EASTERN WASHINGTON UNIVERSITY

Campus Infrastructure Renewal

AUGUST 1, 2014

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CAMPUS INFRASTURCUTUR RENEWAL

EASTERN WASHINGTON UNIVERSITY
CHENEY, WASHINGTON
August 1, 2014

Eastern Washington University commissioned this report to further its efforts to upgrade the Cheney campus infrastructure in support of its current capital master plan, to decrease maintenance costs and to increase operating efficiencies. The report is the result of the collective efforts of the Construction & Planning group of EWU's Division of Business & Finance, the Faculties Maintenance group and the various member of the Design Team listed herein.

National talent,

local focus

The report identifies a number of potential projects and suggests the benefits to be derived from implementing each project.

The report contains conceptual costs intended to help EWU prepare budget requests for the projects it wishes to pursue.

The Design Team wishes to take this opportunity to express its appreciation for the opportunity to assist EWU in its efforts to enhance educational opportunities in the region and extends to Eastern its best wishes for accomplishing its goals.

Contents

EXECUTIVE SUMMARY 2

MASTER PLAN PROJECT COSTS 3

MAINTENANCE EFFICIENCES PROJECT COSTS 4

REPORT APPROACH 6

SEWER SYSTEM PROJECTS 7

STORM SYSTEM PROJECTS 10

PEDESTRIAN SAFETY PROJECTS 16

EMERGENCY VEHICLE PROJECTS 27

STEAM PLANT PROJECTS 33

STEAM DISTRIBUTION PROJECTS 37

CHILLED PLANT PROJECTS 41

CHILLED WATER DISTRIBUTION PROJECTS 45

SNOW MELT PROJECTS 46

ENERGY MANAGEMENT PROJECTS 48

ELECTRICAL & COMMUNICATIONS PROJECTS 50

DIAGRAMS 54

APPENDICIES 55

EXECUTIVE SUMMARY

Eastern Washington University has undertaken this study as the first step to insure that campus infrastructure is able to support the long term growth goals of the University as reflected in the recently updated capital master plan. The report evaluates and makes recommendations for the following systems:

Central Campus Steam Plant	Campus Steam Distribution System
Central Camps Chiller Plant	Campus Chilled Water Distribution System
Campus Energy Management & Control System (EMCS) Network	
Snowmelt System	Potable water
Sanitary sewer	Storm sewer
Irrigation	Medium-voltage electrical
Outside plant communications	Landscaping
Roads, walkways and site lighting	

The recommendations support the sequential implementation of the Comprehensive Campus Master Plan dated September 27, 2013. Schematic-level costs are presented for each recommendation in 2014 dollars. The Master Plan recognizes the significant capital expenditures required to facilitate the University's growth. This study augments the necessary modifications and associated costs required to support that growth.

The suggested infrastructure projects have been grouped in two categories: Those directly affecting the University's capital master plan and those projects which will improve operational efficiencies and maintenance procedures.

MASTER PLAN PROJECT COSTS

CW-1	Sewer System #1	$ 105,000
CW-2	Sewer System #2	$ 100,000
CW-3	Sewer System #3	$ 170,000
CW-4	Sewer System #4	$ 500,000
LI-1	Irrigation Master Control System	$ 175,000
LI-2	Storm System Wastewater Reuse #1	$ 373,000
LI-3	Storm System Wastewater Reuse #2	$ 742,000
LI-4	Storm System Wastewater Reuse #3	$ 715,000
LI-5	Streeter Hall Irrigation Replacement	$ 20,000
LS-1	Pedestrian Safety Improvements: Washington St.	$ 995,000
LS-2	Pedestrian Safety Improvements: ADA	$ 373,000
LS-3	Pedestrian Safety Improvements: Pavers	$ 550,000
SP-1	Repair/Replace Boiler #3	$ 3,500,000
SP-3	Upgrade Boiler Feedwater Pumps	$ 200,000
CP-1	Add Chiller Capacity	$ 3,600,000
CP-2	Upgrade Campus Chilled Water Pumps	$ 200,000
CD-1	Replace West-side Chilled Water Piping	$ 1,000,000
SN-1	Expansion of Snow Melting System Ph 1	$ 2,000,000
SN-2	Expansion of Snow Melting System Ph 2	$ 2,500,000
SN-3	Expansion of Snow Melting System Ph 3	$ 4,000,000
SN-4	Expansion of Snow Melting System Ph 4	$ 2,500,000
SN-5	Expansion of Snow Melting System Ph 5	$ 1,800,000
EL-3	Electrical Switch Replacement	$ 1,800,000
EL-4	Electrical Distribution System Expansion	$ 1,800,000
EL-5	Site Lighting Improvements, Phase 2	$ 3,500,000

MAINTENANCE EFFICIENCES PROJECT COSTS

CR-1	Emergency Vehicle Access #1	$ 60,000
CR-2	Emergency Vehicle Access #2	$ 22,000
CR-3	Emergency Vehicle Access #3	$ 31,000
CR-4	Emergency Vehicle Access #4	$ 40,000
CR-5	Emergency Vehicle Access #5	$ 82,000
CR-6	Emergency Vehicle Access #6	$ 46,000
CR-7	Emergency Vehicle Access #7	$ 240,000
CR-8	Emergency Vehicle Access #8	$ 20,000
CR-9	Emergency Vehicle Access #9	$ 60,000
CR-10	Emergency Vehicle Access #10	$ 30,000
CR-11	Emergency Vehicle Access #11	$ 12,000
SP-2	Boiler Feedwater Stack Economizers	$ 350,000
SP-4	Repair Rozell Heating Plant Boiler Stack	Unknown*
SP-5	Upgrade Natural Gas Service	Unknown**
SD-1	Replace Utility Tunnel Condensate Piping	$ 1,225,000
SD-2	Replace Utility Tunnel Condensate Pumps	$ 200,000
SD-3	Label Utility Tunnel Piping and Valves	$ 150,000
SD-4	Upgrade Piping in Plant Utilities Building	$ 125,000
CP-3	Install VFDs on Chiller Compressors and Cooling Towers	$ 1,250,000
CP-4	Install (2) New Energy Efficient Cooling Towers	$ 450,000
EM-1	Migrate BAS Network to BACnet Network	$ 3,350,000
EL-1	Medium-voltage Electrician	$100,000/year
EL-2	Electrical System Modeling	$ 56,000
EL-6	Optical Fiber Network	$ 2,200,000
Total cost of proposed capital projects:		$43,217,000

* Requires special evaluation of existing conditions to determine scope of work.

** Requires negotiations with service provider to determine feasibility.

The above estimates include the direct costs of materials and labor plus contractor overhead and profit. The estimates do not include escalation, Washington State sales tax, design fees, administrative fees and other “soft” costs.

REPORT APPROACH

This report is the combined efforts of the following design organizations:

Meulink Stauffenberg, Inc. – Mechanical Engineers

David Evans & Associates – Civil Engineers

Michael Terrell - Landscape Architecture, PLLC

NAC|Engineering – Electrical & Communications Engineers.

