CWU

September 15th, 2025

Washington State Office of Financial Management
302 Sid Snyder Ave SW / Mailstop 43113
Olympia, WA 98501-1342

RE: CWU 2026 Supplemental Capital Budget

This letter transmits the Central Washington University (CWU) 2026 Supplemental Capital Budget Request. This request was developed in support of the university's vision, mission, and strategic plan that prioritizes being a learning community of access and opportunity.

Our capital requests focus investments in critical upgrades to our electrical infrastructure. As we continue the legislative implementation of decarbonizations & electrification strategies, the dependence on a reliable means of transmitting electrical power is critical to being successful.

1. **Electrical Grid Security Feeder 14**

Central Washington University seeks funding to replace Feeder #14 on the south section of campus that primarily supports our campus data center in Samuelson Hall. The data center is the central hub of sensitive and student, faculty and staff information, as well as the primary source of distribution for our networking across campus. Several of our feeders have exceeded their 30-year life span and introduce a high potential risk for failure. Feeder #14 is one of these critical systems of ensuring ongoing campus operations. In addition to the data center, feeder #14 will also be the primary power path for our second geothermal facility. Over the course of the next 15-20 years, CWU anticipates nearly 500% growth in electrical demand to support its geothermal campus conversion. This project aligns with the Office of Financial Management (OFM) budget instructions requesting projects that are high priority emergent needs that must be addressed. This project is estimated at **$1.49M**. **Page 16.**

Per the Instructions for 2026 Supplemental Budget Submittals the following impacts of opportunities and access for individuals that have historically been excluded or under-represented.

EQUITY IMPACTS TO UNDER-REPRESENTED COMMUNITTIES

CWU's mission is to build a community of access and opportunity by fostering high impact practices, sustainability, and authentic community partnerships that are grounded in meaningful relationships. The impact of this project request ensures that premium education is accessible to everyone by minimizing interruption to advising, digital content, and other technology-based curriculum information.

CAPITAL PLANNING & PROJECTS
400 E University Way | Ellensburg WA 98926 | Office: 509-963-2906
Email: Delano.Palmer@cwu.edu | Web: CWU.edu/operations/capital

POPULATIONS BENEFITITNG FROM OR BUNDENED BY THE PROPOSAL
The Ellensburg campus serves a large demographic of students from a multitude of economic, social, cultural and religious backgrounds both local to the state of Washington and abroad. Every student attending CWU reaps the benefit of a strong electrical infrastructure supporting educational services.

STRATEGIES TO MITIGATE UNINTENDED CONSEQUENCES
CWU continually evaluates its facilities, infrastructure and capital resources for improvement and strives to implement measures that ensure resiliency and redundancy to maintain its preservations. This project is aimed at mitigating unintended consequences of a power outage impacting our data center by proactively replacing feeder #14 before it experiences catastrophic failure.

Regards,

Delano Palmer
Director of Capital Planning & Projects

CC: Jim Wohlpart, President of Central Washington University
Dania Cochran, Chief of Staff
Patrick Pease, Provost, Exec. VP for Academic Affairs
Joel Klucking, Senior VP of Finance & Administration
Steve Dupont, Director of Government Relations
Stuart Thompson, AVP of Campus Planning & Facilities

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CENTRAL WASHINGTON UNIVERSITY

TABLE OF CONTENTS

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OFM

375 - Central Washington University
Ten Year Capital Plan by Project Class
2025-27 Biennium

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Version: 2A 2025-2027 Supplemental Draft

Report Number: CBS001
Date Run: 8/26/2025 9:27AM

Project Class: Preservation (State-Owned)

Agency Priority	Project by Account-EA Type	Estimated Total	Prior Expenditures	Current Expenditures	Reapprop 2025-27	New Approp 2025-27	Estimated 2027-29	Estimated 2029-31	Estimated 2031-33	Estimated 2033-35
0	**40000206 Electrical Grid Security Feeder 14**									
	063-1 CWU Capital Projects-State	1,491,000				1,491,000				

Total Account Summary

Account-Expenditure Authority Type	Estimated Total	Prior Expenditures	Current Expenditures	Reapprop 2025-27	New Approp 2025-27	Estimated 2027-29	Estimated 2029-31	Estimated 2031-33	Estimated 2033-35
063-1 CWU Capital Projects-State	1,491,000				1,491,000				

OFM

Ten Year Capital Plan by Project Class

*

Report Number: CBS001
Date Run: 8/26/2025 9:27AM

Parameter	Entered As	Interpreted As
Biennium	2025-27	2025-27
Functional Area	*	All Functional Areas
Agency	375	375
Version	2A-A	2A-A
Project Classification	*	All Project Classifications
Include Enacted	No	No
Sort Order	Project Class	Project Class
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

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375 - Central Washington University
Capital Project Request
2025-27 Biennium

*

Version: 2A 2026 Supplemental

Report Number: CBS002
Date Run: 9/10/2025 4:54PM

Project Number: **40000206**
Project Title: **Electrical Grid Security Feeder 14**

Description

Starting Fiscal Year: 2027
Project Class: Preservation (State-Owned)
Agency Priority: 0

Project Summary

To comply with the current state energy policies, CWU expects the electrical load on campus to grow by as much as 500% over the next 15 years. As time goes on, campus energy consumption will move from fossil fuel sources to electricity. Continuity and reliability of the campus electrical service will become more significant, especially during the winter months when below freezing temperatures pose additional risk in the case of an extended power outage. This project will replace an electrical feeder line that serves the south campus, most notably the campus data center and future location of a state funded geothermal plant. This important power supply line is over 30 years old and is at high risk of outages due to failure of the cabling or its terminations. Also, the existing conductor is undersized compared to other feeders on campus, which limits the capacity to support future load additions, such as the geothermal plant.

Project Description

1.What is the problem/opportunity? Identify: priority,underserved people/communities, operating budget savings, public safety improvements & clarifying details. Preservation projects: include information about the current condition of the facility/system.

Following the establishment of House Bill 1390 outlining requirementsfor Decarbonization, CWU (Central Washington University) has been implementing compliance measures on our Ellensburg campus through the construction and expansion of geothermal nodal network to dramatically transition a majority ofour energy production from natural gas. This geothermal conversion will result in massive increase of electrical demand produced by campus thus creating an immediate need to ensure our electrical infrastructure can handle the growing capacity as well as serving emergency needs. Many of our electrical feeders such as Feed # 14 are at the end of their 30-year life span and are in desperate need of upgrade replacement. Feeder 14# is of particular concern as it serves as the informational nerve center of campus that is our data center is housed within Samuelson Hall as well as the future branching for CWU's GeoEco #2 (geothermal node #2).

This project is a priority for CWU to ensure the continuity of services to our data center and ensure we do not suffer a catastrophic failure. It will also provide critical support of the expansion of less carbon intensive geothermal system.

Feeder 14 line switch LSA0 is feeding the campus data center switch LSA10 from a fused supply compartment. Due to its age, the current condition does not align with CWU design and construction standards, which would create an extended outage is line switch LSA0 was to fail. Outages on one feeder then could create power strains on other feeders such as #13 serving the rest of the southern portion of campus.

What will the request produce or construct (predesign/design of a building, additional space, etc.)? When will the project start/end? Identify if the project can be phased, and if so, which phase is included in the request. Provide detailed cost backup.

If this project is approved for funding, engineering would immediately begin to evaluate the detailed needs associated with replacing feeder #14 including possible replacement of its terminations and conductor sizes.

We anticipate engineering to take between 4-5 months in the typical design, bid, build delivery model. Following the engineering phase, we envision a transition into the construction phase that will have a very long lead time associated with equipment delivery before construction is anticipated to begin mid 2027 with construction ending mid 2028 depending on lead time and availability of equipment.

How would the request address the problem or opportunity identified in question 1? What would be the result of not taking action?

375 - Central Washington University
Capital Project Request
2025-27 Biennium
*

Version: 2A 2026 Supplemental
Report Number: CBS002
Date Run: 9/10/2025 4:54PM

Project Number: **40000206**
Project Title: **Electrical Grid Security Feeder 14**

Description

This request would allow CWU to replace a very vulnerable and valuable sector of our electrical infrastructure and ensure continuity of operations of our data center and further expansion of the geothermal system and decarbonization plan.

What alternatives were explored? Why were the recommended alternative chosen? Be prepared to provide detailed cost backup. If this project has an associated predesign, please summarize the alternatives the predesign considered.

It is technically possible to back feed the southern portionof campus targeted with this project, but it would create a greater potential risk associated with multiple building power outages and suspension of our services based out of our central data center. This would also introduce higher vulnerability in our base operations of campus.

Some data services can be cloud based but require an additional operational cost burden to the university in lieu of the benefit of the existing server capacity at the data center.

Which clientele would be impacted by the budget request? Where and how many units would be added, people or communities served, etc.

Because the data center is housed in Samuelson Hall, the potential ramifications of a failure to feeder #14 would impact all 8,500 students, faculty, and staff across all campus site locations that depend on the repository of confidential student information, digitial content, and curriculm content. Continuing in this high-risk situation leads to a server interruption of CWU's operational capabilities for extended amountof time.
Beyond the cyber security risk associated with Feeder #14, Samuelson Hall is home to several high occupancy curriculum departments such as: Computer Science, mathematics, multimodal, sociology, world languages and cultures.

Does this project or program leverage non-state funding?If yes, how much by source? If the other funding source requires cost share,also include the minimum state (or other) share OF project cost allowable and the supporting citation or documentation.

No leveraging of non-state funding isexpected for this project.

Describe how this project supports the agency's strategic master plan or would improve agency performance. Reference feasibility studies,master plans, space programming and other analyses as appropriate.

This project supports the CWU strategic plan by proactively solving a problem before a critical failure occurs; doing so protects the integrity of operations and protect students. This project supports every aspect of CWU's Strategic Plan by emphasizing student success, engagement,belonging and stewardship with the integration of sustainable physical facilities use to illustrate and educate the importance of environmentally concise designs and operations.

See link for CWU StrategicPlan: cwu-vision-mission-values-strat-plan-bot-approved.pdf

Does this project include IT related costs, including hardware, software, cloud-based services, contracts or staff? If yes, attach ITAddendum.

N/A

If the project is linked to the Puget Sound Action Agenda, describe the impacts on the Action Agenda, including expenditure and FTE detail. See Chapter 12 Puget Sound Recovery) in the 2021-23 Operating Budget Instructions.

Version: 2A 2026 Supplemental

Report Number: CBS002
Date Run: 9/10/2025 4:54PM

Project Number: **40000206**
Project Title: **Electrical Grid Security Feeder 14**

Description

N/A

How does this project contribute to meeting the greenhouse gas emissions limits established in RCW 70A.45.050, Clean Buildings performance standards in RCW 19.27A.210, or other statewide goals to reduce carbon pollution and/or improve efficiency?

This project is intended to assist with the execution of CWU's decarbonization plan by expanding our capability of geothermal conversion across campus and cutting down our fossil fuel usage at our steam/chiller plant. Its execution is critical forfuture compliance of several buildings under the Clean Building performance.

How does this project impact equity in the state? Which communities are impacted by this proposal? Include both demographic and geographic communities. How are disparities in communities impacted?

CWU is the most diverse public four-year university in Washington. Along with increasing the number of students of color, CWU has expanded strategies for keeping students enrolled and on-track to graduate. Equity in campus academicsis important to our strategic value of belonging by ensuring operational continuity & emergency protocols are in place.

Is there additional information you would like decisionmakers to know when evaluating this request?

Included with this capital request is the report of MW Engineering providing an assessment of the current scope of work along with future electrical infrastructure needs.

CWU's recent capital project appropriations are heavily dependenton the execution of this proposed electrical grid security project:

North Academic Complex $108M – The first geothermal node academic building has a redundancy need for a second geothermal node that would be fed off of Feeder #14.

Second geothermal $16.4M – the recent appropriation for the second geothermal site has partial vulnerability associatedwith the proposed project due to the age of the 30 year old feeder.

Emergency Back-up Power $11.7M –With the implementation of new generators for the Ellensburg campus,distribution of emergency power is dependent on the condition of modern cabling per current construction standards. Feeder#14 is served at campus data center and is a primary path from substation 1.

Is this project eligible for Direct Pay? If the answer is yes, you must include this project to the list of direct pay projects and information for submittal (see Chapter 1.7 of the capital budget instructions for additional instructions).

Based on the IRS Publication of 5817-G (6-2023), this project would be eligible for the "Clean Electricty Investment Tax Credit (48E)"because CWU's power is sourced from Bonneville Power Administration whose electricity is typically sourced from hydroelectric damns. The replacement of the feeder also ensures the usage of geothermal energy for building heating rather that natural gas fired steam from our central plant.

Is there additional information you would like decision makers to know when evaluating this request?

Because this question is redundant, please see the response to question 12.

REAPPROPRIATION: If the project was originally funded prior to the 2021-2023 biennium, describe the project and each subproject,including the original appropriation year, status of the project and an explanation why a reappropriation is needed.

375 - Central Washington University
Capital Project Request
2025-27 Biennium
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Version: 2A 2026 Supplemental

Report Number: CBS002
Date Run: 9/10/2025 4:54PM

Project Number: 40000206
Project Title: Electrical Grid Security Feeder 14

Description

Not applicable.

