGN IS CAST-IN-PLACE CONCRETE PILES USING RECOMMENDED VALUES IN GEOTECHNICAL REPORT. TRADITIONAL AUGERED STRAIGHT SHAFT PILES OR CONTINUOUS FLIGHT AUGER (CFA) PILES ACCEPTABLE. NOTE LIKELYHOOD FOR CASING IF THE FORMER IS USED PER GEOTECHNICAL REPORT.
2. PILE CAPACITIES TABULATED BASED ON FACTORED SKIN FRICTION RESISTANCE OF CFA CONCRETE PILES:

   4.5m - 6.0m BGL 0 kPa
   6.0m - 10.5m BGL 12 kPa
   > 10.5m BGL 24 kPa
3. OBTAIN REVIEW OF ALL BEARING SURFACES BY A QUALIFIED GEOTECHNICAL ENGINEER REGISTERED IN ALBERTA.
4. FOR ADJACENT PILES (WITHIN CENTRE-TO-CENTRE DISTANCE SHAFT DIAMETER PLUS 2400), CONSTRUCT FIRST THE PILE WITH THE LOWEST BASE ELEVATION.
5. EXTEND SHAFT REINFORCEMENT TO WITHIN 100mm OF THE TOP OF THE PILE, PILE EXTENSION OR PILE CAP (U.N.O.).

NOTE: ALLOW FOR ADDITIONAL 10-P2 & 5-P4 PILES AT THIS STAGE TO ALLOW FOR ELEMENTS NOT DETAILED ON DRAWINGS.



3 S2.01 — **PILE PLAN**
1 : 100

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Letter	Date	By	Description
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B			
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D			
E			
F			
G			
H			

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Sheet University Dwg Num

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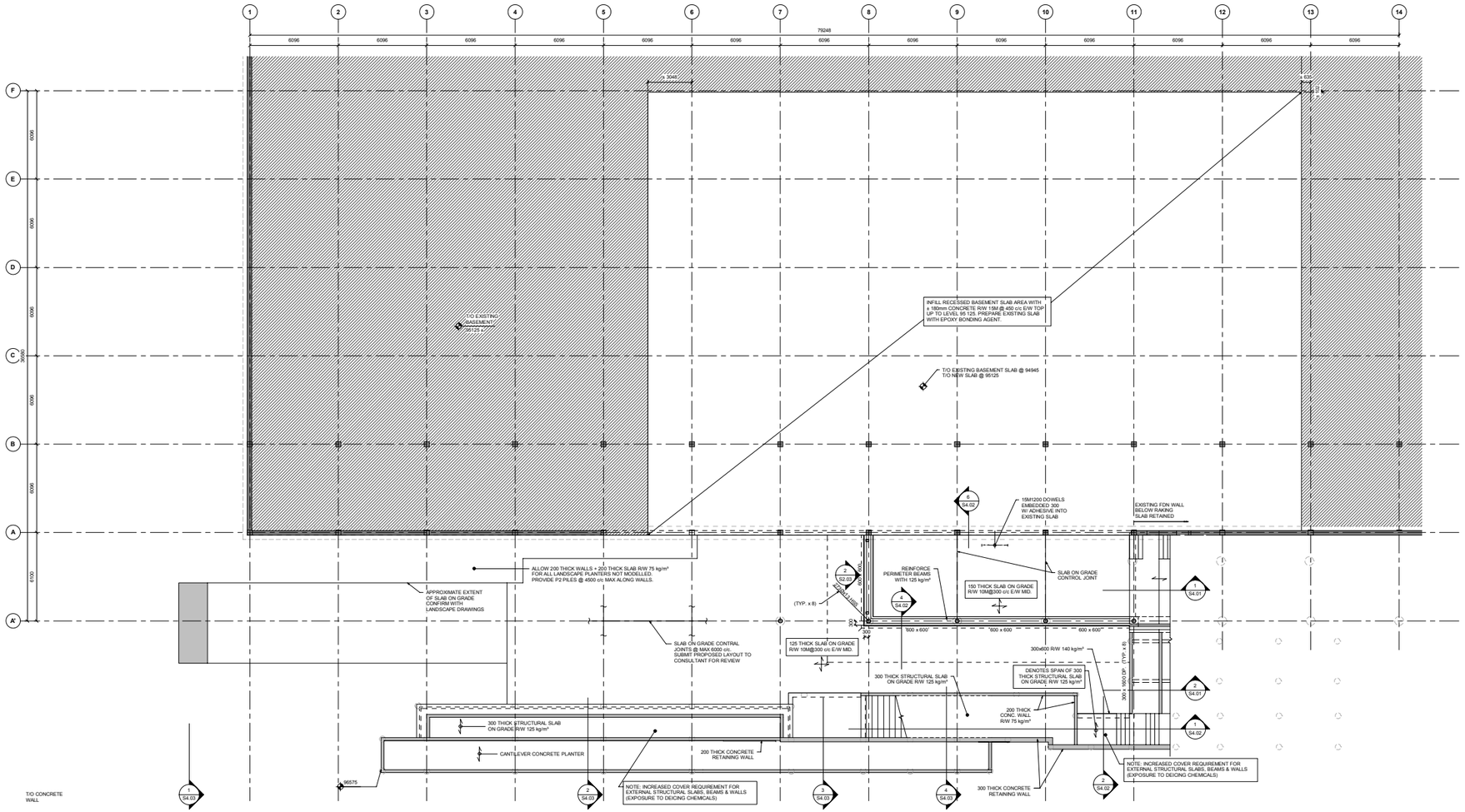
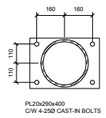


1 BASEMENT PLAN S2.02 — 1 : 100



2 TYPICAL COLUMN BASE PLATE S2.02 — 1 : 10

STEEL COLUMN LEGEND:

COLUMN SIZE — BASE PLATE TYPE MARK REFER SX.XX FOR DETAILS

ANCHOR RODS REFER S2.03

U/S BASE PLATE ASSEMBLY ELEVATION

NOTES: REQUIRED ADDITIONAL ALLOWANCES

DRAWINGS HAVE BEEN PREPARED TO SHOW THE STRUCTURAL INTENT WITH RESPECT TO THE PRIMARY FRAMING MEMBERS AND THE LATERAL LOAD RESISTING SYSTEM. SOME SECONDARY MISCELLANEOUS STRUCTURAL ELEMENTS ARE NOT SHOWN AT THIS STAGE. AN APPROPRIATE COST ALLOWANCE FOR THESE ITEMS SHOULD BE MADE AT THIS STAGE.

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- ROOF ACCESS LADDERS/STAIRS

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

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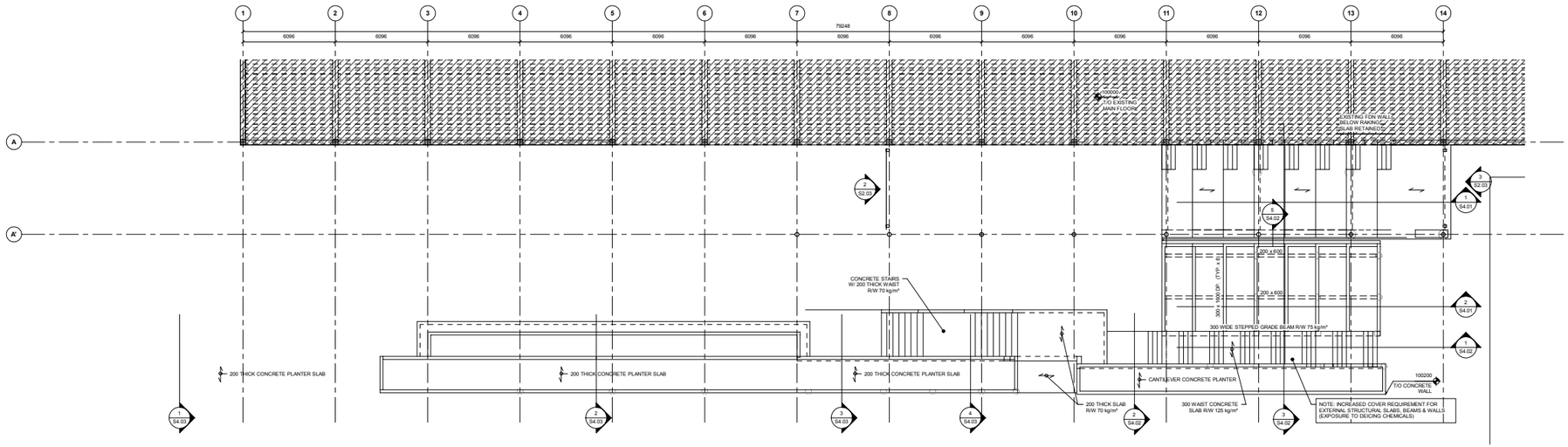
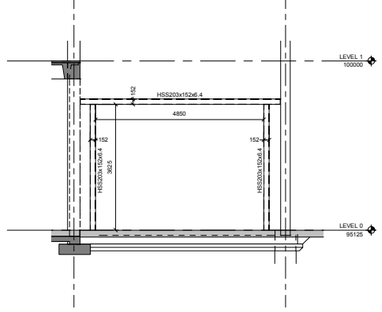
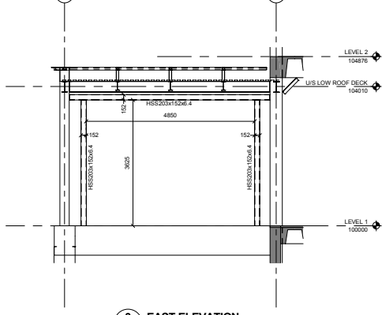


1 S2.03 **MAIN FLOOR FRAMING PLAN**
1 : 100



2 S2.03 **WEST ELEVATION**
1 : 50



3 S2.03 **EAST ELEVATION**
1 : 50

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F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **MAIN FLOOR FRAMING PLAN**

Building **STUDENTS' UNION BUILDING #54400**

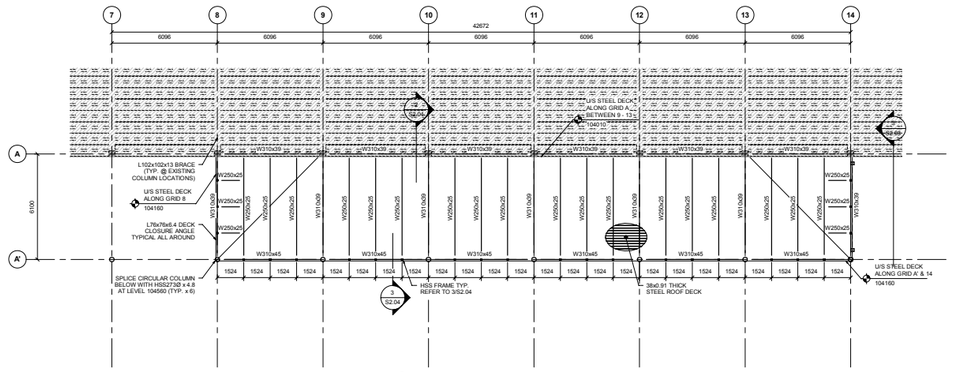
Job Number **XXX##** Work Order Number **#####**

Arch ☐ Mech ☐ Elect ☐ Strct ■ Drawn By **JS**

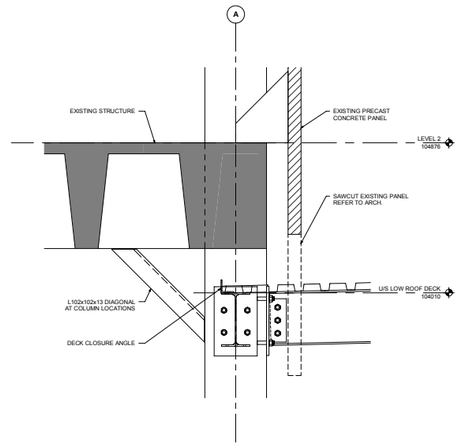
Plot Date **12/03/2013 11:49:26 AM** Issue **A** Revision

Sheet University Dwg Num

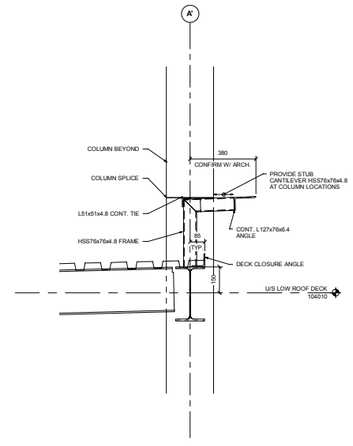
01257E02000 **S2.03**



1 S2.04 **U/S LOW ROOF DECK**
1 : 100



2 S2.04 **NEW ROOF TO EXISTING FLOOR SECTION**
1 : 10



3 S2.04 **HSS FRAME DETAIL**
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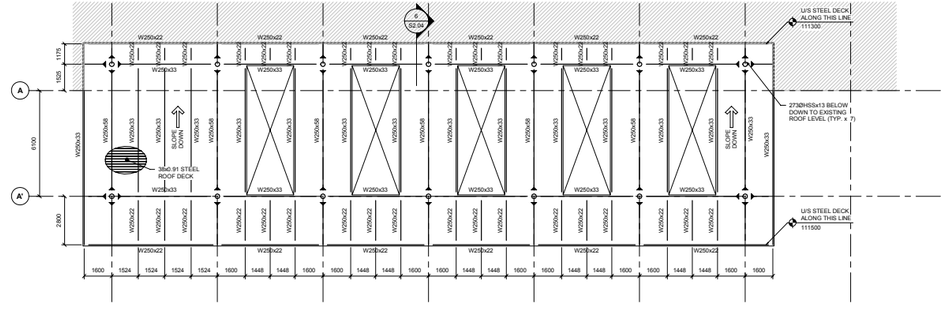

5 S2.04 **U/S HIGH ROOF DECK**
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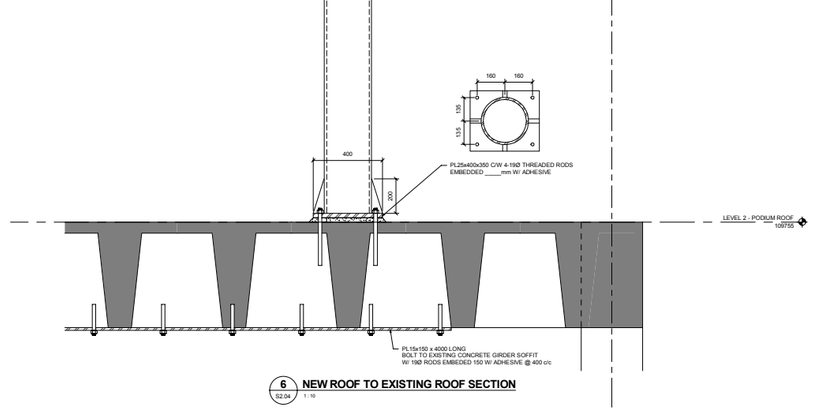

6 S2.04 **NEW ROOF TO EXISTING ROOF SECTION**
1 : 10

NOTES: REQUIRED ADDITIONAL ALLOWANCES

DRAWINGS HAVE BEEN PREPARED TO SHOW THE STRUCTURAL INTENT WITH RESPECT TO THE PRIMARY FRAMING MEMBERS AND THE LATERAL LOAD RESISTING SYSTEM. SOME SECONDARY MISCELLANEOUS STRUCTURAL ELEMENTS ARE NOT SHOWN AT THIS STAGE. AN APPROPRIATE COST ALLOWANCE FOR THESE ITEMS SHOULD BE MADE AT THIS STAGE.

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- SLOPED ROOF STEEL AT 2%
- FALL ARREST POSTS
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- ROOF ACCESS LADDERS/STAIRS

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **ROOF FRAMING PLAN**

Building **STUDENTS' UNION BUILDING #54400**

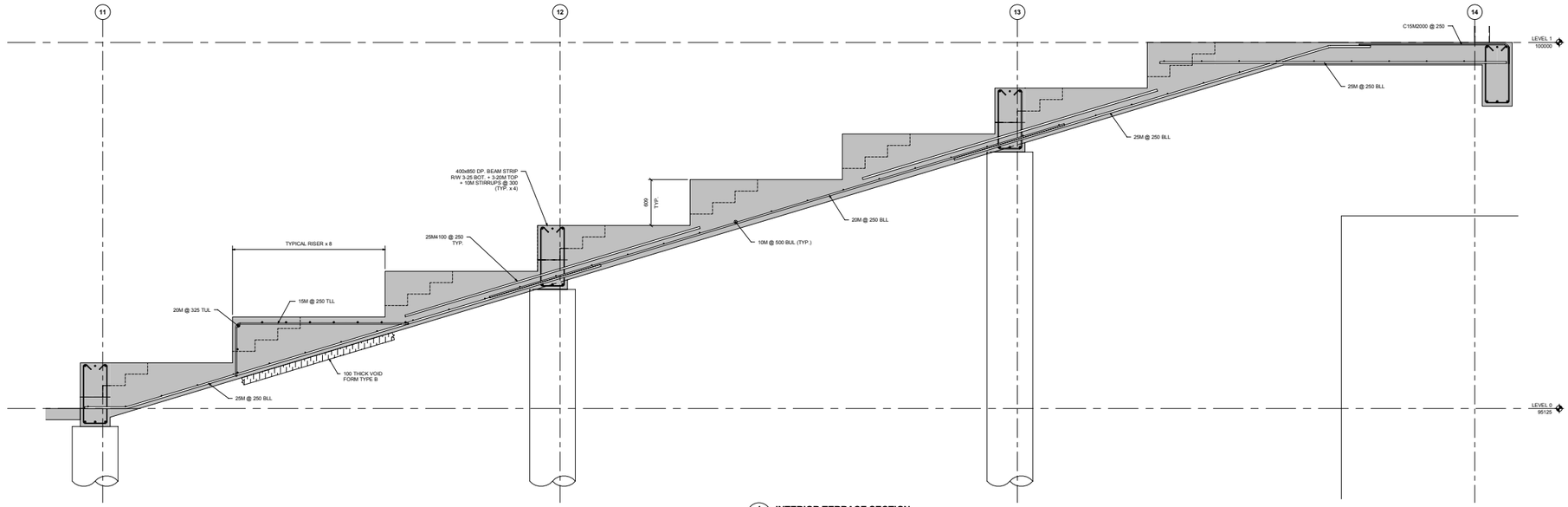
Job Number **XXX##** Work Order Number **#####**

Arch ☐ Mech ☐ Elect ☐ Strct ■ Drawn By **JS**

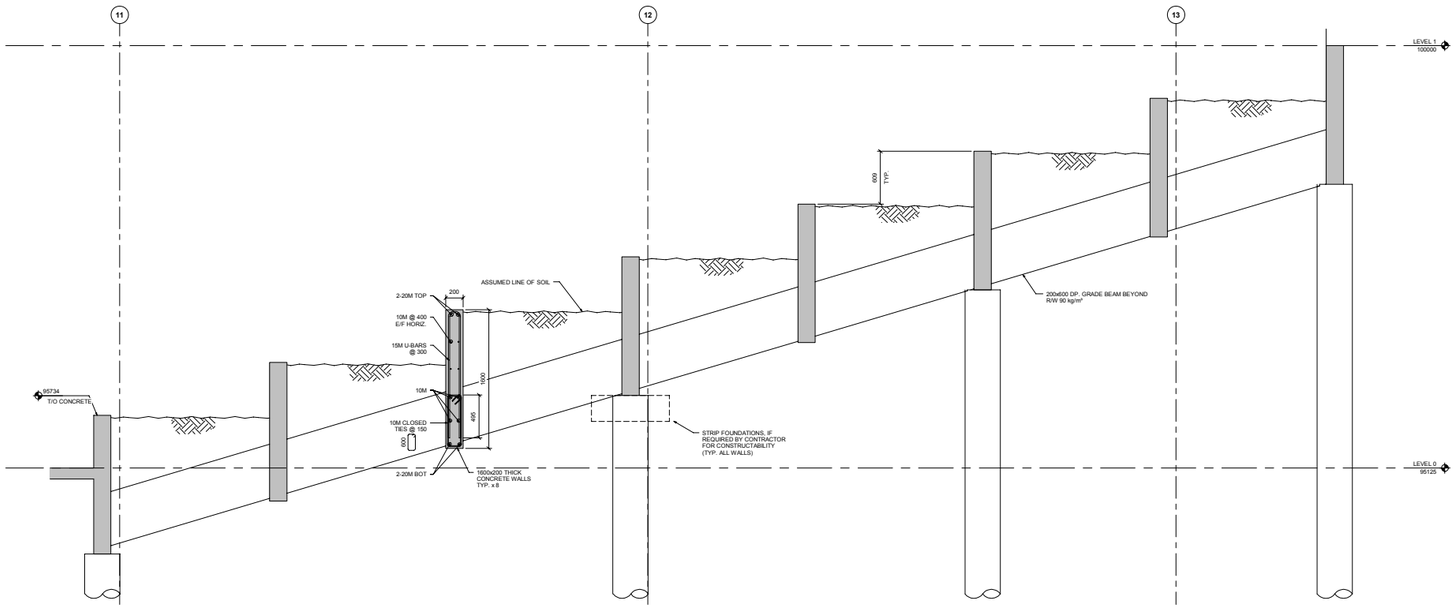
Plot Date **12/03/2013 11:49:28 AM** Issue **A** Revision

Sheet University Dwg Num

01257E02000 **S2.04**



1 S4.01 — **INTERIOR TERRACE SECTION**
1 : 20



2 S4.01 — **LANDSCAPE TIERS SECTION**
1 : 20

NOTES: REQUIRED ADDITIONAL ALLOWANCES

DRAWINGS HAVE BEEN PREPARED TO SHOW THE STRUCTURAL INTENT WITH RESPECT TO THE PRIMARY FRAMING MEMBERS AND THE LATERAL LOAD RESISTING SYSTEM. SOME SECONDARY MISCELLANEOUS STRUCTURAL ELEMENTS ARE NOT SHOWN AT THIS STAGE. AN APPROPRIATE COST ALLOWANCE FOR THESE ITEMS SHOULD BE MADE AT THIS STAGE.

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department: **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title: **SUBSTRUCTURE SECTIONS & DETAILS**

Building: **STUDENTS' UNION BUILDING #54400**

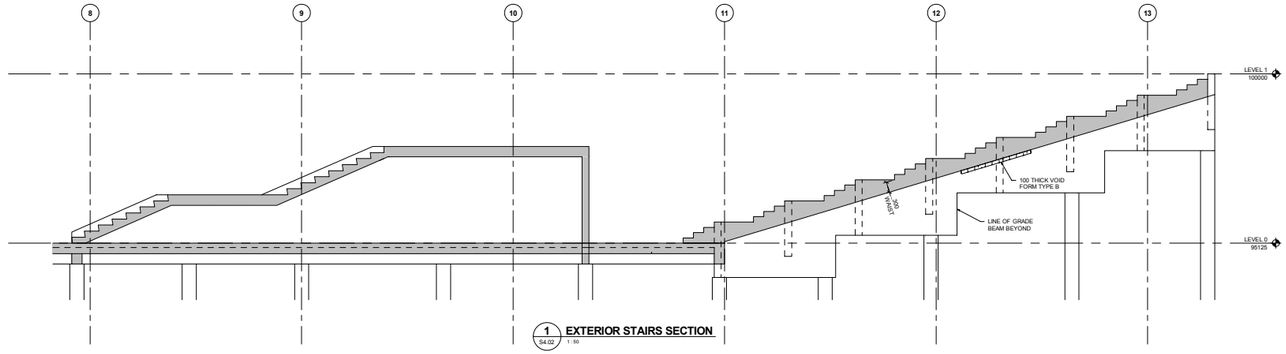
Job Number: **XXX##** Work Order Number: **#####**

Arch ☐ Mech ☐ Elect ☐ Struct ■ Drawn By: **JS**

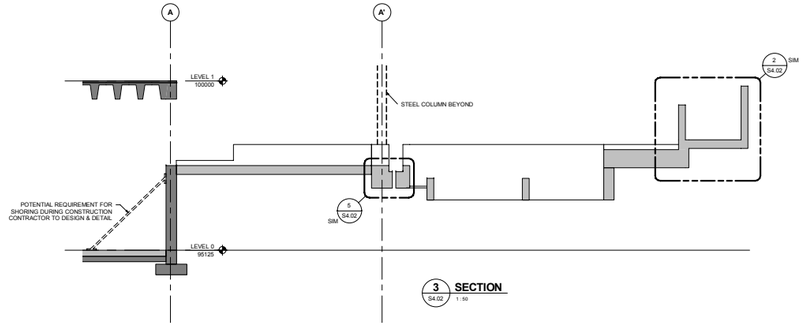
Plot Date: **12/03/2013 11:49:29 AM** Issue: **A** Revision:

Sheet: University Dwg Num:

01257E02000 **S4.01**



1 S4.02 **EXTERIOR STAIRS SECTION**
1 : 50



3 S4.02 **SECTION**
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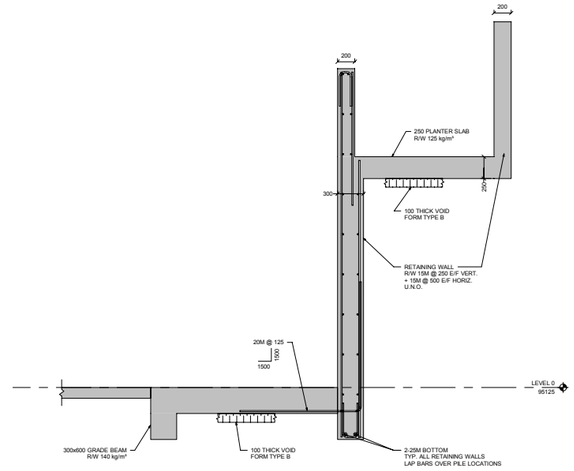

2 S4.02 **PLANTER SECTION**
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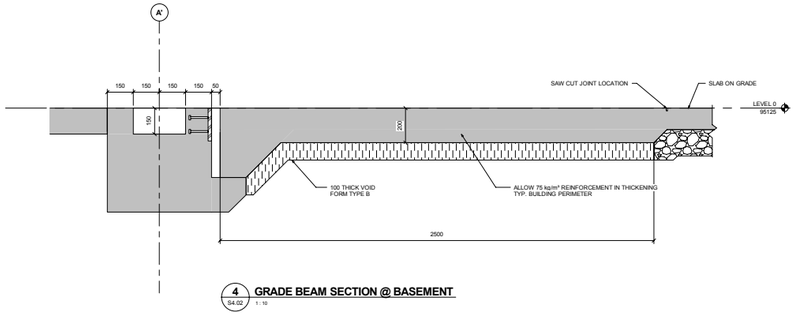
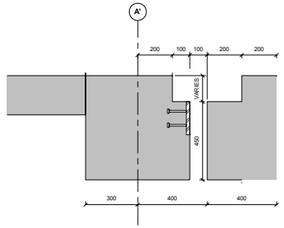


4 S4.02 **GRADE BEAM SECTION @ BASEMENT**
1 : 10



5 S4.02 **GRADE BEAM SECTION @ TERRACE**
1 : 10

6A S4.02 **EDGE SECTION - EXISTING CONDITIONS**
1 : 20

6 S4.02 **EDGE SECTION - NEW**
1 : 20

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **SUBSTRUCTURE SECTIONS & DETAILS**

Building **STUDENTS' UNION BUILDING #54400**

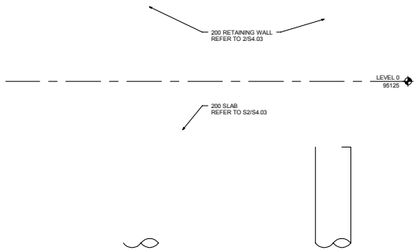
Job Number **XXX##** Work Order Number **#####**

Arch ☐ Mech ☐ Elect ☐ Struct ■ Drawn By **JS**

Plot Date **12/03/2013 11:49:40 AM** Issue **A** Revision

Sheet University Dwg Numb

01257E02000 **S4.02**



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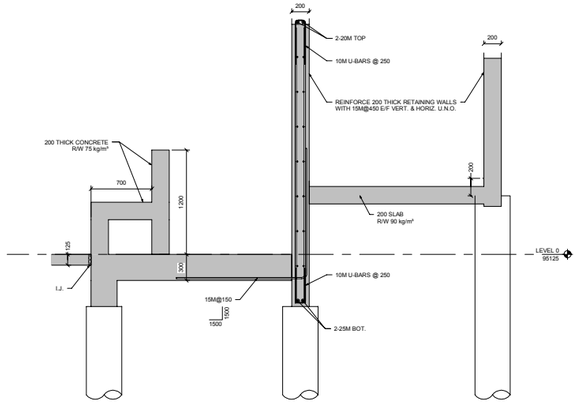

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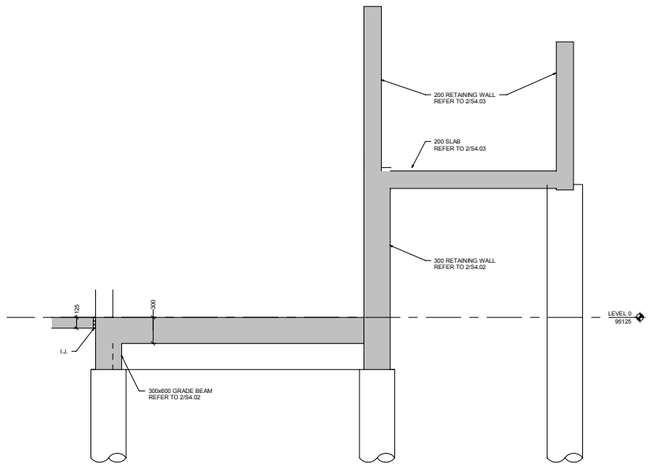

3 SECTION
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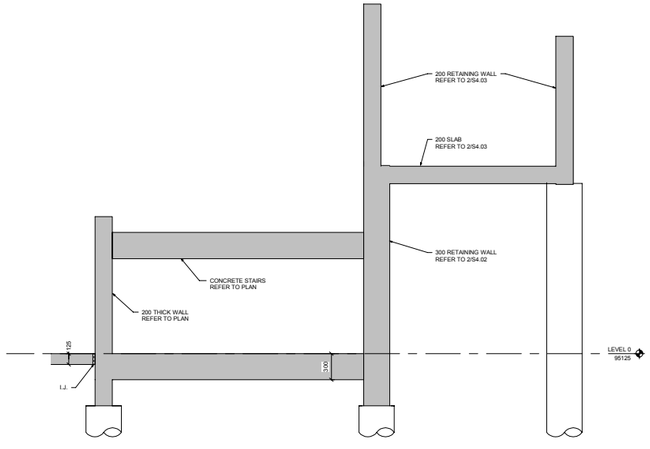

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S4.03 1 : 20

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Issue

Letter	Date	By	Description
A	2013.02.15	RR	Issued for DD
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department **STUDENTS' UNION BUILDING**

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Dwg Title **SUBSTRUCTURE SECTIONS & DETAILS**

Building **STUDENTS' UNION BUILDING #54400**

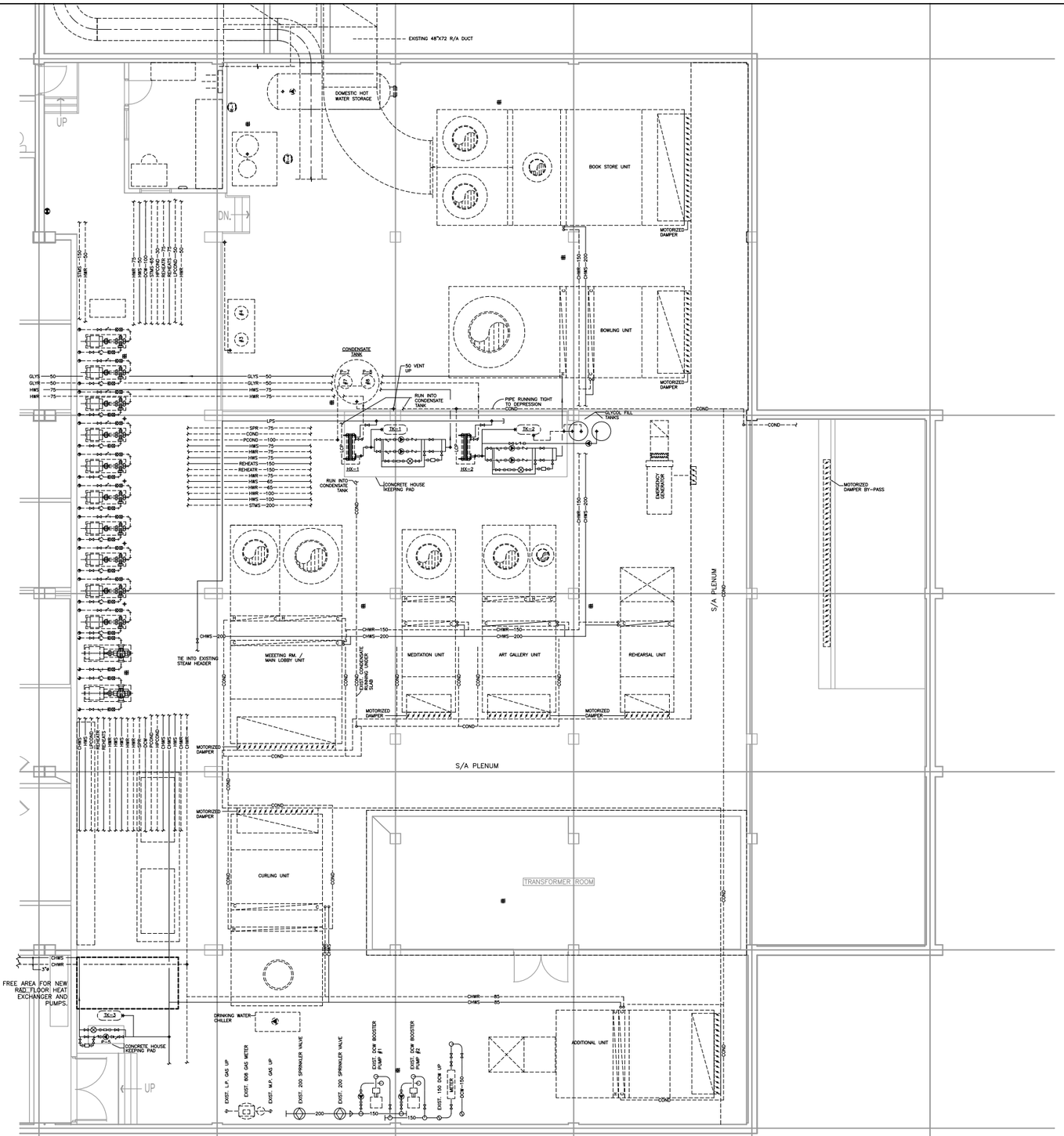
Job Number **XXX##** Work Order Number **#####**

Arch ☐ Mech ☐ Elect ☐ Strct ■ Drawn By **JS**

Plot Date **12/03/2013 11:49:41 AM** Issue **A** Revision

Sheet University Dwg Num

01257E02000 **S4.03**



1 M1 LARGE SCALE MECHANICAL ROOM

SCALE: 1:50

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Issue

Letter	Date	By:	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By:	Description

Faculty/Department: STUDENTS' UNION BUILDING

ADDITION AND RENOVATION

Client Approval Date:

Dwg Title: **LARGE SCALE MECHANICAL PLAN**

Building: **STUDENTS' UNION BUILDING #54400**

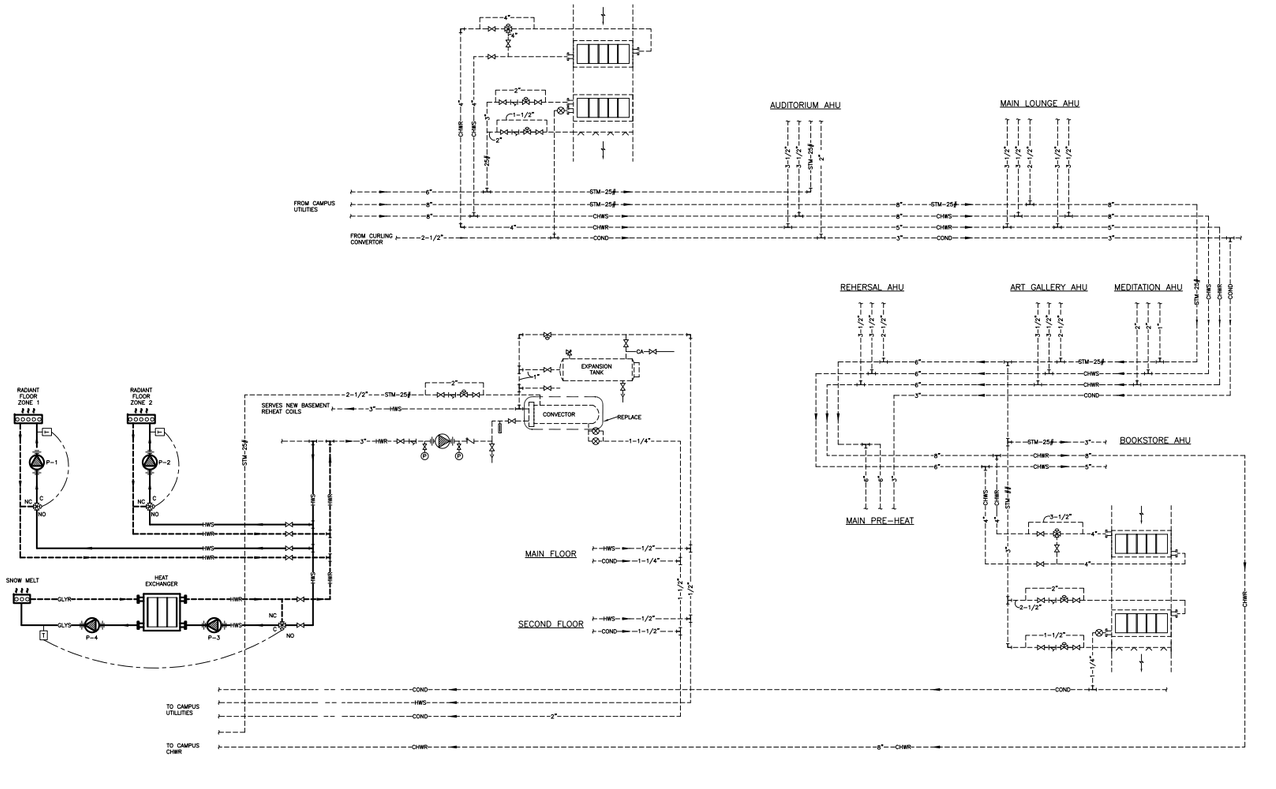
Job Number: XXX## Work Order Number: #####

Arch ☐ Mech ☐ Elect ☐ Struct ☐ Drawn By: DW

Plot Date: 15/02/2013 Issue: A Revision:

Sheet: University Dwg Num:

01257E02000 **M1**



1 M2 MECHANICAL SCHEMATIC
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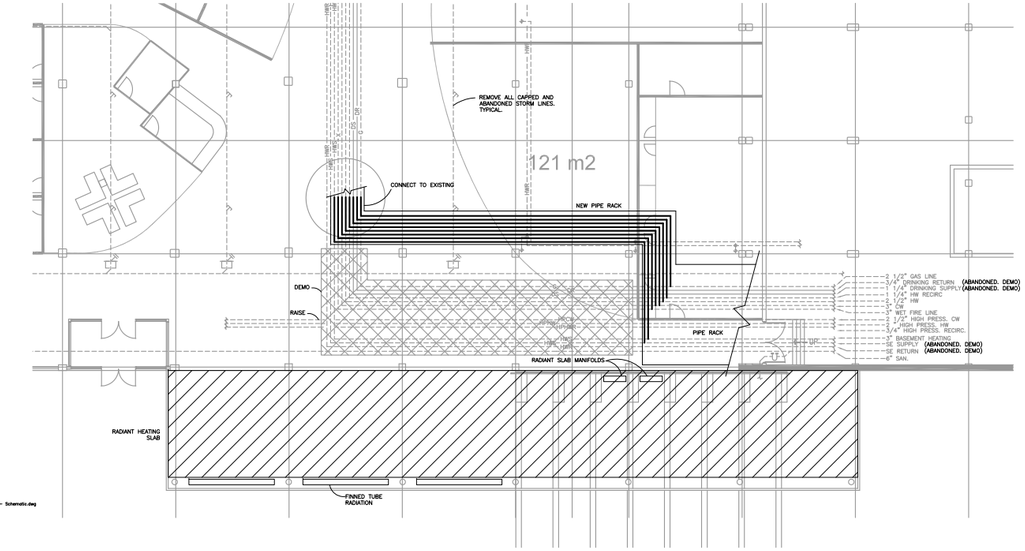

2 M2 PIPING PLAN
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Issue

Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department: STUDENTS' UNION BUILDING

ADDITION AND RENOVATION

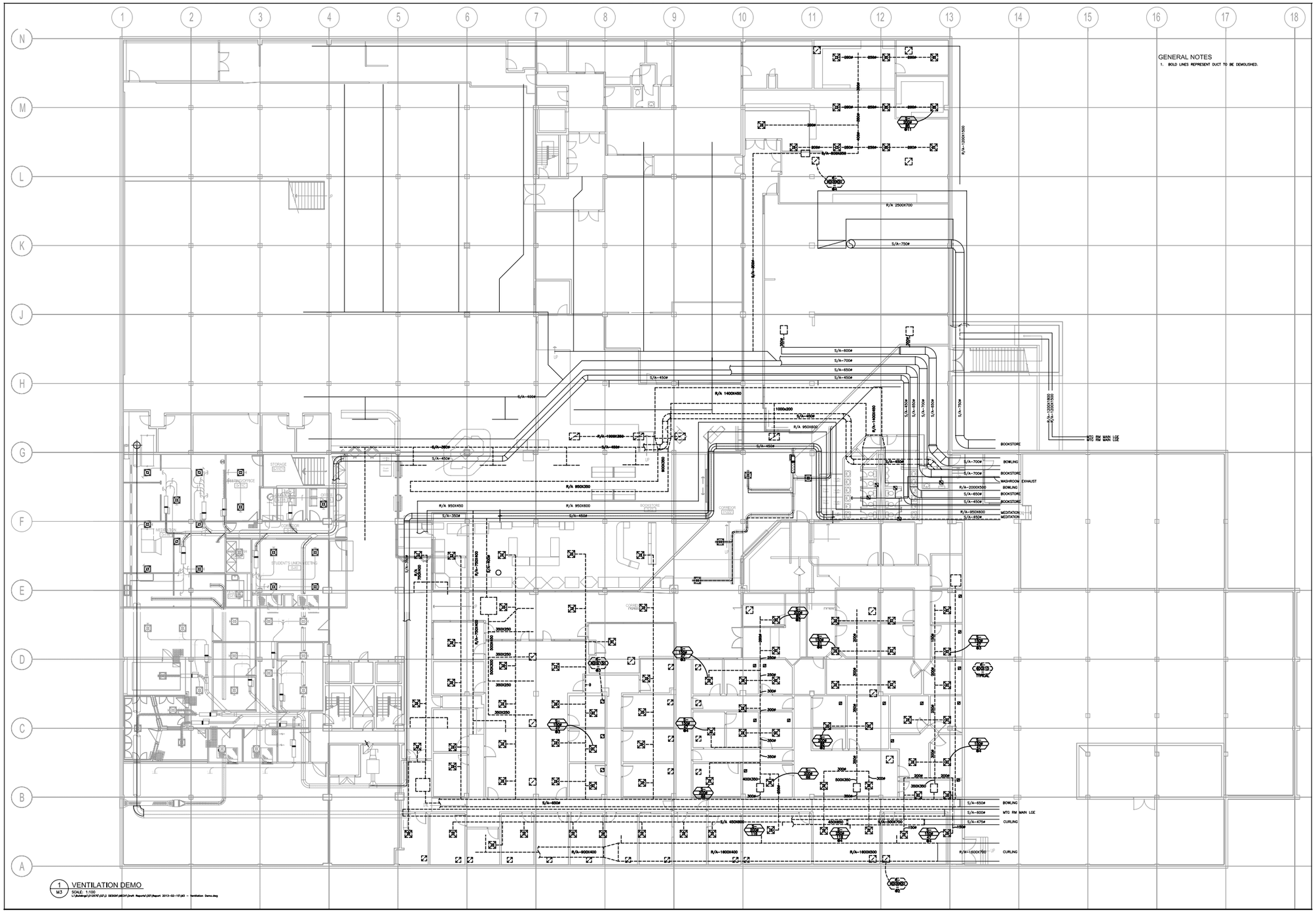
Client Approval Date

Dwg Title: **SCHEMATIC AND PIPING PLAN**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number	XXX##	Work Order Number	#####
Arch ☐ Mech ☐ Elect ☐ Struct ☐		Drawn By	DW
Plot Date	15/02/2013	Issue	A
Revision			
Sheet		University Dwg Num	

01257E02000 **M2**



1 M3 VENTILATION DEMO
SCALE: 1:100
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Issue

Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department: STUDENTS' UNION BUILDING

ADDITION AND RENOVATION

Client Approval Date

Dwg Title: **VENTILATION DEMO**

Building: STUDENTS' UNION BUILDING #54400

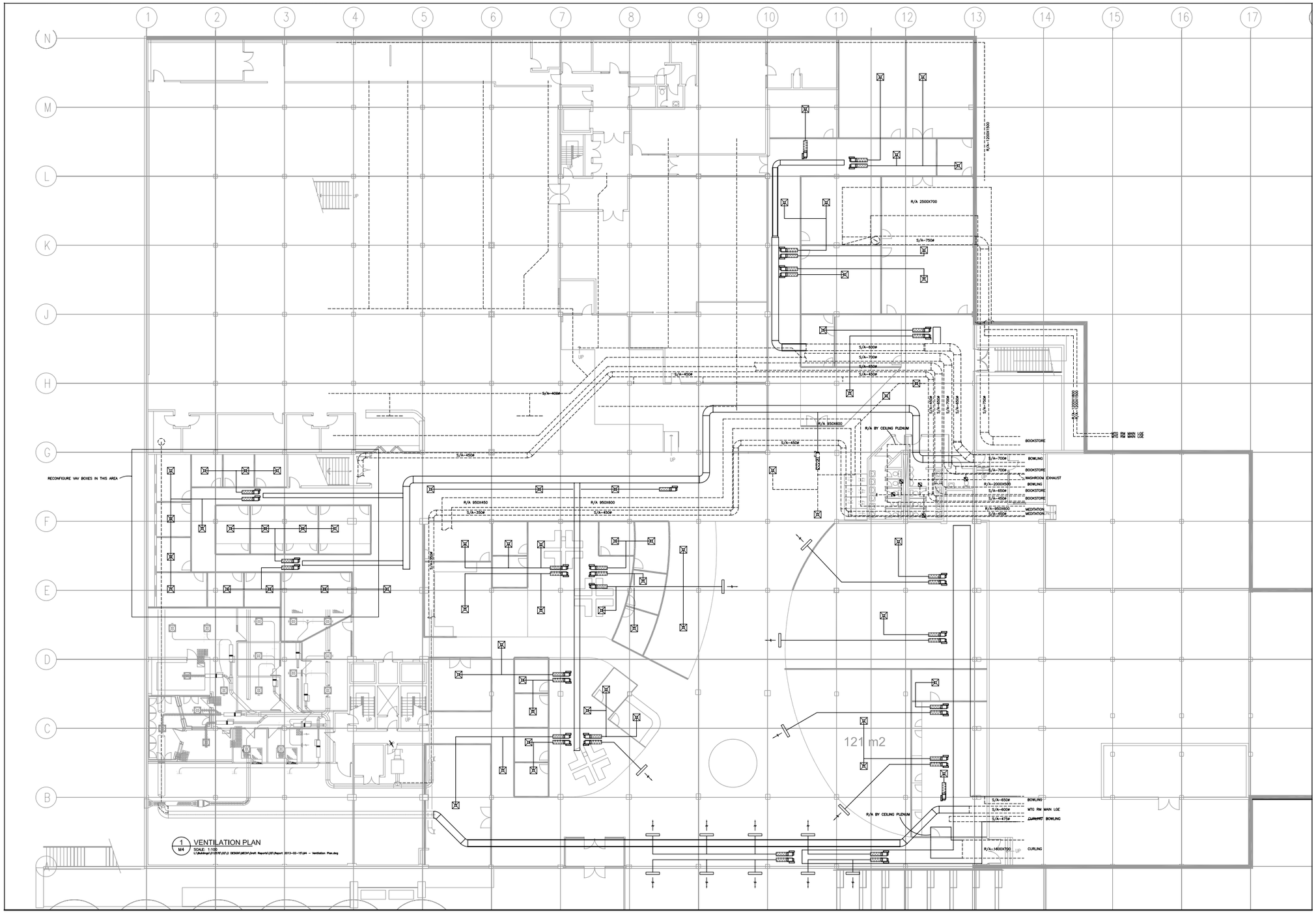
Job Number: XXX## | Work Order Number: #####

Arch ☐ Mech ☐ Elect ☐ Struct ☐ | Drawn By: DW

Plot Date: 13/02/2013 | Issue: A | Revision

Sheet | University Dwg Num

01257E02000 | M3



1 M4 VENTILATION PLAN
SCALE: 1:100
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Issue

Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department STUDENTS' UNION BUILDING

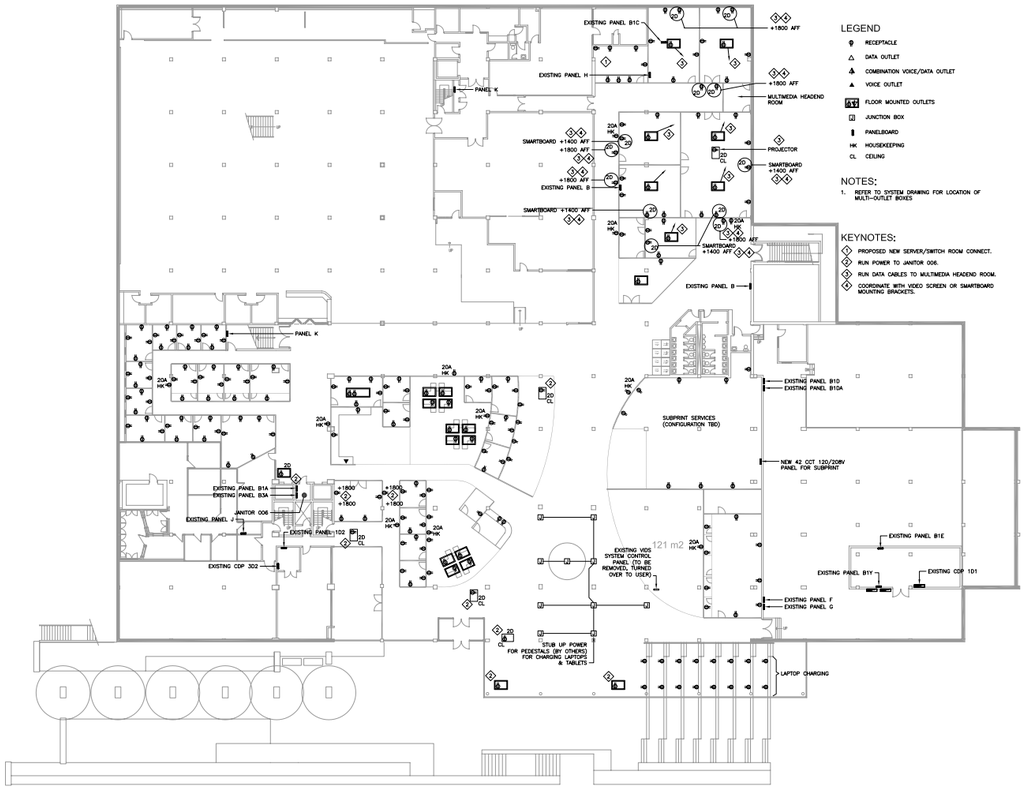
ADDITION AND RENOVATION

Client Approval Date

Dwg Title **VENTILATION PLAN**

Building **STUDENTS' UNION BUILDING #54400**

Job Number XXX##		Work Order Number #####	
Arch ☐ Mech ☐ Elect ☐ Struct ☐		Drawn By DW	
Plot Date 13/02/2013		Issue A	Revision
Sheet		University Dwg Num	
01257E02000			M4



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Issue

Letter	Date	By	Description
A			
B			
C			
D			
E			
F			
G			
H			

Revision

Letter	Date	By	Description

Faculty/Department: STUDENTS' UNION BUILDING

ADDITION AND RENOVATION

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Dwg Title: **LOWER LEVEL POWER PLAN**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number – | Work Order Number –

Arch ☐ Mech ☐ Elect ■ Struct ☐ | Drawn By: Author

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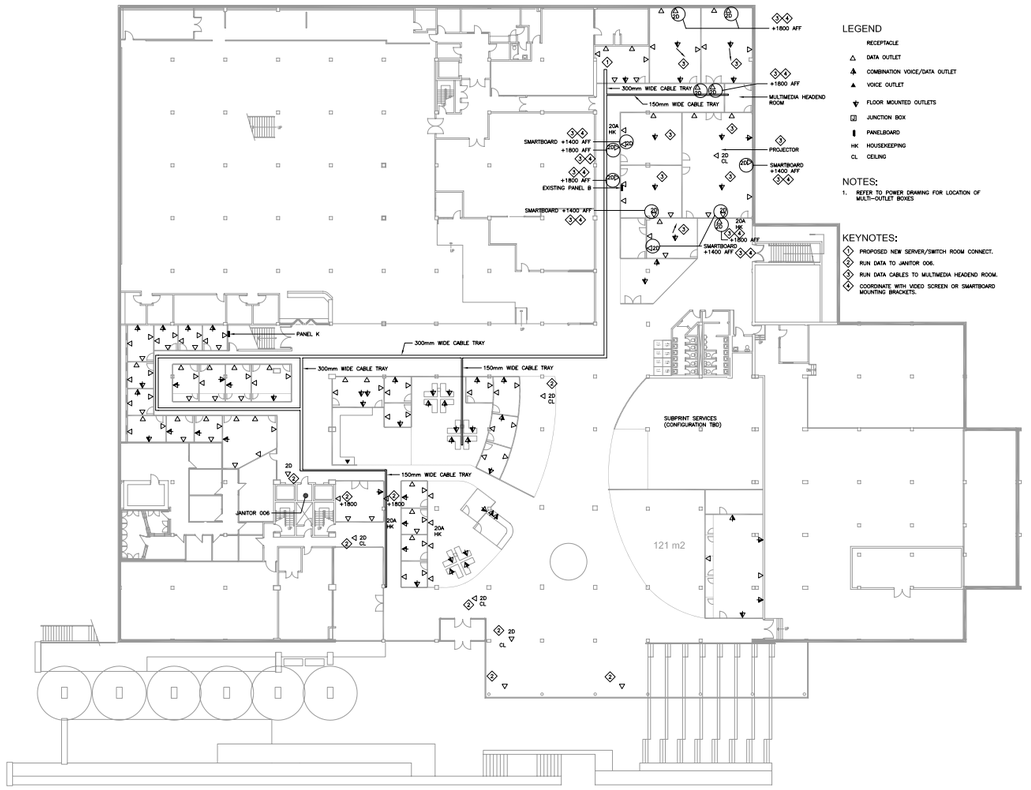

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Key Plan

NORTH

Issue

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Revision

Letter	Date	By	Description

Faculty/Department STUDENTS' UNION BUILDING

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **LOWER LEVEL SYSTEMS PLAN**

Building **STUDENTS' UNION BUILDING #54400**

Job Number –

Work Order Number –

Arch ☐ Mech ☐ Elect ■ Struct ☐

Drawn By **Author**

Plot Date –

Issue **E**

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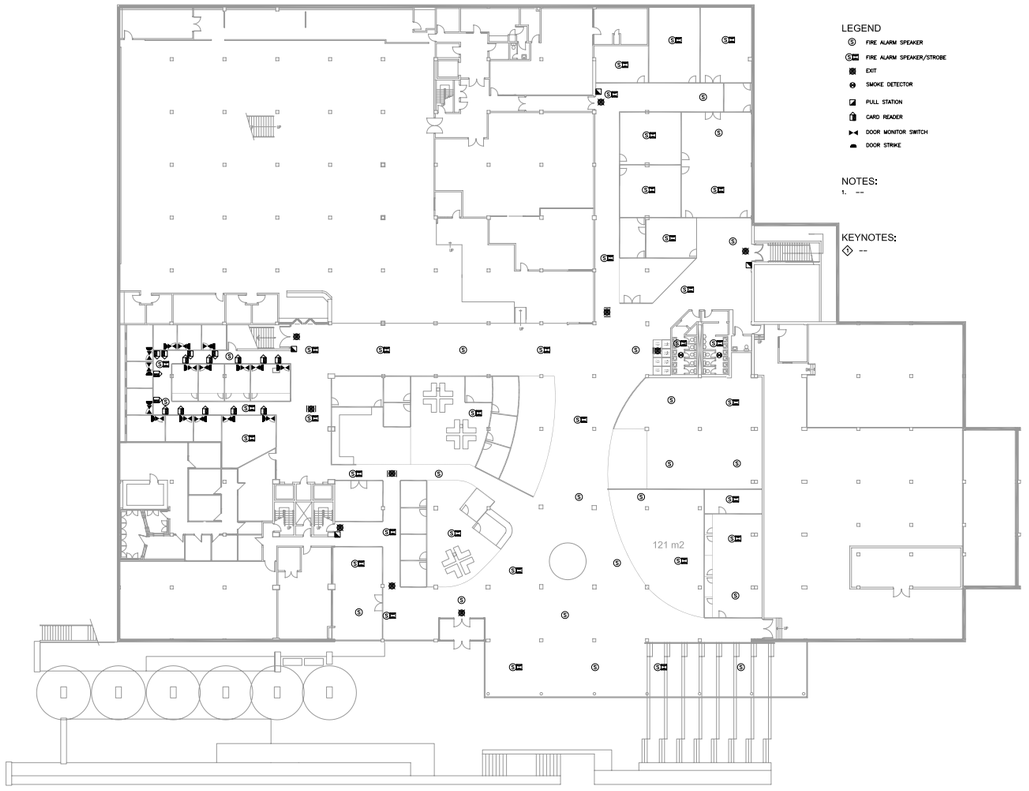

LEGEND

- FIRE ALARM SPEAKER
- FIRE ALARM SPEAKER/STROBE
- EXIT
- SMOKE DETECTOR
- PULL STATION
- CARD READER
- DOOR MONITOR SWITCH
- DOOR STRIKE

NOTES:

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Faculty/Department STUDENTS' UNION BUILDING

ADDITION AND RENOVATION

Client Approval Date

Dwg Title **LOWER LEVEL PROPOSED FIRE PLAN AND MASS NOTIFICATION SECURITY**

Building **STUDENTS' UNION BUILDING #54400**

Job Number —

Work Order Number —

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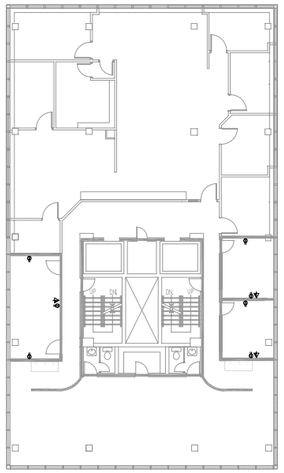

1 E205 LEVEL 3 POWER & SYSTEMS PLAN
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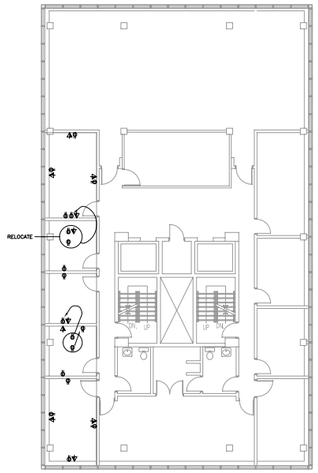

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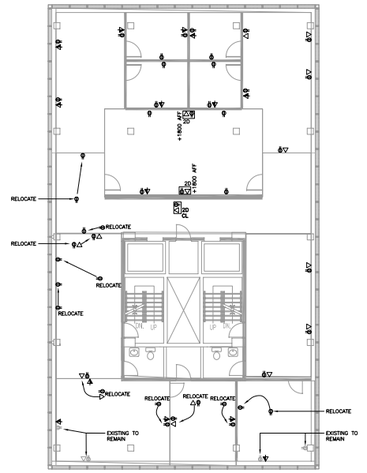

3 E205 LEVEL 6 POWER & SYSTEMS PLAN
SCALE: NTS

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Revision

Letter	Date	By	Description

Faculty/Department: **STUDENTS' UNION BUILDING**

ADDITION AND RENOVATION

Client Approval Date

Dwg Title: **LEVEL 3,4 AND 6 POWER & SYSTEMS PLANS**

Building: **STUDENTS' UNION BUILDING #54400**

Job Number: –
Work Order Number: –
Arch ☐ Mech ☐ Elect ■ Strct ☐
Drawn By: **Author**
Plot Date: –
Revision: **E**
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FINAL Item No. 5

OUTLINE OF ISSUE

Agenda Title: **Appendix XIX: South Campus Long Range Development Plan Amendment 2013**

Motion: THAT the GFC Facilities Development Committee recommends to the Board of Governors, on the recommendation of Planning and Project Delivery, the proposed *Appendix XIX: South Campus Long Range Development Plan Amendment 2013*, as set forth in Attachment 2, as the basis for further planning; and recommends to the Board of Governors the concurrent rescission of 'Section 6.2' of the *Long Range Development Plan 2002*.

Item

Action Requested	☐Approval ☒Recommendation ☐Discussion/Advice ☐Information
Proposed by	Don Hickey, Vice-President, Facilities and Operations
Presenter	Bart Becker, Associate Vice-President (Facilities and Operations); Ben Louie, University Architect, Facilities and Operations; and Anastasia Lim, Executive Director, University Relations
Subject	*Appendix XIX: South Campus Long Range Development Plan Amendment 2013*

Details

Responsibility	Vice President (Facilities and Operations)
The Purpose of the Proposal is (please be specific)	Concluding over four years of campus planning activities and in consultation with neighboring communities consistent with *Appendix XVIII: University of Alberta Consultation Protocol*, the purpose is to amend the University's *Long Range Development Plan* (*LRDP*) and, more specifically, Sectors 12, 13, and 14 located at the University's South Campus,
The Impact of the Proposal is	The proposed plan and consultation report are submitted through University Governance to seek a formal approval of the *LRDP* amendment by the Board of Governors by June, 2013.
Replaces/Revises (eg, policies, resolutions)	Replaces Section 6.2 in the *LRDP*. To review this section of the LRDP, as it is currently set out, see: http://www.facilities.ualberta.ca/~/media/facilities/Documents/PlanningProjDelDOCS/LRDP2002.pdf
Timeline/Implementation Date	Upon final approval by the Board of Governors.
Estimated Cost	N/A
Sources of Funding	N/A
Notes	N/A

Alignment/Compliance

Alignment with Guiding Documents	*Dare to Discover*; Academic Plan (*Dare to Deliver*); Long Range Development Plan (LRDP); and University of Alberta Comprehensive Institutional Plan (CIP)
Compliance with Legislation, Policy and/or Procedure Relevant to the Proposal (please quote legislation and include identifying section numbers)	1. ***Post-Secondary Learning Act* (*PSLA*)**: The *PSLA* gives GFC responsibility, subject to the authority of the Board of Governors, over academic affairs (Section 26(1)) and provides that GFC may make recommendations to the Board of Governors on a building program and related matters (Section 26(1) (o)). Section 18(1) of the PSLA give the Board of Governors the authority to make any bylaws "appropriate for the management, government and control of the university buildings and land." Section 19 of the *Act* requires that the Board "consider the recommendations of the general faculties council, if any, on matters of academic import prior to providing for (a) the support and maintenance

of the university, (b) the betterment of existing buildings, (c) the construction of any new buildings the board considers necessary for the purposes of the university [and] (d) the furnishing and equipping of the existing and newly erected buildings [.] […]" Section 67(1) of the *Act* governs the terms under which university land may be leased.

2. **GFC Facilities Development Committee (FDC) Terms of Reference – Section 3. Mandate of the Committee**:

"1. **Policy Matters**

The Facilities Development Committee is responsible for making recommendations to the Academic Planning Committee or the Board of Governors concerning policy matters with respect to the following. (GFC 29 SEP 2003

A. Planning

1. Comprehensive facilities development plan.

B. Facilities

1. Planning and use of physical facilities, including parking facilities and transportation. (GFC 29 SEP 2003)
2. Use of land owned or leased by the University.
3. Standards, systems and procedures for planning and designing physical facilities."

3. **Board Finance and Property Committee (BFPC) Terms of Reference – Section 3. Mandate of the Committee**: "[…]

3. MANDATE OF THE COMMITTEE

Except as provided in paragraph 4 and in the Board's General Committee Terms of Reference, the Committee shall monitor, evaluate, advise and make decisions on behalf of the Board with respect to all strategic and significant financial and property matters and policies of the University. The Committee shall also consider any other matter delegated to the Committee by the Board.

Without limiting the generality of the foregoing, the Committee shall: […]

Policies

n) review and recommend to the Board policies regarding the acquisition, management, control and disposition of University buildings, land and equipment and regarding individual project proposals and the implications of these short and long-range capital plans to the strategic vision of the University[.] […]

4. LIMITATIONS ON DELEGATION BY THE BOARD

The general delegation of authority by the Board to the Committee shall be limited as set out in this paragraph. Notwithstanding the

	general delegation of authority to the Committee set out in paragraph 3, the Board shall: […] f) approve policies regarding the acquisition, management, control and disposition of University buildings, land and equipment and regarding individual project proposals and the implications of these short and long-range capital plans to the strategic vision of the University[.] […]"

Routing (Include meeting dates)

Consultative Route (parties who have seen the proposal and in what capacity)	GFC Facilities Development Committee (proposed amendment of the University's Long Range Development Plan) – October 25, 2012; GFC Facilities Development Committee (South Campus – Sustainability Pillars) – January 24, 2013; Consultation report for Appendix XIX: South Campus Long Range Development Plan Amendment 2013 (see attachment)
Approval Route (Governance) (including meeting dates)	GFC Facilities Development Committee (for recommendation) – April 25, 2013; Board Finance and Property Committee (for recommendation) – May 28, 2013; Board of Governors (for final approval) – June 21, 2013
Final Approver	Board of Governors

Attachments:

1. Attachment 1 (pages 1 – 3) – Briefing Note
2. Attachment 2 (pages 1 – 109) – Appendix XIX: South Campus Long Range Development Plan Amendment 2013

Prepared by: Ben Louie, University Architect, Facilities and Operations, 780-248-1434, ben.louie@ualberta.ca

Appendix XIX:
South Campus Long Range Development Plan Amendment 2013

Attachment 1

Background

Consultation on the land use plan for the University's South Campus has been ongoing since 2008. After considerable planning and community consultation, the University has begun the formal process of amending the Long Range Development Plan (LRDP) as it pertains to Sectors 12, 13 and 14.

In addition to the existing nine (9) planning principles within the existing 2002 LRDP, the principles of smart growth and planned communities have been further developed and incorporated into the amended plans. These principles reference best practices and adopted a triple bottom line approach that balances the environmental, economic and social aspects of sustainability.

Seven (7) Sustainable Themes of Development were identified and developed as the sustainability pillars in the development of the Sector Plans of South Campus, and include:

- Energy Efficiency
- Waste and Wastewater Management
- Water and Storm water Management
- Ecology and the Environment
- Transportation
- Built Environment
- Health and Complete Communities.

Over the past 4 years there have been numerous consultation meetings in the form of; faculty meetings with Agricultural, Life and Environmental Sciences (ALES) and Physical Education and Recreation (PER), Community Consulting Committee/South Campus Neighbourhood Committee meetings, planning element focus groups (transportation, history, sustainability, built-form), individual neighbourhood meetings, and community wide Open Houses. The result of these discussions has resulted in a series of active dialogues that has resulted in the development of land use plans that are different from that which was approved by the Board in 2002. At this time the university and the communities agree that these discussion should be captured and that the LRDP should be formally amended as it pertains to Sectors 12,13, and 14. In accordance with the consultation process outlined within the LRDP, two formal community wide open houses were held on September 26, 2012 and March 14, 2013. The community was provided access to the Open House materials on-line, with the submission of comments closing 3 weeks later on October 17, 2012 and April 4, 2013 respectively.

Presentation boards for the September 26, 2012 Public Information Open House, together with a summary community consultation and evaluations were presented to Facilities Development Committee (FDC) members on October 25, 2012 to review the consultation comments received to date as well as obtain further opinion and comment for integration into our consultation summary.

Updated goals, challenges and opportunities for each of the seven (7) sustainability pillars were also presented to FDC members on January 24, 2013 for discussion.

Issues

The proposed revised land use plans for Sectors 12, 13 and 14, consultation report consistent with Appendix 18: University of Alberta Consultation Protocol, evaluation summaries of two open houses, and the University's responses are incorporated into Appendix XIX: South Campus Long Range Development Plan Amendment 2013. This document is submitted through University Governance to seek a formal approval of the LRDP amendment by the Board of Governors by June 2013. When approved, Appendix XIX: South Campus Long Range Development Plan Amendment 2013 will replace Section 6.2 in the Long Range Development Plan 2002.

The following is a summary of substantive land use elements and design principles that have remained, as well as those that have been changed.

What Has Been Maintained:

1. Nine (9) Strategic Principles from the 2002 LRDP.
2. Population of 15,000 students, plus associated faculty and staff.
3. Campus focus on academics and research and the infrastructure to support the delivery of the academic vision.
4. No public thorough-fare of traffic allowed through Sector 12 or 13 or onto 62 Avenue from Sector 14.
5. Sector 13 remains designated as agricultural research.

What has changed:

1. **Transportation** developments:
   a. Removal of large public surface parking lots to three structured parking facilities (parkades) in proximity to the entry points to the campus.
   b. Reduction of the parking ratio from 1 stall/4 students to 1 stall/5 students.
   c. Addition of a public road access on the east side of campus at 61 Avenue and 115 Street to access the southeast parking structure.
   d. Addition of a restricted access to Sector 13 Agricultural Research Lands onto 51 Avenue.
   e. Provision of transit/emergency vehicle-only access to Grandview Heights neighborhood from Sector 14.
   f. Proposal of an alternative access location. This concept requires further discussion with the Federal Government.
2. **Sector 12** developments:
   a. Increase in the amount of Recreation/Shared Use area.
   b. Formalization of the Transition area for development of Residences (adjacent to 122 Street) and identification of additional Residence zone east of the LRT.
   c. Formalization of the Open Space zone along the east side of 122 Street.
   d. Relocation of the Storm Water Management pond, to be fully developed as an integrated constructed wetland and bio-swale system.
   e. Relocation of the University Support area to the interior of campus.
3. **Sector 14** developments:
   a. Expansion of Transition zone and its formalization as Residential development.
   b. Addition of a Landscaped Open Space zone with a multi-use trail and plantings on the southern boundary with the Lansdowne neighbourhood (north of the existing alley).
   c. Addition of street-facing low density Residential development on the northern boundary with the Grandview Heights neighbourhood (south of 62 Avenue).
   d. Addition of a Mixed Use development area.
   e. Reduction in the amount of Academic/Research Partnership lands.

f. Incorporation of an integrated constructed wetland and bio-swale system for Storm Water Management.

Recommendation

THAT the GFC Facilities Development Committee recommends to the Board of Governors, on the recommendation of Planning and Project Delivery, the proposed *Appendix XIX: South Campus Long Range Development Plan Amendment 2013*, as set forth in Attachment 2, as the basis for further planning; and recommends to the Board of Governors the concurrent rescission of 'Section 6.2' of the *Long Range Development Plan 2002*.

APPENDIX XIX: SOUTH CAMPUS LONG RANGE DEVELOPMENT PLAN Amendment 2013

BUILDING ON VISION
UNIVERSITY OF ALBERTA

REPLACES SECTION 6.2 IN THE LONG RANGE DEVELOPMENT PLAN 2002

What is a Long Range Development Plan?

The LRDP is responsive to the University's Academic Plan, Strategic Research Plan and the Strategic Business Plan. It is, therefore, a flexible document rather than a rigid template (or 'master plan') and it will need amendment when substantial alterations are made in the University's guiding plans.

The LRDP identifies a set of Strategic Planning Principles that should form the basis for achievement of the goals, objectives and strategies expressed in the Academic, Research and the Business Plans. It identifies as well how the University lands and facilities should be developed in response to these plans and it outlines the operational planning initiatives and guidelines that will direct development.

The LRDP is the overall organizing framework for development and is approved by the Board of Governors as the guiding document for physical planning. The University will develop detailed administrative plans for various geographic sectors of the University in conjunction with the timing of development in these sectors.

Why is the Long Range Development Plan Needed?

The University has always maintained a sufficient land base to meet its development requirements. However, from time to time, it is necessary to review the ways in which it plans development of those lands. The existing LRDP is over 30 years old, thus past its period of relevance. It is time for a new strategic review of the long range development needs and plan for them.