Also contributing to this report were representatives of the various organizations within the EWU facilities umbrella responsible for operating and maintaining the systems evaluated herein. Their understanding and insight provided a unique perspective regarding the condition and reliability of the existing infrastructure systems.

Design organizations met with respective EWU representatives to tour the campus, review existing conditions, discuss operational problems and brainstorm alternatives. The recommendations in this report are primarily the result of observations by the design organizations and operational information provided by EWU personnel.

SEWER SYSTEM PROJECTS

Overview

Project Description: Construct approximately 3,600 feet of new sewer line throughout campus in order to consolidate and reduce the number of discharge points into the City of Cheney's sanitary sewer system. At each discharge point, construct new manholes equipped with electronic flow and concentrate monitoring capabilities that would report back to central facilities. Replace approximately 400 feet of aging sewer line south of Showalter Hall.

Project Justification: Minimize the number of connection points to the City of Cheney sewer system and allow for monitoring capabilities of the system discharge in accordance with the campus General Sewer Plan.

Project Sequence: The sewer projects have been broken out into four phases based on the following descriptions. The sequence in which each project is implemented will be based on available funding.

CW-1 Sewer System - Project #1

Project Description: Replace existing manholes CSS-7, CSS-8, CSS-27,and CSS-45 with new manholes equipped with electronic monitoring to measure the flow and concentration of the waste stream.

The new manhole replacing CSS-7 is intended to monitor the flow from Rozell, Streeter, Morrison, and Surbeck with the replacement manhole for CSS-8 measuring the mixing impact resulting from the addition of snyamncut and Dryden Halls.

Replacement of manhole CSS-27 will allow for monitoring discharge from Patterson Hall, Hargreaves Hall, Isle Hall, and Science Building prior to discharging to the City system.

Replacement of manhole CSS-45 will allow for monitoring discharge from the Anna Maria and Townhouse Apartments prior to discharging to the City system.

Project Justification: Provides the ability to monitor University wastewater discharge flow and concentration prior to discharging to the City of Cheney sanitary sewer system.

Rational for selecting the recommended project: Allows for electronic monitoring of the University's wastewater system in accordance with the University's General Sewer Plan.
Cost: $105,000

CW-2 Sewer System - Project #2

Project Description: Construct approximately 275 linear feet of new sewer line from manhole ESS-56 to ESS-59. This will consolidate the sewer flow from the central part of campus with the flow from Showalter Hall and eliminate one discharge point. Install a new manhole at D Street equipped with electronic monitoring to measure the flow and concentration of the waste stream prior to discharging to the City system.
Replace approximately 400 linear feet of old sewer line through the use of pipe bursting running from manhole ESS-54 to ESS-56.
Project justification: Provides the ability to monitor University wastewater discharge flow and concentration prior to discharging to the City of Cheney sanitary sewer system.
Replaces aging sanitary sewer pipe.
Rational for selecting the recommended project: Allows for electronic monitoring of the University's wastewater system in accordance with the University's General Sewer Plan.
Cost: $100,000

CW-3 Sewer System - Project #3

Project Description: Construct approximately 675 linear feet of new sewer line from manhole ESS-64 to CSS-37 at the intersection of H Street and 7th Street and cut the connection between manhole ESS-64 and CSS-42 eliminating one point of connection to the City system. Install a new manhole at G Street and 7th Street on the existing sanitary line and divert the flow to manhole CSS-37 by constructing approximately 340 linear feet of new sewer line in 7th Street. Extend a new sewer service from Holter House to the new manhole. This will eliminate a second point of connection to the City system.
Construct approximately 200 linear feet of new sewer line from manhole CSS-41 on Washington Street to the existing sewer line serving the Theater Building and redirect the flow to manhole ESS-64. This will eliminate a third point of connection to the City system.

Project Justification: Provides the ability to monitor University wastewater discharge flow and concentration prior to discharging to the City of Cheney sanitary sewer system.
Rational for selecting the recommended project: Allows for electronic monitoring of the University's wastewater system in accordance with the University's General Sewer Plan.
Cost: $170,000

CW-4 Sewer System - Project #4

Project Description: Construct approximately 1,475 linear feet of new sewer line from manhole CSS-25 at Washington Street to manhole CSS-16 at Elm Street, diverting all flow from Washington Street at CSS-25. Reconnect service from the PUB and the Science Building to the new sewer line. Install a new monitoring manhole at Elm Street to replace the existing CSS-16 manhole.
Extend the Erie interceptor from the manhole at Erie Street and Cedar Street to the new monitoring manhole at Elm Street and North 9th Street.
Project Justification: Provides the ability to monitor University wastewater discharge flow and concentration prior to discharging to the City of Cheney sanitary sewer system.
Expands sewer service capacity to the west side of Washington Street.
Rational for selecting the recommended project: Allows for electronic monitoring of the University's wastewater system in accordance with the University's General Sewer Plan.
Cost: $500,000

STORM SYSTEM PROJECTS

Overview

Project Description: Develop a waste water reclamation system and irrigation supply line routed through the existing tunnel system on campus to supplement the irrigation demand for campus. The project includes construction of 150,000 gallons of underground storage and pump system south of the JFK Library, refurbishing and re-use of the existing 100,000 gallons of underground storage tanks east of Showalter Hall together with installation of a new pump system, and installing a new pump system at the existing Patterson Hall underground storage tanks to redirect sump pump discharge from Monroe Hall and overflow discharge from the Patterson tanks down to the Showalter system. The project also includesconversion of the existing irrigation system from potable water to waste water reuse supplied by the existing sump pumps in building basements. Connecting existing irrigation mainline and control valves to new backbone waste water reuse supply mainlines located in utility tunnels. Removal of individual irrigation supply double checks and point of connections as project progresses. Consolidated irrigation double checks to be connected to backbone waste water irrigation mainline as secondary supply.

Project Justification: Reduce demand for potable water from the campus wells and reuse nuisance water currently pumped to the City of Cheney storm sewer system.

Project Sequence: Projects would be completed in multiple phases based on available funding and as waste water reuse storage, pumps and backbone mainline area brought on line. Phases include:

LI-1 Irrigation Master Control System

Project Description: Install master control system converting existing out dated standalone controllers into integrated control system. Replace existing controllers with new controllers and extending new control wires to existing irrigation control valves. Connect new controllers to central monitoring through Ethernet connections. Conversion in two phases.

Phase I: Central campus east of Washington Street

Phase II: Campus athletic facilities and adjacent areas west of Washington Street.

Project Justification: Upgrade of the irrigation control system will directly result in:

Greater control of irrigation scheduling. Connection of existing batter operated controllers to central control. Coordinated ability to integrate irrigation system with waste water reuse irrigation system storage and pumping. Reduced water use through more efficient irrigation.