Location
City: Ellensburg **County:** Kittitas **Legislative District:** 013

Project Type
Major Projects-Infrastr Replacemnt

Growth Management impacts
SEPA process is where Central Washington University (CWU) is required to adhere to the State planning efforst with all applicable city and county jurisdictions. Environmental Policy Act (SEPA). Growth management act impacts are considered.

Funding

			Expenditures		2025-27 Fiscal Period	
Acct Code	**Account Title**	**Estimated Total**	**Prior Biennium**	**Current Biennium**	**Reapprops**	**New Approps**
063-1	CWU Capital Projects-State	1,491,000				1,491,000
	Total	**1,491,000**	**0**	**0**	**0**	**1,491,000**

		Future Fiscal Periods			
		2027-29	**2029-31**	**2031-33**	**2033-35**
063-1	CWU Capital Projects-State				
	Total	**0**	**0**	**0**	**0**

Schedule and Statistics

	Start Date	**End Date**
Predesign		
Design	7/1/2026	10/1/2026
Construction	11/1/2026	5/1/2028

	Total
Gross Square Feet:	1
Usable Square Feet:	1
Efficiency:	100.0%
Escalated MACC Cost per Sq. Ft.:	1,013,712
Construction Type:	College Classroom Facilities
Is this a remodel?	No
A/E Fee Class:	B
A/E Fee Percentage:	10.28%

Cost Summary

OFM

375 - Central Washington University
Capital Project Request
2025-27 Biennium

*

Version: 2A 2026 Supplemental

Report Number: CBS002
Date Run: 9/10/2025 4:54PM

Project Number: 40000206
Project Title: Electrical Grid Security Feeder 14

Cost Summary

		Escalated Cost	% of Project
Acquisition Costs Total		**0**	**0.0%**
Consultant Services			
Pre-Schematic Design Services		0	0.0%
Construction Documents		77,845	5.2%
Extra Services		82,776	5.6%
Other Services		35,687	2.4%
Design Services Contingency		10,073	0.7%
Consultant Services Total		**206,381**	**13.8%**
Maximum Allowable Construction Cost(MACC)	**1,013,712**		
Site work		1,013,712	68.0%
Related Project Costs		0	0.0%
Facility Construction		0	0.0%
GCCM Risk Contingency		0	0.0%
GCCM or Design Build Costs		0	0.0%
Construction Contingencies		51,945	3.5%
Non Taxable Items		0	0.0%
Sales Tax		91,646	6.2%
Construction Contracts Total		**1,157,302**	**77.6%**
Equipment			
Equipment		0	0.0%
Non Taxable Items		0	0.0%
Sales Tax		0	0.0%
Equipment Total		**0**	**0.0%**
Art Work Total		**0**	**0.0%**
Other Costs Total		**25,967**	**1.7%**
Project Management Total		**101,397**	**6.8%**
Grand Total Escalated Costs		**1,491,047**	
Rounded Grand Total Escalated Costs		**1,491,000**	

Operating Impacts

No Operating Impact

Version: 2A 2026 Supplemental

Report Number: CBS002
Date Run: 9/10/2025 4:54PM

Project Number: **40000206**
Project Title: **Electrical Grid Security Feeder 14**

Operating Impacts

Narrative

The purpose of this project is an updgrade and replacement of underground infrasturucture feeders that has limited on-going maitenance costs.

OFM

Capital Project Request

2025-27 Biennium

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Parameter	Entered As	Interpreted As
Biennium	2025-27	2025-27
Agency	375	375
Version	2A-A	2A-A
Project Classification	*	All Project Classifications
Capital Project Number	40000206	40000206
Sort Order	Project Priority	Priority
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

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STATE OF WASHINGTON
AGENCY / INSTITUTION PROJECT COST SUMMARY

Updated June 2025

Agency	Central Washington University
Project Name	Electrical Grid Security Feeder 14
OFM Project Number	40000206

Contact Information

Name	Delano Palmer
Phone Number	509-963-2906
Email	delano.palmer@cwu.edu

Statistics

Gross Square Feet	1	MACC per Gross Square Foot	$976,000
Usable Square Feet	1	Escalated MACC per Gross Square Foot	$1,013,772
Alt Gross Unit of Measure	1		
Space Efficiency	100.0%	A/E Fee Class	B
Construction Type	College classroom facilit	A/E Fee Percentage	10.64%
Remodel	No	Projected Life of Asset (Years)	30

Additional Project Details

Procurement Approach	DBB	Art Requirement Applies	No
Inflation Rate	3.16%	Higher Ed Institution	Yes
Sales Tax Rate %	8.60%	Location Used for Tax Rate	Ellensburg
Contingency Rate	5%		
Base Month (Estimate Date)	August-25	OFM UFI# (from FPMT, if available)	
Project Administered By			

Schedule

Predesign Start		Predesign End	
Design Start	July-26	Design End	October-26
Construction Start	November-26	Construction End	May-28
Construction Duration	18 Months		

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Project Cost Summary

Total Project	$1,431,793	Total Project Escalated	$1,491,049
		Rounded Escalated Total	$1,491,000

Amount funded in Prior Biennia	$0
Amount in current Biennium	**$1,491,000**
Next Biennium	$0
Out Years	$0

Acquisition			
Acquisition Subtotal	**$0**	**Acquisition Subtotal Escalated**	**$0**

Consultant Services			
Predesign Services	$0		
Design Phase Services	$75,237		
Extra Services	$80,000		
Other Services	$33,802		
Design Services Contingency	$9,452		
Consultant Services Subtotal	**$198,491**	**Consultant Services Subtotal Escalated**	**$206,380**

Construction			
Maximum Allowable Construction Cost (MACC)	$976,000	Maximum Allowable Construction Cost (MACC) Escalated	$1,013,772
DBB Risk Contingencies	$0		
DBB Management	$0		
Owner Construction Contingency	$48,800		$51,885
Non-Taxable Items	$0		$0
Sales Tax	$88,133	Sales Tax Escalated	$91,647
Construction Subtotal	**$1,112,933**	**Construction Subtotal Escalated**	**$1,157,304**

Equipment			
Equipment	$0		
Sales Tax	$0		
Non-Taxable Items	$0		
Equipment Subtotal	**$0**	**Equipment Subtotal Escalated**	**$0**

Artwork			
Artwork Subtotal	**$0**	**Artwork Subtotal Escalated**	**$0**

Agency Project Administration			
Agency Project Administration Subtotal	$95,369		
DES Additional Services Subtotal	$0		
Other Project Admin Costs	$0		
Project Administration Subtotal	**$95,369**	**Project Administration Subtotal Escalated**	**$101,397**

Other Costs			
Other Costs Subtotal	**$25,000**	**Other Costs Subtotal Escalated**	**$25,968**

Project Cost Estimate			
Total Project	**$1,431,793**	Total Project Escalated	**$1,491,049**
		Rounded Escalated Total	**$1,491,000**

Funding Summary

	Project Cost (Escalated)	Funded in Prior Biennia	Current Biennium 2025-2027	2027-2029	Out Years
Acquisition					
Acquisition Subtotal	$0				**$0**
Consultant Services					
Consultant Services Subtotal	$206,380		$206,380		**$0**
Construction					
Construction Subtotal	$1,157,304		$1,157,304		**$0**
Equipment					
Equipment Subtotal	$0				**$0**
Artwork					
Artwork Subtotal	$0				**$0**
Agency Project Administration					
Project Administration Subtotal	$101,397		$101,397		**$0**
Other Costs					
Other Costs Subtotal	$25,968		$25,968		**$0**

Project Cost Estimate

Total Project	**$1,491,049**	**$0**	**$1,491,049**	**$0**	**$0**
	$1,491,000	**$0**	**$1,491,000**	**$0**	**$0**
Percentage requested as a new appropriation			**100%**		

What is planned for the requested new appropriation? (*Ex. Acquisition and design, phase 1 construction, etc.*)

Following appropriation, engineering would begin for the detailed replacement need of Feeder #14 and supplemental components.

Construction documents would be developed and solicited based on lowest qualified bid for execution to replace the feeder during a time of least impact

Insert Row Here

What has been completed or is underway with a previous appropriation?

Only a preliminary engineering report, included with the capital request has been completed.

Insert Row Here

What is planned with a future appropriation?

No future appropriation is planned.

Insert Row Here

Cost Estimate Details

Acquisition Costs					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
Purchase/Lease					
Appraisal and Closing					
Right of Way					
Demolition					
Pre-Site Development					
Other					
Insert Row Here					
ACQUISITION TOTAL	**$0**		**NA**	**$0**	

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Cost Estimate Details

Consultant Services					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
1) Pre-Schematic Design Services					
Programming/Site Analysis					
Environmental Analysis					
Predesign Study					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0279**	**$0**	Escalated to Design Start
2) Construction Documents					
A/E Basic Design Services	$75,237				69% of A/E Basic Services
Other					
Insert Row Here					
Sub TOTAL	**$75,237**		**1.0332**	**$77,735**	Escalated to Mid-Design
3) Extra Services					
Civil Design (Above Basic Svcs)					
Geotechnical Investigation					
Commissioning	$40,000				
Site Survey	$20,000				
Testing					
LEED Services					
Voice/Data Consultant					
Value Engineering					
Constructability Review					
Environmental Mitigation (EIS)					
Landscape Consultant	$20,000				
Other					
Insert Row Here					
Sub TOTAL	**$80,000**		**1.0332**	**$82,656**	Escalated to Mid-Design
4) Other Services					
Bid/Construction/Closeout	$33,802				31% of A/E Basic Services
HVAC Balancing					
Staffing					
Other					
Insert Row Here					
Sub TOTAL	**$33,802**		**1.0632**	**$35,939**	Escalated to Mid-Const.
5) Design Services Contingency					
Design Services Contingency	$9,452				
Other					
Insert Row Here					
Sub TOTAL	**$9,452**		**1.0632**	**$10,050**	Escalated to Mid-Const.

CONSULTANT SERVICES TOTAL	**$198,491**		**$206,380**	

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Cost Estimate Details

Construction Contracts					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Site Work					
G10 - Site Preparation	$25,000				
G20 - Site Improvements	$100,000				
G30 - Site Mechanical Utilities					
G40 - Site Electrical Utilities	$793,000				
G60 - Other Site Construction					
utilidor update	$58,000				
Insert Row Here					
Sub TOTAL	**$976,000**		**1.0387**	**$1,013,772**	
2) Related Project Costs					
Offsite Improvements					
City Utilities Relocation					
Parking Mitigation					
Stormwater Retention/Detention					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0387**	**$0**	
3) Facility Construction					
A10 - Foundations					
A20 - Basement Construction					
B10 - Superstructure					
B20 - Exterior Closure					
B30 - Roofing					
C10 - Interior Construction					
C20 - Stairs					
C30 - Interior Finishes					
D10 - Conveying					
D20 - Plumbing Systems					
D30 - HVAC Systems					
D40 - Fire Protection Systems					
D50 - Electrical Systems					
F10 - Special Construction					
F20 - Selective Demolition					
General Conditions					
Other Direct Cost					
Insert Row Here					
Sub TOTAL	**$0**		**1.0632**	**$0**	
4) Maximum Allowable Construction Cost					
MACC Sub TOTAL	**$976,000**			**$1,013,772**	
	$976,000			*$1,013,772*	*per GSF*

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7) Owner Construction Contingency				
Allowance for Change Orders	$48,800			
Other				
Insert Row Here				
Sub TOTAL	**$48,800**	**1.0632**	**$51,885**	
8) Non-Taxable Items				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0632**	**$0**	
9) Sales Tax				
Sub TOTAL	**$88,133**		**$91,647**	
CONSTRUCTION CONTRACTS TOTAL	**$1,112,933**		**$1,157,304**	

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Cost Estimate Details

Equipment					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
1) Equipment					
E10 - Equipment					
E20 - Furnishings					
F10 - Special Construction					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0632**	**$0**	
2) Non Taxable Items					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0632**	**$0**	
3) Sales Tax					
Sub TOTAL	**$0**			**$0**	
EQUIPMENT TOTAL	**$0**			**$0**	

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Cost Estimate Details

Artwork					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Artwork					
Project Artwork	$0				0.5% of total project cost for new construction
Higher Ed Artwork	$7,455				0.5% of total project cost for new and renewal construction
Other	-$7,455				
Insert Row Here					
ARTWORK TOTAL	**$0**		**NA**	**$0**	

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Cost Estimate Details

Project Management					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
1) Agency Project Management					
Agency Project Management	$95,369				
Additional Services					
Other					
Insert Row Here					
Subtotal of Other	*$0*				
PROJECT MANAGEMENT TOTAL	**$95,369**		**1.0632**	**$101,397**	

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Cost Estimate Details

Other Costs					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
Mitigation Costs					
Hazardous Material Remediation/Removal					
Historic and Archeological Mitigation					
Shop Support	$25,000				
Insert Row Here					
OTHER COSTS TOTAL	**$25,000**		**1.0387**	**$25,968**	

Green cells must be filled in by user

C-100 (2026)
Additional Notes

Tab A. Acquisition
Insert Row Here

Tab B. Consultant Services
Insert Row Here

Tab C. Construction Contracts
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Tab D. Equipment
Insert Row Here

Tab E. Artwork
Insert Row Here

Tab F. Project Management
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Tab G. Other Costs
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Agencies are required to submit this form for all projects funded with Bonds or COPs, as applicable. OFM will collect and forward the forms to the Office of the State Treasurer.