With growth continuing at the University of Alberta, and approaching new and higher rates of growth, continued facilities growth requires a useful framework within which to deploy its physical assets effectively, efficiently and in a timely manner in response to academic and research priorities.

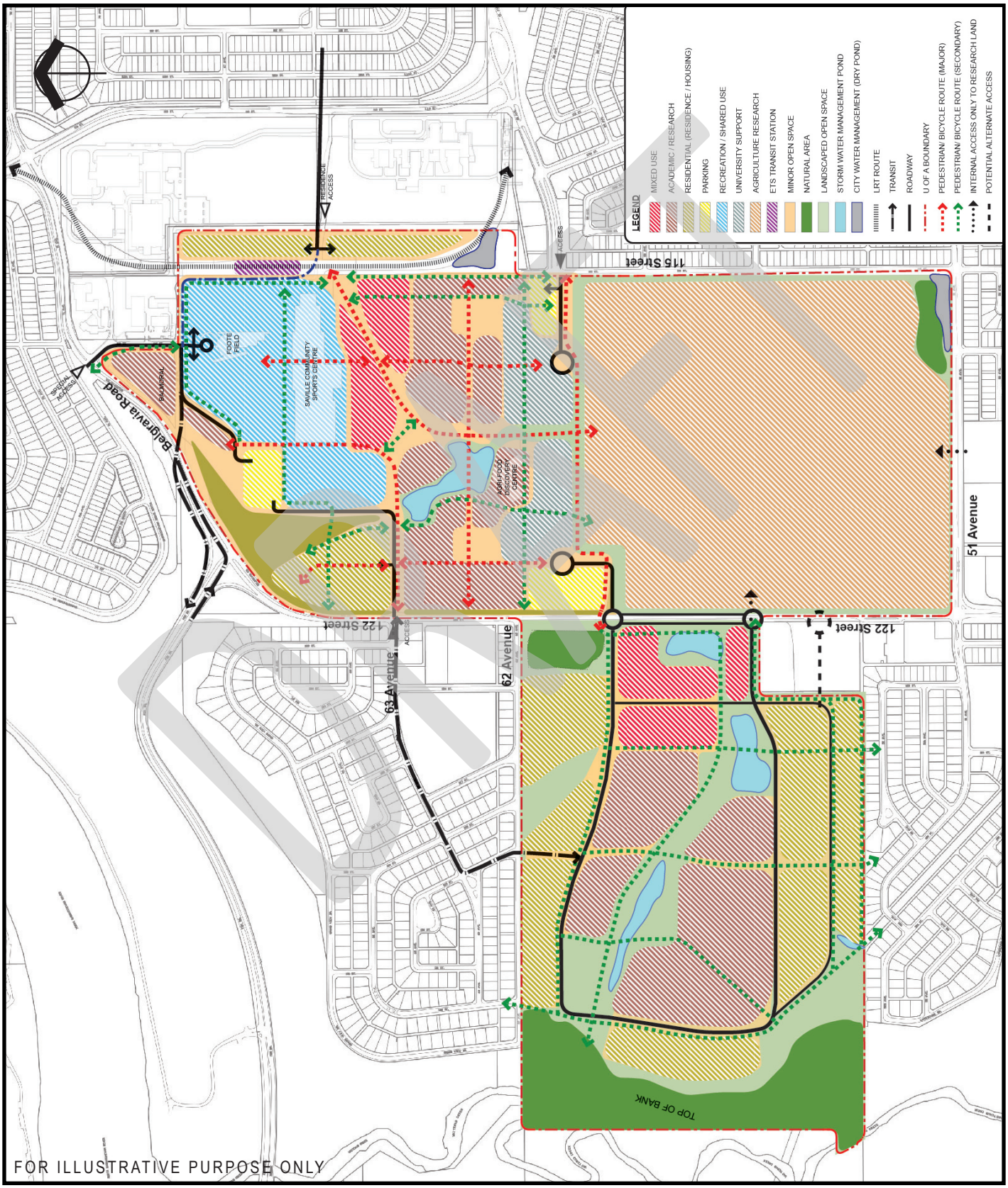


FIGURE 1 (EXHIBIT 27 - 2002)

6.2 South Campus

South Campus will accommodate much of the growth of the University of Alberta for the next thirty years. Over time, it may accommodate faculties and other activities from North Campus, as well as new faculties and new areas of teaching, research and development.

South Campus is planned in a manner consistent with the February 2001 direction from the University Board of Governors, whereby three sectors will be developed over time:

South Campus Sector	Size in hectares
Sector 12	Approximately 75 ha
Sector 13	Approximately 74 ha
Sector 14	Approximately 94 ha

Architectural guidelines will encourage a diversity of quality, signature architecture. Significant green spaces will be created as an amenity to those on-site and in the adjacent communities. Development will be graduated from lower density at the edges of campus to higher density in the centre.

South Campus will be developed based upon a series of Smart Growth and Planned Communities Principles that will ensure the creation of an exemplary campus community.

Smart Growth Principles

- Pursue a healthy and sustainable campus
- Realize operation, academic and social benefits to the University and surrounding communities
- Promote greater connections and communication with the surrounding community
- Create lasting, meaningful and accessible places
- While the U of A needs to maintain barrier-free access and service ability to various facilities, it will promote a pedestrian-oriented campus to the extent possible
- Smart Growth appreciates that a campus will need to be phased as a campus develops

Planned Community Principles

South Campus will embody and balance social, ecological, and economic sustainability in every aspect of its design and function by:

- Enhancing and building upon the existing sustainability and resource stewardship philosophy of the University of Alberta by balancing the three spheres of sustainability: social, economic and environmental;
- Creation of an academic and residential environment which fosters the energetic exchange of ideas and creates a unique sense of place;
- Promoting opportunities for South Campus to act as a living laboratory, utilizing the site for the testing and integration of future urban design innovations;
- Provide strong connections with neighbouring communities, allowing for shared amenities and services;
- Support and advance the university's goal of becoming one of the world's top public educational institutions; and
- Making optimal use of the university's budgetary resources and partnership funding.

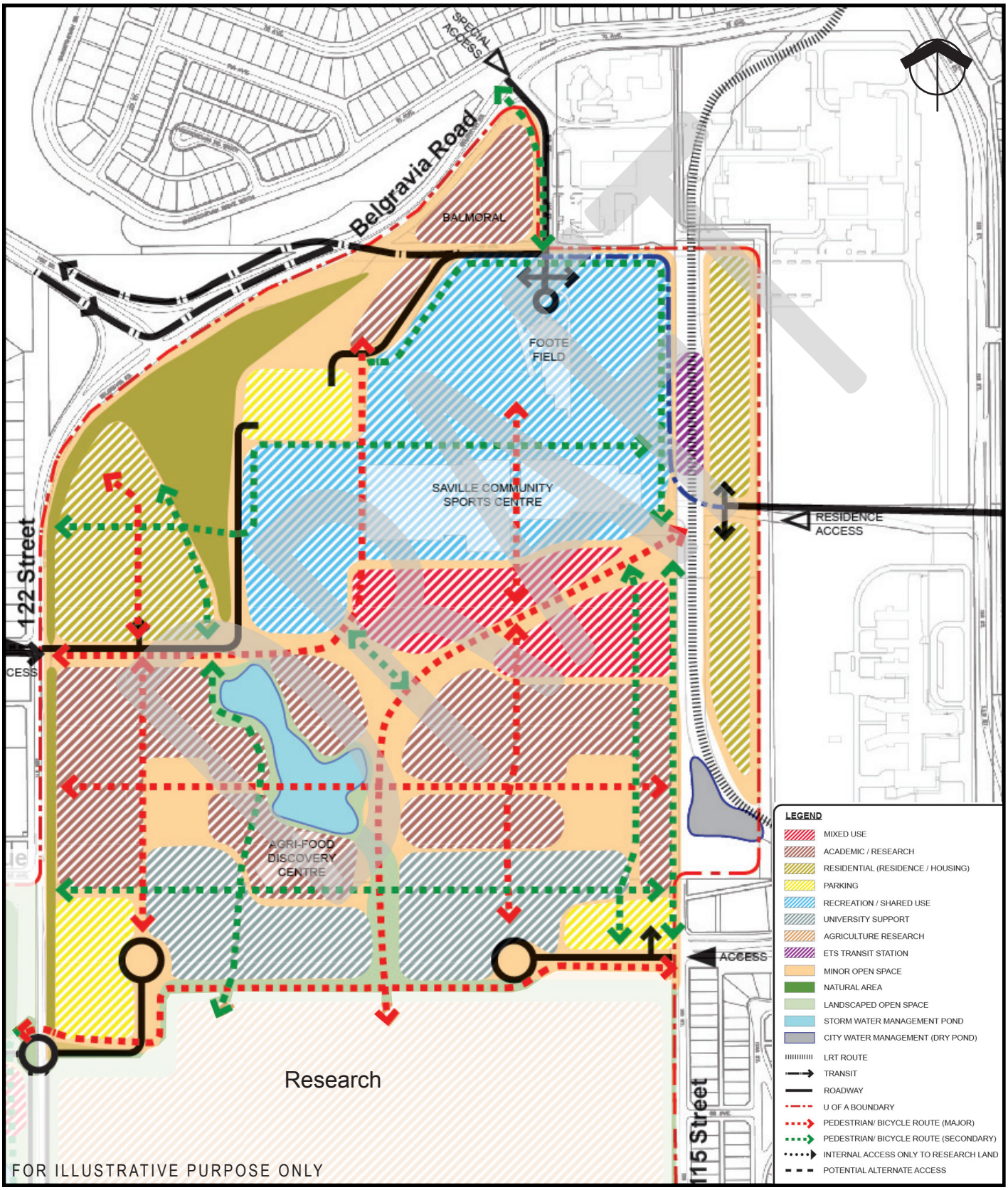


FIGURE 2 (EXHIBIT 28 - 2002)

6.2.1 Sector 12

The physical character of this academic/research sector of South Campus will contrast that of North Campus: it will be park-like; development will be lower in density in order to be compatible with its suburban surroundings; and although accessible by urban roads and transit, it will be pedestrian-oriented.

Over the next 30 years, approximately 15,000 students are projected, resulting in an estimated need of:

- Between 200,000 – 300,000 square meters of new research space;
- Between 200,000 – 300,000 square meters of new teaching and university support space; and
- Housing and residence facilities for up to 5,000 students.

South Campus may grow initially as a specialty campus and home of Centres of Excellence and Achievement and independent Faculties, the Faculties of Physical Education and Recreation (PER) and Agricultural, Life and Environmental Sciences (ALES) are anticipated to be the first occupants of Sector 12.

This academic/research sector of South Campus, with its attractive physical character, evolved reputation, modern facilities, and easy access may become the university's new location of choice for many programs.

6.2.1.1 Land Use Pattern

The land use pattern follows five fundamental strategies:

- Faculty-specific sectors will be accommodated to the extent practical;
- A higher density main street will be developed connecting the LRT station in the north east of the site with an improved gateway feeding to the centre of the Sector. The main street will integrate a mix of use lands including teaching and researching space, student residences, university support services and campus commercial and retail spaces;
- Lower density uses will be located toward the periphery of the site to reduce the impact on surrounding neighbours and provide a more welcoming and interconnected boundary between adjacent land owners;
- The campus will be pedestrian-oriented with distributed formal points of access from vehicles with sufficient parking on the periphery; and
- Creation of a university support area in the southern portion of Sector 12 with direct vehicular access from 60 Avenue. In the near-term, the snow dump and vehicle pool will remain in their existing locations near the west and east edges of Sector 12, respectively.

Developments will occur with consideration to suitable land use transitions and adjacent uses as determined at the sector plan level of detail.

A full range of services, programs and facilities will be developed and sited consistent with the context and smart growth/sustainability principles guiding development of the campus.

It is important to note that significant change will occur over a long period of time. Transitional systems and infrastructure will need to be created to allow for an integrated phased development responsive to the new and

existing facilities in adjacencies and juxtapositions. These issues will be resolved through the creation of sector plans and in development plans as new buildings are being planned and constructed.

6.2.1.2 Open Space

The open space system on this site will comprise formal and informal elements including quads, plazas, gardens and walkways to provide opportunities for formal, casual and leisure outdoor activities. Storm water management facilities will also be incorporated into the network of open space. Through development guidelines, the siting of buildings will be such that significant open space will be part of each development.

Natural environments such as those found presently along the northwest edge of the site will be preserved where possible. While the current wetland will be disrupted, the final development calls for an integrated system of constructed wetland and bioswales. These systems are not only critical to reducing storm run-off, but they will double as living laboratory sites for students and recreation space for faculty, staff, student and surrounding communities to enjoy.

Recreation fields and facilities will be developed to serve the needs of all campus sites including any shortfalls that may occur due to lack of space for these facilities at other campus locations. These spaces will also be open for the surrounding communities to enjoy when not being utilized for university events.

6.2.1.3 Heritage Buildings and Existing Research Facilities

An assessment of potential heritage buildings will be carried out and a preservation plan will be developed as required.

The University of Alberta is committed to enhancing agriculture research, and will not eliminate or arbitrarily move existing research facilities. If for some currently unforeseen reason it were absolutely necessary to do so, the university would replace the research facility at its new location with a facility of equal value. Such activity would occur only through extensive consultation with external partner organizations, faculty and researchers utilizing such facilities.

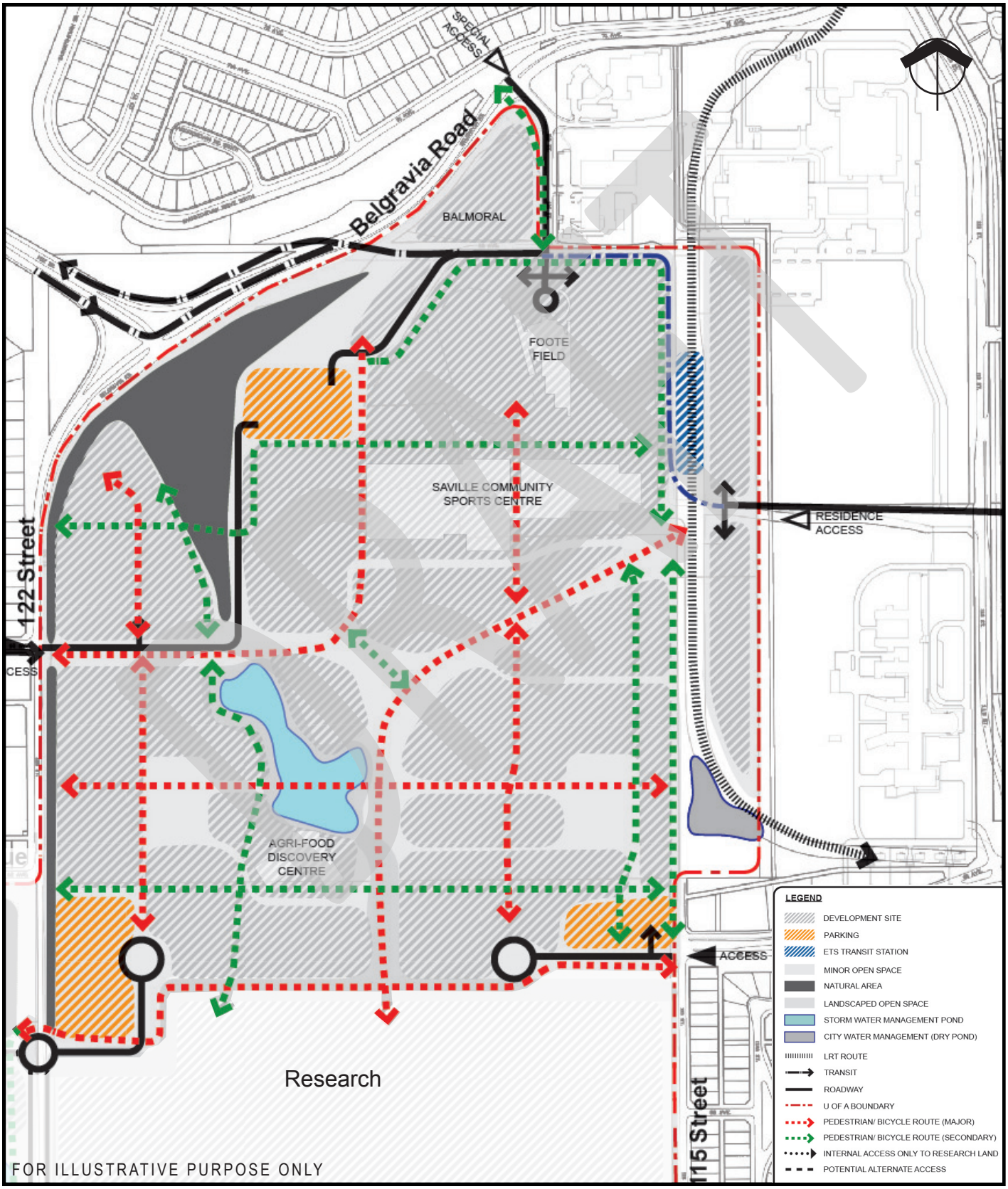


FIGURE 3 (EXHIBIT 30 - 2002)

6.2.1.4 Transportation

Road access to Sector 12 will be from 122 Street at 63 Avenue and from 60 Avenue at 115 Street in the short/medium term; additional access points will be from 116 Street via Belgravia Road and from 65 Avenue via 113 Street in the longer term. Over the 30-year horizon of the plan, some alterations to the road network will be required to accommodate growth at South Campus, as well as urban development in south Edmonton. A revised Transportation Impact Assessment (TIA) was completed and provided to the City of Edmonton for their review and comment based on the planned growth and layout of the sector. Should the need for future revisions be required, they will occur in consultation with the City Transportation Services Department.

Public automobile access will be restricted to the periphery on the site. Public parking structures/lots will be placed in locations near campus access points.

Service vehicle routes will be designed to minimize on-site conflicts with pedestrians and bicycles. These routes may also be utilized to access handicap parking areas.

LRT and bus transit routing will be finalized in consultation with the City Transportation Services Department. South Campus will accommodate a LRT station and a bus transit centre.

6.2.1.5 Parking

Parking will be accommodated on-site through a combination of surface and structured parking facilities located at the entrances to the campus. Initially, parking will be designed as surface lots. As development progresses and land is required, parking will be designed in structured facilities. Over the long term, the majority of parking on campus will be provided in the form of structured parking facilities. Parking for those living within residences, although limited, will be provided within that development zone. As well, as the need arises, handicap parking at certain buildings may be provided.

6.2.1.6 Pedestrian & Bicycle Circulation

The campus main street will be the major intra-campus spine for pedestrian and bicycle traffic.

A hierarchy of pedestrian and bike-ways will be incorporated into the development to allow direct access between facilities on campus.

Outdoor circulation will be developed to shelter pedestrians through the use of landscape and other techniques.

The campus's pedestrian and circulation paths will also tie into logical points of the City of Edmonton's bicycle and multi-use trail system that is located at the perimeter of the sector.

6.2.1.7 Community Linkages

This campus site will be linked to community pedestrian and bicycle systems and therefore to the regional systems as well, e.g. to the river valley system. This provides connectivity between this sector and our other campus communities within Edmonton.

6.2.1.8 Gateways

The major entrances to Sector 12 will be developed as gateways to identify entrances to the campus and to provide information to help orient those arriving at the campus. Gateways will be developed at:

- 122 Street and 63 Avenue;
- 122 Street and 61 Avenue;
- Belgravia Road and 116 Street (existing); and
- 115 Street and 61 Avenue (existing).

While not a gateway, residents needing to access student housing located east of the LRT will gain access to the development via the existing Neil Crawford Access/Edmonton Transit Access at 113 Street and 63 Avenue.

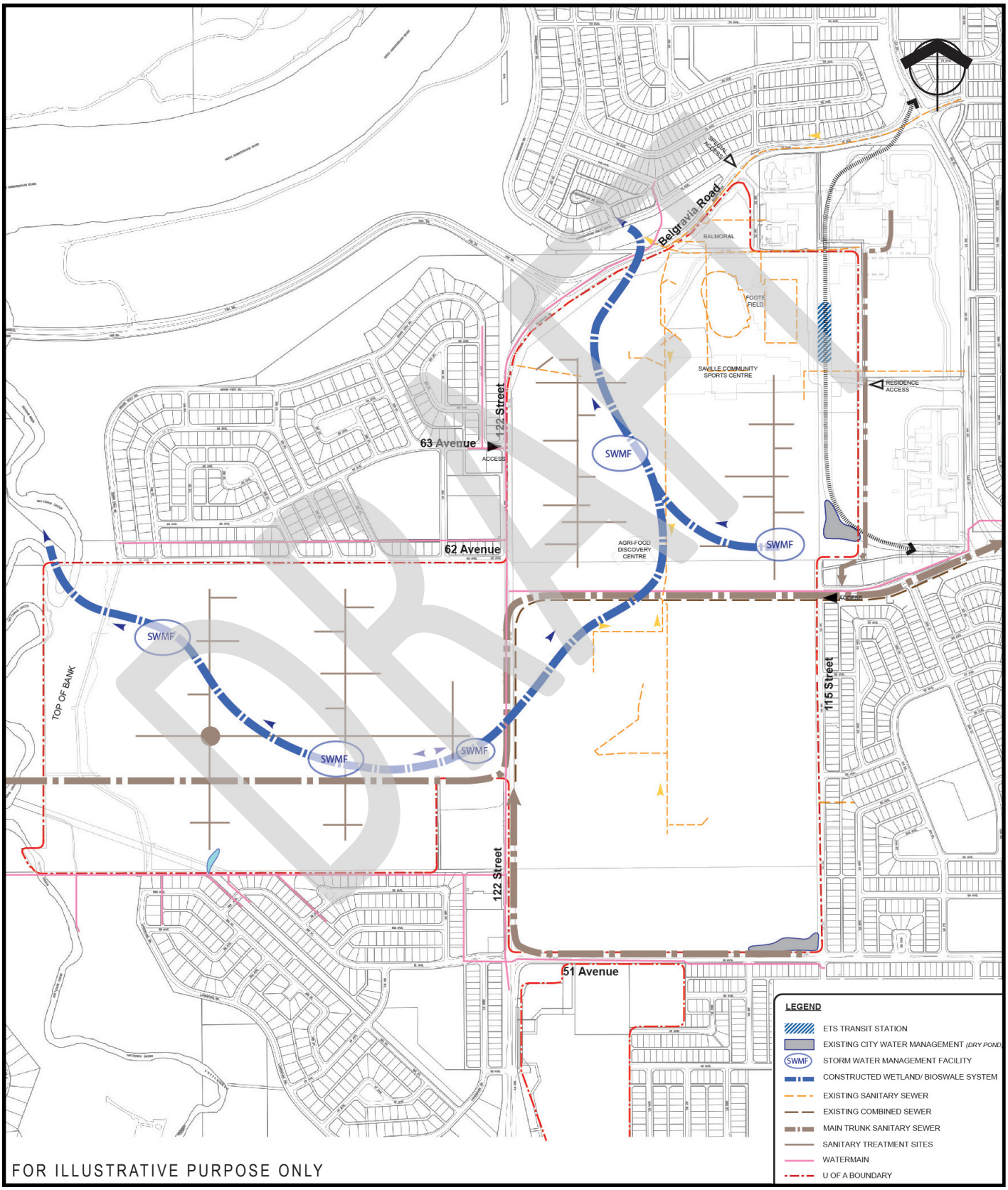


FIGURE 4 (EXHIBIT 32 - 2002)

6.2.1.9 Utilities

In the short term, the campus will access municipal services that are on, or are adjacent to, the site as needed. As development continues, the development of a central energy plant is accommodated within this plan. To limit waste and support self-sufficiency, the campus will utilize sustainable design principles that allow for the concepts of reduce, reuse, recycle; energy and waste reduction of our infrastructure, and where possible on-site reuse or processing of resources.

On-site storm water management is required and two to three hectare wet and/or dry ponds will be developed as warranted. Candidate locations for these ponds are illustrated. The ponds should be integrated with the campus open space system as amenity and wildlife areas.

Further analysis will be undertaken to assess the financial feasibility of a central integrated energy plant for South Campus.

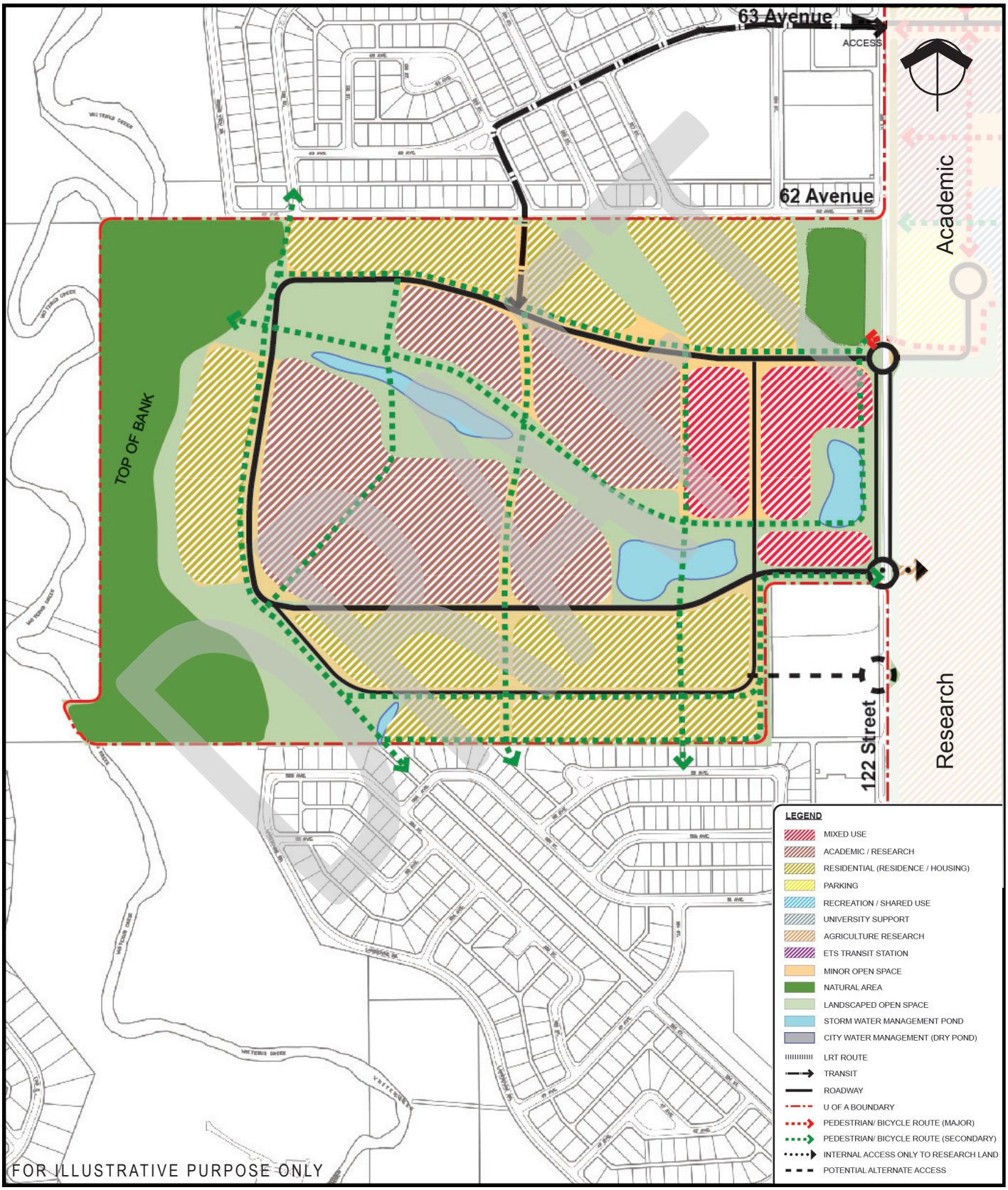


FIGURE 5 (EXHIBIT 33 -2002)

6.2.2 Sector 14

Sector 14 will allow a mixture of architecturally controlled residential and mixed use development, as well as research and/or office development, attractive to partners who not only wish to be associated with the university, but also want a quality address that reflects their corporate values. A partner is defined as an independent firm, or research transition firm, or a joint research venture with an outside agency, or a joint venture among faculties with a close affinity to university research and development where integrating university and public operations within a single facility advances the vision of each organization.

6.2.2.1 Land Use Pattern

The land use pattern of Sector 14 takes into consideration the residential development bordering the lands on the north and south, the environmental character of the western boundary, and the opportunity for access afforded by 122 Street, the eastern boundary.

The development character of Sector 14 will be sensitive to the suburban character of adjacent neighbourhoods. The higher density development will occur on internal lands with lower density development occurring toward the edges of the site. No research facilities will be located within this residential development zone, but will be focused within the academic/research partnered lands and possibly in the mixed-use development zones.

The residential development will respect the edge condition of existing neighbourhoods through the development of ground-oriented low-density housing units in single-detached, semi-detached, and townhouse forms. These housing units will be developed with heights comparable to adjoining development in existing neighbourhoods. Moving toward the centre of the sector and away from existing neighbourhoods, building forms will transition to medium-density low-rise apartment forms. Housing development along the west ravine could see medium-density apartments in a mid-rise form. The development should be such that it respects the top of bank and provides ample space for both formal and informal walking paths, as well as provide strong top of bank views for all to enjoy.

The academic/research partnership lands are where the highest densities will be located. This area will be separated from residential development by a ring road that will have two access points on 122 Street. These facilities will create a research park that would house both university and independent research organizations. This partnered research is critical to the university in meeting its mandate and vision. These buildings for higher density academic and research partnership developments will occur on internal lands, depending on floor space demand.

The mixed use developments will be located at the eastern edge of the site and could see a combination of commercial and residential activity. The location of commercial operations would support the needs of those both living and working within the Sector and promotes a concept of a walkable community. Its location also provides easy access for the neighbouring communities.

The central open space will serve many functions. A constructed wetland and bioswale system will accommodate storm water run-off as well as clean the water before it is discharged along the site's natural drainage paths. This open space, similar to that in Sector 12, will provide an opportunity to use the space as a

living laboratory and support community outreach programs. Through the introduction of formal and informal walking and large park areas, this open space can be used by all residents for outdoor activity and connections to the ravine.

6.2.2.2 Open Space

The open space system will be made up of natural and developed open space.

Open space will be defined on the periphery of the sector as well as internally between building sites. Open space may be passive or may accommodate walkways, bikeways and outdoor community activities.

The storm water management system will be connected to the open space system.

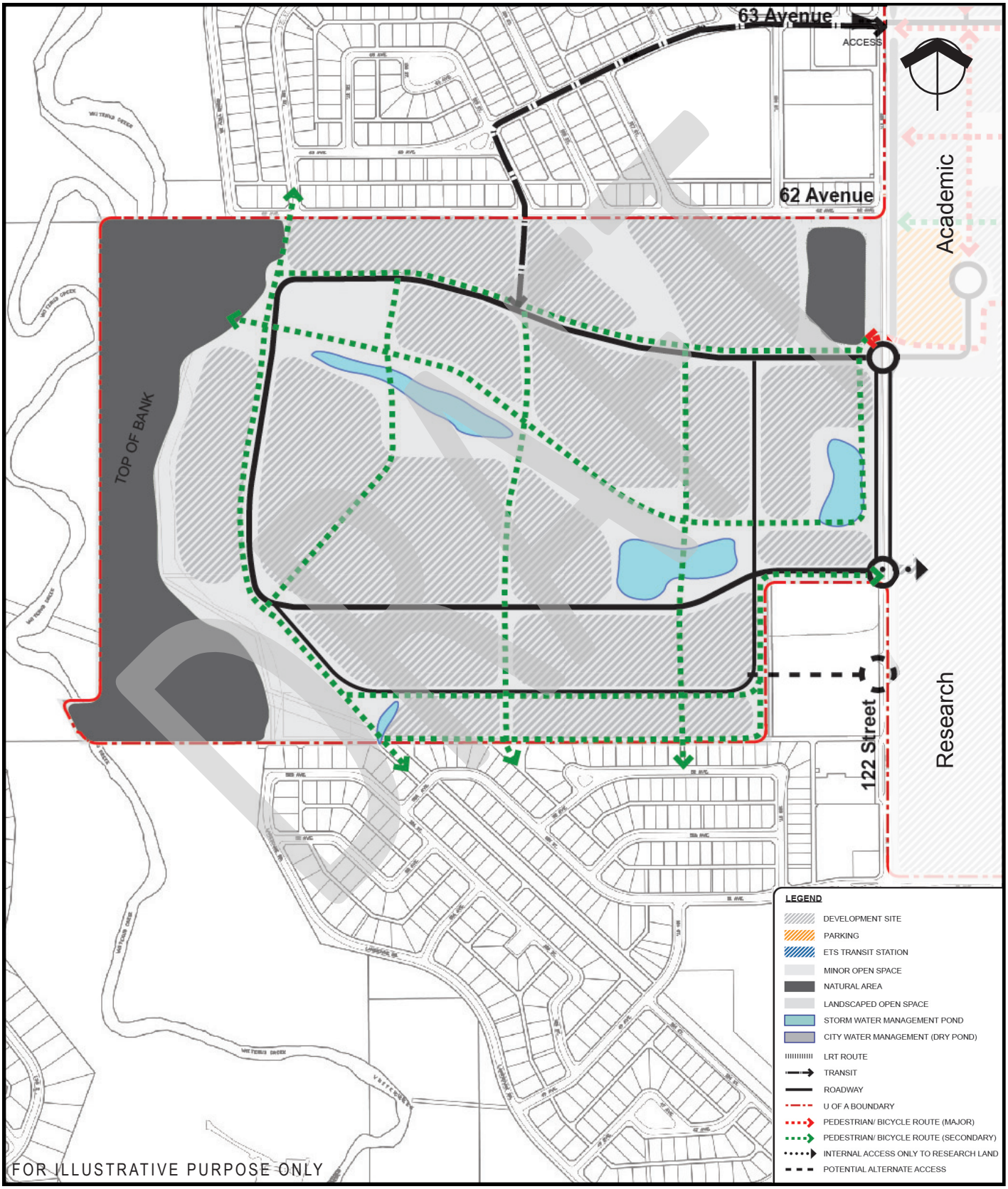


FIGURE 6 (EXHIBIT 34 - 2002)

6.2.2.3 Transportation

Private vehicular access to Sector 14 will be limited to 122 Street with no through access to or from adjacent communities. Those residents of Sector 14 that live in housing directly adjacent to the communities of Grandview and Lansdowne will have access to the existing road and alley systems. The remainder of the site will be serviced by a loop road that will carry auto, service vehicle and transit traffic. A transit and emergency vehicle-only connection is proposed at the north side of the site at 62 Avenue and 127 Street, to provide more effective transit and EMS service. This connector will be restricted and controlled by means that will prevent private vehicle access/shortcutting (i.e.: Bus Jump).

An on-site pedestrian and bicycle circulation system will be provided, connecting to adjacent neighbourhoods and to the rest of South Campus east of 122 Street.

6.2.2.4 Parking

Parking will be included with each site to accommodate the development's parking requirements.

6.2.2.5 Community Linkages

This campus site will be linked to community pedestrian and bicycle systems and therefore to the regional systems as well, e.g., to the river valley system. Connections will be made to existing north-south cycling and pedestrian route on 122 Street, existing walking trails in Whitemud Creek ravine, and to existing sidewalk and trail systems in the Grandview Heights and Lansdowne neighbourhoods. Direct pedestrian and cycling connections will also be made across 122 Street to the rest of South Campus.

6.2.2.6 Utilities

Sector 14 will access municipal services that are found adjacent to the site as needed. However, to limit waste and support self-sufficiency, the campus will utilize infrastructure designs that allow for the processing of waste on-site and the reduction in use or the on-site reuse of resources wherever possible and could possibly be tied back to the central plant located within Sector 12 where feasible.

On-site storm water management will be required and one to three hectare wet and/or dry ponds will be developed as warranted.

Pedestrian, bicycle and transit linkages will be available to the rest of South Campus and North Campus by linking the university trail system with the City of Edmonton systems.