An irrigation control system that is expandable and flexible enough to respond and adapt to new construction.

Implementation can occur at any time in the master plan implementation process. Implementation would need to occur in advance of or concurrently with implementation of the water reuse system phasing.

Cost: $175,000

LI-1	Irrigation Master Control System	
	Phase I: Central Campus East of Washington Street	$110,000
	Phase II: Campus athletic facilities and adjacent areas west of Washington Street	$65,000
	Total:	**$175,000**

LI-2 Storm System Wastewater Reuse #1

Project Description: Construct a second pump vault adjacent to the Patterson Hall storage system. Redirect the sump pumps from Monroe Hall to the new pump vault and connect the existing Patterson Hall storage tank overflow to the new pump vault.
Extend new force main within the tunnel system from the new pump vault to the north side of Showalter Hall to a new discharge manhole. Construct a new gravity line from the discharge manhole to the existing concrete storage tanks in the lawn southwest of Showalter Hall. Construct a new irrigation pump system and supply piping extending from the Showalter pump vault to the steam tunnel north of Showalter and connect to the new campus irrigation supply main to be constructed in the tunnel.
Construct an overflow line from the Showalter system to the existing City storm sewer in 5th Street.
Conversion of the existing irrigation system from potable water to waste water reuse supplied by the existing sump pumps in building basements. Connect existing irrigation mainline and control valves to new backbone waste water reuse supply mainlines located in utility tunnels. Remove individual irrigation supply double checks and point of connections as project progresses. Consolidated irrigation double checks to be connected to backbone waste water irrigation mainline as secondary supply.
Construction of system for main portion of campus east of Washington Street. This project could be divided into smaller phases as water reuse tanks and pumps are constructed at Showalter Hall (existing tank to be converted) and Patterson Hall tanks receive upgrades.
Project Justification: Reduce demand for potable water from the campus wells and reuse nuisance water currently pumped to the City of Cheney storm sewer system. Reduces discharge of stormwater to the City storm system. Reduction of back-flow prevention devices will result in reduced maintenance costs for maintenance and testing of multiple backflow prevention devices.
Project Sequence: Complete in conjunction with LI-1 and in advance of LI-3
Cost:

LI-2	Storm System Waste Water Reuse #1	
	Showalter Tanks / Patterson Upgrade	$315,000

	Associated connections to the existing irrigation system.	$58,000
	Total:	**$373,000**

LI-3 Storm System Wastewater Reuse #2

Project Description: Construct (2) new 75,000 gallon underground storage tanks in the lawn south of John F. Kennedy Library. Intercept the existing storm line running east of the Computing and Engineering Building and redirect the flow to the new storage tanks. Construct an overflow line from the new tanks back to the existing storm line. Construct a new irrigation pump system and supply piping extending from the new tanks to the steam tunnel immediately to the east of the lawn area under the pedestrian mall and connect to the new campus irrigation supply main to be constructed in the tunnel. Conversion of the existing irrigation system from potable water to waste water reuse supplied by the existing sump pumps in building basements. Connect existing irrigation mainline and control valves to new backbone waste water reuse supply mainlines located in utility tunnels. Remove individual irrigation supply double checks and point of connections as project progresses. Consolidated irrigation double checks to be connected to backbone waste water irrigation mainline as secondary supply.

Project Justification: Reduce demand for potable water from the campus wells and reuses nuisance water currently pumped to the City of Cheney storm sewer system. Reduces discharge of stormwater to the City storm system. Reduction of back-flow prevention devices will result in reduced maintenance costs for maintenance and testing of multiple backflow prevention devices.

Project Sequence: Complete after completion of LI-1 and LI-2.

Cost :

LI-3	Storm System Wastewater Reuse #2	
	JFK Tanks	$655,000
	Associated connections to the existing irrigation system.	$87,000
	Total:	**$742,000**

LI-4 Storm System Wastewater Reuse #3

Project Description: Construct (3) new 75,000 gallon underground storage tanks in the south end of the athletic fields west of Washington Street. Intercept the existing storm line in Washington and redirect the flow to the new storage tanks.

Construct a new irrigation pump system and supply piping extending from the new tanks to the irrigation supply main serving the athletic fields.

Construct an overflow line from the new tanks back to the existing storm line in Washington.

Conversion of the existing irrigation system from potable water to waste water reuse supplied by the existing sump pumps in building basements. Connect existing irrigation mainline and control valves to new backbone waste water reuse supply mainlines located in utility tunnels. Remove individual irrigation supply double checks and point of connections as project progresses. Consolidated irrigation double checks to be connected to backbone waste water irrigation mainline as secondary supply.

Project Justification: Reduce demand for potable water from the campus wells and reuses nuisance water currently pumped to the City of Cheney storm sewer system. Reduces discharge of stormwater to the City storm system. Reduction of back-flow prevention devices will result in reduced maintenance costs for maintenance and testing of multiple backflow prevention devices.

Project Sequence: Completion to be concurrent with LI-1.

Cost :

LI-4	Storm System Wastewater Reuse #3	
	New Tanks at Athletic Fields	$565,000
	Associated connections to the existing irrigation system.	$150,000
	Total:	**$715,000**

LI-5 Streeter Hall Irrigation Replacement

Project Description: Construct (3) new 75,000 gallon underground storage tanks in the south end of the athletic fields west of Washington Street. Intercept the existing storm line in Washington and redirect the flow to the new storage tanks.

Construct a new irrigation pump system and supply piping extending from the new tanks to the irrigation supply main serving the athletic fields.

Construct an overflow line from the new tanks back to the existing storm line in Washington.

Conversion of the existing irrigation system from potable water to waste water reuse supplied by the existing sump pumps in building basements. Connect existing irrigation mainline and control valves to new backbone waste water reuse supply mainlines located in utility tunnels. Remove individual irrigation supply double checks and point of connections as project progresses. Consolidated irrigation double checks to be connected to backbone waste water irrigation mainline as secondary supply.

Project Justification: Reduce demand for potable water from the campus wells and reuses nuisance water currently pumped to the City of Cheney storm sewer system. Reduces discharge of stormwater to the City storm system. Reduction of back-flow prevention devices will result in reduced maintenance costs for maintenance and testing of multiple backflow prevention devices.

Project Sequence: Completion to be concurrent with LI-1.

Cost:

LI-5	Streeter Hall Irrigation Replacement	
	Total:	**$20,000**

PEDESTRIAN SAFETY PROJECTS

LS-1 Pedestrian Safety Improvements: Washington Street

Project Description: Construct Washington Street as a parkway with narrowed pedestrian crossings with bump-outs. Plant street trees between the curb and walk, behind the walk and at pedestrian bump-outs where possible to narrow effective width of street lanes and reduce traffic speeds. Construct paver or stamped concrete pedestrian crossings to define pedestrian crossings and provide a physical and visual link from the campus facilities west of Washington to the core of campus east of Washington Street. Collect stormwater in roadside rain gardens for treatment prior to collection in storm drains. This will facilitate pre-treatment of stormwater prior to conveyance to stormwater and wastewater re-use storage. Project to be completed in multiple phases as reconstruction of Washington and street intersections occurs.