1. Will any portion of the project or asset ever be owned by any entity other than the state or one of its agencies or departments? ☐ Yes ☒ No

2. Will any portion of the project or asset ever be leased to any entity other than the state or one of its agencies or departments? ☐ Yes ☒ No

3. Will any portion of the project or asset ever be managed or operated by any entity other than the state or one of its agencies or departments? ☐ Yes ☒ No

4. Will any portion of the project or asset be used to perform sponsored research under an agreement with a nongovernmental entity (business, non-profit entity, or the federal government), including any federal department or agency? ☐ Yes ☒ No

5. Does the project involve a public/private venture, or will any entity other than the state or one of its agencies or departments ever have a special priority or other right to use any portion of the project or asset to purchase or otherwise acquire any output of the project or asset such as electric power or water supply? ☐ Yes ☒ No

6. Will any portion of the Bond/COP proceeds be granted or transferred to nongovernmental entities (businesses, non-profit entities, or the federal government) or granted or transferred to other governmental entities which will use the grant for nongovernmental purposes? ☐ Yes ☒ No

7. If you have answered "Yes" to any of the questions above, will your agency or any other state agency receive **any payments** from any nongovernmental entity, for the use of, or in connection with, the project or assets? A nongovernmental entity is defined as ☐ Yes ☒ No
   a. any person or private entity, such as a corporation, partnership, limited liability company, or association.
   b. any nonprofit corporation (including any 501(c)(3) organization); or
   c. the federal government (including any federal department or agency).

8. Is any portion of the project or asset, or rights to any portion of the project or asset, expected to be sold to any entity other than the state or one of its agencies or departments? ☐ Yes ☒ No

9. Will any portion of the Bond/COP proceeds be loaned to nongovernmental entities or loaned to other governmental entities that will use the loan for nongovernmental purposes? ☐ Yes ☒ No

10. Will any portion of the Bond/COP proceeds be used for staff costs for tasks not directly related to a financed project(s)? ☐ Yes ☒ No

If all the answers to the questions above are "No," request tax-exempt funding. If the answer to any of the questions is "Yes," contact your OFM capital analyst for further review.

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Purpose: To collect a list of capital project request that may qualify for direct pay. Please refer to Section 1.7 of the OFM Capital Budget Instructions for more information. If you have questions about these instructions or capital project eligibility, contact your assigned OFM budget advisor.

Agency Name:

Budget (Capital, Transportation, Operating)	Program/Subprogram Name	Item/Project #	Project Title	Eligible for Direct Pay (Yes/No)	If Column E = No -- stop here	Identify Portion Eligible	Amount of Eligible Portion	Tax Credit Category (select option)	Planned Completion Date	Notes
Capital		*40000206*	*Electrical Grid Security Feeder 14*	*Yes*		*1,491,000*	*1,491,000*	*Clean Electricity Investment Tax*	*5/30/2025*	

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CWU ELECTRICAL GRID SECURITY – FEEDER IMPROVEMENTS STUDY

DATE August 14, 2025

CONTACTS

OWNER REPRESENTATIVES:

Delano Palmer – Director | Capital Planning & Projects

Gary Gleason – Construction Project Coordinator

400 East University Way
Ellensburg, WA 98926

REPORT PREPARED BY:

Joel Enevold, PE – Electrical Engineer
MW Engineers
601 West First Avenue, Suite 1300
Spokane, WA 99201

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

To comply with the current and anticipated future state energy policies, CWU expects their electrical load on campus to grow by as much as 500% over the next 15 years. As many loads on campus including heating will move from fossil fuel sources which can be bulk stored onsite to electricity which cannot readily be stored in large quantities. Continuity and reliability of the campus electrical service will become more significant, especially during the winter months.

MW was engaged by CWU to study the existing campus medium voltage distribution system to assess existing conditions and evaluate the feasibility of options to improve the electrical grid security on campus. The purpose of this report is to outline MW's findings, proposed options, and associated costs so that a decision can be made as to how to proceed with future projects.

The primary focus of this study is the Southern side of campus with an emphasis on existing feeder 14. MW previously performed a similar study to evaluate the Northern side of campus. Those previous findings have been included in this report to provide a comprehensive summary of current campus needs as it relates to electrical grid security.

SECTION 2

DISCUSSION

Existing Conditions

General Campus

CWU takes medium voltage electrical service from the city of Ellensburg at (3) substations and distributes that service throughout campus using a system of medium voltage cable and pad mounted switches which feed grade-level pad mounted transformers, which in-turn serve individual campus buildings and loads. Of the (3) substations that serve campus, (2) are presently providing power to campus from the utility. Substations 1 and 3 presently power the campus and substation 2 is backfed from substation 1 due to an issue on the utility side with the feeder that serves substation 1. It is understood that there are efforts to mitigate this issue and substation 2 may be reactivated at some future date.

The existing buried 12.47kV campus feeders throughout campus are at or beyond the end of their useful service life of 30 years. There are select portions of cabling that have been partially upgraded for new building construction or emergency repairs. These limited improvements have been focused on the Northern side of campus and include feeder 17, brooklane village, and the student village housing complexes near 18th and Alder.

One area of concern for the existing campus distribution system is where a line switch serves another downstream line switch from its fused supply compartment. A high-risk instance of this condition is at feeder 14 line switch LSA0 which is feeding the campus Data Center switch LSA10 from a fused supply compartment. If the LSA0 fuse fails, the campus Data Center would lose power for an extended period. This condition does not align with the CWU construction standards and greatly increases the likelihood of multiple buildings being impacted by an outage due to maintenance or failures, including the campus data center.

The labeling of cables in existing vaults is incomplete and record drawings of the cabling within the existing vaults are inaccurate. This results in longer than normal outages during a feeder cable failure. A cable failure can typically be identified within 6-8 hours for standard working conditions with complete labeling and accurate record drawings. Without complete labeling and record drawings, this time increases to an estimated 12-24 hours, resulting in longer outages for large portions of campus during a cable failure incident. The lack of labeling and record drawings also creates a safety issue when trying to identify which cable in the vault is not active and can then be safely worked on since some of the feeders pass through the same vault multiple times.

South Campus

The existing southern area of campus is generally served by existing 12.47kV underground campus feeders 13 and 14. Campus feeder 36 is also available as a backup to feeder 13 and substation 1. That interconnection occurs at existing line switch LSA1.

Feeder 14 is treated as a dedicated feeder to serve the campus data center located within the Samuelson building. An automatic transfer switch at the Samuelson building monitors normal source power from feeder 14 and transfers to standby campus feeder 32 if there is a loss of power on feeder 14. The stability and security of feeder 14 is critical to the campus data center daily operations. Feeder 14 cabling is estimated to be more than 30 years old and is at high risk of outages due to failure of the cabling or its terminations. Also, the existing conductor size of feeder 14 is undersized compared to other existing feeders on campus, which limits the capacity of feeder 14 to support future load additions.

The current master plan for the CWU campus includes the addition of a new GeoEco plant on the Southern side of campus. The planned location for this geothermal heating and cooling plant is east of the existing Samuelson building and near existing feeder 14. It is anticipated that feeder 14 will be the source of normal power for the future GeoEco plant facility.

The “South” campus buildings currently served by each feeder can be summarized as follows:
Feeder 13: *Sue-Lombard, Kamola, Tunstall, Connell, Hebeler, Mitchell, Shaw, Barge, Munson, Mail, Old Boiler House.*
Feeder 14: *Samuelson (Data Center), Future GeoEco Plant.*

Outstanding Existing Conditions from Previous Study:

North central Campus:
The existing service to Hogue hall contains a medium voltage line switch which feeds a downstream line switch from a fused switch compartment. This configuration is not desirable and does not meet CWU campus standards. Existing duct bank is present south of Hogue hall to possibly reconfigure this part of the distribution to eliminate this existing condition. The open green space east of Music is an area of campus where future development may occur. Currently there is no electrical infrastructure present in this green space to support this anticipated growth.

Northeast Campus:
There is an existing line switch located at the entrance to brooklane village that is used to switch (2) campus feeders for electrical service to the residential housing buildings. The fused side of the line switch is tapped to also provide service to the existing campus pumphouse building transformer. This tap is not desirable and does not meet CWU campus standards. The pumphouse transformer has reached the end of its useful service life and is due for replacement including a new concrete pad. The open green space north and south of east 18th avenue and east of Alder St. is an area of campus where future development may occur. Currently there is no electrical infrastructure present on the south side of east 18th avenue to support this anticipated growth.

Proposed Campus Improvements

Replacement of Feeder 14: (See South Campus Attachment)

Replacement of feeder 14 cabling to increase system capacity and to improve grid security for the campus data center within the Samuelson building. Additionally, feeder 14 has been identified as the potential source for the planned campus GeoEco plant to support geothermal campus heating and cooling. The reliability of feeder 14 will be critical to campus IT operations and building heating and cooling needs. This work would require a combination of new duct banks and existing duct banks for the new cabling installation. The replacement feeder installation would also include the installation of new pad mounted line switching equipment, including a line switch in the vicinity of the future GeoEco plant site. As part of this scope of work, the contractor would be responsible for proofing out all existing buried pathways in the vicinity of work and providing updated butterfly diagrams for existing & new vaults to document the existing pathway infrastructure and cable routing.

The complete scope of work noted above is recommended to be performed immediately.

Estimated Cost* **$807,000**

Outstanding Campus Improvements

Revised Service at Hogue Hall: (See NC @ Hogue Attachment)

Revise service at Hogue Hall line switch LSC4A to be fed from existing line switch LSC3 or LSC4. This would require new cabling in existing ductbanks.

Estimated Cost* **$178,000**

Expansion east of Music: (See NC @ Music Attachment)

Add new underground duct banks, cabling and switching equipment to expand feeder 18 to the open green space east of Music.

Estimated Cost* **$494,000**

Revised service at Pumphouse: (See NE @ Brooklane Attachment)

Remove existing tap at line switch and add new above grade sectionalizing cabinet. Replace existing pumphouse transformer and provide new housekeeping pad. Transformer to be OFCI. Existing cabling to remain.

Estimated Cost* **$37,000**

Expansion south of 18th ave: (See NE @ 18th Attachment)

Add new underground duct banks, cabling and switching equipment to expand feeder 21 or 25 to the open green space south of east 18th avenue.

Estimated Cost* **$1,267,000**

***Estimating Notes:**
Estimates exclude Sales Tax.
Estimates include Design Fees.
Estimates exclude Construction Contingency.
Estimates assume work will be performed by a contractor, not CWU.

SECTION 3

RECOMMENDATIONS

Feeder 14 – It is recommended that existing feeder 14 be replaced for the following reasons:

1. Replacement of feeder 14 will allow for buildout of the planned GeoEco plant in the south area of campus.
2. Feeder 14 is critical for data center daily operations on campus. Replacement will mitigate any risk due to failure of the existing cabling that has exceeded its useful service life.
3. Replacement of feeder 14 will improve existing maintenance issues related to feeder identification and manhole congestion due to excess cabling.

Proposed Feeder 14 Project Schedule

Design Phase	3 Months
Bid Phase	1 Month
Construction Phase	6 Months

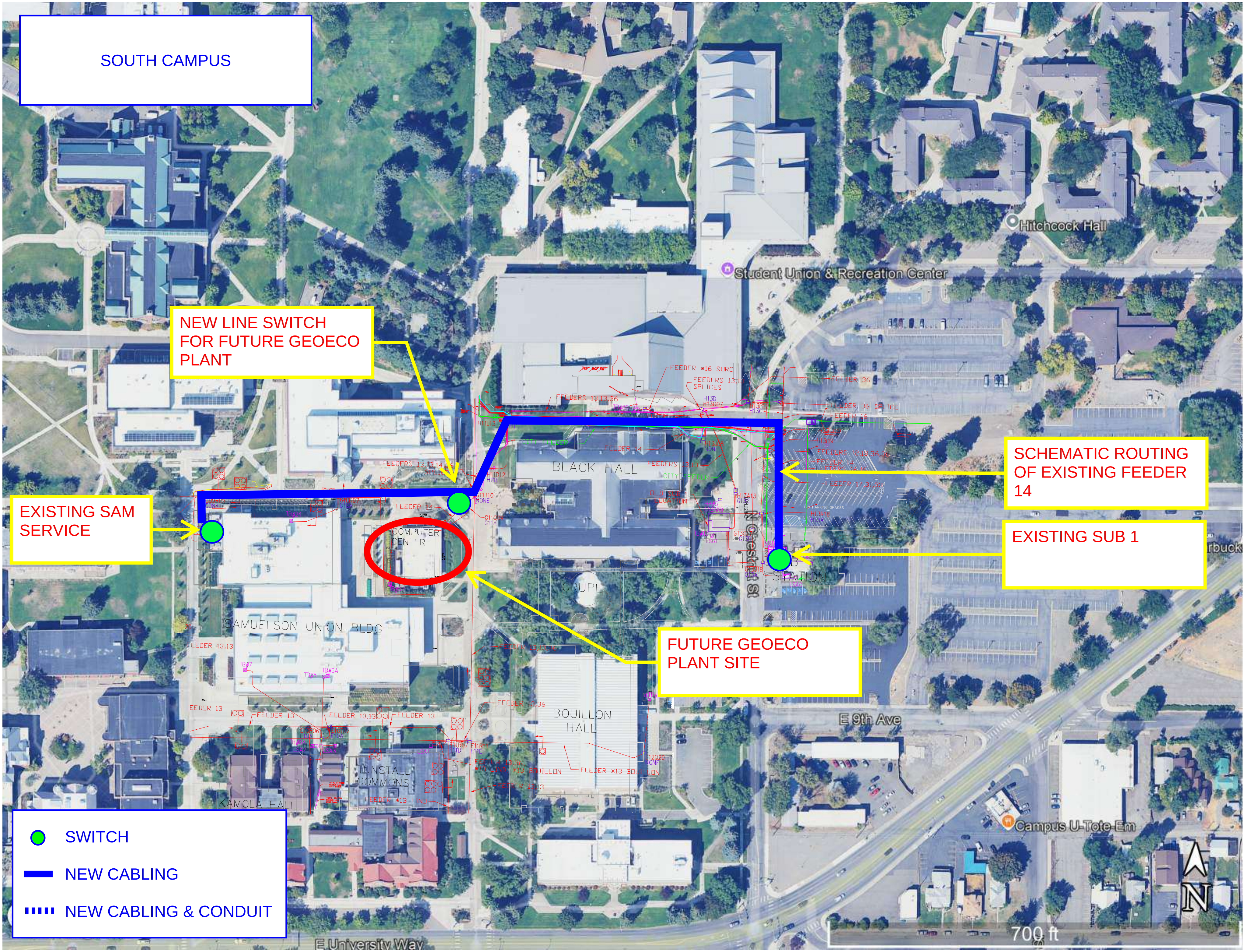
END OF REPORT

List of Attachments:

- Conceptual Drawings, Sketches.
- Product Data

MW Engineers

601 West First Avenue, Suite 1300
Spokane, WA 99201, USA


SOUTH CAMPUS
NEW LINE SWITCH FOR FUTURE GEOECO PLANT
EXISTING SAM SERVICE
COMPUTER CENTER
BLACK HALL
SCHEMATIC ROUTING OF EXISTING FEEDER 14
EXISTING SUB 1
FUTURE GEOECO PLANT SITE
SAMUELSON UNION BLDG
BOUILLON HALL
TUNSTALL COMMONS
KAMOLA HALL
N Chestnut St
E 9th Ave
E University Way
Hitchcock Hall
Student Union & Recreation Center
Campus U-Tote-Em
SWITCH
NEW CABLING
NEW CABLING & CONDUIT
700 ft
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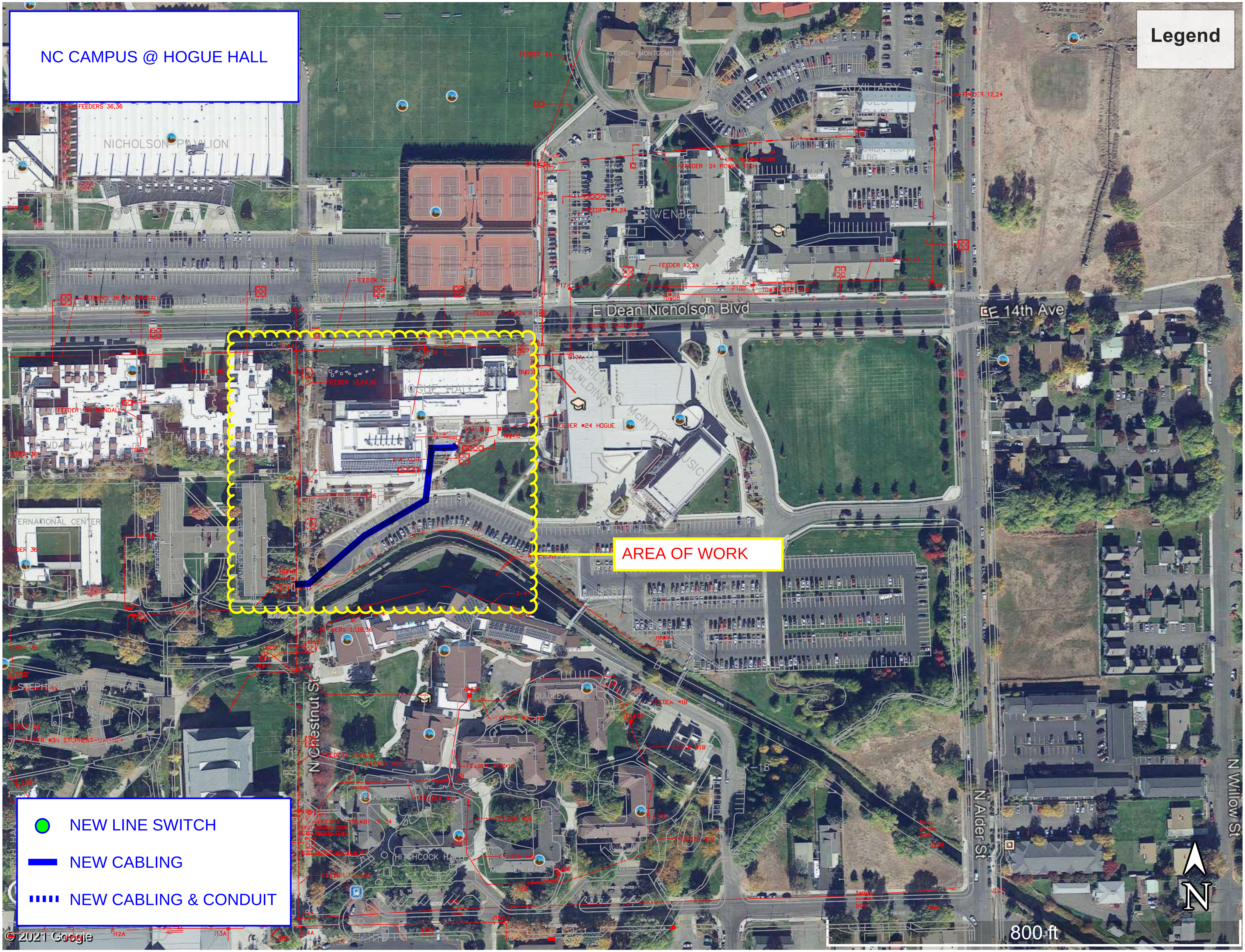
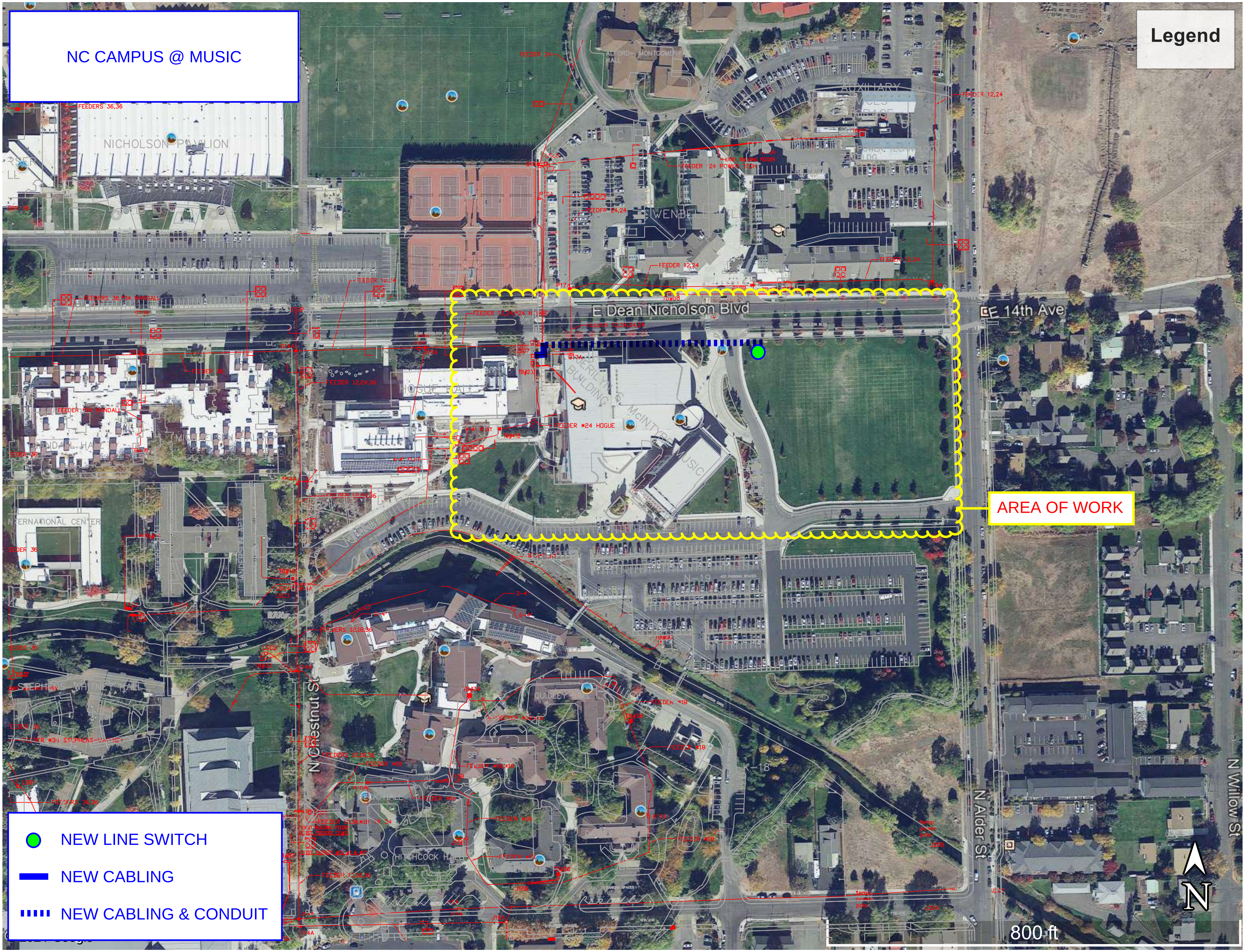

NC CAMPUS @ HOGUE HALL
Legend
NICHOLSON PAVILION
E Dean Nicholson Blvd
E 14th Ave
HOGUE HALL
AREA OF WORK
N Chestnut St
N Alder St
N Willow St
HITCHCOCK HALL
QUIGLEY
NEW LINE SWITCH
NEW CABLING
NEW CABLING & CONDUIT
800 ft
N
© 2021 Google