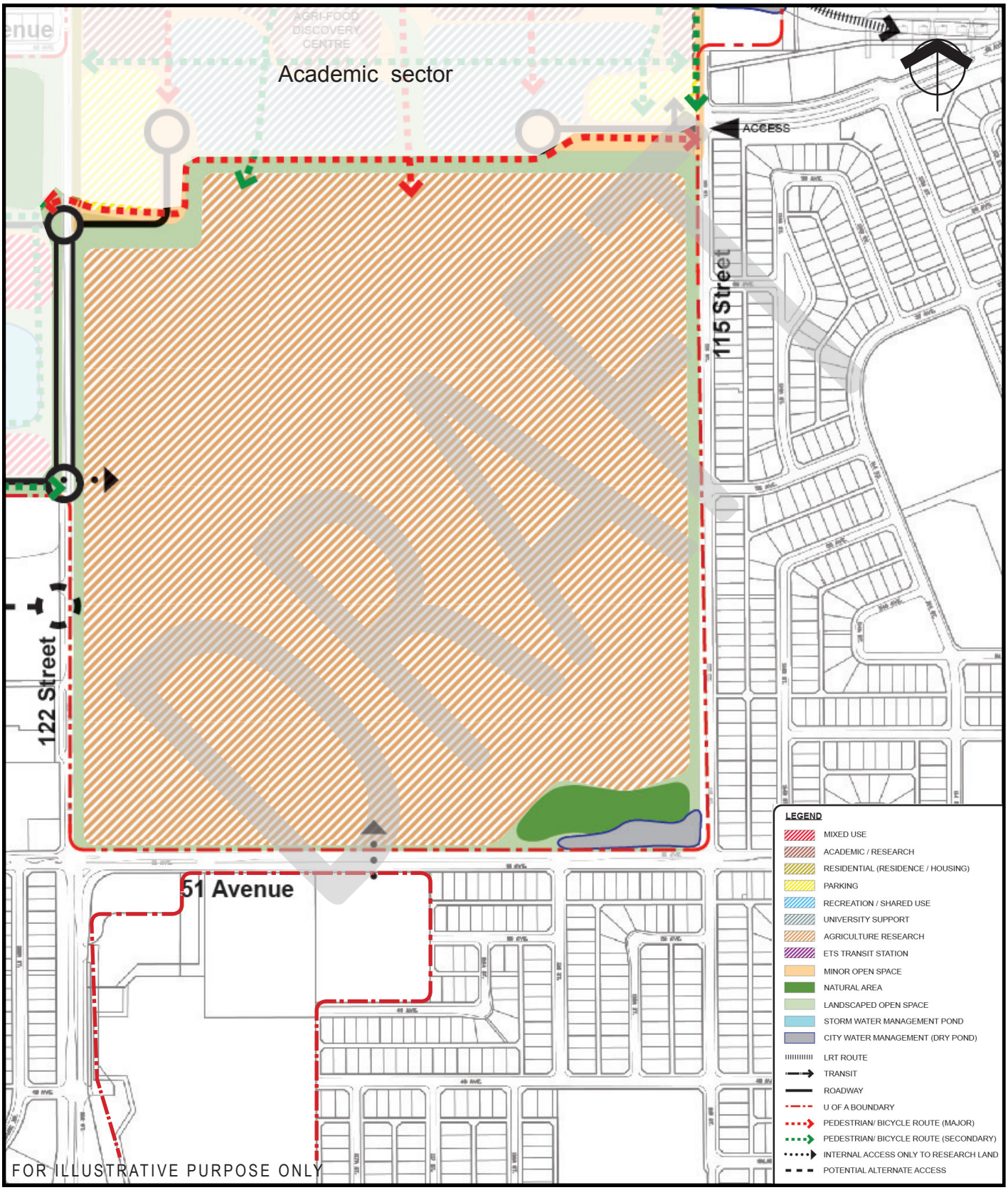


FIGURE 7 (EXHIBIT 35 - 2002)

6.2.3 Sector 13

For the foreseeable future, these lands will continue to be used and developed to support the research initiatives of the University of Alberta.

6.2.3.1 Land Use Patterns

Current research station facilities will be consolidated over time in the new Sector 13. While recent land purchases will slowly see production research relocate to these sites, Sector 13 is intended for animal, crop, and other agricultural research activities.

The focus of research may continue in the area of biological life sciences that may include research related to livestock, crop, food processing and other similar research domains.

Research staff housing may be needed on site.

6.2.3.2 Open Space

Building sites will be developed as required. Open space and easy sight lines will be integral elements in achieving the required bio-security on site.

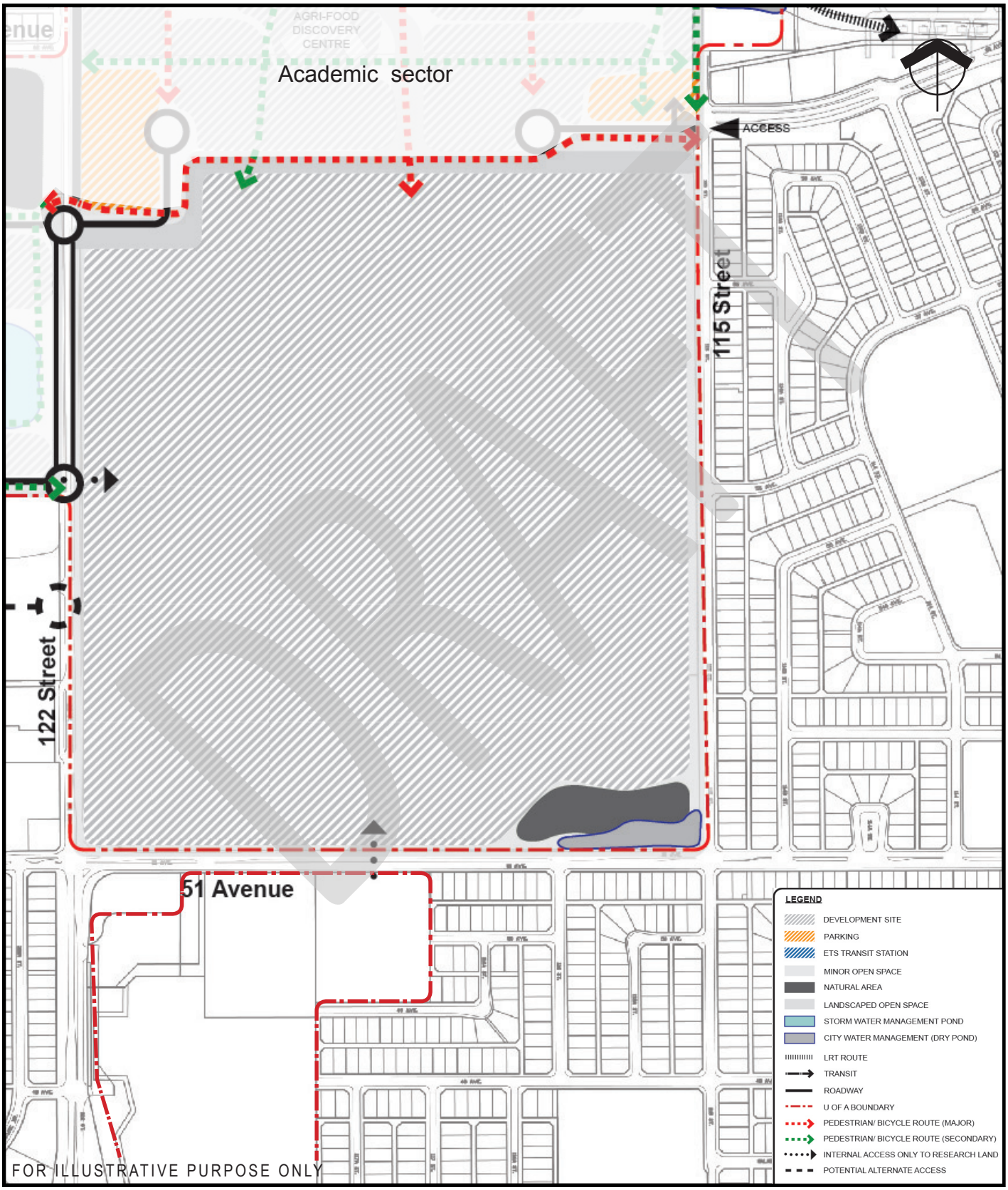


FIGURE 8 (EXHIBIT 36 - 2002)

6.2.3.3 Transportation

Access to Sector 13 will be restricted. The primary vehicle access will be from 122 Street. A secondary access is possible from 60 Avenue, shared with access to the service sector of South Campus.

Pedestrian and bicycle ways will only be considered on the periphery of the site between public roads and the site security fence.

6.2.3.4 Parking

Parking for research staff and service vehicles will be provided at each building site in accordance with the needs of the building.

6.2.3.5 Community Linkages

This site will be linked to community pedestrian and bicycle systems on its periphery only. Access to Sector 13 will be restricted to authorized personnel for bio-security reasons and perimeter fencing and gates will be installed.

6.2.3.6 Utilities

Development of Sector 13 lands will access municipal services that are found adjacent to the site.

On-site storm water management will be developed as warranted.

Community Consultation Process

How did we get to the amendment?

The University of Alberta (U of A) follows the Post Secondary Learning Act (PSLA) which outlines the consultation process required for an amendment for the Long Range Development Plan (LRPD). The university also follows a consultation protocol outlined in Appendix 18 of the LRDP which was submitted to the Minister in 2004. An outline of community engagement and how the U of A fulfilled the consultation requirements outlined in Appendix 18 is demonstrated below.

What steps were taken to get to the amendment?

The LPRD was confirmed in 2002 by the Minister. Since 2002 the U of A has held the following:

Since 2002 the U of A has worked with the communities surrounding the South Campus:

- December 3, 2003 – South Campus Sector Plan open house
- June 30, 2008 – South Campus Sector Plan community workshop
- October 7, 2008 – South Campus Sector Plan community workshop
- November 18, 2008 – Open house
- February 16, 2010 – Open house for the Saville Community Sports Centre
- April 20, 2010 – South Campus Sectors Plan community workshop
- November 1, 2010 – South Campus Sectors Plan community workshop
- November 17, 2010 –U of A/Community Committee (UACC) regularly scheduled meeting with South Campus sectors Plan community workshop
- November 26, 2010 – U of A Staff and Student South Campus Sectors Plan open house
- November 29, 2010 - Community wide South Campus Sectors Plan open house
- January 12, 2011 – Grandview League executive meeting
- May 26, 2011 – Belgravia League executive meeting
- October 26, 2011 – Belgravia community open house
- September 26, 2012 - Community wide Progress Update on Amendment of Land Use Plans for South Campus (data gathering for LRDP amendment) open house
- March 14, 2013 - Community wide LRDP amendment open house

South Campus Focus Groups:

- April 16, 2009 – Community Connections study group
- April 21, 2009 – Sustainability and Design study group
- April 23, 2009 – Transportation study group
- June 29, 2009 - Community Connections study group
- June 30, 2009 – Transportation study group
- October, 2009 – Urban Land Institute (ULI) Report
- October 29, 2009 - Historical Preservation study group
- November 12, 2009 – Sustainability and Design study group
- February 8, 2011 – Meeting with Lansdowne Community League
- November 8, 2011 – South Campus Focus Group – Lansdowne Community League (meeting 1/2)
- November 9, 2011 – South Campus Focus Group – Grandview Community League (meeting 1/2)
- November 14, 2011 – South Campus Focus Group – Lendrum Community League (meeting 1/2)

- December 13, 2011 – South Campus Focus Group – Lansdowne Community League (meeting 2/2 - deferred).

The following is a summary of the major topics the U of A heard from the community from past open houses:

- 2002 Long Range Development Plan (LRDP)
  - Transportation and traffic
  - Retain green space
  - Community connections
- 2008 South Campus Sector plan
  - Community connections
  - Theme/historical preservation
  - Transportation
  - Sustainability and design
- 2010 South Campus Sector Plan
  - Concerns rose regarding parking and traffic
  - Design and sustainability
  - Environment
  - Buffers
- September 26, 2012 Progress Update on Amendment of Land Use Plans for South Campus
  - Transportation/traffic/parking
  - Green space – more of it
  - Development of the West 240

The U of A meets with the communities of South Campus through the South Campus Consultation Group (SCCG) which was created through an MOU with the University and the South Campus Neighbourhood Collation (SCNC) in May 2012. The following is a list of meetings that were held and open houses to address the LRDP in South Campus, leading up to the open house where the amendments were shown to all community members for final review and comments:

- June 14, 2012
- July 5, 2012
- July 23, 2012
- July 25, 2012 – Hosted by the community of Malmo
- August 14, 2012
- September 5, 2012
- September 26, 2012: Community wide Progress Update on Amendment of Land Use open house
- January 15, 2013
- February 12, 2013
- March 4, 2013 – preview of material for March 14, 2013 open house
- March 14, 2013: Community wide LRDP amendment open house

All 2012-13 open house summaries and approved SCCG meeting minutes are available on the University Relations website at www.communityrelations.ualberta.ca.

The U of A also follows a consultation protocol outlined in Appendix 18 of the LRDP. The following are the processes as outlined in Appendix 18 and the actions U of A has taken to meet all requirements.

Appendix 18 states:

Long Range Development Planning and Amendments

a) **When the University undertakes a new Long Range Development Plan, or amends its existing LRDP, owners of land within 60 metres of the University's land and the host municipality will be notified. Such notification will include date, time and location for an information session to present the conceptual plans, or substantive changes, and an invitation to review, and comment on the planning, in writing 21 days following the presentation.**

U of A action - The U of A mailed letters of notification which contained the date, time and location for an information session (Open House) to present substantive changes of the LRDP Amendment Open House, March 14, 2013 to owners of land within 60 metres of the University's land and host municipality, The City of Edmonton. The mailing list was identified by the City of Edmonton, Central Area Unit, City Wide Planning Section according to home owner title information. The letters to residents 60 metres of the University of Alberta land and the City of Edmonton were mailed to allow a full two week advanced notification period prior to the open house.

b) **Notification will take the form of a directed letter to each identified stakeholder in a). The planning document will be available through the communications website of the University.**

U of A action – The notification in a) indicated where information for amendment planning document could be found on U of A website. Please note additional communication tools were used to advertise the March 14, 2013 open house:

a. Portable road signs were placed in five locations from two weeks prior to open house;
b. An ad was place in the Edmonton Journal;
c. Information about the open house was place on the U of A website on the Community Relations website and the main U of a homepage under Events;
d. E-mail regarding information about March 14, 2013 open house was e-mailed to members of the SCCG; and
e. E-mail invitation sent to City of Edmonton Councillor, Don Iveson, and Member of Legislated Assembly, Steve Young outlining details for March 14, 2013 open house.

c) **Following this presentation and invitation to direct stakeholders, the University shall publish, within a newspaper, newsletter or publication circulating in the areas in which the University's lands are located, notification of the public of its opportunity to review the proposed LRDP, or amendments, and comment upon it (them). The proposed plan/amendments will be available upon the University's communications website. Comments will be received in writing up to 21 days of the notice.**

U of A action – All materials presented and distributed at the March 14, 2013 open house was placed on the U of A website for 21 days (ending April 4, 2013). The U of A published an ad in the Edmonton Journal on March 15, 2013 inviting the public to review and comment on the information presented.

Portable road signs were placed in five locations to inform community members to review and comment on materials from the open house at the Community Relations website.

d) University administration will prepare a summary document that they believe accurately reflects the major concerns and comment expressed. This document will be reviewed by the stakeholders identified in a), and will be modified until agreement is reach on accuracy. During the planning stage, these concerns will be considered.

U of A action – A document that summarized all comments received is attached. This summary document was mailed to stakeholders identified in a) on April 12, 2013. All stakeholders were asked to provide additional comments by April 23, 2013. The summary document was sent to the Office of Facilities and Operations for considerations for further LRDP amendment.

e) Recommendations to the Board of Governors with respect to the LRDP and/or its amendments will include the consultation summary documents(s), and a document highlighting how administration has used these comments to develop the Plan and recommendations.

U of A action – Attached please find the summary document and a document highlighting how administration has used comments from the March 14, 2013 open house.

f) Upon Board of Governors approval, the LRDP and/or amendments will be sent to the Minister for review and confirmation that the contents of the amendment/LRDP comply with the Regulations of the Post Secondary Learning Act.

U of A action – Once the LRDP Amendment is approved by the Board of Governors the amendment will be sent to the Minister of Enterprise and Advanced Education for confirmation.

UNIVERSITY OF ALBERTA

Consultation summary

Long Range Development Plan – Amendment to Land Use Plan for South Campus

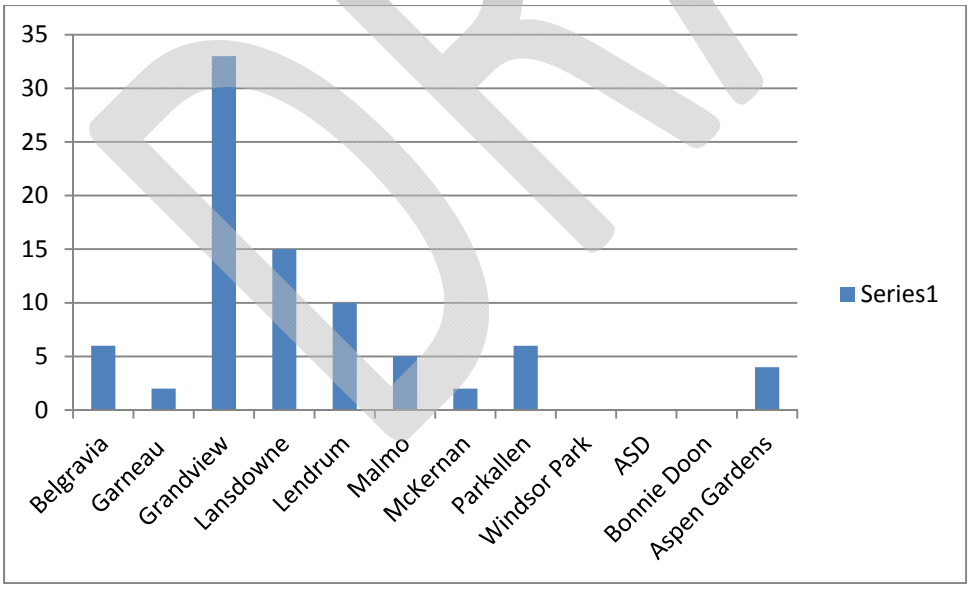
Preliminary Fact Finding Open House – presentation of draft amendment material
Wednesday, September 26, 2012, 5:30 – 8:30 p.m.
McKernan School, 11330 – 76 Avenue

Final LRDP Amendment Open House
Thursday, March 14, 2012, 5:30 – 9:00 p.m.
McKernan School, 11330 – 76 Avenue

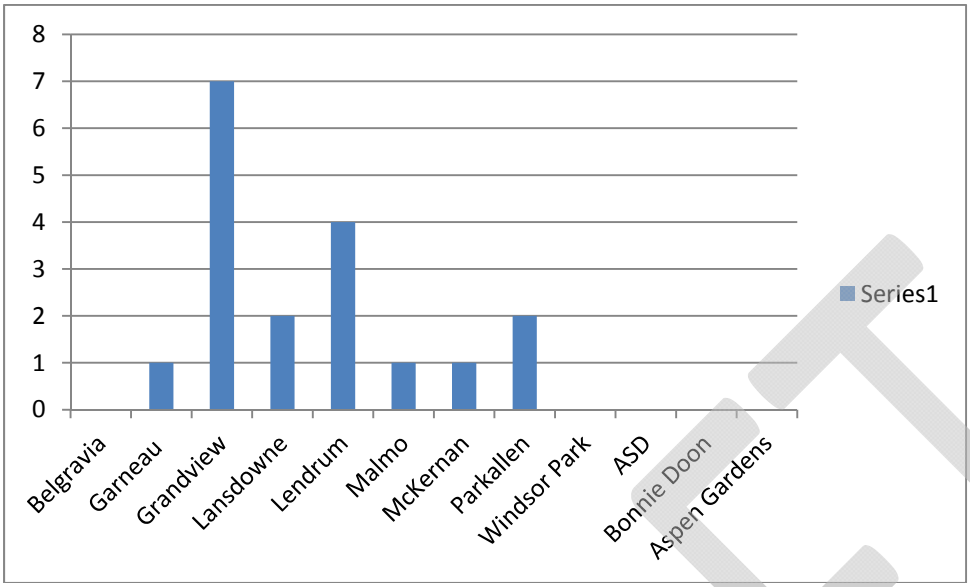
September 26, 2012 - 101 evaluations received
March 14, 2013 – 25 evaluations received

1. If you reside in one of the following neighbourhoods please circle that neighbourhood:

September 26, 2012



March 14, 2013



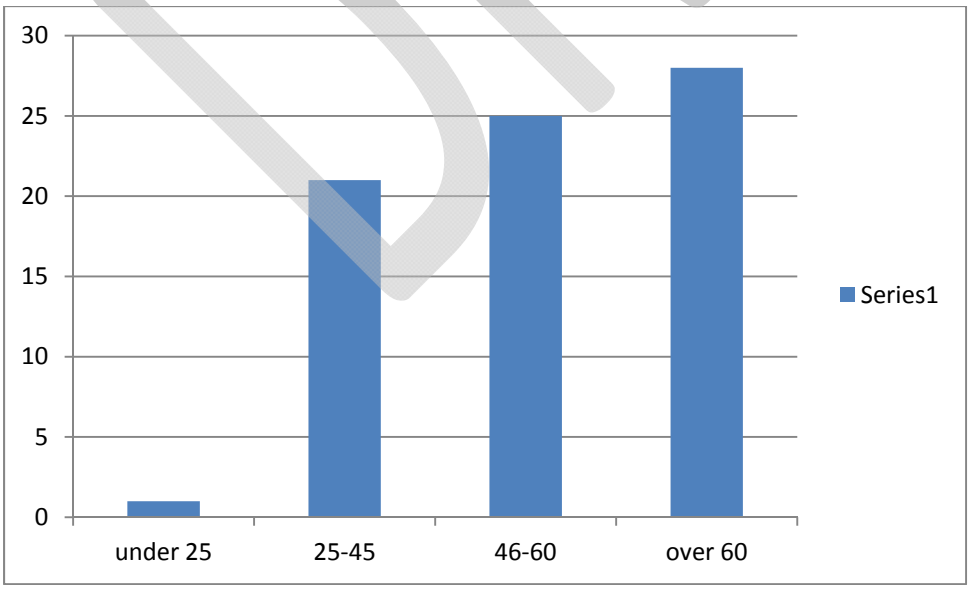
2. If you reside in a different neighbourhood please provide the name of that neighbourhood.

   September 26, 2012 - N/A

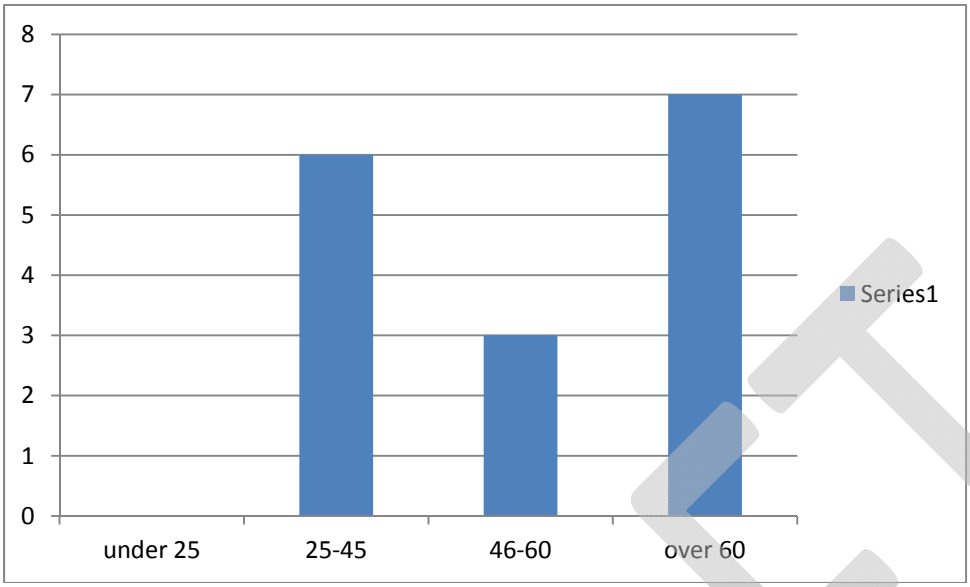
   March 14, 2013 - Oliver

3. Please check the age category that you are in.

September 26, 2012

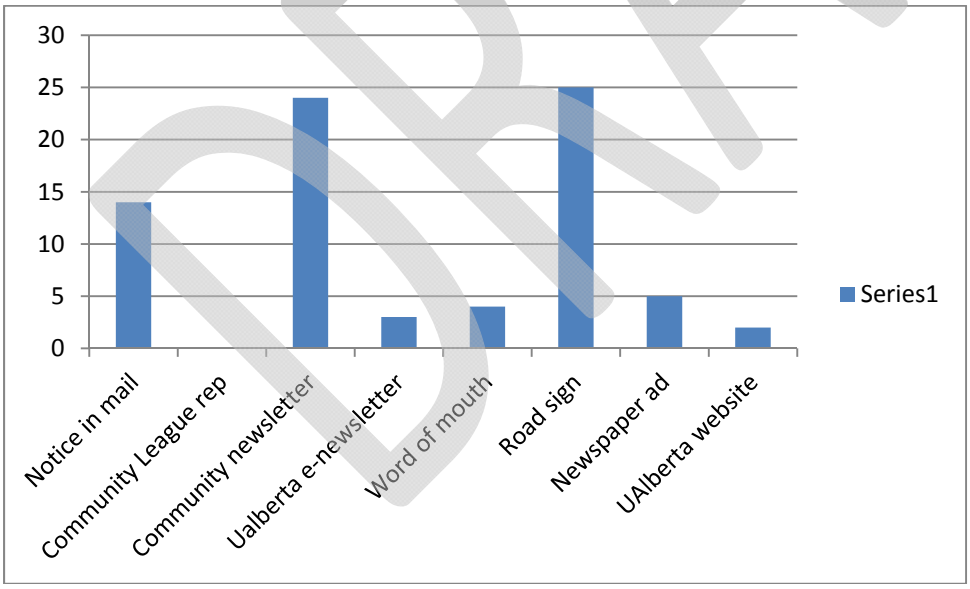


March 14, 2013

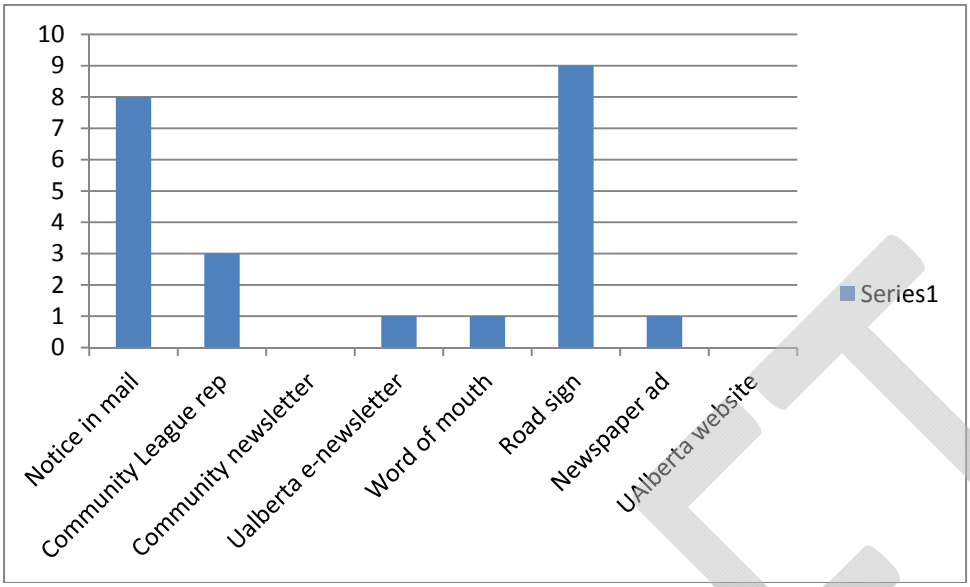


4. How did you hear about this open house?

September 26, 2012

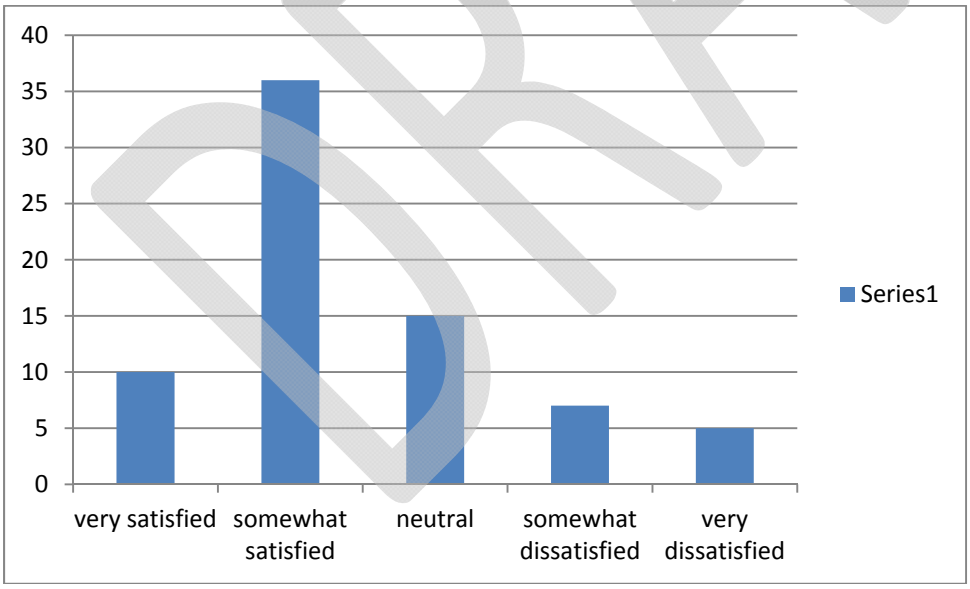


March 14, 2013



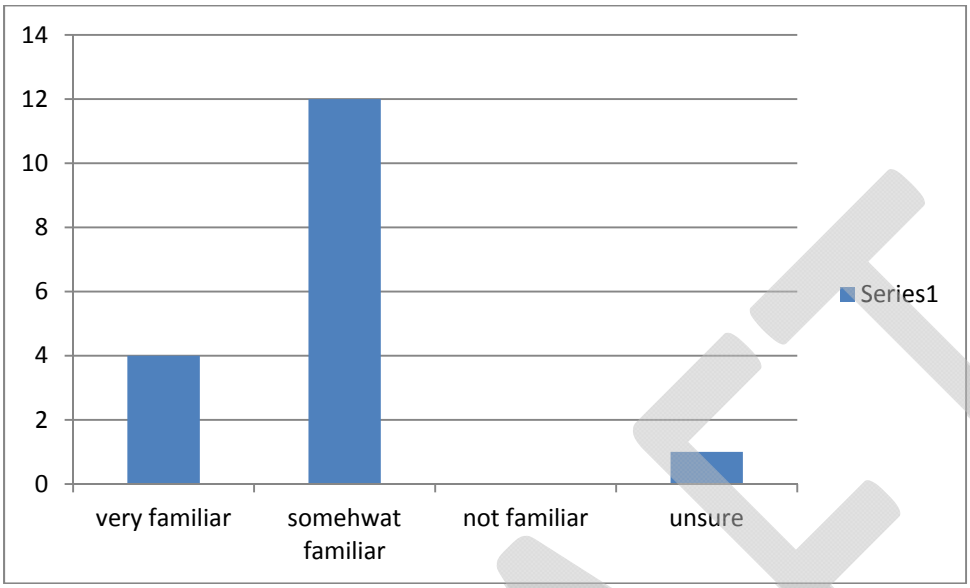
5. Did the material that was presented explain and increase your understanding of the Long Range Development Plan – Amendment to Land Use Plan for South Campus?

September 26, 2012



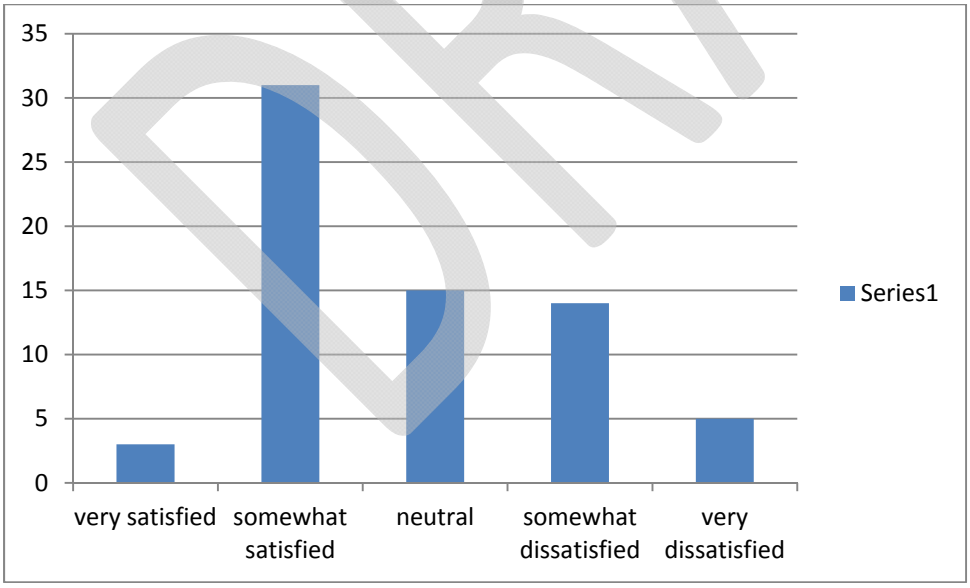
March 14, 2013 (re-worded question as requested by community representatives)

Are you familiar with the purpose of the Long Range Development Plan?



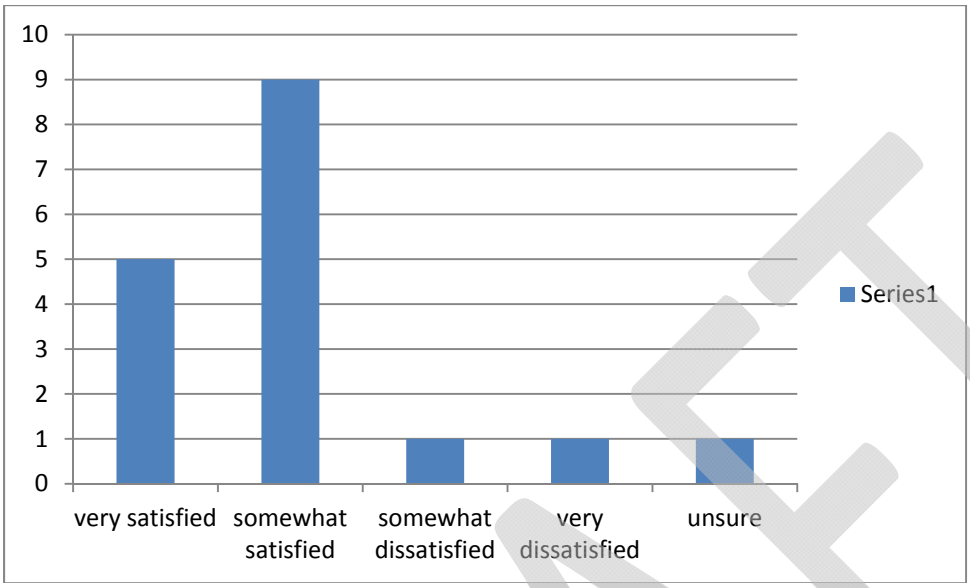
6. Do you have a better understanding of how the South Campus plan will fit into your community?