Project Justification: Pedestrian safety improvements were identified in the previous Master Plan and Campus ADA evaluation. The construction of expanded campus educational, recreational and athletic facilities in the western portion of campus will require improved pedestrian linkages that provide safe crossing of Washington Street. *"5. Reinforce and improve the overall cohesion of campus, specifically linkages across Washington Street, whenever possible." (Planning Principles, Comprehensive Campus Master Plan Executive Summary, Eastern Washington University, September 27, 2013)* Implementation to occur in phases.

Project Sequence: Project can be completed in phases in conjunction with construction of infrastructure improvements and facilities on the west side of Washington Street.

Cost:

LS-1	Pedestrian Safety Improvements: Washington Street	
	Total:	**$995,000**

LS-2 Pedestrian Safety Improvements: ADA

Project Description: Replace existing ADA crossings that are not compliant with current ADA requirements. Coordinate with CR Emergency Vehicle Access projects as necessary.

Crossing #	Issue	Improvement	Estimate	Priority
LS2.1 Washington @ Surbeck	**Ramps:** Ramps on both sides however west side is a driveway ramp not a pedestrian ramp. West ramp does not align well with flat part of existing vehicle drive. **Tactile Warning:** No tactile warning strips are present. **Striping:** The crossing is marked/striped, in good condition. **Signage:** The crossing has signage with solar flashing lights on both sides of the street. **Other:** West sign partially obstructed by tree branches.	**Ramps:** Install new pedestrian curb ramp separate from curb cut for vehicle drive on west side of Washington. Replace existing ramp on east side of street with new ramp that has a tactile warning strip. Align new ramps. **Tactile Warning:** See note above. **Striping:** Good, no recommendations. **Signage:** Good, no recommendations. **Other:** Tree trim branches to provide clear sightlines to pedestrian crossing sign.	$17,000.00	2
LS2.2 Washington & Cedar @ North Bowl	**Ramps:** Four ramps are present. No ramp for pedestrian crossing Washington from the south side of Cedar **Tactile Warning:** Missing on tactile warning strips on 3 of the four existing ramps. **Striping:** None of the crossings at this intersection are striped. **Signage:** No signs or lights are present at this crossing although it is a busy intersection. **Other:** Very close proximity to crossing #1. Uneven asphalt in places.	**Ramps:** Install new pedestrian curb ramp separate from curb cut for vehicle drive and align with ramp across Washington. Replace existing 3 ramps that don't have tactile warning strip with new ramps that do. **Tactile Warning:** See note above. **Striping:** Add 3 striped crosswalks. **Signage:** Add two solar flashing lights with signs at crossing. Add one, non-lit pedestrian crossing sign on Cedar. **Other:** Patch and/or replace asphalt to provide smooth crossing and transition to ramps. Repair damaged curb.	$20,500.00	1
LS2.3 Washington and Elm	**Ramps**: Present **Tactile Warning:** Not present on ramps along the east side of Washington Street. **Striping:** Only south	**Ramps:** Replace two ramps that do not have tactile warning strips with new ramps that do. **Tactile Warning:**	$13,500.00	1

	east to south west is striped. Missing striped crossing in three other areas. **Signage:** Flashing yellow lights and signs present only at south portion of intersection, both sides of street. **Other:** Ramps and crossing from south west to south east not lined up well (not straight). Ramps are not dual direction.	See note above. **Striping:** Add crosswalk striping on east side of Washington, west side of Washington and across Washington on the north portion of the intersection. **Signage:** Add additional, non-lit, pedestrian crossing signs at Elm. **Other:** Consider dual direction curb ramps when replacing or installing new ramps.		
LS2.4 Washington	**Ramps:** Present. No crossing on north corner across Washington, only on south. **Tactile Warning:** Not present on south west corner. **Striping:** Only across Washington on south portion of intersection. Missing across parking lot entry drive. **Signage:** Solar flashing lights and signs present across Washington. **Other:** Potential for pedestrian and vehicular conflict at entry drive. Potential for pedestrian bump outs here.	**Ramps:** Replace south west corner ramp with new ramp which includes tactile warning strip. **Tactile Warning:** See note above. **Striping:** Add striping along entry drive to parking lot. **Signage:** Good. **Other:** Consider pedestrian bump out into Washington Street.	$9,000.00	2
LS2.5 Washington	**Ramps:** Present on both sides of street. **Tactile Warning:** Only present on east side of street, not installed on west ramp. **Striping:** Crossing of Washington is striped. **Signage:** Flashing solar lights and signs installed for crossing. **Other:** Damage of pavers at base of ramp below crossing and stairs on the east side of the street. Potential for pedestrian bump outs here.	**Ramps**: Replace west ramp with new ramp which includes tactile warning strip. **Tactile Warning:** See note above. **Striping:** Good, no recommendation. **Signage:** Good, no recommendation. **Other:** Consider pedestrian bump out into Washington Street. Repair pavers at base of ramp east of crossing.	$9,000.00	2
LS2.6 Washington	**Ramps:** Present at all corners, some should be dual direction so they line up better with ramps across the street.	**Ramps:** Replace, and align or install dual direction ramps so that crossings align with	$10,500.00	1

	Tactile Warning: Missing at the north east corner curb ramp. **Striping:** Missing on south and west portions of the intersection. **Signage**: Yes there are flashing lights and signs on the south and north sides of the intersection on Washington. These are different than the other signs along Washington. No signage on 7th. **Other:** Long stretch of no crossings between #6 and #7. Potential for crossing at Art and Archives. Bus stop location could block views of crossing on 7th street. Relocation of the bus shelter would also open up views to campus sign. Potential for improved plantings around open areas on north east corner.	each other. Replace north east ramp with new ramp which includes tactile warning. **Tactile Warning:** See note above. **Striping:** Install striped crossing on south and west portions of the intersection. **Signage:** Replace signs and lights with new to match existing solar lights north on Washington. **Other:** Consider relocation of bus shelter and crossing at archives building.		
LS2.7 7th and I Street	**Ramps:** Missing ramps at median on east side of 7th one on the south west side of 7th and on the west side of 7th. Missing 5 ramps total **Tactile Warning:** Present on all existing ramps. **Striping:** No striping present at crossing. **Signage:** No ped crossing signs. **Other:** Consider adding one or two additional street lights on the east side of 7th.	**Ramps:** Install ramps on city side (east) of street, and on south west side, 5 total. **Tactile Warning:** Ensure warning strips are installed on new ramps. **Striping:** Paint crossings. **Signage:** Install three pedestrian crossing signs. **Other:** Add one additional street light on east side of 7th.	$17,500.00	5
LS2.8 7th and H Street at Robert Reid	**Ramps:** Missing one ramp on west side of 7th at parking lot driveway. **Tactile Warning:** Existing ramp on west side of 7th is missing tactile warning, all others have it. **Striping:** If a ramp is added at the south west side a third crossing would be needed. The two existing crossings have faded paint. **Signage:** One existing pedestrian crossing sign.	**Ramps:** Install one new ramp and replace one ramp which does not have tactile warning strip. **Tactile Warring:** See note above. **Striping:** Re-paint existing crossings and add new crossing paint on south west side of intersection. **Signage:** Add one additional	$7,000.00	5