NC CAMPUS @ MUSIC
Legend
NICHOLSON PAVILION
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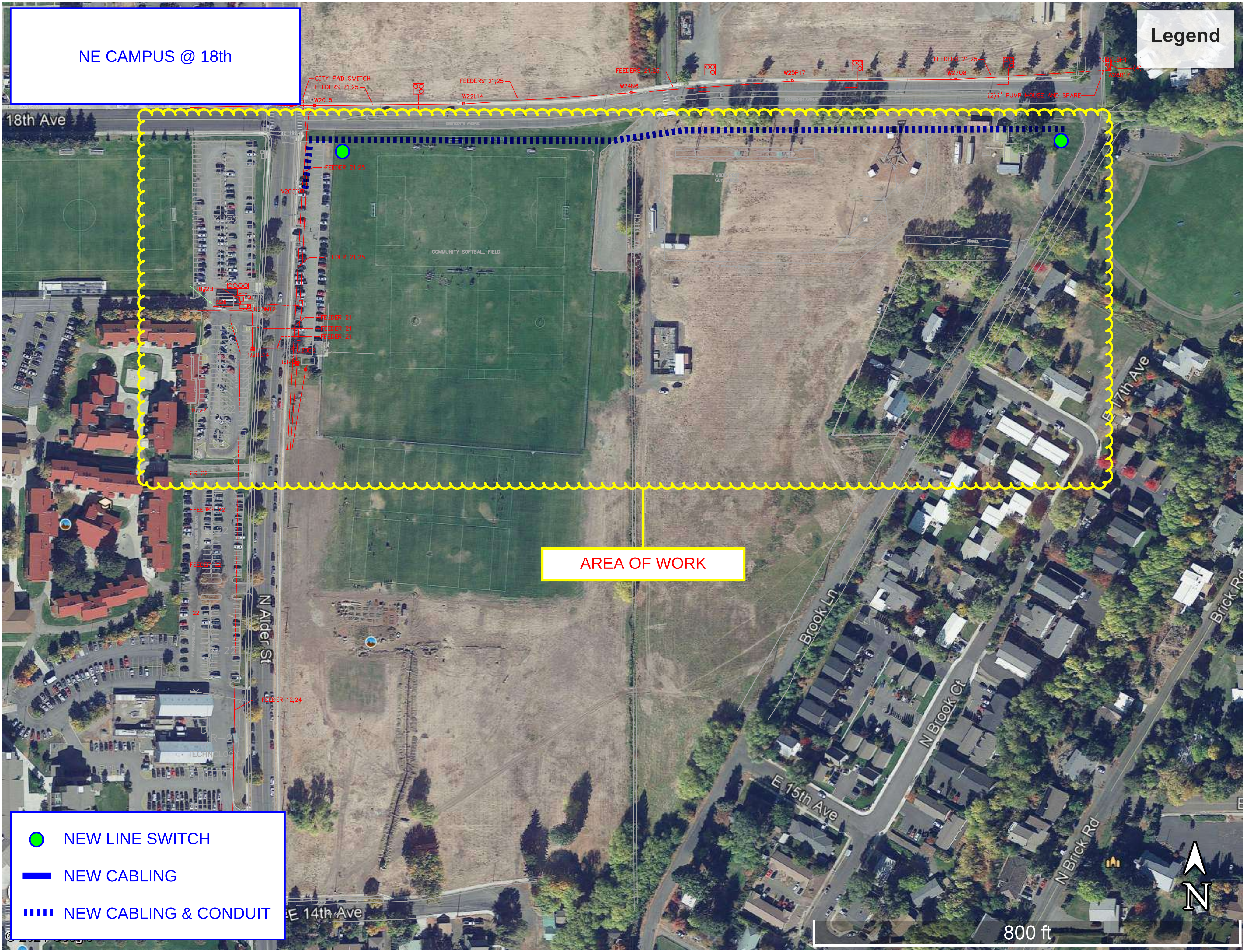
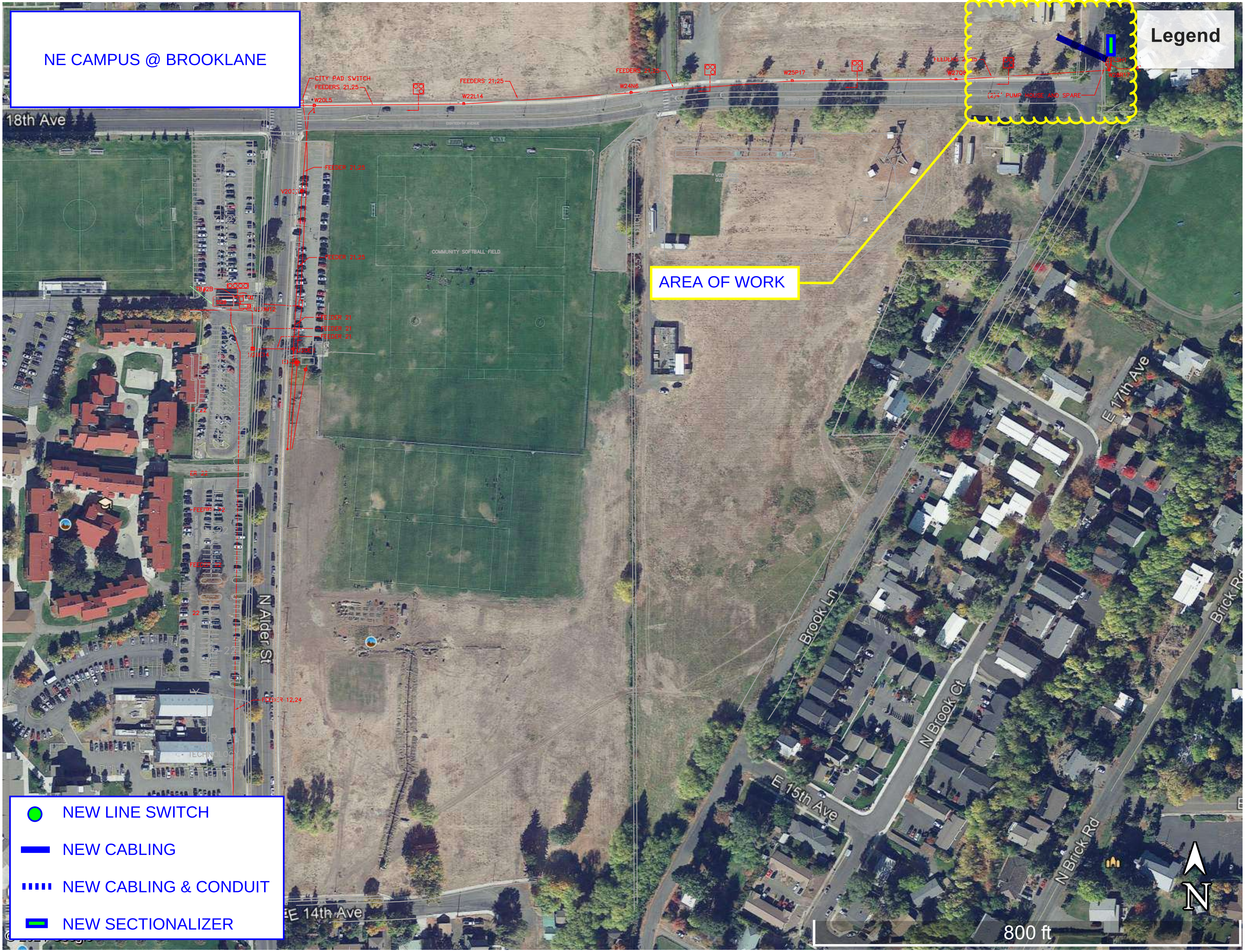
NEW CABLING & CONDUIT


NE CAMPUS @ 18th
Legend
18th Ave
N Alder St
E 14th Ave
E 15th Ave
Brook Ln
N Brook Ct
N Brick Rd
Brick Rd
E 17th Ave
AREA OF WORK
NEW LINE SWITCH
NEW CABLING
NEW CABLING & CONDUIT
800 ft
N



NE CAMPUS @ BROOKLANE
Legend
18th Ave
CITY PAD SWITCH
FEEDERS 21,25
AREA OF WORK
N Alder St
E 17th Ave
Brook Ln
N Brook Ct
E 15th Ave
E 14th Ave
N Brick Rd
Brick Rd
NEW LINE SWITCH
NEW CABLING
NEW CABLING & CONDUIT
NEW SECTIONALIZER
800 ft
N

Uniblend® CPE High Speed

EPR/Copper Tape Shield/CPE, Medium-Voltage Power, Shielded
15 kV, UL Type MV-105, 133% Ins. Level, 220 Mils

XTRA LOW FRICTION XLE TECHNOLOGY

Product Construction:

Conductor:
- 2 AWG thru 1000 kcmil annealed bare copper compact Class B strand

Extruded Strand Shield (ESS):
- Extruded thermoset semi-conducting stress-control layer over conductor

Insulation:
- Lead-free Ethylene Propylene Rubber (EPR) insulation, contrasting in color to the black semi-conducting shield layers

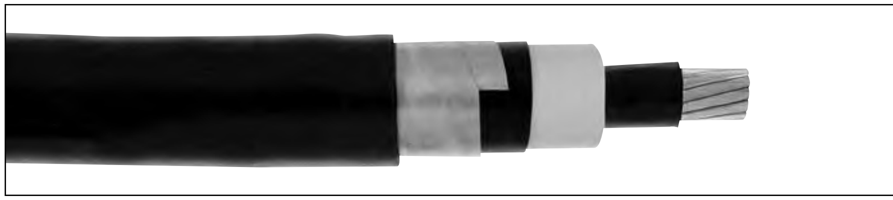
Extruded Insulation Shield (EIS):
- Thermoset semi-conducting polymeric layer free stripping from insulation

Metallic Shield:
- 5 mil annealed copper tape with an overlap of 25%

Jacket:
- Flame-retardant, moisture- and sunlight-resistant Chlorinated Polyethylene (CPE)

Options:
- STRANDFILL® – blocked conductor. Tested in accordance with ICEA T-31-610

Applications:
- Superior performance in petrochemical plants, pulp and paper mills, sewage and water treatment plants, environmental protection systems, railroads, mines, utility power generating stations, steel mills, textile plants and other industrial three-phase applications



Applications (cont'd.):
- For use in wet or dry locations when installed in accordance with NEC
- For use in aerial, conduit, open tray and underground duct installations
- For use in direct burial if installed in a system with a ground conductor that is in close proximity, and conforms with NEC 250.4(A)(5)

Features:
- Rated at 105°C
- Excellent flame resistance – burns to an ash; does not exhibit thermoplastic drip
- Excellent heat, moisture and sunlight resistance
- Excellent flame resistance
- Outstanding corona resistance
- Flexibility for easy handling
- High Speed low friction technology for easy cable pulling
- High dielectric strength
- Low moisture absorption
- Electrical stability under stress
- Low dielectric loss
- Chemical-resistant
- Meets cold bend test at -35°C
- 105°C rating for continuous operation
- 140°C rating for emergency overload conditions
- 250°C rating for short circuit conditions

Compliances:
- National Electrical Code (NEC)
- UL 1072
- ICEA S-93-639/NEMA WC74
- ICEA S-97-682
- AEIC CS8
- UL listed as Type MV-105 for use in accordance with NEC, UL File # E90501
- UL 1685 (Sizes 1/0 AWG and larger) UL Flame Exposure Test
- Sizes 1/0 AWG and larger are listed and marked "Sunlight-Resistant FOR CT USE" in accordance with NEC
- IEEE 1202 (70,000 BTU/hr)/CSA FT4
- EPA 40 CFR, Part 261 for leachable lead content per TCLP method
- OSHA Acceptable
- RoHS Compliant

Packaging:
- Material cut to length and shipped on non-returnable wood reels. Lengths in excess of 10,000 lbs. are provided on returnable steel reels that require a deposit
- Extra charges apply for cuts less than 1000 ft., lagging, pulling eyes, paralleling and triplexing

CATALOG NUMBER	COND. SIZE (AWG/ kcmil)	NOMINAL CONDUCTOR DIAMETER	INSULATION DIAMETER INCHES		NOMINAL JACKET THICKNESS		NOMINAL CABLE DIAMETER		NOMINAL CABLE WEIGHT		COPPER WEIGHT		AMPACITY CONDUIT IN AIR (1)		AMPACITY UNDERGROUND DUCT (2)		AMPACITY TRAY (3)		CONDUIT SIZING (4) (INCHES)
		INCHES	MIN.	MAX.	INCHES	mm	INCHES	mm	LBS/1000 FT	kg/km	LBS/1000 FT	kg/km	90°C	105°C	90°C	105°C	90°C	105°C	
15 kV¥, UL TYPE MV-105, 133% INS. LEVEL, 220 MILS																			
17131.130205	2	0.27	0.710	0.800	0.080	2.03	0.99	25.14	655	975	276	411	150	165	155	165	-	-	3
17131.130105	1	0.31	0.745	0.830	0.080	2.03	1.02	25.91	730	1086	332	494	170	190	175	185	-	-	3.5
17131.135105	1/0	0.34	0.780	0.865	0.080	2.03	1.06	26.92	820	1220	403	600	195	215	200	215	195	220	3.5
17131.135205	2/0	0.38	0.820	0.905	0.080	2.03	1.10	27.94	933	1388	492	732	225	255	230	245	225	250	3.5
17131.135305*	3/0	0.43	0.865	0.955	0.080	2.03	1.14	28.95	1072	1595	603	897	260	290	260	275	260	290	3.5
17131.135405	4/0	0.48	0.920	1.005	0.080	2.03	1.21	30.73	1248	1857	743	1105	295	330	295	315	300	335	4
17131.136005	250	0.53	0.970	1.060	0.080	2.03	1.25	31.75	1402	2086	866	1289	330	365	325	345	335	370	4
17131.136205	350	0.62	1.070	1.155	0.080	2.03	1.35	34.29	1778	2646	1184	1761	395	440	390	415	415	460	5
17131.136505	500	0.74	1.190	1.275	0.080	2.03	1.47	37.34	2325	3460	1657	2466	480	535	465	500	515	575	5
17131.137005	750	0.91	1.370	1.460	0.080	2.03	1.65	41.91	3250	4836	2445	3638	585	655	565	610	665	745	6
17131.637505	1000	1.06	1.520	1.610	0.110	2.79	1.86	47.24	4209	6263	3228	4803	675	755	640	690	795	890	6

Dimensions and weights are nominal. Subject to industry tolerances.

* Non-stock item; minimum runs apply. Please consult Customer Service for price and delivery.

(1) Ampacities are in accordance with Table 310.60(C)(73) of the NEC for triplexed or three single conductor copper cables in isolated conduit in air based on a conductor temperature of 90°C (194°F) or 105°C (221°F), temperature denoted in column header, and an ambient air temperature of 40°C (104°F).

(2) Ampacities are in accordance with Table 310.60(C)(77) of the NEC for triplexed or three single conductor copper cables in underground ducts (three conductors per duct), based on a conductor temperature of 90°C (194°F) or 105°C (221°F), temperature denoted in column header, and an ambient earth temperature of 20°C (68°F), electrical duct arrangement per Figure 310.60 Detail 1, 100% load factor, and earth thermal resistance (rho) of 90.

(3) Ampacities are based on single conductor Type MV-105 sizes #1/0 AWG and larger in an uncovered tray in accordance with Section 392.80(B)(2) of the NEC at an ambient air temperature of 40°C (104°F) the ampacities are based on 75% of the values per Table 310.60(C)(69), operating temperature denoted in column header. For cable trays with unventilated covers for more than 6 feet, the ampacities shall not exceed 70% of the values per Table 310.60(C)(69).

(4) Based on nominal cable diameters, three single cables in the duct (PVC Schedule 40) with no ground wire and a maximum of 40% fill. Jam ratio has been considered but should be checked for individual installations.

¥ 100% insulation level is available upon request.

Note: a) Sizes smaller than 1/0 AWG do not include "FOR CT USE".
b) The NESC Lightning bolt symbol is on all Uniblend® constructions.

General Cable

RoHS Compliant Directive 2011/65/EU

UL LISTED

MANUAL PMH PAD-MOUNTED GEAR

OUTDOOR DISTRIBUTION (14.4 KV AND 25 KV)

CONTENTS

Introduction

The underground grid has evolved over time to support the trend of reducing overhead lines. This is because underground lines have been shown to increase reliability, have minimal operational costs, and improve worker safety.