September 26, 2012



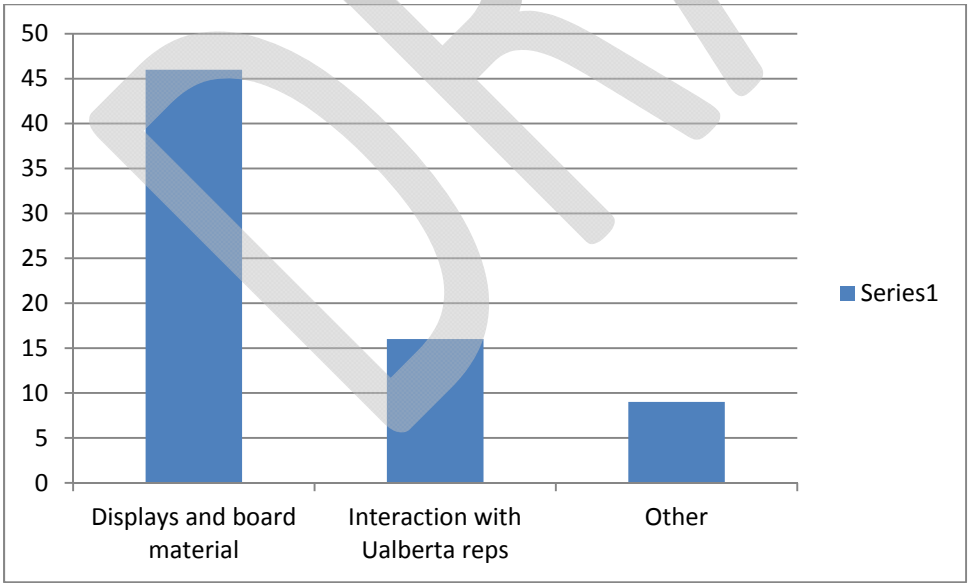
March 14, 2013

Did the material that was presented explain the purpose of the Long Range Development Plan? (re-worded question as requested by community representatives)

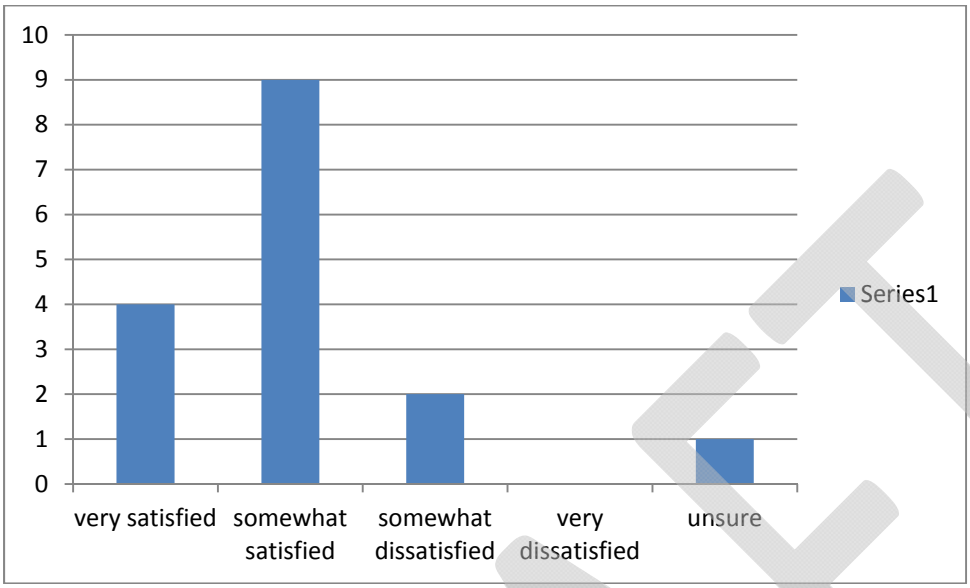


7. I found the following aspects of the open house most valuable:

September 26, 2012



Did the material that was presented explain the proposed amendment (changes) to the Long Range Development Plan for South Campus? (re-worded question as requested by community representatives)



8. Please comment on your impressions regarding one or more of the following components:

September 26, 2012

- Energy efficiency
  - Focus on green forms of energy; very pleased with plan; appears adequate; UAlberta has put great effort into thinking about energy – especially interested in concepts for solar and geothermal energy, feeling positive.
- Waste and waste water management
  - Good to know there is a plan; good changes; pleased with plan – should be a MUST for all new buildings.
- Storm water management
  - Good to see a plan; concerned about storm water management on existing facilities; plan does not accommodate the huge volumes of water during large rain storms.
- Ecology and the environment
  - It would appear that the W 240 site will require considerable site preparation (i.e. earth moving) to prepare the site for building of roads and buildings - the university needs a strategy to reclaim the land after site preparation so that the land is not sitting as a large undeveloped construction site for the next 15-20 years with dust blowing around and weeds growing.
  - Waste of good farmland.
  - More green space please.
  - Concerned – current development impacting the environment and the effect of amphibian.
  - Keep community garden.

    - Not much respect – a naturally evolved wetland will be paved and a constructed wetland will maybe be created?
    - Environment sustainable systems sound impressive but are they financially sustainable?
    - Pleased to see environment development considerations seem to be of paramount important.
- Transportation
    - Want to see lighter traffic in my neighbourhood concerned about higher traffic amounts.
    - Access off of 122 Street through U of A land as much as possible, access off of 122 Street/63 Avenue dangerous.
    - Transportation plan is weak.
    - Transportation plan is good.
    - Reduce need for parking, confused about on parking numbers.
    - Glad to see good transit in the newer development.
    - No park and ride.
    - Changes since last meeting show reasonable response to feedback.
    - Transportation plan – tough call. I do not what to be challenged getting in and out of my neighbourhood, roundabouts should be further analyzed.
- Built environment
    - Development over the last 10 years has not matched visuals.
    - Single dwellings facing on 62 Avenue.
    - No residential on West 240 – research only.
    - Height of academic and research facilities a concern.
    - Design specifics are not in place so difficult to assess; no architectural standards – a hodge podge campus.
    - More information and examples on density.
    - If what is depicted is actually done it would be most excellent.
    - Sport facilities hugely over built – build only for students and staff not the general public.
- Healthy and complete community
    - I am looking forward to the development of South Campus.
    - No trust in your healthy and complete community.
    - Plan is positive.
    - Lack of clear plan and options for handling interface between existing neighbourhoods and growth scenarios.

March 14, 2013

Please comment on your impressions regarding the amendment to land use plan for South Campus: ? (re-worded question as requested by community representatives)

Sector 12:

Themes

- Good impression, making progress, overall seems good, like graduate residences and green belt along 122 Street, residences should be only shorter buildings in height and if taller buildings needed, those should be located on interior of campus, residences on east side near LRT require thoughtful planning.

- Needs to be more dense and urban with better connectors to routes beyond campus, very narrow, not developed to interact with City of Edmonton, and needs to be much more dense.
- Information is not specific enough, still confused about final plans, want to see exactly what will be developed.
- The LRDP needs substantive changes and re-thought rather than tweaks, U of A's focus/goals need to remain on education and not be landlord and parking provider.

Sector 14 (West 240):

Themes

- Faculty of ALES and land for research being ignored.
- Like revisions, making progress, overall quite good, acceptable.
- Still concerned about Lansdowne and Grandview, back land for residence fronting on 62 Ave is good, happy with increase to transition space but unsure if it will be green space, Grandview and Lansdowne significantly affected.
- The sector will put thousands of people into cars, uncertainty of where the bus is linking sector to the train, limited transportation linkage.
- Prefer 2002 plan, focus on LEED.

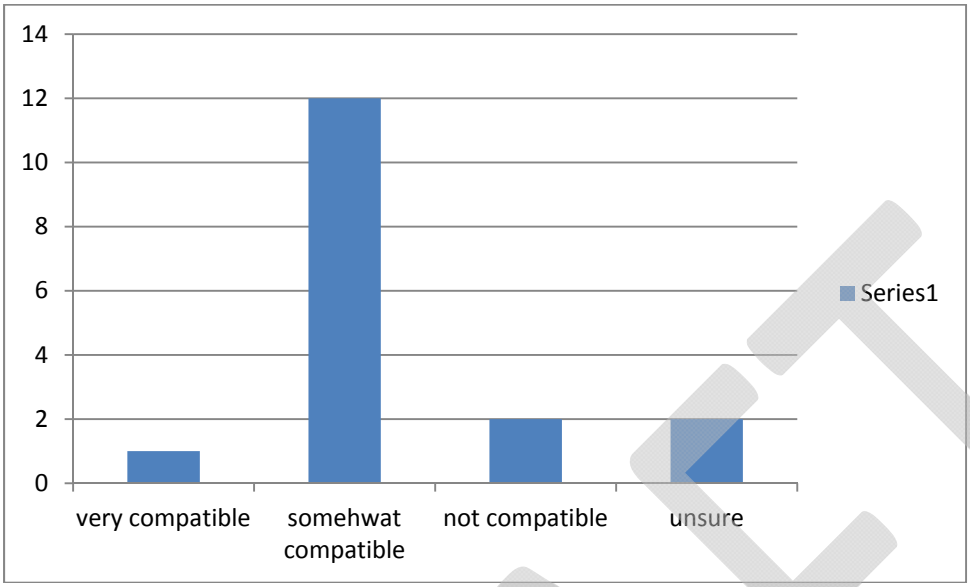
Additional questions on the March 14, 2013 evaluation as requested by community representatives:

Q - If you were unsure in questions 6 and/or 7, please elaborate further why you felt unsure. (re-worded questions as requested by community representatives)

Themes

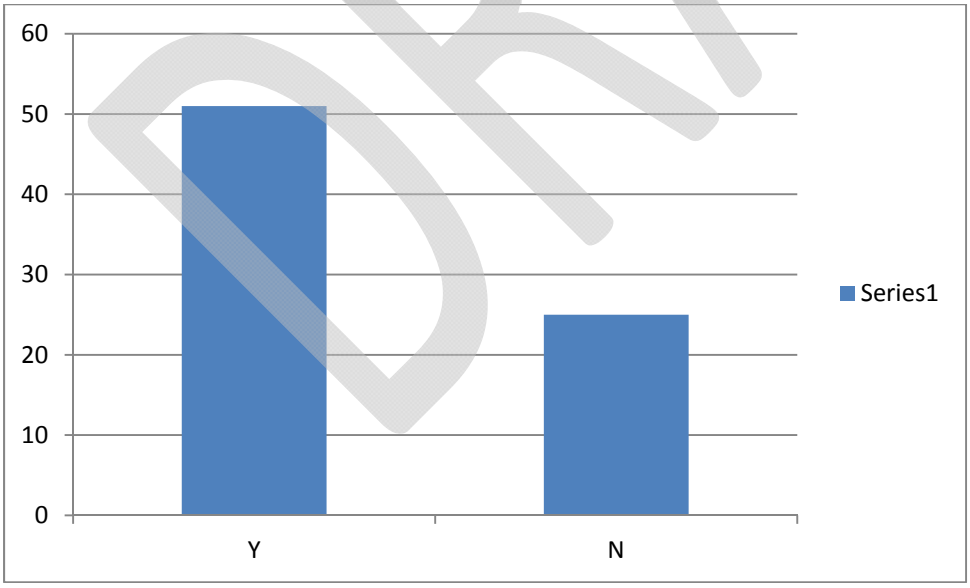
- Coverage of what the changes are was good. Coverage of why the changes less clear.
- LRDP too general.
- Slow down the presentation and provide take away document that has information in bullet form
- Colors/shades on board material difficult to distinguish

Q - How do you see South Campus plans, both the proposed land uses and possible developments, fitting into your community?



9. Are you aware of the South Campus Consultation Group (SCCG) that was recently formed to represent the voice of neighourhoods that surround the UAlberta South Campus?
   - ☐ Yes
   - ☐ No

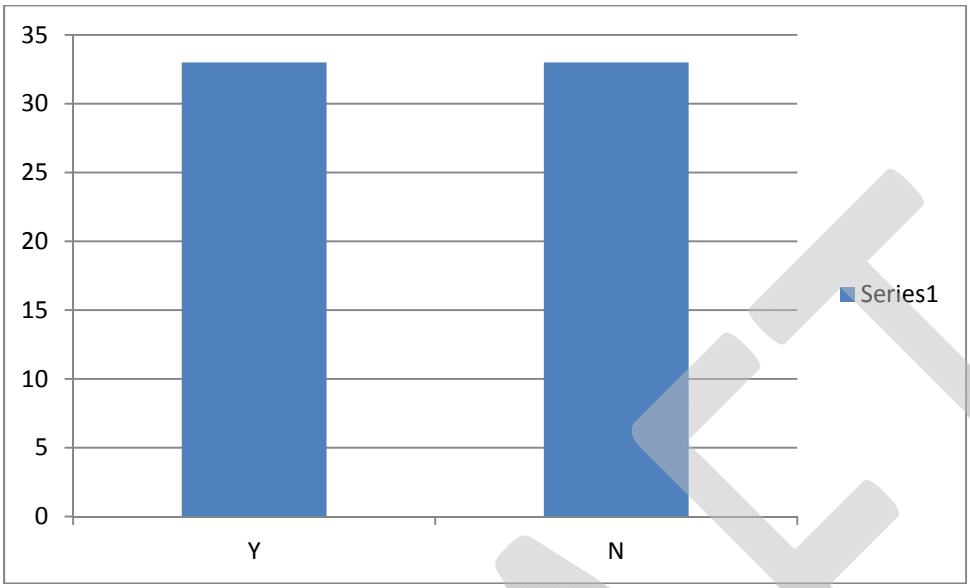
September 26, 2012 only



Would you like your SCCG member to contact you?

☐ No

☐ Yes (please provide contact information on the front of the form)



10. Please tell us the top three (3) topics you would like to address with regards to the amendments to the Long Range Development Plan - amendment to land use plan?

September 26, 2012

1. Transportation/traffic/parking
2. Green space – more of it
3. Development of the West 240

March 14, 2013

Please tell us the top three (3) topics you would like to have addressed with regard to the amendments to the land use plan for South Campus? (re-worded question as requested by community representatives)

1. Impact related to parking, traffic, noise, bus links for LRT, roads and sidewalks/paths around South Campus and plans for roundabouts on 122 Street.
2. Sensitive design: low impact development, more density, compatible with surrounding neighbourhoods, plan for active living.
3. Power plant too close to residential, underground power lines/transmitters

11. Please provide any other suggestions/concerns/questions about the South Campus Sectors Plan that you might have.

September 26, 2013

Themes

- Transportation – concerns about 122 Street/63 Avenue intersection; people parking in surrounding neighbourhoods; cut through traffic.
- Green space – plan needs more green space; preserve farmland; develop density around South Campus LRT station to retain green space and agriculture research; protect wildlife in Sector 14; loss of organic land base; Canada goose and duck migration route needs to be protected.
- Consultation – needs to be improved; don't assume activists represent views of entire community; U of A needs to listen and be a good neighbor; everyone seems hopeful – hope that is the case.
- West 240 – do not develop; if developed must be self-contained and isolated; residents of Grandview and Lansdowne require bigger buffer zones; no access to their communities; concerns about schools; need for services.
- Aim higher, inspire community and be ambitious; the plan looks good but will it happen due to budgets, the communities will bear the costs of unanticipated changes. The plan should serve academic goals not regional community recreation needs e.g. Saville Centre.

March 14, 2013

- West 240: question about the density range, do not develop because it serves interest of healthy food supply, housing needs to match homes from mature neighbourhoods, multiuse trail/landscape buffer surrounding W 240, generous open space landscaping with trees, no connector through W 240 between Lansdowne and Grandview, no access for emergency vehicles into Grandview from W 240, any research on sociological consequences of imbalance between Grandview and housing planned for W 240.
- Great sustainability elements, amended plan looks like a good fit, info presented suggest some concerns have been acknowledged, access to bus link well placed, concerns about capacity issues on the LRT serving South Campus, need for connectivity of bike and pedestrian access.
- LRPD outdated, opposed to amendment, remove plans for Sector 14, U of A should not build facilities not directly related to research, teaching and student residences, U of A developing South Campus hodgepodge and appears to developing to make money and not providing education opportunities.
- Traffic and parking from all sectors will negatively impact surrounding neighbourhoods, roundabouts on 122 Street a concern, call for updated traffic impact assessment and parking demand study.
- Building over wetlands a concern.
- Lack of density, U of A has unique opportunity to bring people from suburbs back into the city, do not plan something that is lifeless that does not attract people.
- Question about the difference between LRDP and Sector Plan, question about the plans for Sector 13, request for information and details on coordination of recreational facilities with City of Edmonton.

Questions and Stakeholder Comments	University Response
26-Sep-12	
Energy Efficiency	
Focus on green forms of energy; very pleased with plan; appears adequate; Ualberta has put great effort into thinking about energy - especially interested in concepts for solar and geothermal energy, feeling positive.	No response required.
Waste and Waste Water Management	
Good to know there is a plan; good changes; pleased with plan – should be a MUST for all new buildings.	No response required.
Storm Water Management	
Good to see a plan; concerned about storm water management on existing facilities; plan does not accommodate the huge volumes of water during large rain storms.	Design of future facilities will accommodate storm flows.
Ecology and the Environment	
It would appear that the W 240 site will require considerable site preparation (i.e. earth moving) to prepare the site for building of roads and buildings - the university needs a strategy to reclaim the land after site preparation so that the land is not sitting as a large undeveloped construction site for the next 15-20 years with dust blowing around and weeds growing.	Site development will occur on a phased basis.
Waste of good farmland. More green space please.	LRDP identifies substantial green space to be preserved and/or created with campus development.
Concerned – current development impacting the environment and the effect on amphibians.	Site development will pursue environmental performance targets. Constructed wetland system will replace the habitat function of existing area inhabited by amphibians.
Keep community garden.	Community gardening space will be provided at South Campus.
Not much respect – a naturally evolved wetland will be paved and a constructed wetland will maybe be created?	Existing wetland is a byproduct of human activity, but not designed for ecological function. Proposed constructed wetland system will be designed with ecological function in mind.

Environment sustainable systems sound impressive but are they financially sustainable? Pleased to see environment development considerations seem to be of paramount importance.	Financial sustainability of sustainable systems are a consideration in the design process.
Transportation	
Want to see lighter traffic in my neighbourhood concerned about higher traffic amounts.	Design of South Campus aims to minimize traffic impacts on surrounding neighbourhoods by emphasizing movement to and from campus via alternative transportation, especially transit.
Access off of 122 Street through U of A land as much as possible, access off of 122 Street/63 Avenue dangerous.	The creation of new access points to South Campus is determined in consultation with the City of Edmonton, based upon professional traffic analysis.
Transportation plan is weak.	No response required.
Transportation plan is good.	No response required.
Reduce need for parking, confused about on parking numbers.	Design of South Campus aims to minimize traffic impacts on surrounding neighbourhoods by emphasizing movement to and from campus via alternative transportation, especially transit. Parking numbers have been reduced from 2002 numbers.
Glad to see good transit in the newer development.	No response required.
No park and ride.	A park and ride is not currently contemplated at South Campus.
Changes since last meeting show reasonable response to feedback.	No response required.
Transportation plan – tough call. I do not want to be challenged getting in and out of my neighbourhood, roundabouts should be further analyzed.	The creation of new access points to South Campus will be determined in consultation with the City of Edmonton, based upon professional traffic analysis.
Built Environment	
Development over the last 10 years has not matched visuals.	Design Guidelines in Sector Plan will guide substantial development projects.
Single dwellings facing on 62 Avenue.	LRDP indicates Land-Use, whereas the frontage of buildings will be addressed in

	Sector Plan and substantial development stages.
No residential on West 240 – research only.	Residential development is intended to provide a transition between existing residential neighbourhoods and different land uses such as research.
Height of academic and research facilities a concern.	Heights will transition from the edges of campus to avoid shadowing or privacy impacts on existing residential neighbourhoods.
Design specifics are not in place so difficult to assess; no architectural standards – a hodge podge campus.	Architectural standards are a component of the South Campus Sectors Plan process.
More information and examples on density.	Examples of anticipated density have been provided and are available for review. Further progress will be addressed at Sector Plan stages.
If what is depicted is actually done it would be most excellent.	No response required.
Sport facilities hugely over built – build only for students and staff not the general public.	Shared use recreational facilities will support Academic mission and communities.
Healthy and Complete Community	
I am looking forward to the development of South Campus.	No response required.
No trust in your healthy and complete community.	No response required.
Plan is positive.	No response required.
Lack of clear plan and options for handling interface between existing neighbourhoods and growth scenarios	The anticipated transition between new campus development and existing neighbourhoods has been articulated in greater detail in the LRDP and Sectors Plan.
14-Mar-13	
Sector 12 Themes	
Good impression, making progress, overall seems good, like graduate residences and green belt along 122 Street, residences should be only shorter buildings in height and if taller buildings needed, those should be located on interior of campus, residences on east side near LRT require thoughtful planning.	Heights will transition from the edges of campus to avoid shadowing or privacy impacts on existing residential neighbourhoods.

Needs to be more dense and urban with better connectors to routes beyond campus, very narrow, not developed to interact with City of Edmonton, and needs to be much more dense.	Campus densities are intended to be less than the existing North Campus, in consideration of the existing development in adjacent neighbourhoods. Connectivity with City of Edmonton roads and Multi-Use-Trails are provided where possible.
Information is not specific enough, still confused about final plans, want to see exactly what will be developed.	The LRDP is a Land-Use plan. The Sector Plan will include more details about the character of proposed development than the existing LRDP.
The LRDP needs substantive changes and re-thought rather than tweaks, U of A's focus/goals need to remain on education and not be landlord and parking provider.	U of A's focus is on the creation of an exceptional campus environment. The mandate is academic support to students/faculty/staff.
Sector 14 Themes	
Faculty of ALES and land for research being ignored.	ALES land requirements will continue to be provided for within Sector 13 and in other locations acquired for this purpose.
Like revisions, making progress, overall quite good, acceptable.	No response required.
Still concerned about Lansdowne and Grandview, back land for residence fronting on 62 Ave is good, happy with increase to transition space but unsure if it will be green space, Grandview and Lansdowne significantly affected.	Setbacks and green space where Sector 14 adjoins existing neighbourhoods will be further addressed in Sector planning.
The sector will put thousands of people into cars, uncertainty of where the bus is linking sector to the train, limited transportation linkage.	Details of bus integration with LRT is to be determined by the City of Edmonton. The design of South Campus aims to minimize automobile use by providing for alternative transportation options and providing a mix of land uses to create a complete community.
Prefer 2002 plan, focus on LEED.	No response required.
Additional Questions and Themes	
Coverage of what the changes are was good. Coverage of why the changes less clear.	No response required.
LRDP too general.	The LRDP is a Land-Use plan. Sector Plans will provide more details about the character of proposed development than the existing LRDP.

Slow down the presentation and provide take away document that has information in bullet form	Presentation and board materials remain on website at communityrelations.ualberta.ca.
Colors/shades on board material difficult to distinguish	Colours and patterns in LRDP land use figures have been adjusted for readability.

10. Please tell us the top three topics you would like to have addressed with regard to the amendments to the land use plan for South Campus?

26-Sep-12	
Transportation/traffic/parking	Information on what is intended for transportation, traffic and parking at South Campus are provided in the LRDP amendment and draft Sectors Plan.
Green space – more of it	A substantial amount of green space is provided for at South Campus.
Development of the West 240	Details on what is proposed for Sector 14 are included in the LRDP amendment and draft Sectors Plan.
14-Mar-13	
Impact related to parking, traffic, noise, bus links for LRT, roads and sidewalks/paths around South Campus and plans for roundabouts on 122 Street.	Information on the proposed transportation concepts for South Campus are provided in the LRDP amendment and draft Sectors Plan. Some questions require input from the City of Edmonton.
Sensitive design: low impact development, more density, compatible with surrounding neighbourhoods, plan for active living.	Details with respect to how South Campus will address these topics are included in the LRDP amendment and draft Sectors Plan.
Power plant too close to residential, underground power lines/transmitters	University service area, to be located in Sector 12, provides reasonable setbacks from these areas to existing neighbourhoods.

26-Sep-12

Themes

Transportation – concerns about 122 Street/63 Avenue intersection; people parking in surrounding neighbourhoods; cut through traffic.	Some questions require input from the City of Edmonton (design of 63 Avenue intersection; parking management in adjacent neighbourhoods). Cut-through traffic will not be possible with designs for Sector 12 or 14.
Green space – plan needs more green space; preserve farmland; develop density around South Campus LRT station to retain green space and agriculture research; protect wildlife in Sector 14; loss of organic land base; Canada goose and duck migration route needs to be protected. Consultation – needs to be improved; don't assume activists represent views of entire community; U of A needs to listen and be a good neighbor; everyone seems hopeful – hope that is the case.	Plan incorporates significant green space and accommodates agricultural research in Sector 13. Density is focused close to LRT. Habitat for wildlife will be a consideration int the design of the constructed wetland system and preservation of existing treed areas. Consultation activities aim to support the U of A as a good neighbour.
West 240 – do not develop; if developed must be self-contained and isolated; residents of Grandview and Lansdowne require bigger buffer zones; no access to their communities; concerns about schools; need for services.	Sector 14 is proposed as a self-contained sector with no direct private vehicle access to existing neighbourhoods. Sector 14 will provide new services and children for area schools.
Aim higher, inspire community and be ambitious; the plan looks good but will it happen due to budgets, the communities will bear the costs of unanticipated changes. The plan should serve academic goals not regional community recreation needs e.g. Saville Centre.	The plan prioritizes university needs and identifies partnerships where they may be beneficial to university interests. The LRDP first and foremost must support the institutional academic goals. The plan sets certain expectations for development.

14-Mar-13

Themes

West 240: question about the density range, do not develop because it serves interest of healthy food supply, housing needs to match homes from mature neighbourhoods, multiuse trail/landscape buffer surrounding W 240, generous open space landscaping with trees, no connector through W 240 between Lansdowne and Grandview, no access for emergency vehicles into Grandview from W 240, any research on sociological consequences of imbalance between Grandview and housing planned for W 240.	No private vehicle access to existing neighbourhoods is proposed, and transition areas will provide green space and setbacks from existing development. Proposed residential development will be compatible with that in existing neighbourhoods. This will be further explored in Sector Plans and substantial development stages.

Great sustainability elements, amended plan looks like a good fit, info presented suggest some concerns have been acknowledged, access to bus link well placed, concerns about capacity issues on the LRT serving South Campus, need for connectivity of bike and pedestrian access.	Bus link and LRT elements are planned in collaboration with the City of Edmonton. Connectivity of bike and pedestrian access links are intended to align with City of Edmonton multi-use trails, paths, etc.
LRPD outdated, opposed to amendment, remove plans for Sector 14, U of A should not build facilities not directly related to research, teaching and student residences, U of A developing South Campus hodgepodge and appears to developing to make money and not providing education opportunities.	LRDP is outdated, which is the reason for the amendment. Primary focus at South Campus is the development of research, teaching and student housing facilities.
Traffic and parking from all sectors will negatively impact surrounding neighbourhoods, roundabouts on 122 Street a concern, call for updated traffic impact assessment and parking demand study.	Traffic impacts to existing neighbourhoods have been minimized or removed through design wherever possible. Details of transportation elements subject to review by the City of Edmonton. The 2011 Traffic Impact Assessment is still valid and is aligned to the City of Edmonton's 2043 Transportation Plans.
Building over wetlands a concern.	Constructed wetland system will replace existing wet areas.
Lack of density, U of A has unique opportunity to bring people from suburbs back into the city, do not plan something that is lifeless that does not attract people.	Plan aims to create an active and vibrant campus, but the form of campus development must be considerate of existing neighbourhoods.
Question about the difference between LRDP and Sector Plan, question about the plans for Sector 13, request for information and details on coordination of recreational facilities with City of Edmonton.	LRDP is a high-level plan for all campus sites, Sectors Plan is a more detailed plan for South Campus only. Sector 13 will continue to provide space for agricultural research and other activities currently carried out at South Campus.

TRANSPORTATION PLANNERS AND ENGINEERS

bunt & associates

Fox Drive Extension into U of A South Campus Traffic Assessment

Final Report

Prepared for

The City of Edmonton and The University of Alberta

Date

January 7, 2011

Prepared by

Bunt & Associates

Project No.

3027.37

CORPORATE AUTHORIZATION

This document entitled "***Fox Drive Extension into U of A South Campus Traffic Assessment, Final Report***" was prepared by Bunt & Associates for the benefit of the Client to whom it is addressed. The information and data in the report reflects Bunt & Associates best professional judgment in light of the knowledge and information available to Bunt & Associates at the time of preparation. Except as required by law, this report and the information and data contained are to be treated as confidential and may be used and relied upon only by the client, its officers and employees. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Bunt & Associates accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

PERMIT TO PRACTICE
BUNT & ASSOCIATES (N. ALBERTA) LTD.
Signature _____
Date JAN. 7, 2011
PERMIT NUMBER: P 7991
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Corporate Permit

PROFESSIONAL ENGINEER ALBERTA
CATHERINE L. OBERG

JAN 7, 2011
Engineer's Stamp

January 7, 2011
3027.37

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Re: Fox Drive Extension into U of A South Campus
Traffic Assessment
Final Report

Please find enclosed the Fox Drive Extension into U of A South Campus Traffic Assessment, Final Report for your files.

Preparation of the enclosed report began in January 2010. Over the last year, a number of projects in the area were progressing simultaneously, including the South Campus Sector Plan and plans for Expo 2017. The attached report was prepared based on the best information available at the outset of the project. For example, plans for the University of Alberta West 240 lands had not been initiated when the land use assumptions were identified for the establishment of the 2041 Background Traffic Volumes. As well, the bid package for Expo 2017 was being prepared through 2010 and was therefore considered as part of the Ancillary Considerations section. Therefore, while it is recognized that the landscape in the vicinity of South Campus may have changed, the attached report was finalized based on the initial land use assumptions. It is anticipated that additional traffic assessments will be completed where required to address land use changes and specific site access designs.

At this time, Bunt & Associates would also like to thank both the City of Edmonton and University of Alberta representatives that provided input and reviewed the attached document. It was a pleasure working with the two agencies on this project.

If there are any questions regarding the information contained in the attached report, please contact the undersigned at 780-732-5373 ext. 226.

Yours truly,
Bunt & Associates

Catherine Oberg, P.Eng.
Senior Transportation Engineer

TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

LIST OF EXHIBITS

LIST OF TABLES

1. INTRODUCTION

1.1 Preface

The University of Alberta (U of A) is currently preparing sustainable Sector Plans outlining the long term development plans for the South Campus area. The South Campus development area is generally located south of Belgravia Road, north of 51 Avenue, and east of 122 Street. The development area also includes the West 240 area, located between the Landsdowne and Grandview neighbourhoods west of 122 Street. The completion of the South Campus Sector Plans will provide the foundation for the development of a new university campus. At this time the South Campus is being planned to accommodate a total population of approximately 19,750 students, faculty and staff by 2030. Of this total population, the student population is anticipated to be in the order of 15,000 people.

The expansion of the U of A along the South LRT line represents the extension of the campus as a "linear urban campus" that incorporates the South LRT into the daily operation of the campus. LRT operations will not only transport students, faculty, and staff to the South Campus area but will also facilitate the movement of students, faculty, and staff between the North and South Campus areas as well as between these two campuses and the downtown campus. In general, the U of A would like to maximize the utility associated with South LRT operations as a strategy to reduce single occupant vehicle travel to the South Campus. Therefore, as part of the development of the South Campus Sector Plan, multi-modal access to the site will be considered.

With the opening of the South Campus LRT and Transit Centre in April 2009 and the more recent opening of South LRT to Century Park, key components of the transit system to the South Campus have been established. Long term operations of the LRT may include changes to frequency and number of cars, but the alignment of the track through the U of A South Campus will not change. As well, it is anticipated that the primary transit centre for the South Campus will be maintained adjacent to the South Campus LRT station to provide effective coordination between bus transit and LRT.

With key components of the transit system established, consideration was given to the location and functionality of vehicle access and parking accommodation. Notwithstanding that it is the intent of the U of A to minimize single occupant vehicle travel to and from the South Campus area, it is recognized that private vehicle travel will continue to be a measurable component in the movement of people and goods to and through the South Campus area, particularly in light of the significant community recreation component being planned at this time. The possible use of the development area as the host site for EXPO 2017 also needs to be acknowledged.

The continued use of private vehicle travel to and from the South Campus area will be a reflection of the nature and characteristics associated with University traffic and non-University related traffic. Non-University traffic is anticipated to include traffic generated by community recreation facilities such as the Saville Centre, the GO Centre, the fieldhouse, and the proposed twin ice arenas, as well as traffic generated by the existing and expanded Neil Crawford Provincial Centre (NCPC). In addition to private vehicle traffic activity, service vehicle movements, internal transit movements, and parking will also require accommodation.

1.2 Study Need and Purpose

The South Campus Area is constrained from a traffic accommodation perspective given the restrictions imposed by South LRT development and the existing lack of suitable access to Belgravia Road. The primary purpose of the study is to review alternative traffic networks for the North Quarter of the South Campus area that have the capability of providing an appropriate level of traffic access into the greater South Campus area, which could perform satisfactorily from a traffic operational and access management perspective and which are designed to meet current roadway geometric standards.

The completion of the study will allow for an appropriately designed roadway system plan to be selected and developed. This will allow the University and the City to monitor the implementation of roadway, intersection, and access improvements during the staged development of the plan area. The development of the traffic management plan will reflect current realities and future trends, to the extent that they can be anticipated. In this fashion, cumulative impacts can be evaluated.

1.3 Project Scope

The project scope includes the following:

- Analysis of existing intersection operations at Belgravia Road/Fox Drive and 63 Avenue/122 Street;
- Estimation, distribution and assignment of site generated traffic activity from the north portion of the South Campus sector based on a series of mode split assumptions for the various land use components planned to be developed;
- Review of transit operations to and from the South Campus Transit Centre; and,
- Analysis of alternative site access scenarios including but not limited to access to and from Fox Drive, Belgravia Road, and 122 Street.

2. EXISTING AND FUTURE AREA CONDITIONS

2.1 Site Location

The study area includes the north quarter of the University South Campus area. This study area is generally bounded by Belgravia Road to the north, the LRT alignment to the east, the existing 60 Avenue right-of-way to the south, and 122 Street to the west as shown in **Exhibit 2-1**.

2.2 Existing Adjacent Land Uses

The study area is located within an Alternative Jurisdiction zone that currently accommodates the U of A South Campus, the Saville Centre, the NCPC, and the Alberta School for the Deaf. The Alternative Jurisdiction zone is surrounded by primarily low density residential land uses.

2.3 Existing Roadway Network

Key arterial roadways adjacent to and in the vicinity of the study area include:

51 Avenue is a four-lane divided urban arterial roadway between 111 Street and 122 Street in the vicinity of the South Campus site. West of 122 Street, 51 Avenue transitions to an urban collector roadway within the Lansdowne neighbourhood. The posted speed limit along 51 Avenue in the vicinity of the site is 50 km/hr.

Belgravia Road/71 Avenue is a divided urban arterial that includes two westbound lanes and three eastbound lanes in the vicinity of the South Campus. The posted speed limit along Belgravia Road/ 71 Avenue is 60 km/hr.

122 Street is a four-lane divided urban arterial between Whitemud Drive and Fox Drive. The posted speed limit along 122 Street is 60 km/hr.

113 Street south of 71 Avenue is a four-lane divided urban arterial. 113 Street terminates at 61 Avenue with the arterial roadway continuing along 61 Avenue to the east. The posted speed limit along 113 Street is 60 km/hr.

61 Avenue is a four-lane divided arterial between 104 Street and 113 Street. As the extension of 113 Street, 61 Avenue provides an arterial connection between 113 Street and 111 Street, which provides the continuation of the north/south arterial west of Calgary Trail. The posted speed limit along 61 Avenue in the vicinity of the South Campus site is 60 km/hr. The extension of 61 Avenue west of 113 Street currently provides access to the South Campus area (60 Avenue).