	Other:	pedestrian crossing sign. **Other:**		
LS2.9 7th and G Street at Holter House	**Ramps:** Present in all necessary locations **Tactile Warning:** Present at all ramps. **Striping:** Missing striping at parking lot. **Signage:** Only one sign. **Other:** Some curb damage.	**Ramps:** Good, no recommendations. **Tactile Warning:** Good, no recommendations. **Striping:** Install new striped crossing at entry to parking lot. **Signage:** Add one additional pedestrian crossing sign. **Other:** Potential for improved plantings at P4 sign. Should consider pruning of tree at south east corner for better visibility.	$7,000.00	4
LS2.10 6th and G Street at P1	**Ramps:** Present all have tactile warning. **Tactile Warning:** Present at all ramps. **Striping:** None **Signage:** None **Other:**	**Ramps:** Good, no recommendations. **Tactile Warning:** Good, no recommendations. **Striping:** Add four cross walk stripes. Signage: Add four pedestrian crossing signs. **Other:**	$3,500.00	4
LS2.11 6th and F at Visitor Center	**Ramps:** Missing ramps at connections to paver areas on the west side of intersection. Pavers are ramped but no detectable warning or concrete ramps. **Tactile Warning:** Present at concrete ramps on east side of intersection. **Striping:** Good. **Signage:** Present Other:	**Ramps:** Install 2 ramps at paver area. **Tactile Warning:** New ramps to have tactile warning. **Striping:** Good **Signage:** Good **Other:** Potential for plantings at sign near bus stop.	$6,500.00	5
LS2.12 5th and F Street at Triangle	**Ramps:** Ramps are present. **Tactile Warning**: Present on east and west side of 5th at curve on the western portion of the triangle. The south and south eastern sides of the triangle do not have tactile warning **Striping:** One crossing striped. Only the crossing at the curve.	**Ramps:** Replace ramps that don't have tactile warning strips. **Tactile Warning:** Replace ramps that don't have tactile warning strips. **Striping:** Need striping on straight portions of 5th and F street from tringle. Also,	$70,000.00	3

	Signage: 2 Signs present, only at curve in both directions, no solar flashing lights are present here. **Other:** Some curb damage, concrete walk damaged in triangle.	striping across curve may need to be re-painted in near future. **Signage:** Need additional signage on straight portions of 5th and F street. **Other:** Consider crossing directly/straight across 5th street from the 5th Annex Apartments.		
LS2.13 5th and College at Showalter	**Ramps:** Ramps are present. **Tactile Warning:** All ramps have tactile warning except south east side. One tactile warning strip is damaged (north west ramp). **Striping:** Crossings are not striped, different colors mark the crossing, color transition may not be drastic enough for visually impaired individual. **Signage:** Two pedestrian crossing signs, no solar flashing lights. **Other:** Good sight lines.	**Ramps:** Replace south east ramp with new ramp which has tactile warning strip. **Tactile Warning:** See note above. **Striping:** Pavers to remain, consider more contrasting paver colors. **Signage:** Add one additional pedestrian crossing sign on College Street. Other:	$7,500.00	4
LS2.14 5th and D Street at Kingston Parking	**Ramps:** Ramps present. **Tactile Warning:** Ramp at south west corner missing tactile warning strip. **Striping:** Missing striping from north west to south west corners. **Signage:** Two pedestrian crossing signs, no solar flashing lights. **Other:** Some asphalt is uneven at ramps. Tree obstructing pedestrian crossing sign on north west corner.	**Ramps:** Replace south west ramp with new ramp that has tactile warning strip. **Tactile Warning:** See note above. **Striping:** Install one new striped crossing. **Signage:** Add one additional pedestrian crossing sign. **Other:** Tree trimming should be done so crossing sign can be seen better. Re-pave or patch asphalt for even crossing.	$5,000.00	4
LS2.15 5th and C Street at Kingston and Indian Ed.	**Ramps:** Present at all four corners. **Tactile Warning:** Present on all ramps. **Striping:** Present at all four crossings. All but one crossing is heavily	**Ramps:** Good, no recommendations. **Tactile Warning:** Good, no recommendations. **Striping:** Re-paint worn striping at	$3,000.00	4

	worn. **Signage:** Two pedestrian crossing signs. **Other:** Potential to combine light posts and existing signs to reduce sign/post litter. Potential for improved landscaping in front of sign at corner near Kingston Hall	one crossing. **Signage:** Add two additional pedestrian crossing signs. **Other:** Install ornamental plantings at sign. Combine signs and light posts to reduce number of posts in area.		
LS2.16 Across C Street from Kingston	**Ramps:** Present on both sides of C Street. **Tactile Warning:** Missing on south side of C Street. **Striping:** Present and in good condition. **Signage:** One pedestrian crossing sign. **Other:** Potential for improved plantings near bus shelter and existing evergreen tree.	**Ramps:** Replace ramp on south side of C Street with new ramp which has a tactile warning strip. **Tactile Warning:** See note above. **Striping:** Good, no recommendations. **Signage:** Add one additional pedestrian sign. **Other:** Add planting around bus shelter.	$3,500.00	5
LS2.17 Across C Street from Senior	**Ramps:** Present, ramp on north side of C Street is narrow and likely does not meet required width. **Tactile Warning:** Present. **Striping:** Good condition. **Signage:** No signage or flashing solar lights. **Other:**	**Ramps:** Replace ramp on north side of street with wider ramp. **Tactile Warning:** Good, no recommendations. **Striping:** Good, no recommendations. **Signage:** Add signage both directions, two signs. **Other:**	$5,500.00	5
LS2.18 C Street and 7th and P5	**Ramps:** Present, ramps along north side of street are narrow/small and may not be sufficient in size. **Tactile Warning:** South east corner ramp is missing tactile warning strip. **Striping:** Missing striping in two locations, along entry to parking lot and north side of C street. **Signage:** Two pedestrian crossing signs. **Other:**	Ramps: Tactile Warning: Striping: Signage: Other:	$6,000.00	4