Utilities are looking to continue this evolution by updating or expanding their present systems to meet present and future demands. PMH Pad-Mounted Gear offers several key benefits that provide outstanding value, including security, long life, reliable performance, and a wide range of solutions for different applications.

It’s the complete switching and protection package that combines the ratings, configurations, components, and features to make it easy to select, easy to install, and easy to operate.

S&C Manual PMH Pad-Mounted Gear, incorporating S&C Mini-Rupter® Switches and S&C Power Fuses with Uni-Rupter® Interrupters in free-standing, self-supporting enclosures, are available in a variety of circuit configurations to allow you to tailor medium-voltage switching and protection packages to your underground distribution applications.

These PMH models, which are available in ratings of 14.4 kV and 25 kV, feature external handle-operated, 600-ampere Mini-Rupter Switches for three-pole switching of source circuits. S&C Mini-Rupter Switches are specifically designed to handle all three-phase live-switching duties, including full-load and associated transformer-magnetizing and cable-charging currents plus fault-closing operations.

Feeder circuits may be provided with Mini-Rupter Switches for 600-ampere three-pole switching or hook-stick operated S&C Power Fuses with Uni-Rupter Interrupters for 200- or 400-ampere single-pole switching plus protection.

PMH models accommodate a choice of S&C SML Power Fuses or S&C Fault Fiter® Electronic Power Fuses. Permanently accurate SML-20 and SML-4Z Power Fuses and Fault Fiter Electronic Power Fuses, available in a wide choice of ampere ratings and time-current characteristics, provide superb protection against the full spectrum of fault currents and precise coordination with all upstream and downstream protective devices. After a fault occurs, only the inexpensive refill unit or fuse unit of the power fuse, or the interrupting module of the electronic fuse, must be replaced while the fault is being located and corrected.

With S&C Pad-Mounted Gear, you get in-air visibility, in-air switching, and in-air insulation. Readily visible components give the operator the ability to visualize the circuit configuration and all of the components being operated. Open switch gaps are easily established and verified. Unlike gear with hidden switch contacts, no cumbersome procedures are required to establish working clearances. Full visibility allows easy identification of blown fuses, and there is no messy insulating oil to contend with when fuses are removed for replacement. In-air insulation eliminates the need to buy, install, monitor, or maintain any insulating medium.

A dual-purpose front barrier of fiberglass-reinforced polyester is provided for each switch and fuse. When the switch or fuse is in the Open position, this barrier can be inserted into the open gap to guard against inadvertent contact with live parts. Interphase and end barriers (where required) of the same material are provided with each switch for BIL ratings and with each set of fuses for phase segregation and to facilitate fuse handling. Additional barriers of fiberglass-reinforced polyester separate front and rear compartments and isolate the tie bus. Full-length steel barriers separate adjoining compartments. Each switch, fuse, and bus terminal is provided with a ground stud, as is each ground pad.

S&C Manual PMH Pad-Mounted Gear is available in 12 models with switches and fuses in circuit configurations to fit every requirement, giving you complete flexibility in designing your underground system. S&C has drawn upon an inventory of basic design concepts developed through more than 60 years of designing and manufacturing pad-mounted gear to create these totally pre-engineered packages. Standardization of construction eliminates drawing preparation time and dramatically reduces drawing approval time, bringing you all the economies to be realized from repetitive manufacturing.

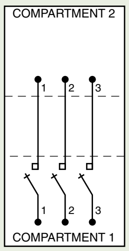
Manual S&C PMH Pad-Mounted Gear allows you the greatest flexibility in designing reliable and economical underground distribution systems to serve industrial, institutional, commercial, or residential applications.

Whether the application is simply switching and protecting an individual transformer or a complex scheme requiring sectionalizing and/or multiple tapping of a primary feeder to serve transformers or laterals, S&C Pad-Mounted Gear does it all.

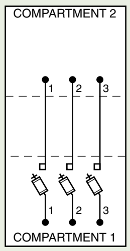
PMH Models

FIGURE 1. S&C Pad-Mounted Gear is available in 12 pre-engineered models. Use these circuit configurations to solve your underground switching and protection problems. The system design possibilities are virtually unlimited.

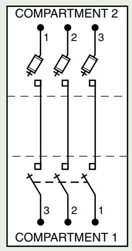
See descriptions of the pre-engineered models in the Appendix at the end of this document. Figure 1 notes



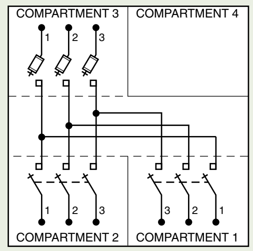
PMH-3



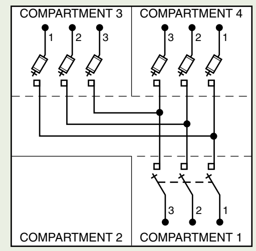
PMH-4



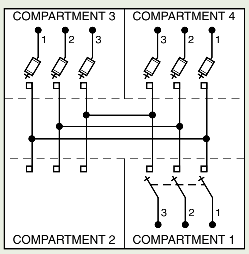
PMH-5



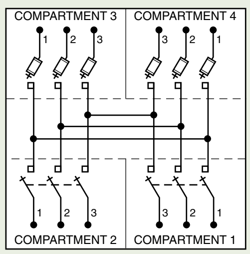
PMH-6



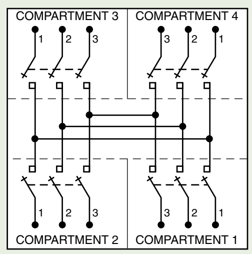
PMH-7



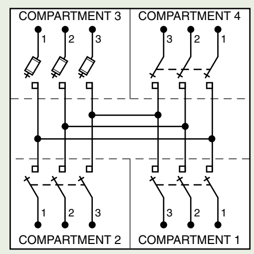
PMH-8



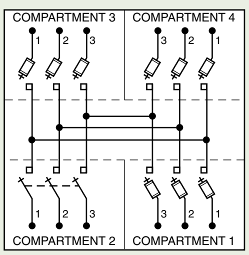
PMH-9



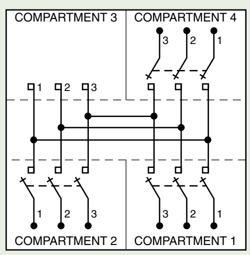
PMH-10



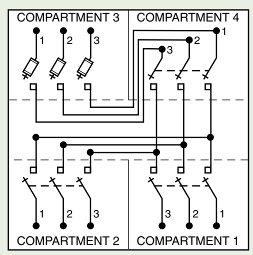
PMH-11



PMH-12



PMH-13



PMH-19

Three basic circuit types meet the requirements of different loads. The variety of circuit configurations available in pad-mounted gear simplifies your system design task.

Three basic circuit types—radial, primary-selective, and looped-primary— are used alone and in combination to design underground distribution systems. You can combine these three circuit types to produce a system with economics and reliability tailored to the requirements of the load.

Radial circuits, such as those shown in **Figure 2 on page 6**, provide the simplest and most economical method of delivering power to a load. However, should a fault occur on the radial source cable, power will be lost to all of the loads on that cable until the fault is located and corrected.

This type of circuit is often used on industrial, commercial, and institutional systems, where complete control over the security and growth of the system is possible. For utility systems, greater redundancy and the ability to serve loads through more than one route are often required so a high degree of service continuity can be provided in spite of the exposure to dig-ins, vandalism, and other events beyond the control of the utility.

One method used to achieve higher continuity of service is primary-selective service from two circuits, shown in **Figure 3 on page 7**. With primary-selective service, one circuit serves as the preferred source providing power to the load, while the second circuit remains available as the alternate source of supply. If the preferred source fails, switching operations may be performed to provide power to the load from the alternate source. These switching operations can be performed by manual or power-operated pad-mounted gear or metal-enclosed switchgear.

FIGURE 2. Radial circuits are often used on industrial, commercial, and institutional in-plant distribution systems. Figure 2a illustrates a Model PMH-5 used to switch and protect a single load, and Figure 2b diagrams a Model PMH-7 serving two loads. By using multiple radial circuits and segmenting the loads, only the load or loads associated with a given process must shutdown if a fault occurs. Other radial circuits remain unaffected. The low cost of pad-mounted gear is the key to the design of an extensive system with a high degree of segmentation.

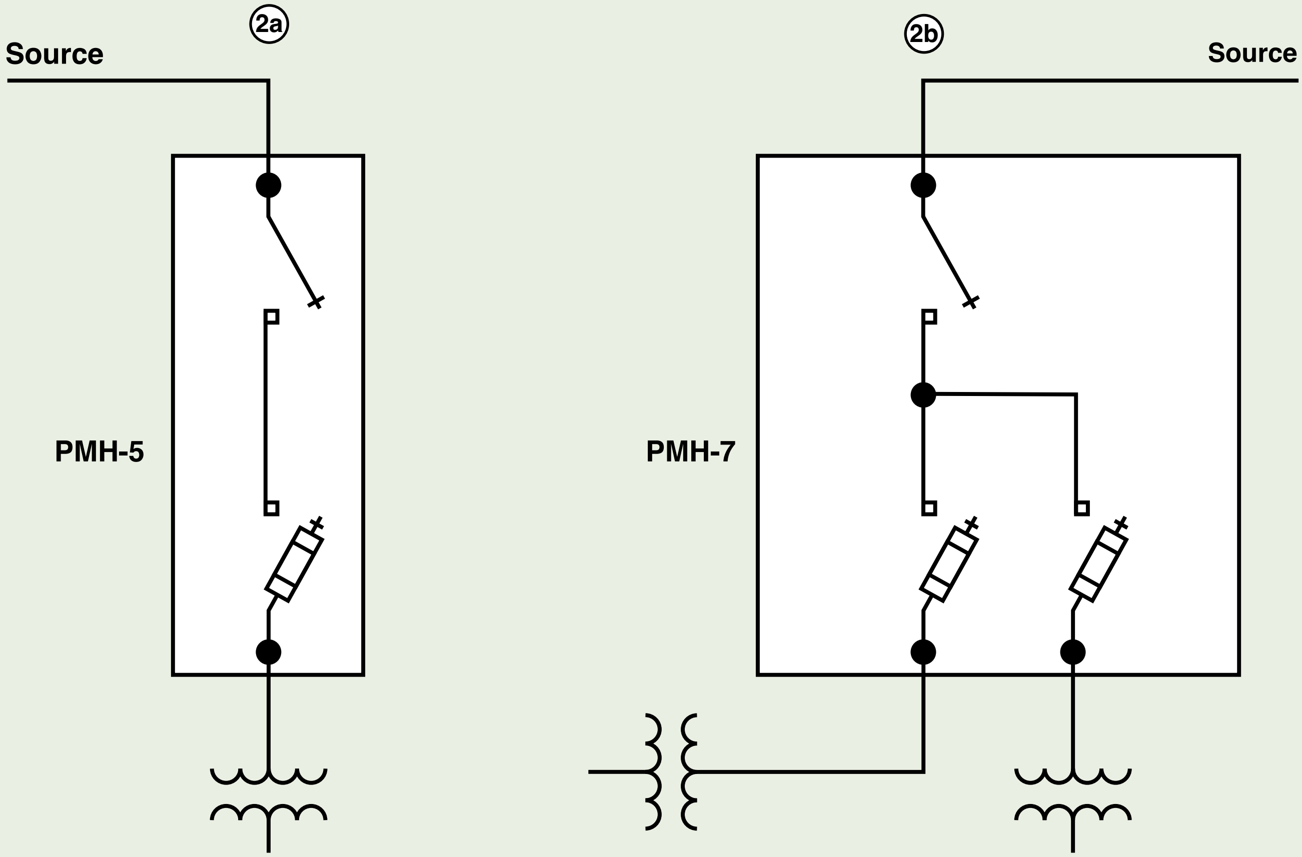


FIGURE 3. A Model PMH-9 is used to provide primary-selective service from two utility sources.