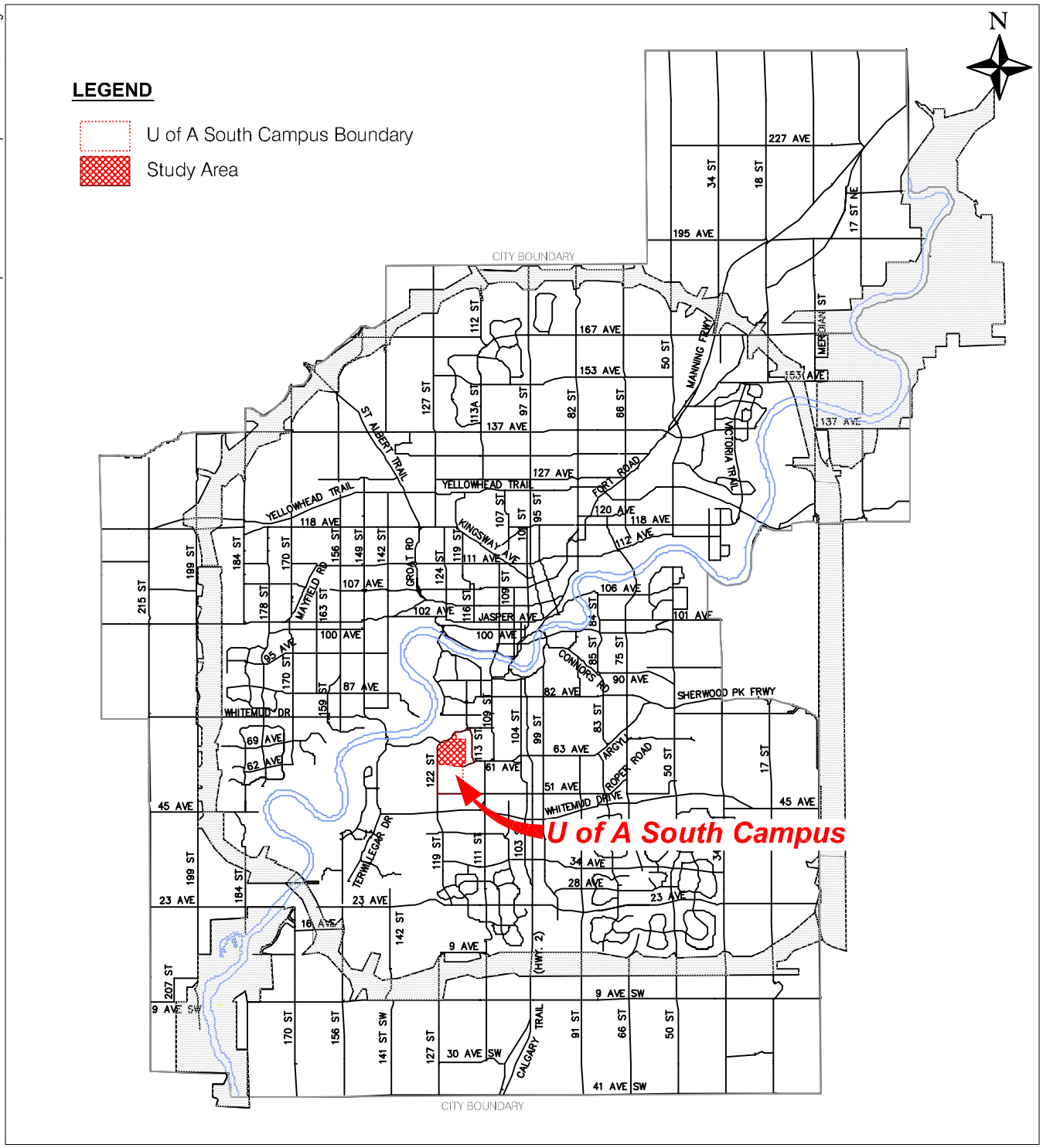


Exhibit 2-1

Scale NTS

Site Location

111 Street is a four-lane divided arterial between 51 Avenue and 61 Avenue. South of 51 Avenue additional lanes are added in the vicinity of the Whitemud Drive/111 Street interchange. The posted speed limit along 111 Street is 60 km/hr.

Fox Drive is a six-lane divided urban arterial, (four travel lanes plus curbside lanes dedicated to transit) that provides a connection between 122 Street/Belgravia Road and Whitemud Drive. The posted speed limit along Fox Drive is 70 km/hr, with a short section of the eastbound lanes posted at 60 km/hr approaching Belgravia Road. Fox Drive has recently been upgraded to six lanes to accommodate curb side dedicated transit lanes as part of the overall Quesnell Bridge roadway improvement project.

Whitemud Drive is a six-lane free-flow facility that is a key component in the City of Edmonton's inner ring loop. The posted speed limit on Whitemud Drive is 80 km/hr. In the southwest, interchanges are located along Whitemud Drive at Calgary Trial/Gateway Boulevard, 111 Street, 122 Street (119 Street), Terwillegar Drive, 53 Avenue, and Fox Drive. Access to Whitemud Drive is also available via 106 Street as C/D roads are provided between Calgary Trail and 111 Street.

2.4 Existing Daily and Peak Hour Traffic Volumes

Existing and historical traffic flows on arterial roadways immediately adjacent to, and in the vicinity of the South Campus were ascertained based upon a review of Average Annual Weekday Traffic Volume Reports prepared by the Transportation Department. **Table 2-1** summarizes the traffic volumes along the arterial roadways in the vicinity of the study area.

Table 2-1: Average Annual Weekday Traffic Volumes

Location	2002	2003	2004	2005	2006	2007
51 Avenue west of 107 Street	-	19,700	-	18,500	-	17,800
51 Avenue west of 111A Street	10,600	-	13,300	-	-	-
61 Avenue west of 109 Street	-	14,300	-	16,100	-	27,300
111 Street south of 61 Avenue	-	35,300	-	38,900	-	32,500
113 Street south of Belgravia Road	29,400	-	29,500	-	-	-
122 Street north of 51 Avenue	12,600	-	12,900	-	-	-
122 Street south of Fox Drive	-	12,300	-	11,900	-	12,700
122 Street north of Whitemud Drive	-	15,000	-	14,800	-	16,600
Belgravia Road east of Fox Drive	37,200	-	37,600	-	-	-
Fox Drive west of Belgravia Road	-	34,800	-	34,300	-	30,700
Whitemud Drive west of 122 Street	86,800	99,000	-	101,800	94,800	89,400
Whitemud Drive north of 53 Avenue	103,700	103,000	-	-	92,600	93,800
Quesnell Bridge	112,900	113,700	117,000	118,900	112,000	109,500

Table 2-2 and **Table 2-3** summarize the Weekday AM and PM Peak Hour traffic movements (two-way) along the arterial roadways adjacent to the study area.

Table 2-2: Weekday AM Peak Hour Traffic Volumes

Location	Direction	2002	2003	2004	2005	2006	2007
51 Avenue west of 107 Street	EB	-	692	-	664	-	589
	WB	-	398	-	366	-	334
51 Avenue west of 111A Street	EB	676	-	701	-	-	-
	WB	317	-	329	-	-	-
61 Avenue west of 109 Street	EB	-	579	-	696	-	-
	WB	-	533	-	499	-	-
111 Street south of 61 Avenue	NB	-	2,004	-	1,903	-	1,865
	SB	-	708	-	725	-	716
113 Street south of Belgravia Road	NB	1,110	-	816	-	-	-
	SB	918	-	989	-	-	-
122 Street north of 51 Avenue	NB	1,079	-	1,060	-	-	-
	SB	330	-	341	-	-	-
122 Street south of Fox Drive	NB	-	913	-	971	-	935
	SB	-	263	-	322	-	230
122 Street north of Whitemud Drive	NB	-	1,226	-	1,203	-	1,362
	SB	-	395	-	401	-	397
Belgravia Road east of Fox Drive	EB	2,104	-	2,032	-	-	-
	WB	667	-	710	-	-	-
Fox Drive west of Belgravia Road	EB	-	1,820	-	1,846	-	1,673
	WB	-	877	-	878	-	741
Whitemud Drive west of 122 Street	EB	5,091	4,997	-	4,375	4,439	3,976
	WB	3,218	3,213	-	3,423	3,041	2,266
Whitemud Drive north of 53 Avenue	NB	4,695	4,605	-	-	3,915	3,233
	SB	3,967	3,778	-	-	3,217	4,531
Quesnell Bridge	NB	4,521	4,333	4,687	4,693	4,059	4,500
	SB	4,610	4,585	4,675	4,853	4,175	4,525

Table 2-3: Weekday PM Peak Hour Traffic Volumes

Location	Direction	2002	2003	2004	2005	2006	2007
51 Avenue west of 107 Street	EB	-	738	-	699	-	818
	WB	-	968	-	992	-	896
51 Avenue west of 111A Street	EB	349	-	483	-	-	-
	WB	674	-	710	-	-	-
61 Avenue west of 109 Street	EB	-	573	-	592	-	-
	WB	-	836	-	944	-	-
111 Street south of 61 Avenue	NB	-	1,097	-	1,193	-	957
	SB	-	1,998	-	2,082	-	1,888
113 Street south of Belgravia Road	NB	1,395	-	1,333	-	-	-
	SB	1,312	-	1,254	-	-	-
122 Street north of 51 Avenue	NB	519	-	548	-	-	-
	SB	683	-	700	-	-	-
122 Street south of Fox Drive	NB	-	534	-	689	-	686
	SB	-	649	-	604	-	588
122 Street north of Whitemud Drive	NB	-	530	-	618	-	761
	SB	-	812	-	820	-	837
Belgravia Road east of Fox Drive	EB	1,103	-	935	-	-	-
	WB	2,250	-	2,210	-	-	-
Fox Drive west of Belgravia Road	EB	-	1,030	-	1,051	-	1,001
	WB	-	2,183	-	2,060	-	2,197
Whitemud Drive west of 122 Street	EB	3,731	3,606	-	3,114	3639	3,215
	WB	4,628	4,398	-	4,790	4758	4,461
Whitemud Drive north of 53 Avenue	NB	4,376	4,223	-	-	3798	4,377
	SB	4,541	4,604	-	-	4386	3,769
Quesnell Bridge	NB	5,302	5,199	5,400	5,460	4723	5,117
	SB	4,793	4,620	4,841	4,845	4304	4,586

Overall traffic volumes on the arterial roadways in the vicinity of the study area appear to be relatively consistent between 2002 and 2007, with the exception of 61 Avenue west of 109 Street, where a significant increase in daily traffic was noted in 2007. In general, the daily and peak hour volumes from 2002 to 2007 are reflective of arterials within a mature part of the City of Edmonton.

In addition to the above historic traffic volume data, the City of Edmonton completed intersection turning movement counts at the Belgravia Road/116 Street intersection in 2007 and the Belgravia Road/Fox Drive and 63 Avenue/122 Street intersections in 2008. The AM and PM Peak hour turning movement volumes measured at these intersections are summarized in **Exhibit 2-2**. While more recent counts have been completed at intersections within the study area, a review of the data suggests that road closures associated with Whitemud Drive construction may have resulted in changes in traffic patterns in the vicinity of South Campus. The 2008 counts are therefore anticipated to be the most recent counts available that reflect the availability of the complete roadway network.

2.5 Existing Transit Operations

The south LRT extension to South Campus opened on April 25, 2009 and the extension to Century Park opened on April 24, 2010. In addition to LRT service to South Campus, the South Campus Transit Centre also opened in April 2009 and accommodates seven basic routes, seven peak hour routes, one night route, and a shuttle to Fort Edmonton Park. **Table 2-4** summarizes the bus transit service accommodated at the South Campus Transit Centre.

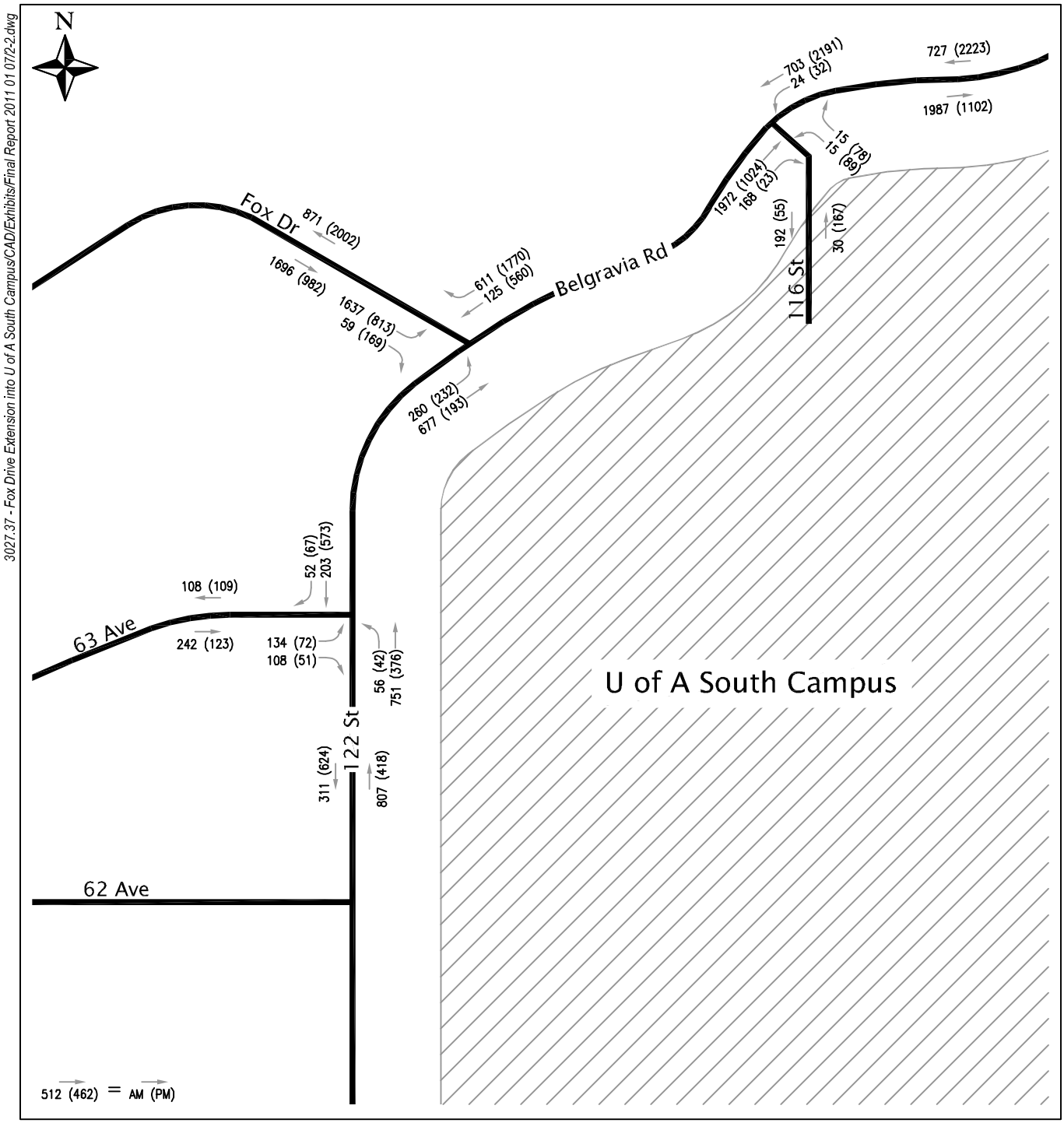


Exhibit 2-2

Scale NTS

Existing (2008) Traffic Volumes
AM (PM) Peak Hour

Table 2-4: South Campus Transit Centre – Available Bus Routes

Route	Service	Destination	Weekday Frequency (minutes)			
			AM/PM Peak Hours	Midday	Early Evenings	Late Evenings
4	Basic	West Edmonton Mall - Capilano	15	15	15	30
30	Basic	Leger	15	30	30	
32	Peak	Brander Gardens/Southgate	30			
36	Basic	Century Park	15	30	30	
43	Peak	Century Park	7/8			
50	Basic	Southgate	15	30	30	60
53	Basic	Southgate	15	30		
55	Basic	Southgate	30	30	30	
104	Peak	Lymburn	30			
105	Peak	Lessard	15			
106	Basic	Capilano	30	30		
133	Peak	West Edmonton Mall	30			
138	Peak	Wedgewood	30			
139	Peak	Grange	30			
330	Night	Leger				60
596	Sunday & Holiday	Fort Edmonton/Valley Zoo (May - Sept)				

In addition to the transit routes now serving South Campus, two basic routes operate along 51 Avenue (Routes 33 and 34).

2.6 Existing Pedestrian and Bicycle Routes

Sidewalks are currently provided along the following arterials:

- 51 Avenue - sidewalks are provided on both sides of 51 Avenue between 111 Street and 115 Street, but are only provided on the south side between 115 Street and 122 Street
- 60 Avenue – Sidewalks are provided along the north side of 60 Avenue, west of 113 Street.
- 61 Avenue – Sidewalk connections extend from 113 Street into the Lendrum Neighbouhood at the 61 Avenue/113 Street intersection and into the Parkallen neighbourhood at the 61 Avenue/113 Street and 61 Avenue/111 Street intersections.
- Belgravia Road/71 Avenue – A sidewalk is provided on the north side of the service road located on the north side of Belgravia Road. This sidewalk provides access to the pedestrian overpass, above Belgravia Road, located west of 116 Street. Sidewalk connections are also provided along the south side of Belgravia Road from 113 Street into the NCPC lands, and from 116 Street to Fox Drive.
- 111 Street – Sidewalks are provided on both sides of 111 Street south of 61 Avenue.
- 113 Street – Sidewalks are provided on both sides of 113 Street; however, the walk on east side is adjacent to the houses along the service road.
- 122 Street – The sidewalk on the south side of Belgravia Road continues on the east side of 122 Street to 63 Avenue. South of 63 Avenue a sidewalk is provided on the west side of 122 Street.

Two main north/south bicycle routes are provided adjacent to the study area. The first north/south route includes a separated bike path (sidewalk shared with pedestrians) along the west side of 122 Street/119 Street from Fairway Drive to 63 Avenue. At 63 Avenue a short link of separated bike path is provided on the east side of 122 Street, which connects to a signed bike route (on roadway) along roadways within South Campus. The signed bike route connects to a pedestrian overpass that goes over Belgravia Road at approximately 116 Street. The signed bike route then continues north along 116 Street and 115 Street to 87 Avenue.

The second north/south route extends north from Whitemud Drive as a signed bike route on 115 Street to 60 Avenue, and along 60 Avenue to 113A Street. East of 113A Street a separated bike path is provided to 113 Street, and continues north along the west side of 113 Street to 74 Avenue. An east/west signed bike route is identified along 74 Avenue west of 113 Street, which connects to the signed bike route along 115 Street.

In addition to the above, a multiuse trail was recently opened along the west side of the LRT tracks.

2.7 Future Roadway Network

Whitemud Drive is currently being widened, with construction scheduled for completion in 2010. The construction project also includes the rehabilitation and widening of the Quesnell Bridge and the reconstruction and widening of the Fox Drive overpass. Upon completion in 2010, Whitemud Drive will accommodate six lanes plus two auxiliary lanes between the Fox Drive overpass and 149 Street. As well a Transit Priority Lane will be provided on the Whitemud Drive/Fox Drive southbound to eastbound loop ramp, the 149 Street northbound to eastbound ramp will be widened to two lanes, and Fox Drive will be widened by one lane in each direction.

The U of A South Campus is located within a mature area of the City of Edmonton. Other than the improvements currently underway on Whitemud Drive and Fox Drive, no major roadway network modifications are anticipated in the future.

2.8 Horizon Year Background Traffic Volumes

The City of Edmonton Transportation Department provided 2041 AM peak hour, PM peak hour, and Daily link volume estimates for use in determining background traffic volumes for the evaluation of the traffic impacts associated with development of the U of A South Campus.

The 2041 model volumes provided by the City of Edmonton include traffic anticipated to be generated by the U of A South Campus and the NCPC within the 2041 horizon. Three zones are identified that approximately correspond to the South Campus and the NCPC development areas. These three zones include combined employment estimates in the order of 4,500 employees and population estimates in the order 5,540 people.

Access to the three study area zones within the model includes two accesses to 122 Street, one access to Belgravia Road, and two accesses to 113 Street. As well, the existing westbound flyover from the north end of the South Campus lands to Fox Drive westbound is included in the model. The model also includes a link from Fox Drive Eastbound directly into the South Campus lands; although it accommodated minimal volumes.

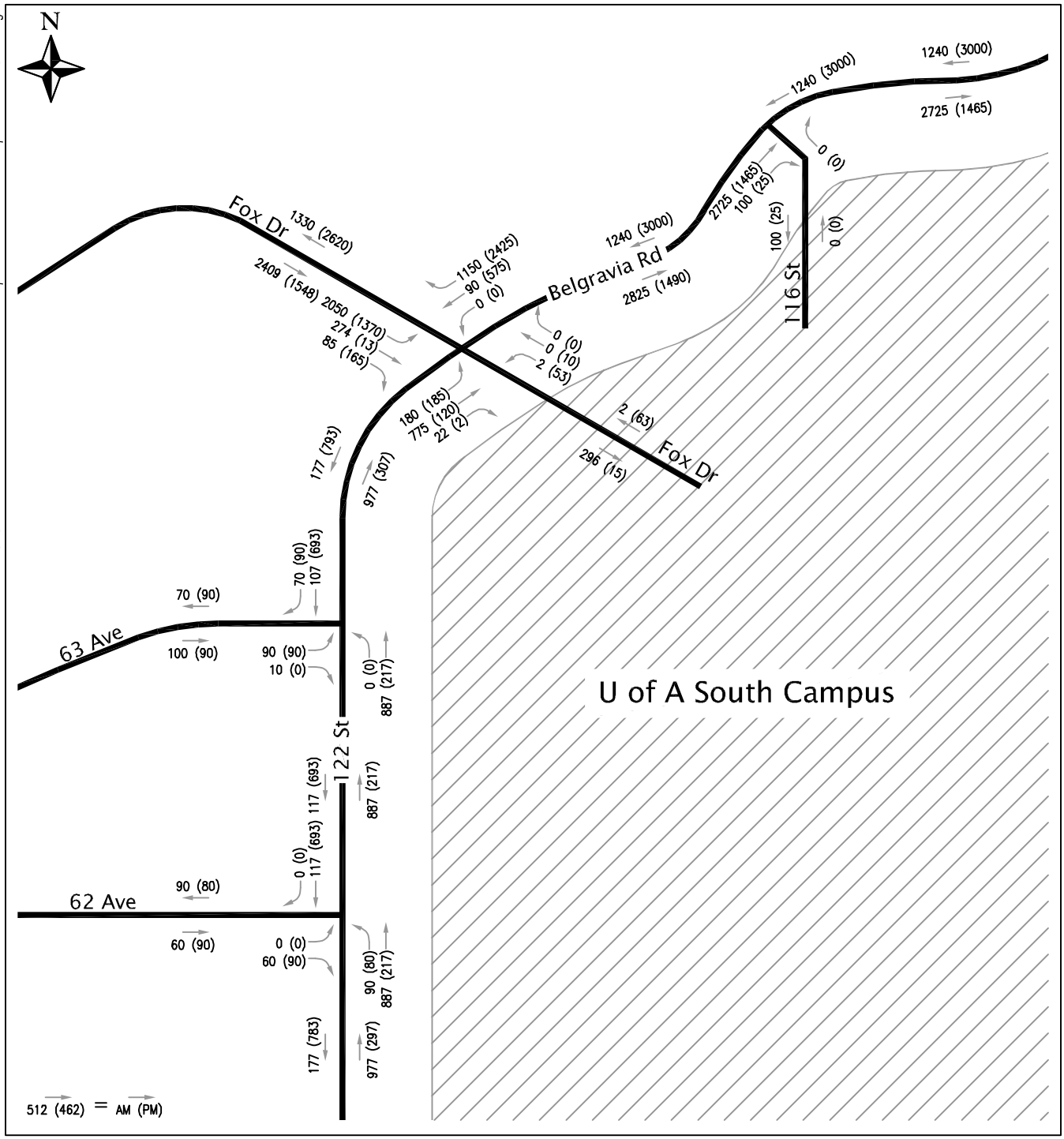
The City of Edmonton provided select link analysis plots (in percentages) illustrating the origin and destination of traffic for each of the three study area zones, as well as for short cutting traffic that was identified in the model as traveling through the NCPC between 113 Street and Fox Drive. The select link analysis plots were used to remove short cutting traffic through the NCPC and to remove traffic associated with the U of A. Traffic anticipated to be associated with the 860 NCPC employees included in the model was retained.

Once the model volumes were adjusted to remove short cutting and U of A traffic, potential traffic growth associated with the NCPC was added to the network. Based on a review of the *South Campus/Neil Crawford Provincial Centre Planning Study: Traffic Impact Assessment* (NCPC TIA) prepared by IBI Group

in March 2007 on behalf of the Government of Alberta and the U of A, the NCPC is anticipated to expand to ultimately include approximately 3,500 employees on-site. Using the trip generation information included in the NCPC TIA, the number of trips anticipated to be generated by the net increase in employees on the NCPC site, as compared to the 2041 model, was estimated. Therefore, the traffic anticipated to be generated by an additional 2,640 employees on the NCPC site was added to the 2041 background traffic volumes. While it is recognized that the NCPC TIA identifies that the ultimate expansion could occur by 2030, as it is an ultimate build out, the number of employees on site should be consistent in the 2041 horizon.

In addition to the above, the 2041 background volumes were adjusted to reflect the potential for the fourth leg at the Belgravia Road/Fox Drive intersection and the reconfiguration of the Belgravia Road/116 Street intersection from an all-directional to a right in/right out access. **Exhibit 2-3** illustrates the 2041 Background Traffic Volumes used in the assessment.

It should be noted that the 2041 background traffic volumes do not include significant development on the U of A West 240 lands. The 2041 model provided by the City of Edmonton included employment and population estimates of 940 employees and 230 residents within the U of A West 240 lands by 2041. It is anticipated that a more detailed traffic assessment will be completed once development concepts have been prepared for the U of A West 240 lands and more accurate employment and population estimates can be provided.



3027.37 - Fox Drive Extension into U of A South Campus/CAD/Exhibits/Final Report 2011 01 07/2-3.dwg

Exhibit 2-3

Scale NTS

2041 Background Traffic Volumes (Option 1) AM (PM) Peak Hour

3. LAND USE ASSUMPTIONS

3.1 Study Area

For the purposes of this assessment, the study area includes the lands located within the north portion of the South Campus. This generally includes Sector 12 (north ¼) as defined in the South Campus Sector Plan Long Range Development Plan prepared by Stantec. **Exhibit 3-1** illustrates the study area.

3.2 Land Use Assumptions

Development within the South Campus is anticipated to include academic, research, and administration space, student residences, and parkades in the central and southern portions of the South Campus, with a series of recreation facilities developed along the north boundary that will be shared with community users. **Exhibit 3-2** illustrates the potential layout of the South Campus, based on draft information provided by the U of A.

The recreation facilities proposed on the north boundary of the campus include:

- Saville Centre – existing
- Foote Field - existing
- GO Centre – under construction
- Twin Ice Arena – proposed
- Fieldhouse – proposed

The Saville Centre is a combination curling/tennis facility that includes 10 curling sheets and 8 indoor tennis courts. In addition, a gymnasium, a fitness centre, and general public space are included in the facility.

Foote Field is the home field for the U of A Golden Bears and also includes track and field space.

The GO Community Centre is currently under construction and includes a main spectator gym (2,800 seats), general gymnasium and fitness facilities, and court areas that can be used for volleyball and basketball. While the court areas can accommodate both volleyball and basketball courts, available site plans generally indicate that the north court area would predominantly be used for basketball (max 5 courts) and the south court area would predominantly be used for volleyball (max 12 courts).

3027.37 - Fox Drive Extension into U of A South Campus\CAD\Exhibits\Final Report 2011 01 07\3-1.dwg

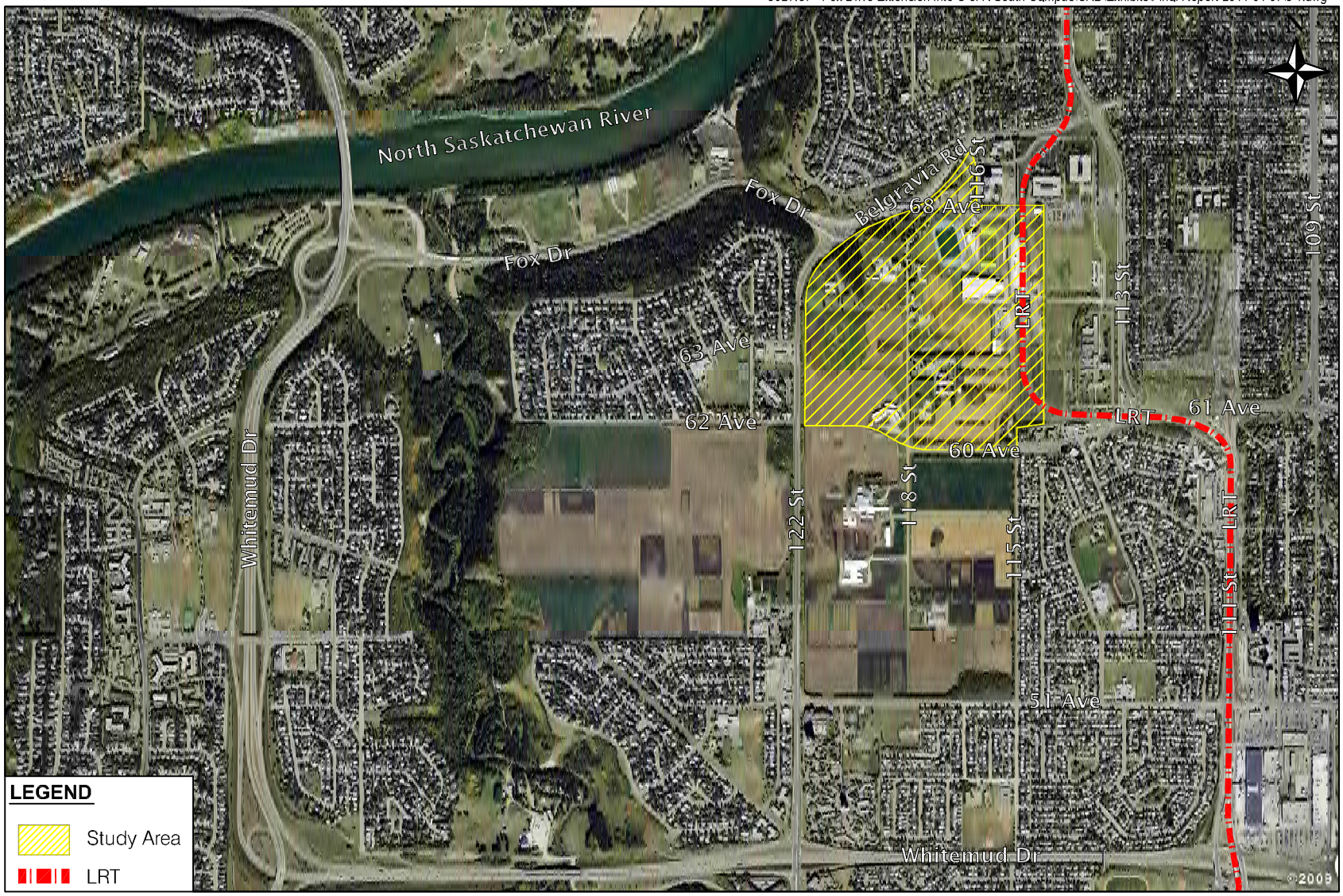
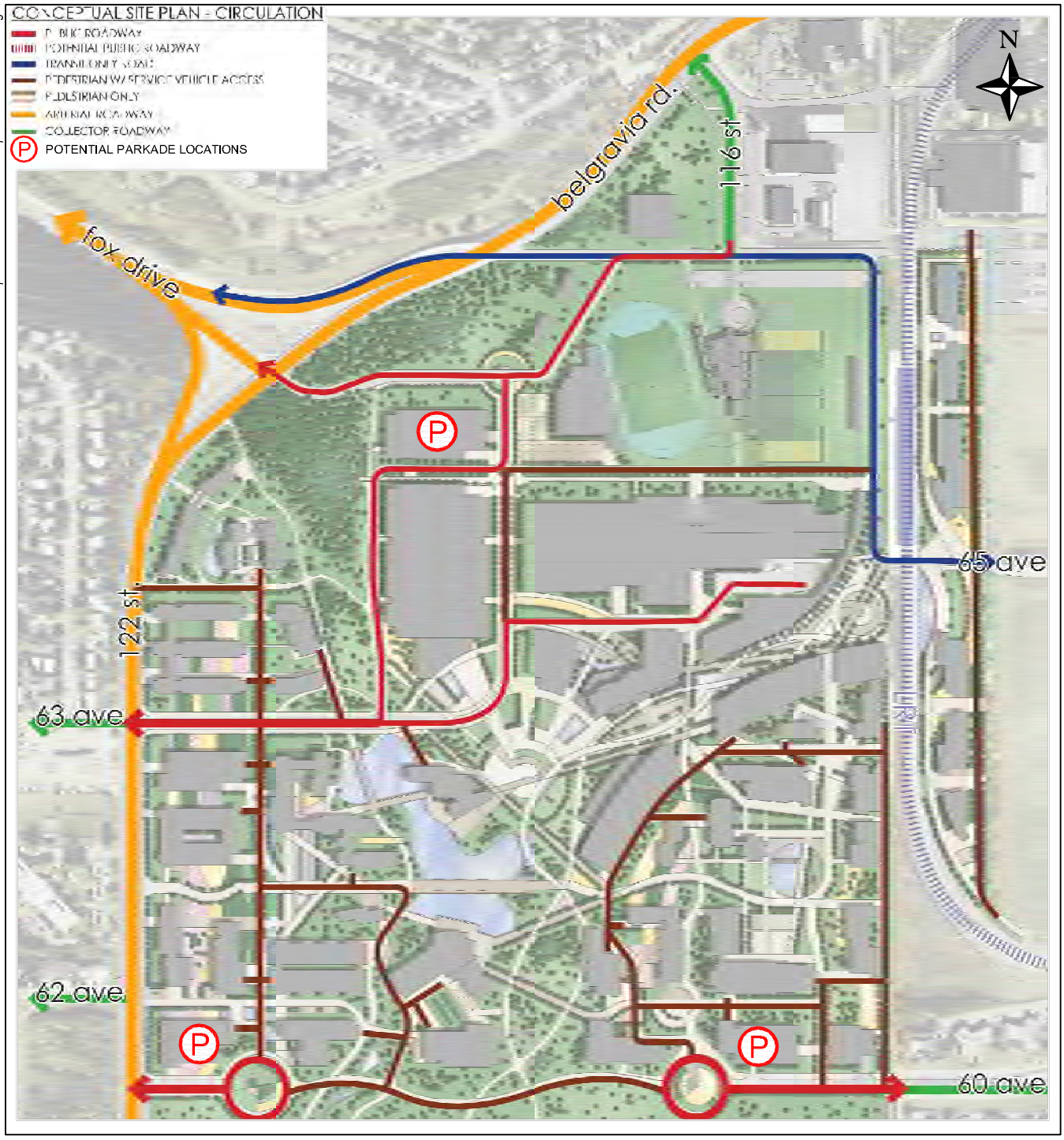


Exhibit 3-1

Scale NTS

Study Area



3027.37 - Fox Drive Extension into U of A South Campus/CAD/Exhibits/Final Report 2011 01 07/3-2.dwg

Exhibit 3-2

Scale NTS

South Campus Concept Plan

At this time, details regarding the twin ice arena and field house complexes have not been established. For the purposes of this assessment is assumed that the twin ice arena facility will include two NHL size ice rinks and associated locker rooms, referee rooms, a concession stand, and small meeting rooms. It is anticipated that the field house could accommodate a variety of indoor sporting events including soccer, ball hockey, and lacrosse.

3.3 On-Site Parking

Based on a review of the South Campus Sector Plan, the South Campus is anticipated to accommodate 15,000 students (full time learning equivalents – FLEs) and 4,750 faculty and staff (full time equivalents – FTEs) by 2030. This is anticipated to represent the build out of Sector 12 and has been used for assessment purposes.

Based on information contained in the South Campus Sector Plan, a recommended parking supply ratio of 0.15 trips/total population has been assumed to determine the potential parking requirements on the site. Based on this parking ratio, a total of approximately 3,000 parking stalls may be developed on site. For the purposes of the assessment it is assumed that three parkades will be developed on the periphery of the South Campus. It is assumed that a southeast parkade would be located in the vicinity of 60 Avenue and 115 Street and accommodate 700 stalls, that a southwest parkade would be located in the vicinity of 62 Avenue and 122 Street and accommodate 1,150 stalls, and that a northwest parkade would be located in the vicinity of 63 Avenue and 122 Street and also accommodate 1,150 stalls. The northwest parkade would accommodate both University users and recreation facility user groups, while the south east and southwest parkades are anticipated to accommodate primarily University users.

3.4 Access Options

It is anticipated that a site access will be provided in the southeast quadrant at approximately 60 Avenue and 115 Street and in the southwest quadrant at 62 Avenue and 122 Street. These accesses have been identified in close proximity to the assumed parkades servicing the campus. As well, the existing access at Belgravia Road and 116 Street is anticipated to be modified to a right in/right out only access as a result of poor sightlines for the northbound left turn and potential queuing issues regarding the westbound left turn. In addition to these accesses, three options were reviewed for access to the north portion of the South Campus as follows:

- Option 1 – Two Additional Accesses: The extension of Fox Drive into the South Campus at Belgravia Road and the construction of the fourth leg of the 63 Avenue/122 Street intersection.
- Option 2 – The construction of the fourth leg of the 63 Avenue/122 Street intersection only.
- Option 3 – The extension of Fox Drive into the South Campus at Belgravia Road only.

4. TRIP GENERATION

4.1 Trip Generation Assumptions

4.1.1 U of A Students, Staff, and Faculty

Trips anticipated to be generated by U of A students, faculty, and support staff have been estimated based on a review of the ITE *Trip Generation, 8th Edition*. Based on this review, ITE land use code 550 – University/College identifies an average AM peak hour trip rate of 0.21 trips per student (80% inbound, 20% outbound) and a PM peak hour trip rate of 0.21 trips per student (30% inbound, 70% outbound).

As ITE trip rates are based on survey data, they inherently account for mode split and auto occupancy factors, therefore no additional reductions in trip-making activity have been applied. The AM and PM peak hour trip generation characteristics anticipated to be exhibited by the University land use component (students, faculty, and staff) are summarized in **Table 4-1**.