LS2.19 C Street and Elm at Triangle	**Ramps:** Missing ramps in multiple locations. **Tactile Warning:** Missing on ramps that cross entry to P15. All other existing ramps have warning strips. **Striping:** Present, worn in some places and may need re-painting in the near future. **Signage:** Two pedestrian crossing signs. **Other:** No direct crossing of C Street, must go through triangle, consider direct crossing south/south east of triangle. Sever cracking of sidewalk west of triangle. Cracking/damaged asphalt. Damaged curbs. Uneven/damaged pavers. Opportunity for more planting around sign. Looks like some areas are very dry and plants are not receiving enough water.	**Ramps:** Install 3 new ramps, plus replace two existing ramps with new ramps that have tactile warning strips. **Tactile Warning:** See note above. **Striping:** Repaint stripes in next year or two. **Signage:** Add two solar flashing lights at this intersection. **Other:** Repair curb, pavers and asphalt. Irrigation adjustments necessary in island.	$69,000.00	3
LS2.20 Elm Street and 9th Street	**Ramps:** Present **Tactile Warning:** Present **Striping:** Existing striping is faded and needs to be re-painted. Missing striping on entry to drop off zone on south side and across Elm on the east side of the intersection. **Signage:** Two pedestrian crossings signs, no solar flashing lights. **Other:** Some curb damage. Potential for improved plantings in median along drop off drive if this remains.	**Ramps:** Good, no recommendations. **Tactile Warning:** Good, no recommendations. **Striping:** Repaint all existing crossings, add new crossing at drive entry to drop off area. **Signage:** Good, no recommendations. **Other:**	$3,000.00	4
LS2.21 Elm Street and 10th Street at URC	**Ramps:** Present **Tactile Warning:** Present **Striping:** Worn and different than other striping. Signage: Flashing solar lights with signs are present at this crossing. **Other:** Good lighting. Contrast from asphalt to concrete may not be	**Ramps:** Good, no recommendations. **Tactile Warning:** Good, no recommendations. **Striping:** Replace striping with new, to match striping in other locations on campus. **Signage:** Good, no recommendations.	$2,500.00	3

	enough for visually impaired individual.	**Other:**		
LS2.22 PUB Parking Crossings	**Ramps:** Present, don't line up to face each other well. **Tactile Warning:** Present **Striping:** Severely faded, need to be re-painted. Signage: No signage for pedestrians crossing parking lot entry drive. **Other:** Steep, not ADA accessible. Curb damage on west corner.	**Ramps:** Replace one or two ramps so that crossings align with each other. **Tactile Warning:** Good, no recommendations. **Striping:** Restriped both (2) crossings. **Signage:** Add two pedestrian crossings signs. **Other:** Repair curb.	$3,000.00	4
LS2.23 9th and Cedar Street	**Ramps:** Only on western corners. Eastern corners do not connect to sidewalks. **Tactile Warning:** Ramp on south west corner is missing tactile warning strip. **Striping:** No striping. **Signage:** No signage or flashing lights. **Other:** Low traffic area.	**Ramps:** Replace ramp on south west corner with ramp that has tactile warning strip. **Tactile Warning:** See note above. **Striping:** Add one striped crosswalk. **Signage:** Add one pedestrian crossing sign. **Other:**	$7,500.00	5
LS2.24 10th and Cedar Street at URC and New Res Hall	**Ramps:** No ramp on north west or south west corner. Also no ramp at south east corner, just curb cut for vehicle drive. **Tactile Warning:** Present on all existing ramps except ramp at north west corner. **Striping:** No striping along north side of street at entry to P13. **Signage:** No signage or solar lights. **Other:** May consider bollards on south side of Cedar.	**Ramps:** Install two new ramps where there currently are none, also replace existing ramp with new ramp that has tactile warning strip. **Tactile Warning:** See note above. **Striping:** Strip crosswalk along north side of intersections. **Signage:** Add two solar crossing lights with signs. Other:	$55,000.00	3
LS2.25 11th and Cedar	**Ramps:** Only present on north side of street. Missing on south side of Cedar. **Tactile Warning:** Only present on ramp in north east corner. Striping: No striping present. **Signage:** No signage. **Other:** Consider two	**Ramps:** Install two new ramps both on south side of Cedar. Also replace existing ramp on north east corner with new ramp including tactile warning strip. **Tactile Warning:** See note above.	$11,500.00	4

	crossings of Cedar from north side of street. Currently no direct crossing of Cedar. Un-necessary grass patch in concrete curb at emergency beacon?	**Striping:** Add three striped crosswalks. **Signage:** Provide three new pedestrian crossing signs. **Other:** Add two new crossings, see striping and ramps above.		

Project Justification: Non-compliant ADA crossings and circulation routes limit safe access to campus facilities by individuals with disabilities. While not all routes can be accessible, curb ramps are required to meet ADA requirements. In addition, improvements to ADA crossings enhance pedestrian safety for individuals of all abilities.
Project Sequence: Individual Projects can be completed as construction occurs at intersections for Emergency Vehicle Access improvements or other maintenance projects. These projects include installation of underground infrastructure, sidewalk and pavement replacement.
Cost:

LS-2	Pedestrian Safety Improvements: ADA	
	Total:	**$373,000**

LS-3 Pedestrian Safety Improvements: Pavers

Project Description: Install approximately 16,000 square feet of pavers on both sides of Elm Street from Erie Street to Washington Street. Installation of pavers at this location is consistent with the Master Plan for improvement of east-west pedestrian connections. Elm Street is identified as an important edge and a major connection between parking lots, recreation and athletic facilities west of Washington and the Student Recreation Center and the Project includes removal of existing sidewalks and installation of new pavers.
Project Justification: Extension of the campus paver pedestrian system provides continuity and a sense of place. Additionally, maintenance staff has previously indicated that snow and ice are more easily cleared from pavers. Snow tends to melt on paver

areas before it will on concrete walks. The installation of paver pedestrian walkways along Elm Street supports the following Planning Principles from the master plan:

"Improve the overall character of the campus with the implementation of each project. Create and follow a framework that welcomes neighbors and accommodates future expansion beyond existing boundaries.

Reinforce and improve the overall cohesion of campus, specifically linkages across Washington Street, whenever possible."

(Planning Principles, Comprehensive Campus Master Plan Executive Summary, Eastern Washington University, September 27, 2013)

Project Sequence: Individual Projects can be completed as construction occurs at intersections for Emergency Vehicle Access improvements or other maintenance projects. These projects include installation of underground infrastructure, sidewalk and pavement replacement.

Cost:

LS-3	Pedestrian Safety Improvements: Pavers	
	Total:	**$550,000**

EMERGENCY VEHICLE PROJECTS

Emergency Vehicle Access

Project Description: Implement the access improvement projects identified in the "2014 Eastern Washington University Access Study."

Project Justification: Emergency vehicle access to several buildings on campus currently does not meet fire department access requirements.

Project Sequence: Projects will be sequenced based on available funding.

CR-1 Emergency Vehicle Access #1

Project Description: In order to access the Aquatics Building, emergency vehicles currently must utilize a narrow gravel drive located west of the Jim Thorpe Fieldhouse. In order to meet access criteria, a new 20-foot minimum paved roadway would need to be constructed beginning at the southwest corner of the Fieldhouse and continuing to the northwest corner of the Aquatics Building, connecting to the existing paved surface on the north side of the building. In order to provide an aerial working pad, the new access would need to be widened to 26-foot minimum adjacent to the west side of the Aquatics Building.