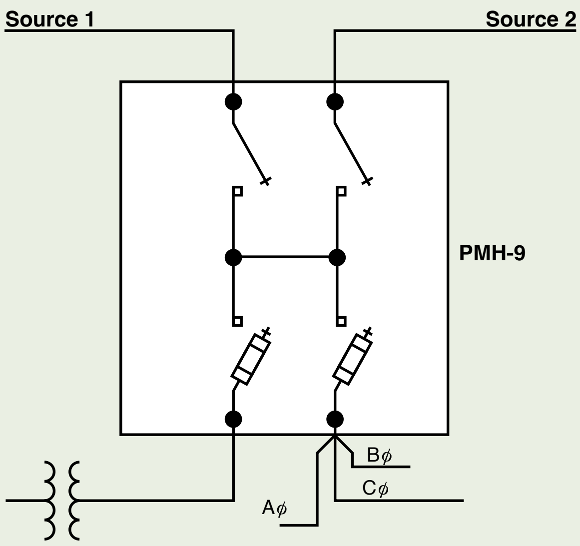
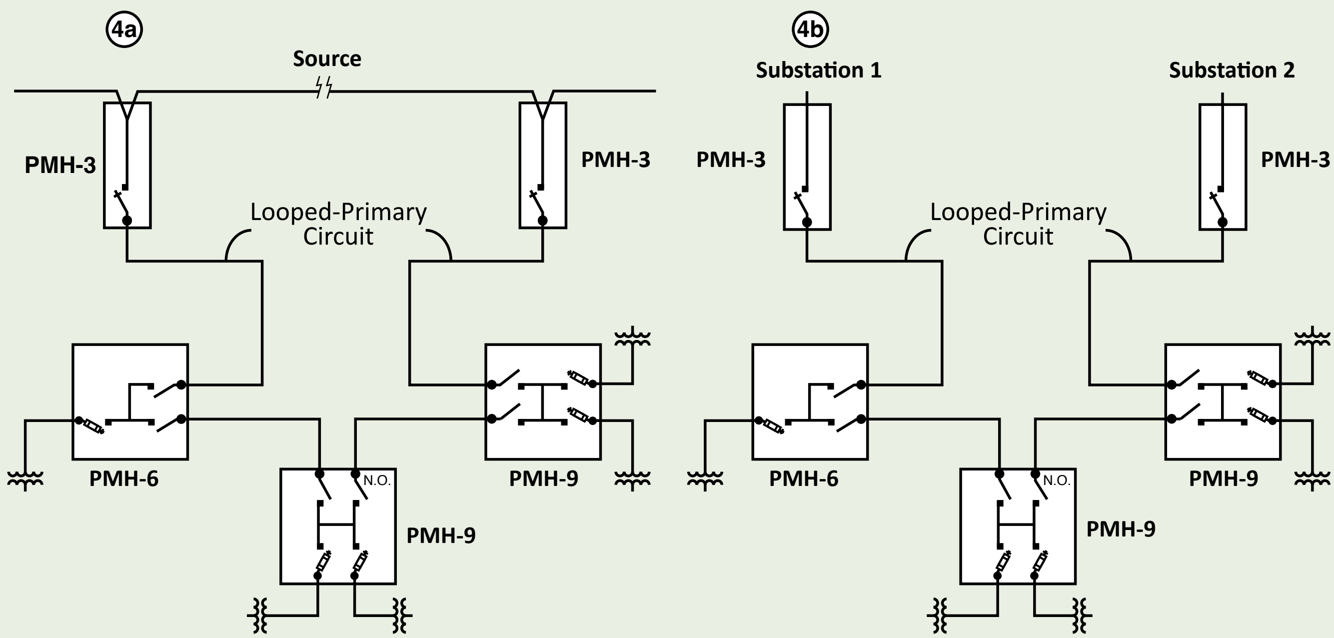


Figure 3 shows a Model PMH-9 being used to switch and protect one three-phase transformer and three single-phase loads. These loads can be selectively served from either of the two sources.

The looped-primary circuit is another way to provide a higher level of service continuity. This type of circuit does not reduce the frequency of interruptions compared to a radial circuit, but it does permit quick restoration of service to all loads following a fault on the looped-primary feeder cable. A looped-primary circuit is served from either one or two sources and has one normally open sectionalizing point near the center of the loop so interruptions caused by cable failures will be restricted to half of the loop. Additional sectionalizing points are provided within the loop to allow power to be supplied to each load from either end of the loop. In the event of a failure within the loop, switching can be performed to isolate the failed section and provide power to all of the loads in the loop.

Figure 4 illustrates two simple looped-primary circuits, each consisting of two Model PMH-9s and one Model PMH-6 used to switch and protect various loads. The looped-primary circuit noted as 4a in **Figure 4** is served by a single source, and the looped-primary circuit noted as 4b is served by two different utility substations. In both circuits, one of the interrupter switches in the middle of the loop is open under normal conditions, so the loads connected to either section of the cable are served from opposite ends of the loop. Should a fault occur on a section of the looped-primary feeder cable, the upstream protective device on the source serving that portion of the loop will operate to clear the fault. Selective manual switching operations can then be performed to isolate the faulted section of cable and restore power to all loads.

FIGURE 4. Two looped-primary systems using PMH models in 600-ampere loops.

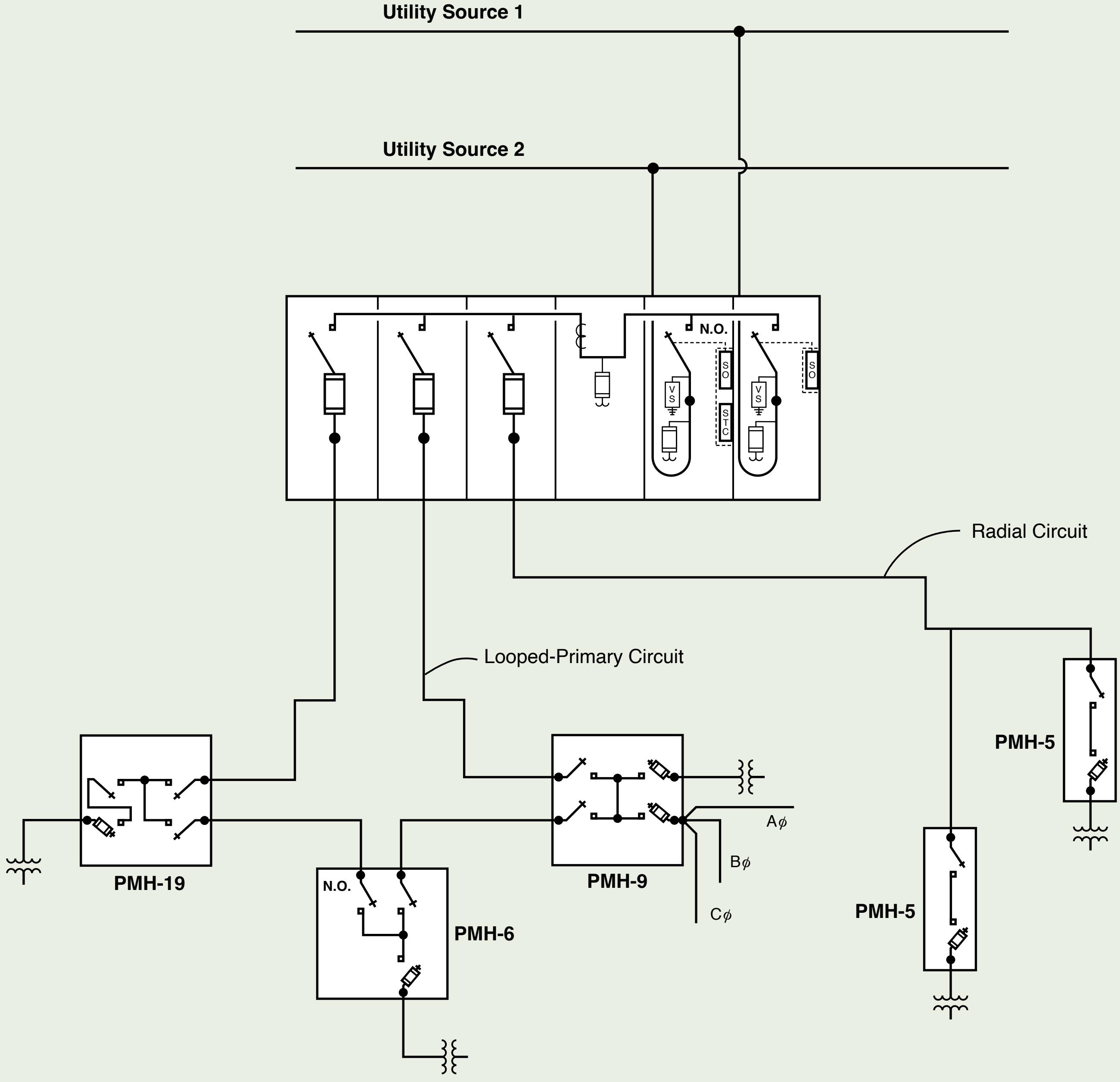


In serving campus-type industrial, commercial, and institutional installations (such as universities, shopping centers, and industrial parks), pad-mounted gear can be used in conjunction with metal-enclosed switchgear to provide a high degree of service continuity. In **Figure 5 on page 10**, metal-enclosed switchgear is being applied as an automated primary-selective service-entrance switching center. Here, the common-bus primary-selective system is used, so all loads on the system are supplied by one utility source with an alternate source available if the preferred source fails. In the event preferred-source voltage is lost, automatic switching operations will occur to provide power to the loads from the alternate source. Distribution of power to some of the loads within the system is accomplished using pad-mounted gear on a looped-primary feeder circuit connected to two feeder bays of the metal-enclosed switchgear.

Serving dispersed loads with looped-primary circuits complements the service continuity provided by the primary-selective system and provides operating flexibility. See **Figure 6 on page 11**. Two other transformer loads are served by Model PMH-5s on a radial circuit from one feeder bay. Fusing of each transformer individually in this way enhances protection by allowing use of smaller fuse ampere ratings.

The basic circuit types described above can be combined into a complex system, as shown in **Figure 7 on page 12**. Even this complex system can be implemented with standard units of S&C Pad-Mounted Gear, illustrating the flexibility in system design afforded by the broad variety of models available.

FIGURE 5. A simple distribution system using pad-mounted gear for sectionalizing within a loop and on two radial circuits, with metal-enclosed switchgear applied as a service-entrance switching center and for switching and protecting the ends of the looped-primary circuit. If the pad-mounted gear belongs to a non-utility user, key interlocks are supplied to comply with the National Electrical Code. Should a fault occur on the load side of such gear, switching must be performed to de-energize the fuses before access can be gained to the fuses. This means both loads on a Model PMH-9 must be de-energized when a fault occurs on either one. If this is unacceptable, Model PMH-6s may be used, but switches in the loop must still be opened before gaining access to the fuses. Model PMH-19s which incorporate a tap switch in series with the fuses, allow access to the fuses without opening the loop.



The widely dispersed segmented blocks of load are served by a major loop and a number of subloops. The PMH models illustrated in the major loop are all served by a single looped-primary circuit connected to two utility sources. Should a fault occur on the main looped-primary cable, manual switching operations can be performed to restore service to the loads, as previously described on **page 5** for a simple loop system.

As shown in illustration 7a in **Figure 7 on page 12**, both ends of the multiple single-phase subloops serving the small loads of a residential area are connected to a Model PMH-9. In a similar manner, the Model PMH-9 shown in illustration 7b serves both ends of a three-phase subloop serving several three-phase loads. Configuration 7c diagrams a three-phase subloop consisting of Model PMH-9 units connected to a Model PMH-6 on one side of the main looped-primary circuit and to a Model PMH-9 on the other side. The Model PMH-9 also serves an isolated three-phase load.

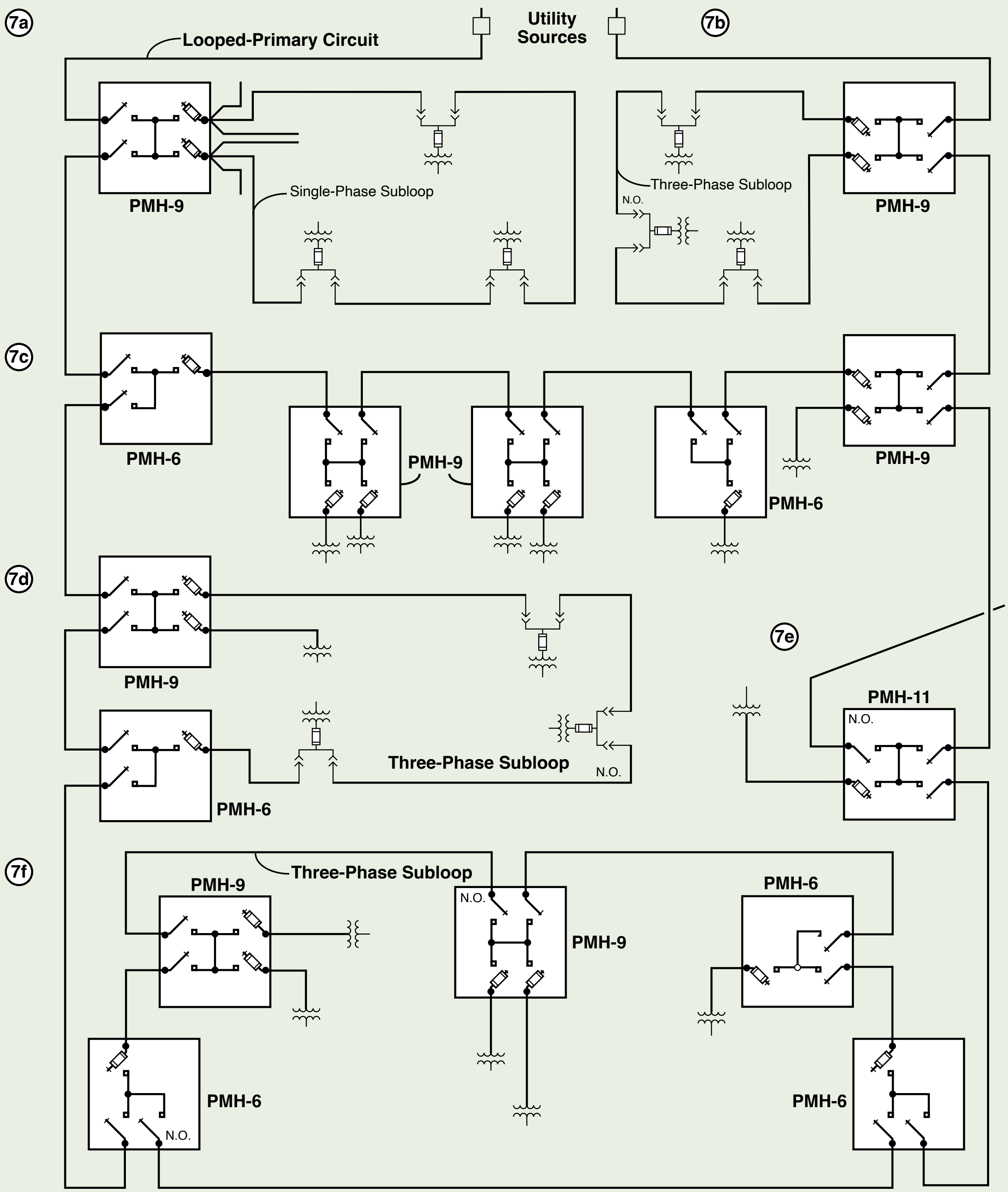
By connecting the subloop across the main loop in this way, the loads on the subloop may be served from either utility source as circumstances dictate. Illustration 7d is similar to 7b, except the ends of the subloop are connected to different PMH units instead of the same one. This situation may occur when the subloops cover a very large area, making the cable runs necessary to return the subloop to the original pad-mounted gear excessively long.