Table 4-1: U of A Students, Staff, and Faculty AM and PM Peak Hour Trip Generation

Variable	Trip Generation Rate	IN		Out		Total Trips
AM Peak Hour						
15,000 students	0.21 trips / student	80%	**2,520**	20%	**630**	**3,150**
PM Peak Hour						
15,000 students	0.21 trips / student	30%	**945**	70%	**2,205**	**3,150**

4.1.2 Saville Centre

The Saville Centre currently accommodates a number of user groups attending to various facility components including curling, tennis, gymnasium activity, fitness centre, and public meeting areas. As this facility is anticipated to continue to operate as it currently does, the estimate of trips associated with this facility has been based on discussions with U of A facility operators.

Patron arrivals and departures in the AM peak hour tend to be limited to the fitness centre and the curling rinks. While the fitness centre may include both inbound and outbound patrons, the curling rinks generally attract trips in the AM peak hour for a 9:00 AM start time. Based on discussions with the operators at Saville, it is estimated that up to 150 patrons arrive, and 50 patrons leave the Saville Centre during the AM peak hour on a typical weekday.

Table 4-2 presents the PM peak hour patron characteristics associated with the various components of the Saville Centre, while **Table 4-3** presents the AM and PM peak hour trip generation characteristics

anticipated based on applying mode split and auto occupancy assumptions. It is of note that trips specifically associated with facility staff have not been included as it is anticipated that these trips have been captured in the above trip rate applied to the U of A students, staff, and faculty component of the overall site.

Table 4-2: Saville Centre PM Peak Hour Patron Estimate

Facility Component	Patrons			Notes
	In	Out	Total	
Curling Rinks	80	80	160	-10 curling sheets, 8 patrons per sheet arriving for 5:30PM start (80 inbound patrons) -10 curling sheets, 8 patrons per sheet leaving prior to 5:30PM start (80 outbound patrons)
Tennis Courts	32	16	48	-8 tennis courts, 4 players per court arriving for 5PM start (32 inbound patrons) -50% of courts generate outbound person trips prior to 5PM start (16 outbound patrons)
Gymnasium	40	10	50	
Fitness Centre	20	10	30	
Public Meeting Space	0	0	0	-Anticipated to generate trips outside of peak hours
Miscellaneous	30	10	40	-Includes visitors, guests, spectators, etc... not otherwise accounted for
Total Patrons	**202**	**126**	**328**	

Table 4-3: Saville Centre AM and PM Peak Hour Trip Generation

		AM Peak		PM Peak	
Patron Load		**In**	**Out**	**In**	**Out**
		150	**50**	**202**	**126**
Auto Trips		**In**	**Out**	**In**	**Out**
Mode Split to Transit	10%	-	-	-	-
Mode Split to Auto	85%	106	35	143	89
Auto Occupancy	1.2				
Primary Trip Subtotal		**106**	**35**	**143**	**89**
Mode Split to Drop-off Inbound	5%	8	8	10	10
Mode Split to Pick-up Outbound	5%	3	3	6	6
Drop-off/Pick Up Trip Subtotal		**11**	**11**	**16**	**16**
Total Trips		**117**	**46**	**159**	**105**

4.1.3 GO Centre

Activity at the GO Centre in the AM peak hour is anticipated to be limited to the gymnasium/fitness centre. It is estimated that the patron loads associated with the GO Centre in the AM peak hour could be in the order of 50 inbound patrons and 25 outbound patrons.

Table 4-4 presents the PM peak hour patron characteristics associated with the various components of the GO Centre. **Table 4-5** presents the AM and PM peak hour trip generation characteristics anticipated based on applying mode split and auto occupancy assumptions to the anticipated patron loads. The mode split assumed for the GO Centre is slightly higher than that assumed for the Saville Centre, as it is anticipated that users of the GO Centre may include a younger demographic with a slightly higher propensity to use transit for recreation trips.

Again, trips specifically associated with facility staff have not been included as it is anticipated that these trips have been captured in the above trip rate applied to the U of A students, staff, and faculty component of the overall site.

Table 4-4: GO Centre PM Peak Hour Patron Estimate

Facility Component	Patrons			Notes
	In	Out	Total	
Basketball	96	24	120	-4 courts, 24 patrons per court (96 inbound patrons) -25% of courts generate outbound person trips (24 outbound patrons)
Volleyball	90	15	105	-6 courts, 15 patrons per court (90 inbound patrons) -1 court generates outbound person trips (15 outbound patrons)
Gymnasium/Fitness Centre	40	20	60	
Spectator Event Gym	0	0	0	-Typically used evenings and weekends
Miscellaneous	20	10	30	-Includes visitors, guests, spectators, etc... not otherwise accounted for
Total Patrons	**246**	**69**	**315**	

Table 4-5: GO Centre AM and PM Peak Hour Trip Generation

		AM Peak		PM Peak	
Patron Load		**In**	**Out**	**In**	**Out**
		50	**25**	**246**	**69**
Auto Trips		**In**	**Out**	**In**	**Out**
Mode Split to Transit	15%	-	-	-	-
Mode Split to Auto	80%	33	17	164	46
Auto Occupancy	1.2				
Primary Trip Subtotal		**33**	**17**	**164**	**46**
Mode Split to Drop-off Inbound	5%	3	3	12	12
Mode Split to Pick-up Outbound	5%	1	1	3	3
Drop-off Trip Subtotal		**4**	**4**	**15**	**15**
Total Trips		**37**	**21**	**179**	**61**

4.1.4 Twin Ice Arenas

The twin ice arena facility is anticipated to include 2 NHL sized ice sheets and associated locker rooms, referee rooms, concession and small meeting rooms. In the AM peak hour, traffic associated with the site is anticipated to be minimal; therefore, for the purpose of this study, 5 inbound trips have been assumed to be associated with the Twin Ice Arenas in the AM peak hour.

Based on a review of operating characteristics of other ice arenas in the City of Edmonton, the ice arenas have been assumed to generate about 100 patrons per rink during the PM peak hour (40 players, 60 spectators/coaches/other). It has been assumed that all peak hour patrons arrive during the PM peak hour. In addition, 50 outbound patrons have been assumed to account for rink users (prior to the peak hour) leaving the facility. Patron and trip generation characteristics assumed for the twin ice arena facility are summarized in **Table 4-6**.

Table 4-6: Twin Ice Arena AM and PM Peak Hour Trip Generation

		AM Peak		PM Peak	
Patron Load		**In**	**Out**	**In**	**Out**
		5	**0**	**200**	**50**
Auto Trips		**In**	**Out**	**In**	**Out**
Mode Split to Transit	0%	-	-	-	-
Mode Split to Auto	100%/95%	5	0	76	19
Auto Occupancy	1.0/2.5				
Primary Trip Subtotal		**5**	**0**	**76**	**19**
Mode Split to Drop-off Inbound	0%/5%	0	0	10	10
Mode Split to Pick-up Outbound	0%/5%	0	0	3	3
Drop-off Trip Subtotal		**0**	**0**	**13**	**13**
Total Trips		**5**	**0**	**89**	**32**

4.1.5 Field House

It is anticipated that the fieldhouse will operate year-round and host a wide variety of indoor sporting events including indoor soccer, ball hockey, and lacrosse. The peak periods of the fieldhouse are assumed to occur during the weekday evenings and weekend afternoons. Therefore, minimal AM peak hour traffic is anticipated. For the purpose of this study, 5 inbound trips have been assumed to be associated with the Field House in the AM peak hour.

The PM peak hour patron demand has been estimated assuming user group profiles based on discussions with the operators of existing facilities and experience working on similar projects. A complement of about 35 players and coaches and an average spectator attendance of 20 people have been assumed to

represent inbound traffic demand generators associated with the facility during the PM peak hour. User groups that could generate this type of demand include minor soccer associations, ball hockey associations and leagues, and lacrosse leagues. In addition, 40 outbound patrons have been assumed to account for facility users (prior to the peak hour) leaving the facility.

Table 4-7: Fieldhouse AM and PM Peak Hour Trip Generation

		AM Peak		PM Peak	
Patron Load		**In**	**Out**	**In**	**Out**
		5	**0**	**110**	**40**
Auto Trips		**In**	**Out**	**In**	**Out**
Mode Split to Transit	0%	-	-	-	-
Mode Split to Auto	0%/95%	5	0	105	38
Auto Occupancy	1.0/2.0				
Primary Trip Subtotal		**5**	**0**	**105**	**38**
Mode Split to Drop-off Inbound	0%/5%	0	0	6	6
Mode Split to Pick-up Outbound	0%/5%	0	0	2	2
Drop-off Trip Subtotal		**0**	**0**	**8**	**8**
Total Trips		**5**	**0**	**113**	**46**

4.2 Trip Generation Totals

Table 4-8: Total Peak Hour Trip Generation

Auto Trips	AM Peak Hour		PM Peak Hour	
	In	**Out**	**In**	**Out**
U of A students, staff, and faculty	2,520	630	945	2,205
Saville Centre	117	46	159	105
GO Centre	37	21	179	61
Twin Ice Arena	5	0	89	32
Fieldhouse	5	0	113	46
Total Trips	**2,684**	**697**	**1,485**	**2,449**

4.3 Trip Distribution

The distribution of trips associated with the South Campus are assumed to reflect the typical origin-destination patterns within the southwest inner area. Therefore, 2041 origin-destination information from the City's Origin-Destination Car Driver Trips for Edmonton and the Surrounding Region was used in the assessment.

4.4 Trip Assignment

Traffic was assigned to the adjacent roadway network based on the availability of parking within the South Campus and the access options considered for review. **Exhibit 4-1** summarizes the AM and PM peak hour site generated traffic anticipated to utilize the study area intersections based on Access Option 1.

4.5 Total Traffic

The traffic anticipated to be generated by the study area was superimposed on the 2041 Background Traffic Volumes to provide the 2041 Total Traffic volumes for use in the assessment of each access option. **Exhibit 4-2** summarizes the 2041 Total Traffic volumes used in the assessment of Access Option 1. Site Generated and 2041 Total Traffic volumes for Access Options 2 and 3 are included in **Appendix A**.

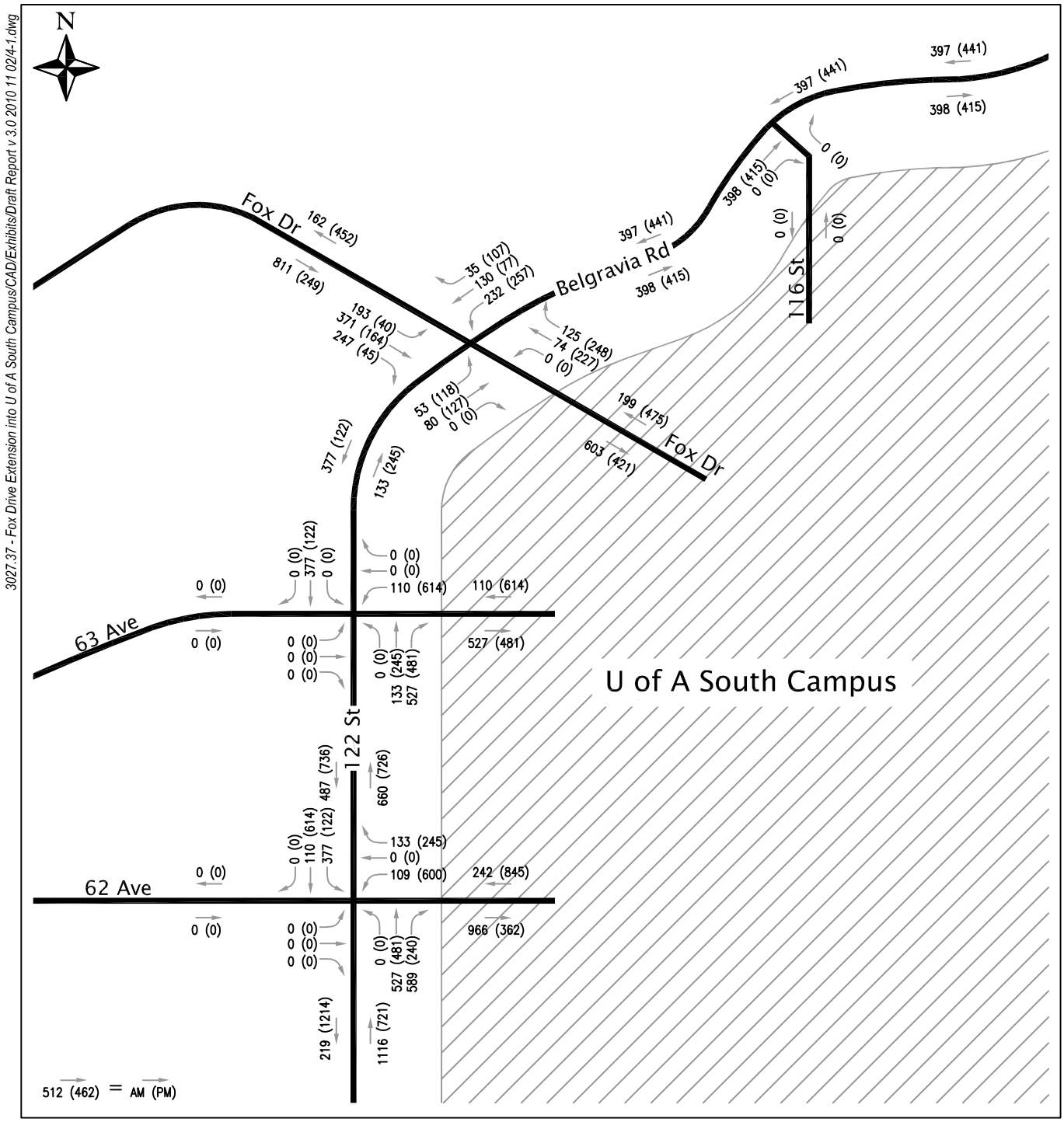


Exhibit 4-1

Scale NTS

Site Generated Traffic Volumes (Option 1)
AM (PM) Peak Hour

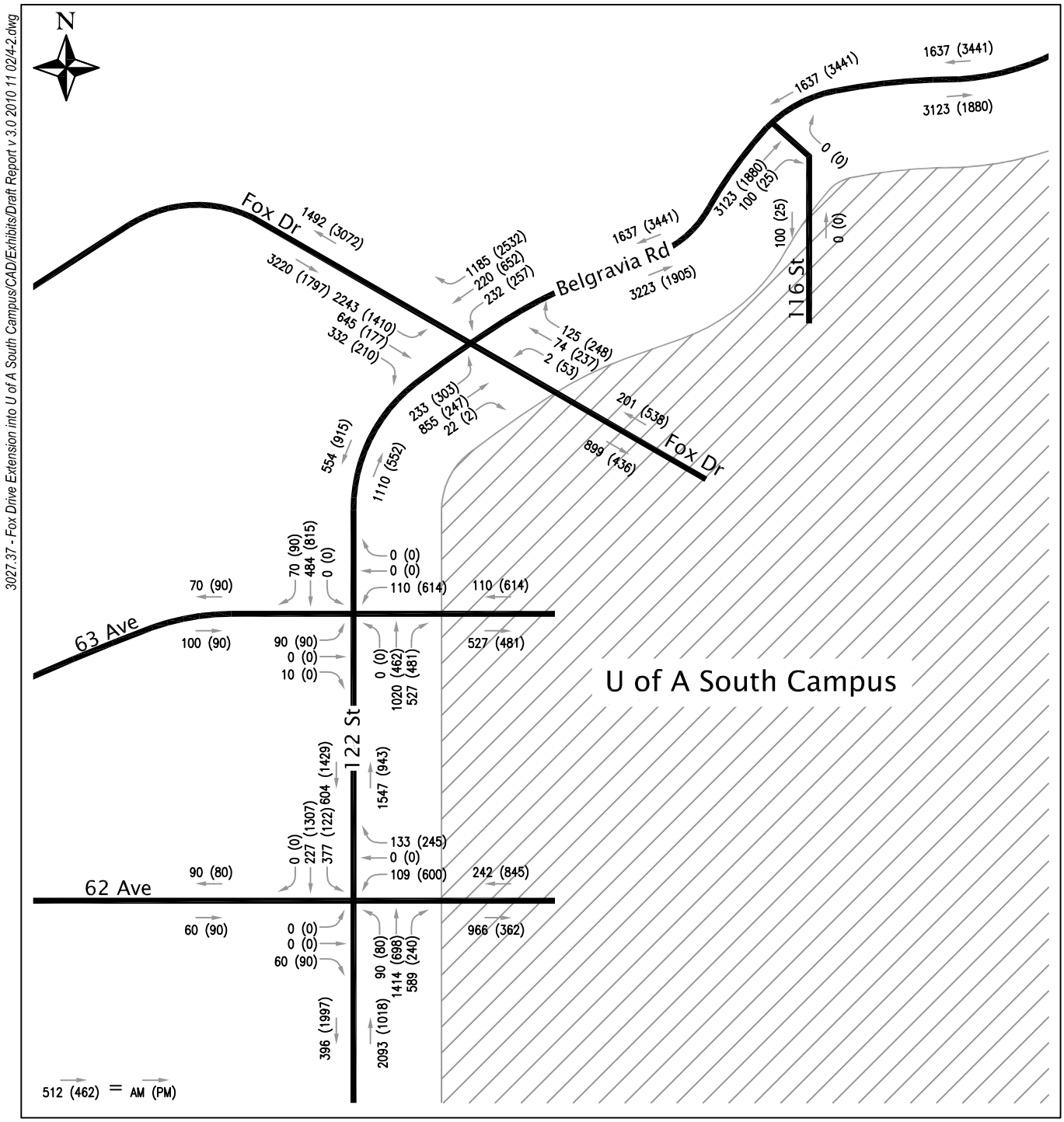


Exhibit 4-2

Scale NTS

2041 Total Traffic Volumes (Option 1) AM (PM) Peak Hour

5. TRANSPORTATION ASSESSMENT

5.1 Intersection Analysis Assumptions

The capacity analysis is based on the methods outlined in the Highway Capacity Manual 2000, using SYNCHRO 7.0 analysis software.

Intersection operations are typically rated by two measures. The volume-to-capacity (v/c) ratio describes the extent to which the traffic volumes can be accommodated by the physical capacity of the road configuration and traffic control. A value (measured during the peak hour) less than 0.90 indicates that generally there is sufficient capacity and the projected traffic volumes can be accommodated at the intersection. A value between 0.90 and 1.0 suggests unstable operations may occur and volumes are nearing capacity conditions. A calculated value over 1.0 indicates that traffic volumes are theoretically exceeding capacity. The second measure of performance, Level of Service (LOS), is based on the estimated average delay per vehicle among all traffic passing through the intersection. A low average delay merits a LOS A rating. Average delays greater than 80 seconds per vehicle at a signalized intersection generally produce a LOS F rating, while at unsignalized intersections a LOS F is reached when vehicles experience an average delay greater than 50 seconds.

The City of Edmonton's Roadway Planning and Design Objectives (February 2005 Edition) identifies the Peak Hour Level Of Service (LOS) Design Objectives for Signalized Arterials at LOS D in the medium term and E in the long term. At signalized intersections, LOS D generally relates to v/c ratios between 0.75 and 0.90, while LOS E generally relates to v/c ratios greater than 0.9 and less than 1.0.

The anticipated 95th percentile queue length has also been included in the following assessment summaries. The queues provided may include a footnote that relates to the ability of the program to estimate the queue accurately. The 'm' footnote indicates that the volume entering the intersection is being metered by an upstream intersection. The Synchro help file also provides the following regarding the '#' footnote:

"The # footnote indicates that the volume for the 95th percentile cycle exceeds capacity. This traffic was simulated for two complete cycles of 95th percentile traffic to account for the affects of spillover between cycles. If the reported v/c <1 for this movement, the methods used represent a valid method for estimating the 95th percentile queue. In practice, 95th percentile queue shown will rarely be exceeded and the queues shown with the # footnote are acceptable for the design of storage bays."

The methodology includes a number of assumptions that relate to the operating conditions present at the intersections. The following assumptions were used in the analysis.

- Saturation Flow Rate – 1,850 vphg
- Minimum Lane Width – 3.6 metres
- Total Lost Time Adjustment Factor– 0.5
- Peak Hour Factor – 1.0
- %HV – existing percentages at Belgravia Road/Fox Drive, 2% 122 Street intersections

5.2 Intersection Assessments

As the purpose of the study is to evaluate the access options in the north portion of the plan area, the study includes assessments completed for the Belgravia Road/Fox Drive intersection and the 63 Avenue/122 Street intersection for each of the following three access options.

- ***Option 1*** – Two Additional Accesses: The extension of Fox Drive into the South Campus at Belgravia Road and the construction of the fourth leg of the 63 Avenue/122 Street intersection.
- ***Option 2*** – The construction of the fourth leg of the 63 Avenue/122 Street intersection only.
- ***Option 3*** – The extension of Fox Drive into the South Campus at Belgravia Road only.

The following sections summarize the results of the assessments completed.

5.2.1 Belgravia Road and Fox Drive

The intersection of Belgravia Road and Fox Drive is currently a signalized T-intersection. **Table 5-1** summarizes the existing operations of the Belgravia Road/Fox Drive intersection based on 2008 measured traffic volumes and signal timings.

Table 5-1: Belgravia Road and Fox Drive 2008 Existing AM and PM Peak Hours

	EB (122 Street)		WB (Belgravia Rd)		SB (Fox Dr)	
Movement	**L**	**T**	**T**	**R**	**L**	**R**
2008 AM Peak Hour – Signalized (110s cycle)						
Geometry	L/T/T		T/T/R		L/L/R	
Volume (vph)	260	677	125	611	1637	59
v/c	0.57	0.52	0.20	0.35	0.87	0.06
Delay (s)	32.2	29.6	40.4	0.5	28.1	5.2
LOS	C	C	D	A	C	A
95th Queue (m)	67	77	21	0	187	8
Intersection Delay			**23.8**	**Intersection LOS**		**C**
2008 PM Peak Hour – Signalized (100s cycle)						
Geometry	L/T/T		T/T/R		L/L/R	
Volume (vph)	232	193	560	1770	813	169
v/c	0.62	0.11	0.39	1.00	0.60	0.22
Delay (s)	22.9	12.6	22.7	24.6	27.4	4.1
LOS	C	B	C	C	C	A
95th Queue (m)	41	15	54	#85	85	13
Intersection Delay			**23.3**	**Intersection LOS**		**C**

As shown in Table 5-1, the intersection of Belgravia Road and Fox Drive was projected to be operating well in the AM peak hour, although the assessment doesn't factor in downstream congestion, which may reduce overall operations in the field. In the PM peak hour, the westbound free flow right turn is projected to be at capacity under existing conditions.

With the addition of the fourth intersection leg in Option 1 and Option 3, the intersection geometry was assumed to include the following:

- ***West Approach (Belgravia Road)*** – One left turn bay, two through lanes, one right turn bay
- ***East Approach (Belgravia Road)*** – one left turn bay, two through lanes, one channelized free flow right turn bay
- ***South Approach (U of A Fox Drive Extension)*** – one left turn bay, one through lane, one right turn bay
- ***North Approach (Fox Drive)*** – dual left turn lanes, one through lane, one channelized right turn bay

Tables 5-2 and **5-3** summarize the results of the Belgravia Road/Fox Drive intersection analyses for access Options 1 through 3 for the AM and PM peak hours respectively. The signal timings were optimized for each scenario analyzed.

Table 5-2: Belgravia Road and Fox Drive 2041 Total Traffic Scenarios AM Peak Hour

	EB (122 Street)			WB (Belgravia Rd)			NB (U of A Access)			SB (Fox Dr)		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Option 1 (Fox Drive and 63 Ave Accesses) -Signalized (120s cycle, SB, EB, and WB L Phases)												
Geometry	L/T/T/R			L/T/T/R			L/T/R			L/L/T/R		
Volume (vph)	233	855	22	232	220	1185	2	74	125	2243	645	332
v/c	0.77	1.17	0.07	1.27	0.26	0.67	0.02	0.34	0.50	1.25	0.62	0.29
Delay (s)	64.3	137.2	34.3	187.6	39.0	2.0	47.5	53.1	27.0	140.4	18.8	1.9
LOS	E	F	C	F	D	A	D	D	C	F	B	A
95th Queue (m)	#75	#162	m8	#109	34	0	3	33	30	#352	136	12
Intersection Delay						**84.7**	**Intersection LOS**					**F**
Option 2 (63 Ave Access Only) -Signalized (120s cycle, EB L Phase)												
Geometry	L/T/T			T/T/R						L/L/R		
Volume (vph)	301	877			453	1185				2518		621
v/c	1.00	0.74			0.81	0.67				1.25		0.56
Delay (s)	67.5	16.5			61.5	2.0				140.5		9.6
LOS	E	B			E	A				F		A
95th Queue (m)	#111	84			#78	0				#429		76
Intersection Delay						**71.3**	**Intersection LOS**					**E**
Option 3 (Fox Drive Access Only) -Signalized (120s cycle, NB, SB, EB, and WB L Phases)												
Geometry	L/T/T/R			L/T/T/R			L/T/R			L/L/T/R		
Volume (vph)	233	855	467	232	220	1185	106	80	125	2243	727	332
v/c	0.77	1.17	0.96	1.27	0.26	0.67	0.63	0.37	0.49	1.27	0.84	0.35
Delay (s)	31.3	113.5	49.2	187.6	39.0	2.0	42.3	53.8	25.0	148.9	36.8	6.5
LOS	C	F	D	F	D	A	D	D	C	F	D	A
95th Queue (m)	#54	#163	#129	#109	34	0	#27	35	29	#357	#216	31
Intersection Delay						**81.8**	**Intersection LOS**					**F**

Table 5-3: Belgravia Road and Fox Drive 2041 Total Traffic Scenarios PM Peak Hour

	EB (122 Street)			WB (Belgravia Rd)			NB (U of A Access)			SB (Fox Dr)		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Option 1 (Fox Drive and 63 Ave Accesses) - Signalized (120s cycle, SB, EB, and WB L Phases)												
Geometry	L/T/T/R			L/T/T/R			L/T/R			L/L/T/R		
Volume (vph)	303	247	2	257	652	2532	53	237	248	1410	177	210
v/c	0.97	0.26	0.01	0.85	1.00	1.43	0.33	0.95	0.63	0.99	0.18	0.20
Delay (s)	73.9	34.8	24.5	61.2	85.4	210.0	53.3	97.7	17.7	53.5	14.3	2.2
LOS	E	C	C	E	F	F	D	F	B	D	B	A
95th Queue (m)	#119	41	m1	#88	#121	#474	26	#110	35	#207	34	11
Intersection Delay						**117.4**	**Intersection LOS**					**F**
Option 2 (63 Ave Access Only) -Signalized (120s cycle, EB L Phase)												
Geometry	L/T/T			T/T/R						L/L/R		
Volume (vph)	457	248			952	2552				1423		322
v/c	1.10	0.14			1.00	1.44				0.99		0.40
Delay (s)	97.1	5.7			73.6	215.2				58.0		11.6
LOS	F	A			E	F				E		B
95th Queue (m)	#183	m6			#163	#483				#224		45
Intersection Delay						**126.2**	**Intersection LOS**					**F**
Option 3 (Fox Drive Access Only) -Signalized (120s cycle, NB, SB, EB, and WB L Phases)												
Geometry	L/T/T/R			L/T/T/R			L/T/R			L/L/T/R		
Volume (vph)	304	246	431	257	652	2532	593	311	248	1410	229	210
v/c	1.02	0.39	0.70	0.61	1.00	1.43	0.91	1.00	0.58	1.06	0.55	0.37
Delay (s)	84.3	39.8	22.3	36.1	85.4	210.0	41.5	102.0	15.6	74.5	46.6	7.0
LOS	F	D	C	D	F	F	D	F	B	E	D	A
95th Queue (m)	#122	42	67	71	#121	#474	#163	#138	35	#219	77	20
Intersection Delay						**110.4**	**Intersection LOS**					**F**

As shown in Table 5-2, the southbound left turn is anticipated to be over capacity under all three access options evaluated. While the v/c ratio is estimated to be 1.25 under both Access Options 1 and 2, the actual capacity predicted for the southbound left turn under Access Option 2 is actually greater, at approximately 2015 vph as compared to approximately 1,795 vph under Access Option 1. As well, Option 2 is anticipated to have one additional movement operating at capacity in the AM peak hour, as opposed

to two additional movements operating significantly over capacity as shown for Option 1. Based on a review of v/c ratios and delays it is anticipated that Option 2 would operate at higher levels of service overall than Option 1 in the AM peak hour. Option 3 is similar to Option 1, but with higher overall volumes; therefore, it is considered to be the least effective access option in the AM peak hour from the perspective of the Belgravia Road/Fox Drive intersection operations.

As shown in Table 5-3, the westbound right turn is anticipated to be over capacity under all three access options analyzed. Although the westbound right turn is projected to be over capacity in the PM peak hour in 2041, the movement currently operates under free flow conditions, and no improvements have been identified.

Overall, in the PM peak hour under Access Option 1, the remaining intersection movements at the Belgravia Road/Fox Drive intersection (other than the westbound right turn) are anticipated to operate at or below capacity. In the PM peak hour, the Belgravia Road/Fox Drive intersection is anticipated to operate with two movements at or near capacity, and one movement, the eastbound left turn, operating over capacity by approximately 10% under Access Option 2. While the Belgravia Road/Fox Drive intersection is anticipated to accommodate a greater range of movements at or below capacity in the PM peak hour under Access Option 1, Option 2 could be considered a viable option in the PM peak hour based on the magnitude of traffic potentially impacted by capacity constraints. The projected v/c ratio of 1.10 means that the movement is projected to be over capacity by approximately 40 to 50 eastbound left turns.

Similar to the AM peak hour, Access Option 3 is anticipated to have higher overall volumes at the Belgravia Road/Fox Drive intersection as compared to Access Option 1. Although Access Option 1 is anticipated to operate below capacity for the majority of movements, the additional volume under Access Option 3 results in a number of additional movements being projected to operate at or above capacity. Therefore, Access Option 3 is not anticipated to be an effective access option for the development of the South Campus lands and has not been included in the remaining assessments.

Based on the assessments completed, the analysis of the Belgravia Road/Fox Drive intersection was revised assuming the westbound left turn is relocated to a new signal at the Belgravia Road/116 Street intersection. As the eastbound through and westbound left turn movements are the two movements projected to be over capacity in the AM peak hour under Access Option 1, removing the westbound left turn from the intersection would allow the eastbound through movement to operate below capacity. **Table 5-4** summarizes the results of the revised analysis in the AM and PM peak hours.

Table 5-4: Belgravia Road and Fox Drive 2041 Total Traffic Scenarios Revised Intersection Geometry

	EB (122 Street)			WB (Belgravia Rd)		NB (U of A Access)			SB (Fox Dr)		
Movement	**L**	**T**	**R**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
AM Peak Hour Option 1A (WB Left Banned) -Signalized (120s cycle, SB, and EB L Phases)											
Geometry	L/T/T/R			T/T/R		L/T/R			L/L/T/R		
Volume (vph)	233	855	22	220	1185	2	74	125	2243	645	332
v/c	0.80	0.88	0.05	0.37	0.67	0.02	0.34	0.67	1.16	0.58	0.29
Delay (s)	41.4	34.9	8.2	46.8	1.9	47.5	53.1	65.8	98.3	15.1	1.5
LOS	D	C	A	D	A	D	D	E	F	B	A
95th Queue (m)	#71	#130	m2	37	0	3	33	#55	#332	120	10
Intersection Delay					**49.7**	**Intersection LOS**					**D**
PM Peak Hour Option 1A (WB Left Banned) -Signalized (120s cycle, SB, and EB L Phases)											
Geometry	L/T/T/R			T/T/R		L/T/R			L/L/T/R		
Volume (vph)	303	247	2	652	2532	53	237	248	1410	177	210
v/c	0.97	0.19	0.00	1.00	1.43	0.33	0.95	0.65	0.99	0.18	0.20
Delay (s)	73.0	22.6	15.5	85.4	210.0	53.3	97.7	19.5	53.5	14.3	2.2
LOS	E	C	B	F	F	D	F	B	D	B	A
95th Queue (m)	#118	37	m1	#121	#474	26	#110	38	#207	34	11
Intersection Delay					**119.3**	**Intersection LOS**					**F**

As shown in Table 5-4, the majority of the movements at the Belgravia Road/Fox Drive intersection are anticipated to operate below capacity in the AM peak hour assuming the westbound left turn is banned at the intersection. In the PM Peak hour, banning the westbound left turn did not have a significant impact on the intersection operations.

Although banning the westbound left turn in the PM peak hour didn't have a significant impact on the overall intersection operations, the analysis showed that the majority of the movements are estimated to operate at or below capacity in the PM peak hour, and therefore, Option 1 is anticipated to continue to be the most efficient access option in the PM peak hour.

Based on the revised analysis completed for the Belgravia Road/Fox Drive intersection, a signalized left in was considered for the Belgravia Road/116 Street intersection.

5.2.2 Belgravia Road and 116 Street

The Belgravia Road/116 Street intersection was initially assumed to be downgraded to a right in/right out access. Based on the assessment completed for the Belgravia Road/Fox Drive intersection, an analysis was completed assuming the Belgravia Road/116 Street intersection operates as a signalized right in/right out/left in access. A signal was assumed to address concerns regarding sight lines for the eastbound left turn. A full signalized all-directional access was not considered as this would also require signalizing the high volume westbound through movement in the PM peak hour. **Table 5-5** summarizes the results of the signalized intersection assessment.

Table 5-5: Belgravia Road and 116 Street 2041 Total Traffic Scenario

	EB (Belgravia Rd)		WB (Belgravia Rd)		NB (116 St)	
Movement	**T**	**R**	**L**	**T**	**R**	
AM Peak Hour Option 1A (WB Left at 116 St) -Signalized (120s cycle)						
Geometry	T/T/TR		L/T/T		R	
Volume (vph)	3123	100	232	1405	0	0
v/c	0.88		0.63	0.39	-	
Delay (s)	10.7		51.9	0.3	-	
LOS	B		D	A	-	
95th Queue (m)	m107		81	0	-	
Intersection Delay			**9.7**	**Intersection LOS**		**A**
PM Peak Hour Option 1A (WB Left at 116 St) -Signalized (120s cycle)						
Geometry	T/T/TR		L/T/T		R	
Volume (vph)	1880	25	257	3441	0	
v/c	0.48		0.60	0.95	-	
Delay (s)	1.1		20.7	7.8	-	
LOS	A		C	A	-	
95th Queue (m)	m7		47	0	-	
Intersection Delay			**6.1**	**Intersection LOS**		**A**

As shown in Table 5-5, a westbound left turn could be accommodated at the Belgravia Road/116 Street intersection assuming the intersection is signalized. The westbound through movement in the PM peak hour shows a v/c ratio of 0.95. As the westbound through movement was assumed to be free flow through the intersection, the analysis indicates that the movement is approaching capacity under a two lane section.

5.2.3 63 Avenue and 122 Street

The 63 Avenue/122 Street intersection is currently developed as a signalized T-intersection providing access to the Grandview Heights neighbourhood. As shown in **Table 5-6**, the 63 Avenue/122 Street intersection is anticipated to be operating well in the AM and PM peak hours based on the 2008 traffic volumes and signal timings.

Table 5-6: 63 Avenue and 122 Street 2008 Existing AM and PM Peak Hours

	EB (63 Ave)		NB (122 St)		SB (122 ST)	
Movement	**L**	**R**	**L**	**T**	**T**	**R**
2008 AM Peak Hour – Signalized (70s cycle)						
Geometry	L/R		L/T/T		T/TR	
Volume (vph)	134	108	56	751	203	52
v/c	0.30	0.24	0.09	0.36	0.13	
Delay (s)	19.9	5.5	7.9	8.5	5.8	
LOS	B	A	A	A	A	
95th Queue (m)	25	10	9	39	12	
Intersection Delay			**8.9**	**Intersection LOS**		**A**
2008 PM Peak Hour – Signalized (70s cycle)						
Geometry	L/R		L/T/T		T/TR	
Volume (vph)	72	51	42	376	573	67
v/c	0.11	0.09	0.12	0.21	0.36	
Delay (s)	16.1	5.6	10.8	10.4	11.2	
LOS	B	A	B	B	B	
95th Queue (m)	15	7	8	21	35	
Intersection Delay			**11.0**	**Intersection LOS**		**B**

Under access Options 1 and 2, the intersection would be expanded to include the east intersection approach and could include the following geometry:

- ***West Approach (63 Avenue)*** – one left turn bay, one through/right lane
- ***East Approach (U of A Access)*** – one left turn bay, one left/through/right lane
- ***South Approach (122 Street)*** – one left turn bay, two through lanes, one right turn bay
- ***North Approach (122 Street)*** – one left turn bay, one through lane, one shared through/right lane

The above cross section for the east approach represents an assumed cross-section for the completion of the analysis. It is anticipated that the ultimate cross section for the east intersection leg will be confirmed in conjunction with the development of parkade plans for the northeast parkade. **Tables 5-7** and **5-8** summarize the results of the analysis for the 63 Avenue/122 Street intersection for Access Options 1 through 3 in the AM and PM peak hour respectively.