Project Justification: Provide Emergency Vehicle access to the Aquatics Building

Rational for selecting the recommended project: Emergency vehicle access to the building currently does not meet Fire Department minimum requirements.

Cost : $60,000

CR-2 Emergency Vehicle Access #2

Project Description: There are currently no all-weather surfaces adjacent to Rozell the meet the minimum required to provide aerial access to the building. While Cedar Street is within 30-feet of the building, the steep grade of the roadway prevents it from serving as an aerial access pad location. In order to provide an aerial work pad to Rozell, a new 26' x 50 foot minimum paved area along the west side of the building would need to be developed.

Project Justification: Provide aerial access to Rozell

Rational for selecting the recommended project: Emergency vehicle access to the building currently does not meet Fire Department minimum requirements.
Cost: $22,000

CR-3 Emergency Vehicle Access #3

Project Description: Currently there is no aerial access to either Streeter or Morrison Halls and portions of each building are not within 150 feet of engine access. To provide the required access, the existing concrete walkway immediately north of Streeter Hall would be widened to 20-foot minimum with the westerly most 50-feet widened to 26-foot. This would permit emergency access to within 150-foot of all points of each building and also create an aerial work pad to both buildings. In order to widen this sidewalk, two trees along the north side will need to be removed. In addition to the sidewalk widening, a 20' wide driveway approach would be constructed, street parking spaces restriped, the curb repainted, and "No Parking Fire Lane" signage installed as necessary.
Project Justification: Provide aerial a to Streeter/Morrison
Rational for selecting the recommended project: Emergency vehicle access to the building currently does not meet Fire Department minimum requirements.
Cost estimate: $31,000

CR-4 Emergency Vehicle Access #4

Project Description: Due to the configuration of the roof and building, Dryden Hall requires two aerial access locations. Currently there are no aerial access points to the building. To provide the required aerial work pads, the concrete walkways on the west side of Dryden Hall would be widened to 26-foot for the initial 50 feet of walkway providing the 50' x 26' aerial working pads and providing emergency access to within 150 feet of all points on the building. In addition, a new 20' wide driveway approach would be constructed at each location, street parking spaces restriped, the curb repainted, "No Parking Fire Lane" signage installed as necessary, and four large conifers removed.
Project Justification: Provide aerial a to Dryden Hall

Rational for selecting the recommended project: Emergency vehicle access to the building currently does not meet Fire Department minimum requirements.
Cost: $40,000

CR-5 Emergency Vehicle Access #5

Project Description: Emergency access to the southeast side of the Pence Union Building is currently restricted due to existing light standards and trees located in the middle of the pedestrian walkway. Removal of the four large deciduous trees and relocation of nine light standards would allow emergency access to within 150 feet of all points on the building. In addition, it would also provide emergency access to the northwest corner of John F. Kennedy Library and the northeast corner of the Science Building.
Project Justification: Improve Emergency Vehicle access to Pence, Kennedy, and Science Building.
Rational for selecting the recommended project: Emergency vehicle accesses to the buildings currently do not meet Fire Department minimum requirements.
Cost : $82,000

CR-6 Emergency Vehicle Access #6

Project Description: There is currently no designated aerial access work pad located adjacent to the Science Building. In addition portions of the south and east side of the building is outside the 150 foot access limit. To provide the required access and aerial work pad, two parking spaces in the lot south of the building would be removed, the parking lot restriped, and “No Parking Fire Lane” signage installed as necessary. The concrete sidewalk south of the building would be widened to a minimum 20 feet to permit emergency access with a portion of the walk widened to 26 foot to allow for a 50’ x 26’ aerial work pad. Four walkway lights will need to be relocated for widening to occur.
Project Justification: Provide aerial a to Science Building
Rational for selecting the recommended project: Emergency vehicle access to the building currently does not meet Fire Department minimum requirements.
Cost: $46,000

CR-7 Emergency Vehicle Access #7

Project Description: Emergency access to the north sides of Martin Hall and John F. Kennedy Library are restricted due to a number of conflicts along the pedestrian mall currently serving as the access route. Several deficiencies need to be corrected to meet the minimum access requirements. These include widening of the existing paver walkway to 20 foot, relocation of 18 pedestrian lights and concrete bases, cutting back 10 concrete seat walls, and the removal and/or pruning of several large deciduous trees.
Project Justification: Provide Emergency Vehicle access to Martin Hall and Kennedy Library.
Rational for selecting the recommended project: Emergency vehicle access to these buildings currently does not meet Fire Department minimum requirements.
Cost: $240,000

CR-8 Emergency Vehicle Access #8

Project Description: There is currently no designated aerial access work pad located adjacent to Monroe Hall. To provide aerial access, the concrete walkway on the east side of Monroe Hall would be widened to 20 feet, allowing for emergency vehicle access. At the main entry, the walkway would be widened to 26 foot in order to provide for the aerial work pad. In addition to the widening of the sidewalk, one small deciduous tree would also need to be removed.
Project Justification: Provide Aerial Emergency Vehicle access to Monroe Hall.
Rational for selecting the recommended project: Emergency vehicle access to this building currently does not meet Fire Department minimum requirements.
Cost: $20,000

CR-9 Emergency Vehicle Access #9

Project Description: There is currently no designated aerial access work pad located within 30 feet of Kingston Hall and access to the southeast corner of the building is limited. To provide the required aerial access, the concrete walkway leading from C Street would be widened to 26 feet. In order to widen the sidewalk, one deciduous tree

will need to be removed, one light standard relocated, and the emergency aid station relocated. In addition, a 20 foot curb drop would be installed off of C Street.
For access to the south side of the building, the existing sidewalk leading to the parking lot at the end of D Street would be widened to 20 feet from the end of the parking lot to the walkway leading to Senior Hall. To widen the sidewalk, an existing campus directional sign will need to be relocated.
Project Justification: Provide Aerial Emergency Vehicle access to Kingston Hall.
Rational for selecting the recommended project: Emergency vehicle access to this building currently does not meet Fire Department minimum requirements.
Cost : $60,000

CR-10 Emergency Vehicle Access #10

Project Description: Emergency access to the south side of Kennedy library is currently provided by a 12 foot concrete service drive. To meet the minimum emergency access requirements, the concrete service drive would be widened from 12 feet to 20 feet. Additionally, a portion of the service yard would be widened by roughly 2-feet in order to provide the required 50'x 26' aerial working pad.
Project Justification: Improve Emergency Vehicle access to Kennedy Library.
Rational for selecting the recommended project: Emergency vehicle access to this building currently does not meet Fire Department minimum requirements.
Cost: $30,000

CR-11 Emergency Vehicle Access #11

Project Description: There are several bollards centered in the existing pedestrian walking that serves as the main emergency vehicle access to the Williamson and Kennedy buildings. While the overall width of the walkway meets the 20 foot minimum, the bollards limit the unobstructed width to 10 feet on each side. These bollards need to be removed in order to create a 20 foot unobstructed drive lane.
Project Justification: Improve Emergency Vehicle access to Kennedy Library and Williamson Hall.