The Model PMH-11 shown in illustration 7e serves one isolated three-phase load and supplies a tie to another system. In illustration 7f, a three-phase subloop consisting of two Model PMH-9s and one Model PMH-6 is diagrammed. This last subloop serves a medium-sized commercial park where three-phase power requiring three-phase switching is delivered to several large loads.

FIGURE 6. This large suburban shopping mall is served by seven units of pad-mounted gear in two looped-primary circuits. Two lineups of metal-enclosed switchgear are applied at primary-selective service-entrance switching centers to switch the ends of the loops.

FIGURE 7. To serve many loads of different types dispersed over a wide area, simple circuit arrangements are often combined into a complex distribution system. Illustrated here are different ways to use looped-primary systems to serve various types of load.

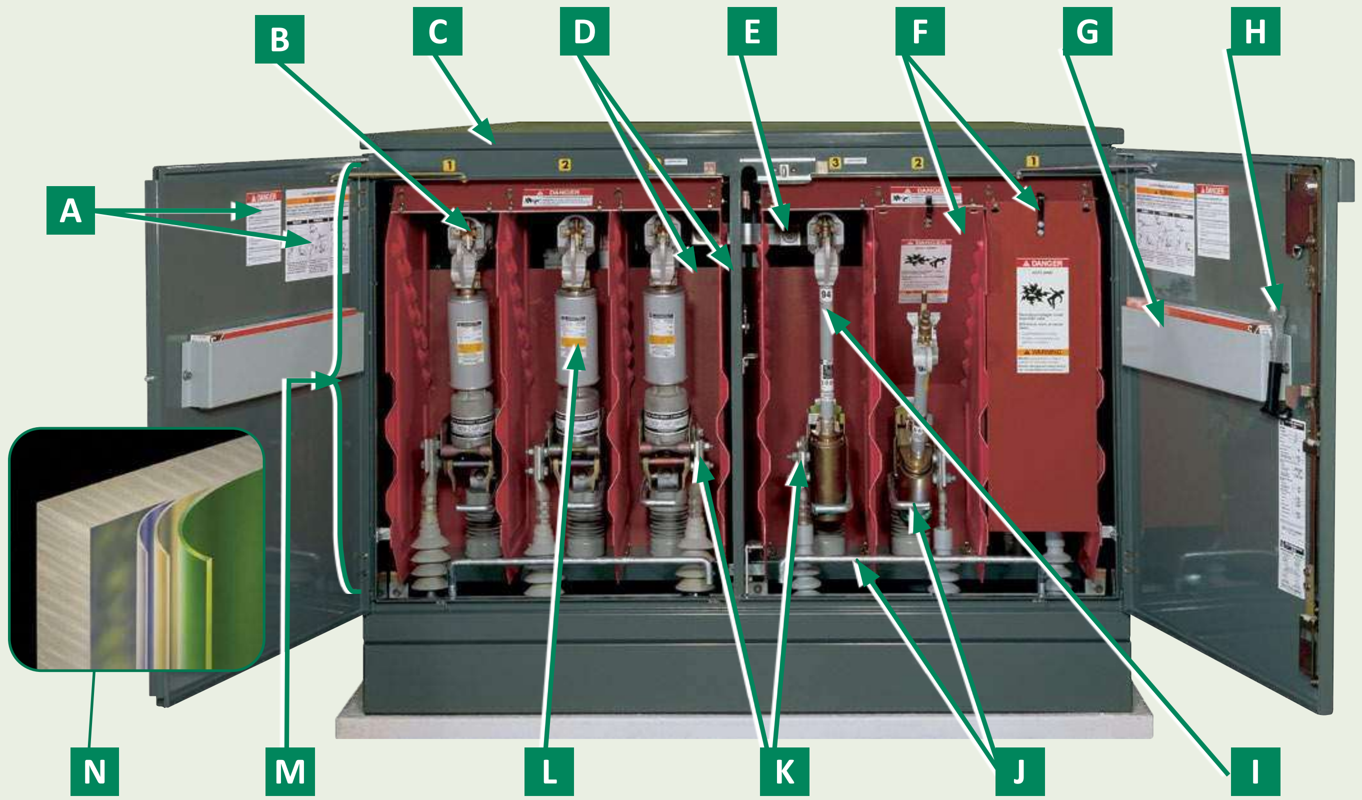
See descriptions of the looped circuits in the Appendix at the end of this document. Figure 7 notes



S&C Pad-Mounted Gear incorporates many provisions to minimize hazards to qualified persons and to the general public. The free-standing, self-supporting enclosure is constructed of heavy (11-gauge) steel sheet metal. All structural joints are welded; there are no externally bolted side sheets or rear sheets to invite removal. See **Figure 8** and **Figure 9 on page 15**

Access to medium voltage is controlled by the S&C Penta-Latch® Mechanism, which latches automatically when the door is closed and can be unlatched only with a pentahead socket wrench or tool. The latching mechanism is fully coordinated with the provision for padlocking; a padlock can be installed only after the door is securely closed and completely latched, and the mechanism can be unlatched only after the padlock has been removed.

FIGURE 8. Fuse-side view of a Model PMH-9 with SML-20 Power Fuses in the right-hand compartment and Fault Fiter® Electronic Power Fuses in the left-hand compartment. (This nonstandard combination of fuses is shown for comparison only.)



Construction (continued)

A Cautionary signs are unmistakably bold and clear.

B S&C Uni-Rupter® Interrupter.

C Insulated roof: A "no-drip" compound on the underside of the roof guards against formation of condensation that could drip onto the energized parts.

D Segregated circuits: Full-length steel barriers separate side-by-side compartments; fiberglass-reinforced polyester barriers separate front compartments from rear compartments and isolate the tie bus.

E Main bus—600 amperes continuous.

F Dual-purpose front barriers of GPO-3-grade fiberglass-reinforced polyester for all fuses and switches guard against inadvertent contact with live parts when in the normal vertical position. Inserted into the open gap of a fuse or switch, barriers provide isolation from bus and upper contacts.

G Storage racks on each fuse compartment door hold up to six SM-4® Refill Units or three SMU-20® Fuse Units per rack lets you restore service quickly.

H Grappler™ Handling Tool: The S&C fuse-handling fitting is provided with each model equipped with fuses.

I SML-20 Power Fuse with Uni-Rupter Interrupter.

J Ground studs for fuse terminals, switch terminals, and the ground pad in each compartment.

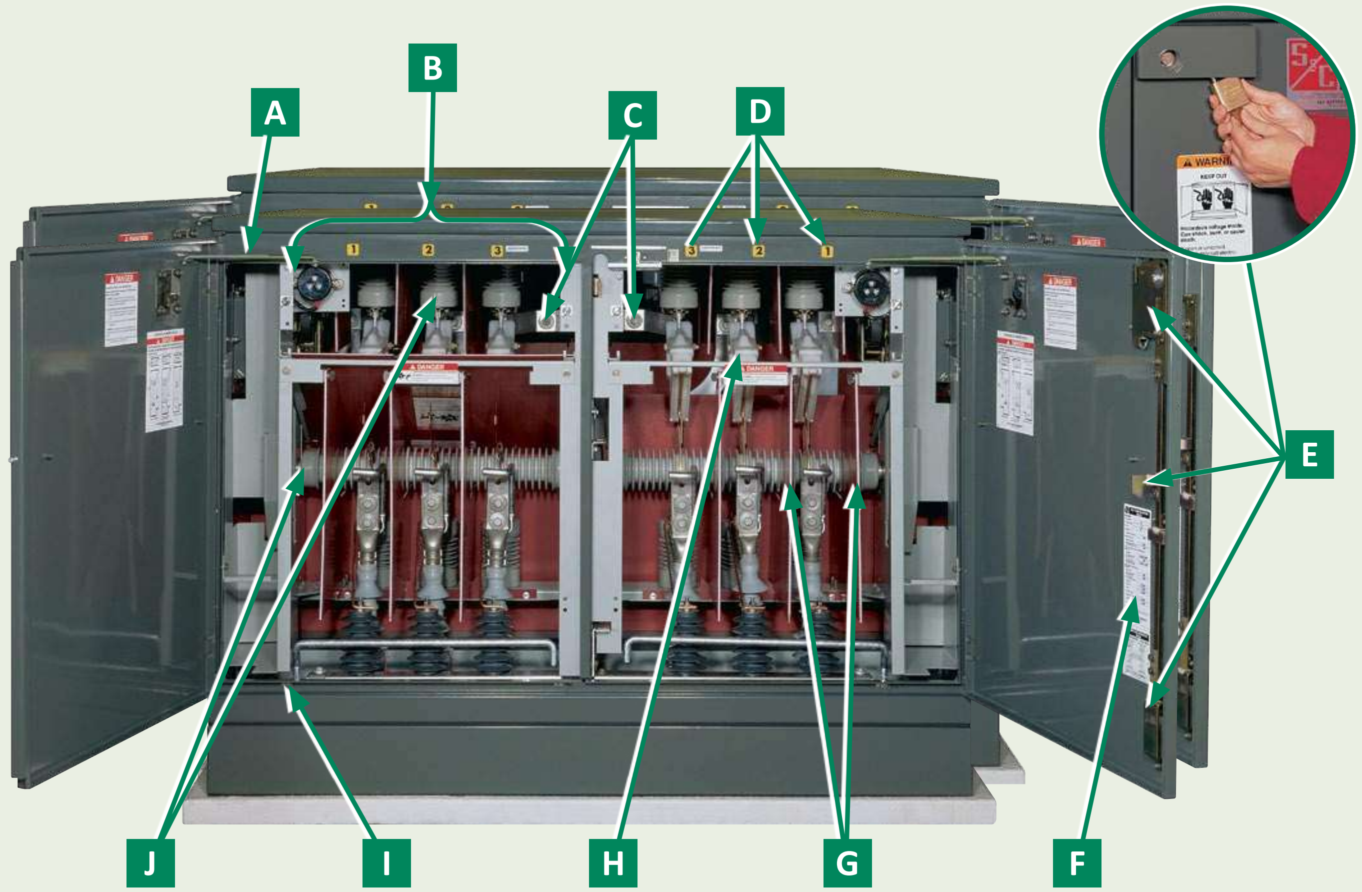
K Terminals accept a wide variety of field-assembled cable-terminating devices.

L Fault Fiter® Electronic Power Fuse with Uni-Rupter Interrupter.

M Corrosion-resistant non-ferrous door hinges and hinge pins.

N S&C's Ultradur® II Outdoor Finish provides a tough, multistage, baked-on finish with exceptional performance proved by a rigorous battery of industry tests.

FIGURE 9. Switch-side view of a Model PMH-9.



Construction (continued)

A Door holders store above the door openings, in full view with the doors open, behind the doors when closed.

B Viewing window for visible verification of the switch position is easily removed for phasing.

C Aluminum bus connections are wire-brushed and protected by an oxide-inhibiting abrasive compound and are bolted at a uniform torque of 50 ft-lb; two Belleville washers per bolt maintain contact pressure.

D Compartment-identification and phase-identification labels.

E Penta-Latch® Mechanism provides vandal-resistant three-point door latching for S&C Pad-Mounted Gear. Closing the door releases the charged Penta-Latch Mechanism, automatically latching the door and securing the pentahead actuator—only after the actuator is secured can a padlock be installed. Protective hood shields padlock shackle.

F Circuit diagram provides instant view of circuit configuration and takes the mystery out of switching operations. The label also gives complete switch and fuse ratings.

G Interphase and end barriers for all switches and fuses of fiberglass-reinforced polyester for superior arc and track resistance-provide phase segregation, help achieve BIL ratings and aid in fuse handling.

H S&C Mini-Rupter® Switch is furnished with operating handle for easy operation. See **Figure 11 on page 21**. The handle folds for storage behind the switch-operating-hub cover.

I Ground pads, on the inside at the bottom door stile in each compartment, accommodate connectors for attachment of cable concentric-neutral ground leads and ground studs.

J Cypoxy™ Insulators, S&C's cycloaliphatic epoxy resin system, insulates all live parts from ground.