Table 5-7: 63 Avenue and 122 Street - AM Peak Hour

	EB (63 Ave)			WB (U of A Access)			NB (122 St)			SB (122 St)		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Option 1 (Fox Drive and 63 Ave Accesses) -Signalized (120s cycle)												
Geometry	L/TR			L/LTR			L/T/T/R			L/T/TR		
Volume (vph)	90	0	10	110	0	0	0	1020	527	0	484	70
v/c	0.41	0.02		0.24	0.25		-	0.38	0.43	-	0.21	
Delay (s)	50.9	0.0		46.3	46.7		-	0.6	1.3	-	3.4	
LOS	D	A		D	D		-	A	A	-	A	
95th Queue (m)	38	0		25	26		-	3	m0	-	18	
Intersection Delay						**5.6**	**Intersection LOS**					**A**
Option 2 (63 Ave Access Only) – Signalized (120s cycle, SB L Phase)												
Geometry	L/TR			L/LTR			L/T/T/R			L/T/TR		
Volume (vph)	90	0	10	116	0	68	0	1020	610	520	484	70
v/c	0.42	0.02		0.42	0.30		-	0.71	0.72	0.83	0.21	
Delay (s)	51.5	0.0		50.9	17.7		-	6.0	11.8	26.0	2.0	
LOS	D	A		D	B		-	A	B	C	A	
95th Queue (m)	38	0		39	21		-	m35	m13	m#147	m8	
Intersection Delay						**13.0**	**Intersection LOS**					**B**

Table 5-8: 63 Avenue and 122 Street - PM Peak Hour

	EB (63 Ave)			WB (U of A Access)			NB (122 St)			SB (122 St)		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Option 1 (Fox Drive and 63 Ave Accesses) -Signalized (120s cycle)												
Geometry	L/TR			L/LTR			L/T/T/R			L/T/TR		
Volume (vph)	90	0	0	614	0	0	0	462	481	0	815	90
v/c	0.32	-		0.61	0.64		-	0.24	0.47	-	0.47	
Delay (s)	30.9	-		37.1	38.8		-	4.2	3.8	-	6.9	
LOS	C	-		D	D		-	A	A	-	A	
95th Queue (m)	31	-		94	101		-	12	29	-	m18	
Intersection Delay						**14.1**	**Intersection LOS**					**B**
Option 2 (63 Ave Access Only) – Signalized (120s cycle, SB L Phase)												
Geometry	L/TR			L/LTR			L/T/T/R			L/T/TR		
Volume (vph)	90	0	0	688	0	153	0	462	533	369	815	90
v/c	0.38	-		0.78	0.77		-	0.44	0.66	0.73	0.50	
Delay (s)	31.0	-		42.9	39.7		-	31.6	17.8	9.9	4.1	
LOS	C	-		D	D		-	C	B	A	A	
95th Queue (m)	31	-		#139	133		-	67	89	m9	m9	
Intersection Delay						**21.6**	**Intersection LOS**					**C**

As shown in Tables 5-7 and 5-8, the potential access at 63 Avenue and 122 Street is anticipated to operate well in the AM and PM Peak hours under either access Option 1 or access Option 2. The addition of the fourth intersection leg is anticipated to result in longer delays for eastbound traffic exiting the Grandview Heights neighbourhood as compared to existing conditions; however, there continues to be sufficient capacity for eastbound movements at the intersection.

Based on the assessments completed, the 62 Avenue/122 Street intersection is anticipated to operate at acceptable levels of services as an access point to the north sector of the South Campus.

As noted previously, the 2041 background traffic volumes assumed limited residential and employment development on the U of A West 240 lands. It is anticipated that full development of the West 240 lands will result in significantly higher residential and employment activity. Additional development within the U of A West 240 lands would increase demands on 122 Street, which could further impact the operations of the sidestreets. It is anticipated that a full TIA will be completed once a development concept has been prepared for the U of A West 240 lands to confirm the transportation requirements for the area.

5.2.4 Intersection Analysis Summary

Under both options where 63 Avenue is extended into the U of A South Campus lands, the assessment indicated that the 63 Avenue/122 Street intersection could accommodate the projected site generated traffic at acceptable levels of service based on the estimated 2041 traffic volumes and assumed traffic control and intersection geometry. As well, it should be noted that the sidestreet geometry assumed for the east intersection leg (U of A Access) was the same for the analyses of Options 1 and 2. Therefore, 63 Avenue is anticipated to provide an excellent opportunity for access into the U of A South Campus.

The operational analyses completed for the Belgravia Road/Fox Drive intersection are less definitive. In the AM peak hour, Access Option 2, which does not include the extension of Fox Drive into the South Campus, is anticipated to operate at higher levels of service than if the extension is provided. However, in the PM peak hour, the Belgravia Road/Fox Drive intersection is anticipated to operate slightly better with the Fox Drive extension than without.

A revised access scenario, including a signalized westbound left turn at the intersection of Belgravia Road and 116 Street and banning the westbound left turn at the Belgravia Road/Fox Drive intersection was also analyzed. Based on the assessment completed, the relocation of the westbound left turn from Fox Drive to 116 Street is anticipated to allow the majority of the movements at the Belgravia Road/Fox Drive intersection to operate at acceptable levels of service in the AM peak hour. As well, the projected v/c ratio for the southbound left turn in the AM peak hour decreased from 1.25 to 1.16 under the revised geometry. A review of the Belgravia Road/116 Street intersection with a signalized westbound left turn indicated that the intersection could operate at acceptable levels of service during peak hours.

Based on the assessment completed, Access Option 1, with the relocation of the westbound left turn from Fox Drive to 116 Street is anticipated to be the most effective option when considering the operations of the key access points, and the impacts on the adjacent roadway network and traffic conditions. If the relocation of the westbound left turn from Fox Drive to 116 Street is not deemed acceptable, the simplicity of the Belgravia Road/Fox Drive intersection under Access Option 2 is recommended based on the improved operating conditions in the AM peak hour.

5.3 Belgravia Road and Fox Drive Intersection Design

Exhibit 5-1 illustrates a potential design of the Belgravia Road/Fox Drive intersection, including the extension of Fox Drive into the U of A South Campus Lands. The intersection geometry included in Exhibit 5-1 is based on the geometry used in the intersection analyses completed for Options 1 and 3. Based on a review of the existing topography southeast of Belgravia Road, it is anticipated that the Fox Drive extension could be constructed with a maximum grade of 6%.

It should be noted that the development of the fourth leg of the Belgravia Road/Fox Drive intersection assumes that transit movements heading to the South Campus Transit Centre would utilize the new intersection leg both northbound and southbound. While there is currently a third southbound left turn lane dedicated to transit vehicles, the revised configuration shown in Exhibit 5-1 does not include a dedicated transit lane. Therefore, the development of a fourth intersection leg at the Belgravia Road/Fox Drive intersection will remove the existing transit only lane through the intersection, potentially increasing delays for transit at the intersection.

3027.37 - Fox Drive Extension into U of A South Campus/CAD/Exhibits/Draft Report v 3.0 2010 11 02/Exhibit 5-1.dwg

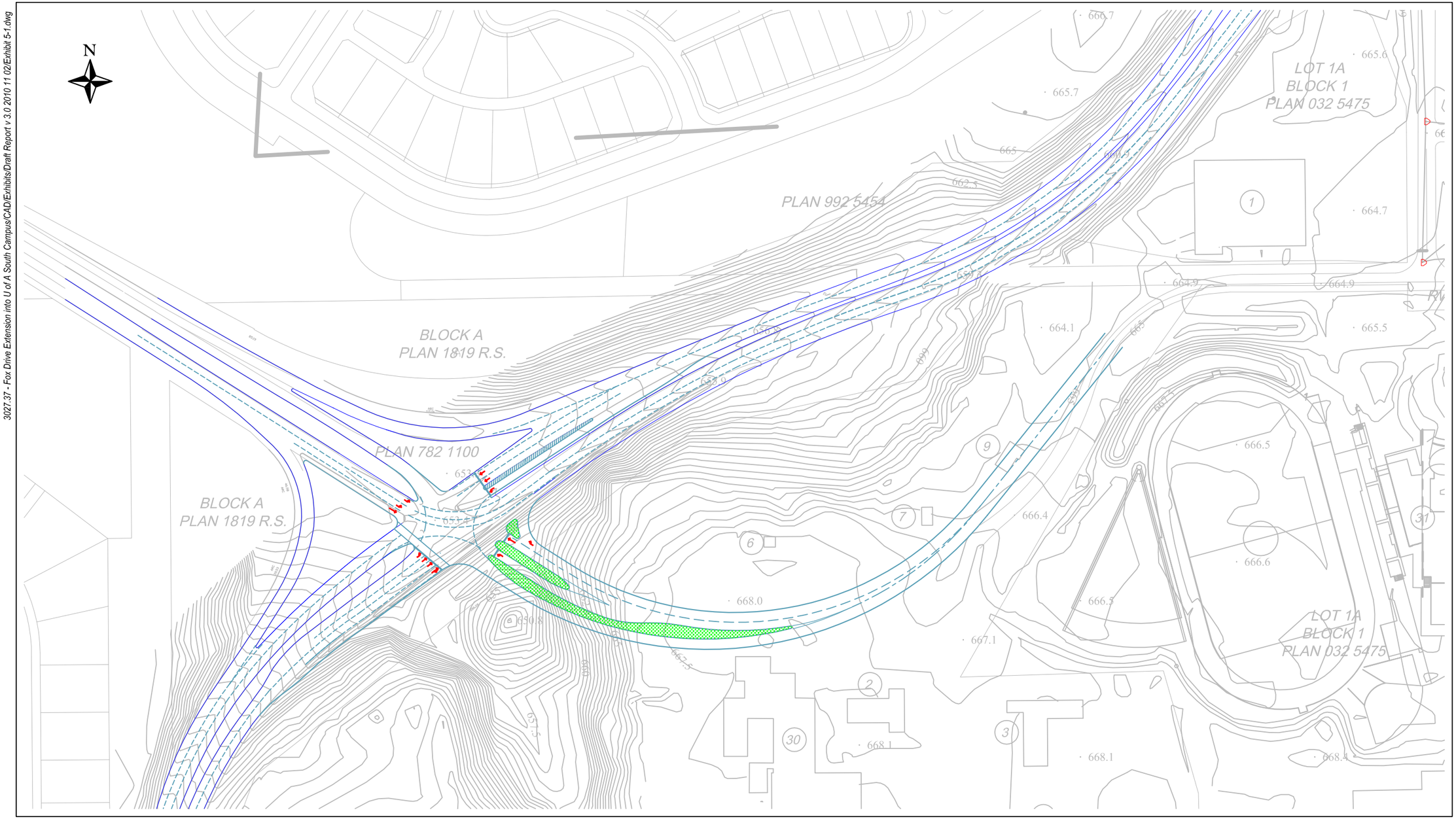


Exhibit 5-1

Scale 1:2000

Belgravia Road and Fox Drive Intersection
Potential Geometry Options 1 & 3

6. ANCILLARY CONSIDERATIONS

In documenting the traffic operational impacts associated with the alternative site access scenarios, it is often difficult to include in the assessment non-traffic operational considerations. In the case of the South Campus access management plan, these items should include:

- City of Edmonton transit related benefits;
- Maximizing utilization of available frontage for access;
- Establishing a "front door" for the South Campus
- Land use planning implications;
- Accommodation of high volume traffic movements from parkade facilities after major events; and,
- Back of house truck access to support EXPO 2017.

6.1 Transit Considerations

The development of a new internal connector from the South Campus Transit Centre to 122 Street/ Belgravia Road could result in reduced operating times for a number of transit routes. At the present time there are three transit routes that leave the South Campus Transit Terminal with an enroute destination of 51 Avenue and 122 Street. Based on a review of available transit schedules, the travel time under current operating conditions is in the order of 10 minutes. Based on discussions with Edmonton Transit, travel time savings in the order of 5 to 6 minutes per departure can be realized if transit vehicles could access 122 Street more efficiently.

It is anticipated that these time savings could allow for improved transit service to neighbourhoods west of the South Campus, through the implementation of route extensions, or the incorporation of secondary timing points along the routes. As well, it is anticipated that transit routes that access the South Campus via Fox Drive would be able to enter the campus via the Fox Drive extension.

While the proposed Fox Drive extension could reduce travel times for routes accessing 122 Street, the elimination of the dedicated transit southbound left turn at the Belgravia Road/Fox Drive intersection could negatively impact transit operations utilizing Belgravia Road, that are not accessing the South Campus Transit Centre.

6.2 Maximizing Utilization of Available Frontage

Although the South Campus development area is generally surrounded on three sides by arterial roadways, access into the South Campus area is very restricted from these roadways. Direct access is anticipated to be available from 122 Street as well as from 60 Avenue west of 113 Street, while limited access is available from Belgravia Road (right in/right out access only). Vehicular access is anticipated to continue to be restricted from 113 Street, as no new vehicle access to the South Campus is proposed across the LRT tracks.

Given the limited arterial roadway access opportunities into the South Campus, consideration should be given to maximizing the development of arterial roadway access where operationally and geometrically feasible to provide improved flexibility in accommodating traffic movements and providing for improved traffic distribution.

6.3 Establishing a "front door" for the South Campus.

Given the locational constraints associated with the development of access into the South Campus area, it is difficult to establish a primary access point that would be the "front door" for both University and community recreation land uses. The extension of Fox Drive across Belgravia Road would provide a strategic, easily accessible South Campus address.

6.4 Land Use Planning Considerations

In establishing the framework for the development of a sustainable South Campus, a founding principle is the creation of an integrated transportation system that prioritizes non-vehicular movement and public transportation. Some of the goals that have been established in support of this cornerstone initiative include:

- Development of a significant South Campus student resident population;
- Implementation of TDM initiatives;
- Focusing on an internal pedestrian and cyclist network as opposed to a passenger vehicle network;
- Limiting the extent of the vehicular roadway network to minimize pedestrian/vehicle conflict points on campus;
- Applying minimal roadway cross sections/widths that meet the intended use(s) of the roads;
- Discouraging public vehicle access through the South Campus area by restricting public vehicular access to the periphery of the campus; and,

- Strategically locate major parking facilities, including structured parking, to promote shared use parking opportunities for a variety of South Campus population groups.

Of the aforementioned goals, restricting public vehicle movements through the South Campus area can be more easily accomplished by minimizing internal roadway development. The current land use plans for the South Campus include the development of a significant student residential precinct immediately to the east of 122 Street north of 63 Avenue. Establishing a single public roadway connector that separates the student residence area from academic buildings would not be consistent with current U of A goals.

6.5 Parkade Traffic Accommodation

As mentioned previously, private vehicle auto travel into the South Campus area will continue to be generated. Although the U of A has the ability to better control the use of private auto travel for students, faculty, and staff, the University has little control over private auto travel generated by non-university population groups.

Current development plans for the North Sector of the South Campus includes major community recreation facilities such as the GO Centre, the Twin Ice Arena complex, and a field house. At this time it is known that the GO Centre will include a major spectator event facility, which can accommodate about 2,800 spectators. The Twin Ice Arena could accommodate patron loads in the order of 3,000 to 5,000 people. It is anticipated that for some major events in either the GO Centre or the Twin Ice Arena complex, many of the trips will be completed by private auto.

To accommodate these types of special events from a parking accommodation perspective, the University plans to construct and operate a shared use parking garage in the northwest corner of the site. It will be important to provide appropriate primary and secondary access facilities to and from this parkade to ensure that the internal circulation systems are designed to accommodate the needs of the various user groups and parking profiles, and to ensure that a flexible parkade portal system is implemented.

Considering the size of this parking structure (in the order of 1,150 stalls), it is recommended that at least two points of entry and exit to the parking structure be considered to accommodate peak periods of traffic activity. Providing two access facilities to/from the parking structure will assist in distributing site generated traffic to the adjacent arterial roadway network in an efficient and effective manner. The development of a direct connection between the parking garage and Fox Drive would facilitate the movement of inbound and outbound vehicles from this future parking garage.

6.6 EXPO 2017 Considerations

The South Campus area has been identified as the host site in the City of Edmonton's bid for EXPO 2017. Although detailed plans for EXPO 2017 have not been finalized, there are opportunities for South Campus facilities to be used as EXPO 2017 facilities. Joint use facilities could include the construction and operation of the parkades to accommodate VIP and employee parking activity. The north sector of the South Campus could also be used to accommodate "back of house" activities. Providing a more direct link from the external roadway system into the north sector of the South Campus could facilitate the movement of truck activity and would minimize the need for and intrusion of internal roadways.

7. STUDY CONCLUSIONS AND RECOMMENDATIONS

7.1 Study Overview

The purpose of this technical review was to assist the City of Edmonton and the U of A in better understanding the transportation and traffic characteristics associated with a proposed extension of Fox Drive south of Belgravia Road. The technical assessment included a logical process and methodology for evaluating the traffic and transportation impacts associated with the possible extension of Fox Drive. The feasibility assessment did not restrict itself to the traffic operational aspects associated with the roadway extension, but also included the review of ancillary transportation related considerations.

7.2 Synopsis

The development of traffic and transportation plans for urban campuses, particularly urban campuses which are being planned as sustainable campuses, are undergoing continuous changes prompted by both external roadway infrastructure systems and policy directed requirements.

In developing a preferred site access strategy for the U of A's South Campus area, the number and location of site access portals should be carefully considered. The development of a sustainable South Campus area traffic access plan must take into consideration anticipated user groups (community and University population groups), land use development activity, plans, and characteristics (educational, recreational and office related land use plans) as well as social, institutional, and environmental objectives. This approach will assist in the planning and development of an access management strategy which minimizes traffic operational impacts on the abutting roadway network, mitigates neighbourhood traffic impacts, and improves local transit circulation characteristics. Key objectives in the development of a preferred access management strategy for the north sector of the South Campus lands include:

- Consideration of land use impacts (vehicular and pedestrian accessibility, types of land use development, surrounding development);
- The need to integrate and maximize the utility of public transit; and,
- To consider institutional and environmental needs and requirements.

The development of the Fox Drive extension into the U of A South Campus area represents a promising component of an overall site access management strategy for this mixed use activity area.

7.3 Conclusions

The technical assessment completed identified a number of key capacity constraints at the Belgravia Road/Fox Drive intersection under all scenarios evaluated. These include the southbound left turn from Fox Drive to Belgravia Road in the AM peak hour, and the reverse westbound to northbound right turn in the PM peak hour. These movements are already substantial and are projected to increase based on the model volumes provided by the City of Edmonton.

Based on the technical assessment completed, the recommended access strategy includes accesses at 63 Avenue and 122 Street, Belgravia Road and Fox Drive, and Belgravia Road and 116 Street. An all-directional access is proposed at 63 Avenue and 122 Street. The Belgravia Road/Fox Drive access is proposed to include the extension of Fox Drive into the U of A South Campus lands, allowing for all movements except the westbound to southbound left turn movement from Belgravia Road into the U of A South Campus. It is proposed that the westbound to southbound left turn movement from Belgravia Road would be allowed via a new signal at the Belgravia Road/116 Street access (right in/right out/left in access).

The recommended access strategy was developed based on a review of the technical analysis completed for the various access strategies reviewed, but also takes into consideration the non-technical rationale for the provision of access to the north portion of the South Campus area. The recommended access strategy also addresses the following initiatives.

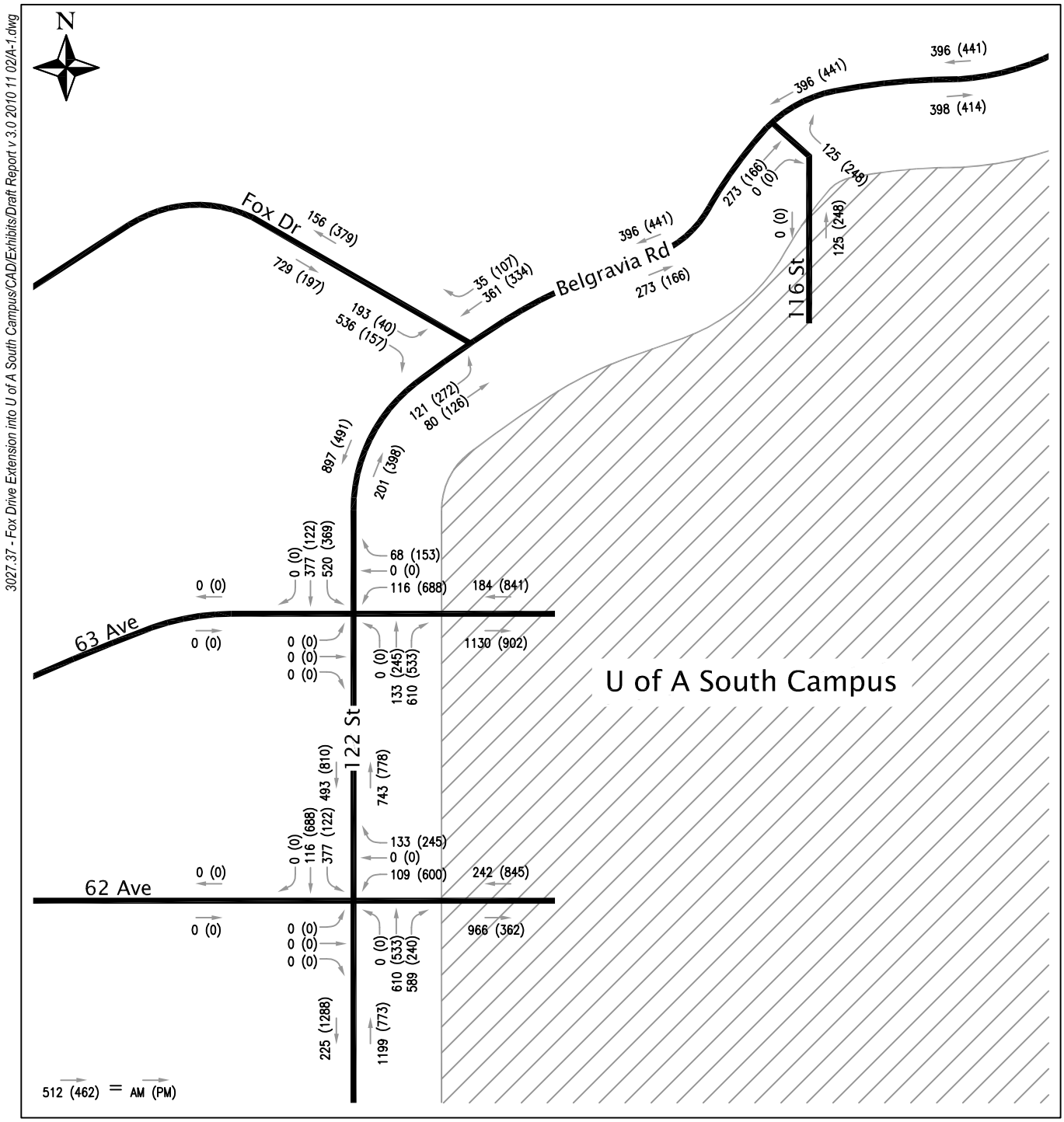
- minimize travel on the adjacent arterial roadway network by maximizing usage of available frontage;
- improve area wide transit characteristics;
- reduce travel time for some site generated traffic movements;
- create a new strategic address for the South Campus area; and.
- provide additional back of house access for delivery vehicles to support Expo 2017.

7.4 Future Work

It is recommended that the U of A initiate environmental and geotechnical studies to better understand the environmental issues and mitigating solutions associated with the construction and operation of a new roadway corridor (Fox Drive extension) into the South Campus area. It is anticipated that these additional studies will further inform the decision making process regarding the extension of Fox Drive into the U of A South Campus.

APPENDIX A

2041 Traffic Volumes
Access Options 2 and 3

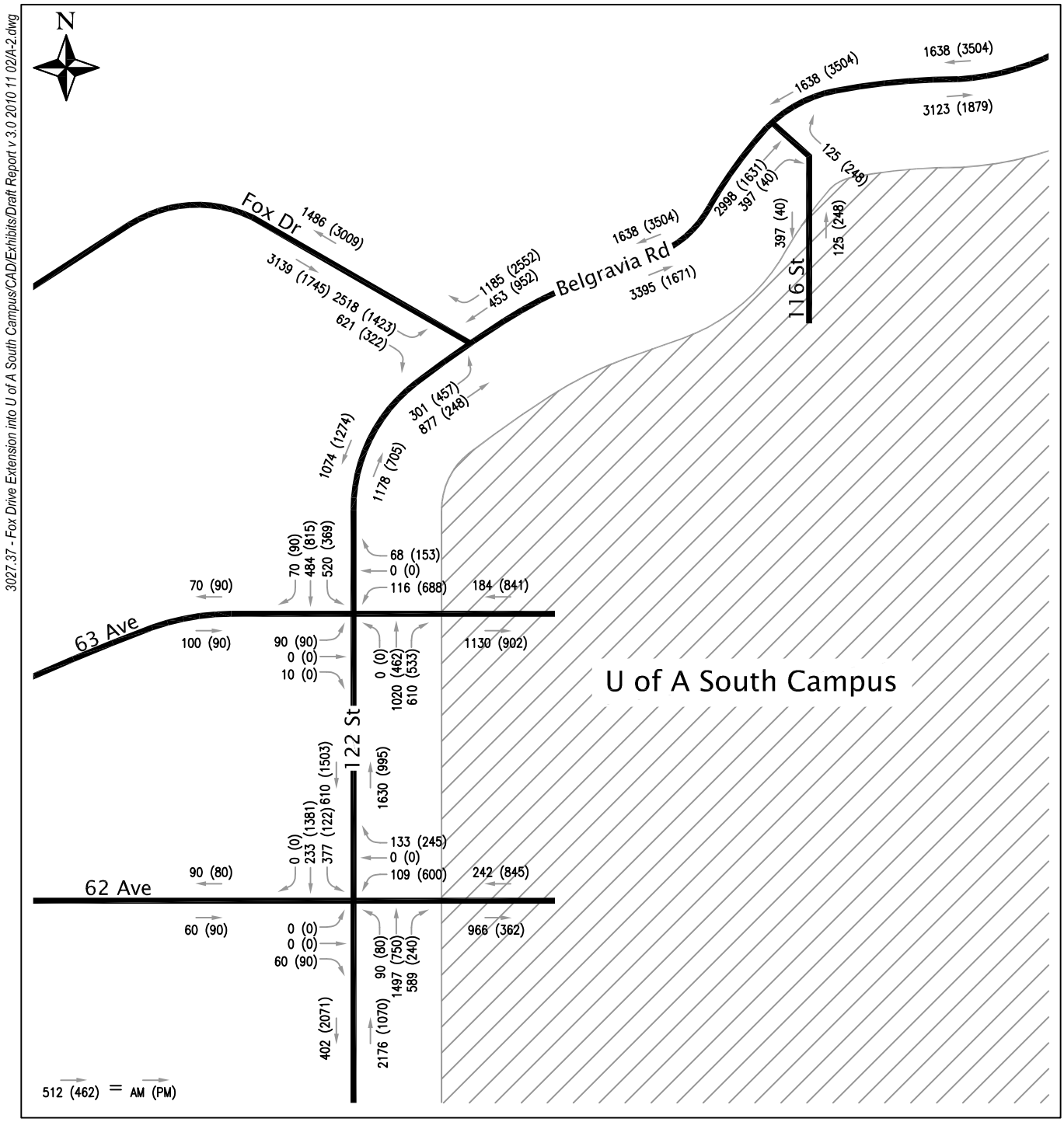


3027.37 - Fox Drive Extension into U of A South Campus/CAD/Exhibits/Draft Report v 3.0 2010 11 02/A-1.dwg

Exhibit A-1

Scale NTS

Site Generated Traffic Volumes (Option 2)
AM (PM) Peak Hour

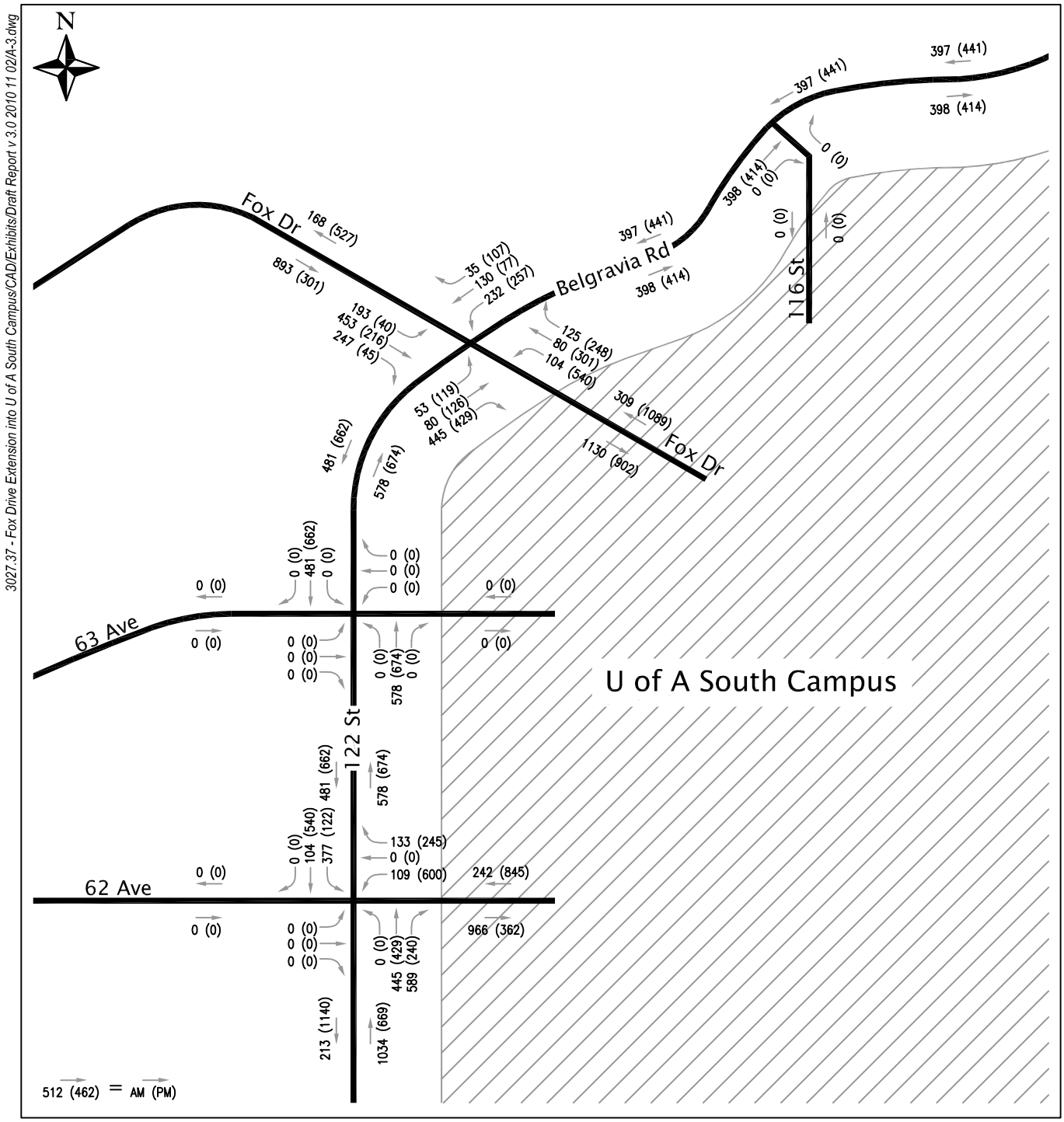


3027.37 - Fox Drive Extension into U of A South Campus/CAD/Exhibits/Draft Report v 3.0 2010 11 02/A-2.dwg

Exhibit A-2

Scale NTS

2041 Total Traffic Volumes (Option 2)
AM (PM) Peak Hour

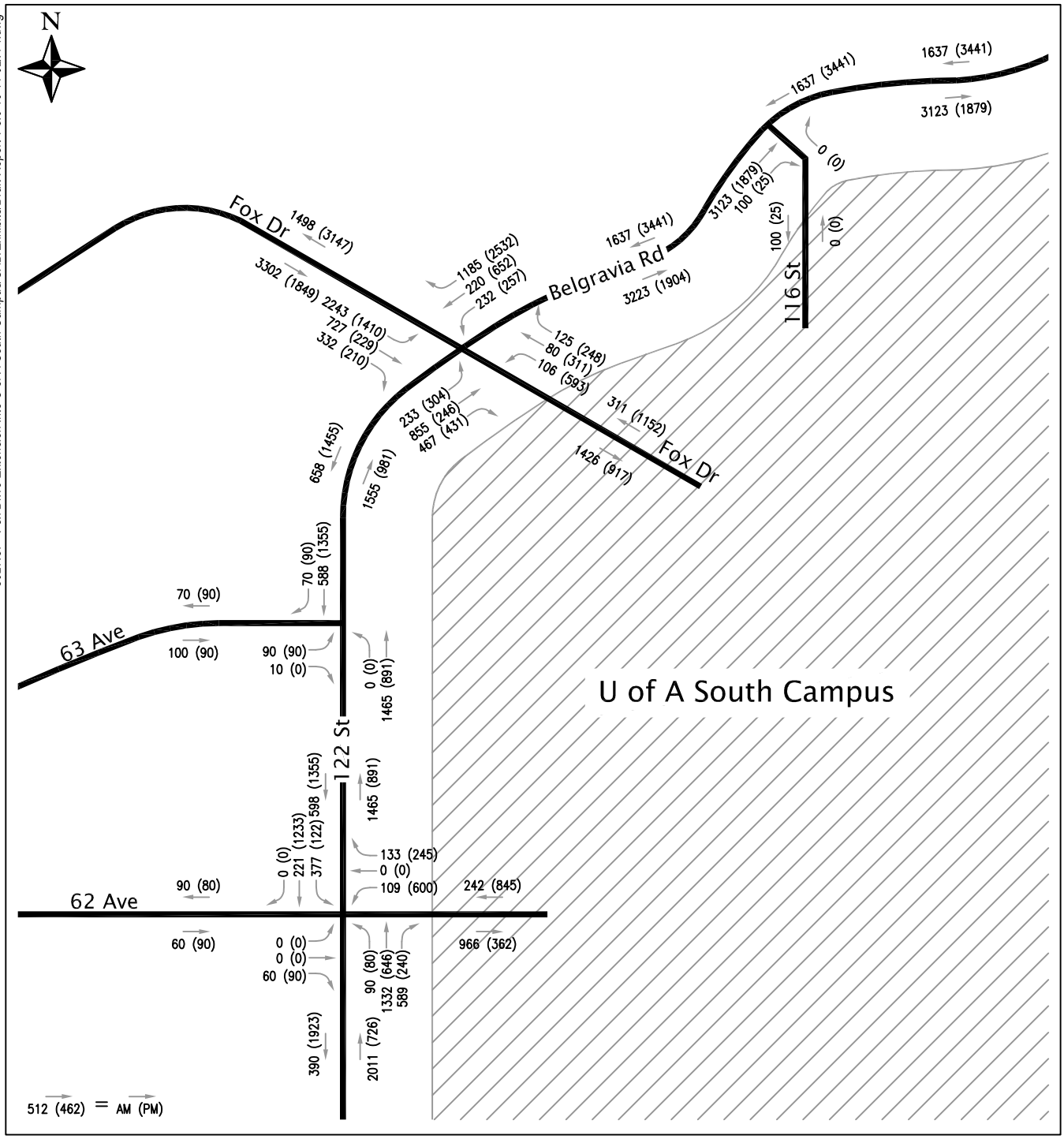


3027.37 - Fox Drive Extension into U of A South Campus/CAD/Exhibits/Draft Report v 3.0 2010 11 02/A-3.dwg

Exhibit A-3

Scale NTS

Site Generated Traffic Volumes (Option 3)
AM (PM) Peak Hour



3027.37 - Fox Drive Extension into U of A South Campus/CAD/Exhibits/Draft Report v 3.0 10 11 02/A-4.dwg

Exhibit A-4

Scale NTS

2041 Total Traffic Volumes (Option 3)
AM (PM) Peak Hour