Rational for selecting the recommended project: Emergency vehicle access to this building currently does not meet Fire Department minimum requirements.

Cost : $12,000

STEAM PLANT PROJECTS

SP-1: Replace Boiler #3

Project Description: Replace existing 25,000 pph steam Boiler #3.

- Install a new 40,000 pph high pressure steam boiler with dual fuel (oil & gas) low NOX burner. Install new correctly sized stack economizer (boiler feedwater pre-heater).

Project Justification: The existing steam Boiler #3 has been out of service for a number of years due to several outstanding breakdowns and lack of repair funds. Boiler #3 is almost 50 years old and parts are difficult to find. Despite being maintained in excellent condition over the years by the EWU staff, this boiler is basically near the end of its life expectancy.

Future campus growth will increase expected plant steam loads by over 30%, which will start to impact boiler plant redundancy & operational flexibility. A new boiler will allow plant operation and redundancy to be maintained in to the future. A new boiler would increase steam plant operational efficiencies.

According to the EWU operations staff, the historical peak campus heating load, seen this last winter, is approximately 75,000 lbs/hr.

Based on the anticipated master plan campus growth for the New Science I & II projects, the new Gateway Athletic Project, the expected addition of future campus steam load is approximately 34%. Based on a peak historic load of 75,000 pph, a 34% increase would put the future campus steam load at over 100,000 pph, which is approximately 50% of the steam plant's present total capacity 217,000 pph.

Sequence / Category:

Capital Master Plan.

Cost:

SP-1: $3,500,000

SP-2: Install Boiler Feedwater Stack Economizers on Boilers #2 & #4.

Project Description: Install new boiler feedwater stack economizers on existing steam boilers #2 & #4. This installation would allow these boiler configurations to match boilers #1 & #5, which already have stack economizers in operation.

Project Justification: The existing steam Boilers #2 and #4, which are mostly operated in the shoulder and summer seasons, are not provided with boiler feedwater stack economizers, which are present on the other plant boilers. As a result, the operational efficiencies of these boilers are not a high as is possible, thereby reducing the plant's overall energy efficiency.

Also, because of the different feedwater configuration that these two boilers use, compared to the other boilers, the feedwater pumping loop must be run at differing pressures, which complicates plant operation.

New boiler feedwater stack economizers would increase boiler plant operational efficiencies, and simplify feedwater system operation.

Sequence / Category:

Improve Operational Efficiencies.

Cost:

SP-2: $350,000

SP-3: Upgrade Boiler Feedwater Pumps

Project Description: Replace the aging feedwater tank transfer pumps and upgrade or supplement the undersized Deaerator unit boiler feedwater pumps.

Project Justification: The existing single speed feedwater transfer pumps that provide feeddwater from the condensate return storage tank to the deaerator tank, are old and in questionable condition. This project would replace these pumps with new high efficiency pumps with improved controls for staging and monitoring.

The existing VFD driven boiler feedwater pumps that are part of the deaerator unit were recently installed as part of an energy retrofit to the plant, but, according to the plant operators, are having trouble keeping up with the feedwater demands of the boilers. These newer VFD driven pumps were downsized to 30 hp each, from the original single speed 50 hp feedwater pumps. Capacity reduction is unknown, but appears to be a factor in plant operation, requiring the operators to run the auxiliary steam-driven feedwater pump during peak loads. Redundancy is questionable with this configuration, so it is proposed that the new feedwater pumps be replaced with larger pumps or supplemented with an additional pump.

Sequence / Category:
Capital Master Plan.

Cost:
SP-3: 200,000

SP-4: Repair Rozell Heating Plant Boiler Stack

Project Description: Repair the existing Rozell Heating Plant concrete/masonry boiler stack.

Project Justification: The condition of the existing exterior concrete/masonry boiler stack at the Rozell heating plant is the subject of some concern. According to EWU staff, there is reason to suspect some of the interior lining material has started to fail and/or fall off. Further, it is unknown if the original construction and/or present condition of this stack is up to present seismic standards.
A full analysis of the existing boiler stack condition is not in the scope of this study. Further analysis is recommended.

Sequence / Category:
Maintenance & Repair.

Cost:

SP-4: Unknown (Further study required).

SP-5: Upgrade Natural Gas Service from AVISTA

Project Description: Increase the natural gas supply capacity to the Central Campus Steam Plant from the utility provider, AVISTA.

Project Justification: The existing steam boilers are limited in the amount of natural gas that they are allowed to consume at a given peak instant by agreement with the gas utility provider, AVISTA. Reportedly the high pressure gas supply distribution to the City of Cheney is limited based on AVISTA transmission gas line capacity. This issue is limits the steam boiler plant to a maximum consumption rate of approximately 56,000 lbs/hr, at which point the plant has to supplement its capacity by burning #2 fuel oil (diesel). Because it is not beneficial to fire the boilers on fuel oil due to emission concerns, efficiency reductions and added wear and tear, the ability to fire a greater percentage of the boiler plant on natural gas is desired.

Sequence / Category:

Unknown. Pending the timing of AVISTA natural gas infrastructure upgrades to the City of Cheney.

Cost:

SP-5: Unknown. (Further study required. Capital costs for gas capacity increase to Campus would presumably be paid for by AVISTA as part of their normal growth plans.)

STEAM DISTRIBUTION PROJECTS

SD-1: Replace Utility Tunnel Condensate Piping

Project Description: Replace aging gravity condensate piping system & components in utility tunnels. New piping to be heavier wall thickness, Sched. 80, compared to the existing standard wall Sched. 40 piping presently installed. New steam trap stations and valves would be provided.

Project Justification: Although the existing gravity condensate drainage piping system, that serves the high pressure steam distribution within the utility tunnels, appears to be in good condition and has been well maintained, most of this piping is around 40 years old. Although there have not been reports of major leaks or failures, this piping system is nearing the end of its useful life.

Because the condensate piping system is subjected to more severe service than the steam supply piping, on account of the presence of oxygen and other condensed gases, such as carbolic acid, internal corrosion is much more likely. This leads to premature pipe wall failure and leaks, as well as damage to components, such as valve and steam traps.

Sequence / Category:

Improved Maintenance & Operational Efficiencies.

Cost:

SD-1: $1,225,000

SD-2: Replace Utility Tunnel Electric Condensate Pumps with Steam-Powered Pumps

Project Description: Replace existing simplex type electric condensate pumps in the utility tunnel with new steam-powered condensate pumps.

Project Justification: The existing simplex type electric condensate pumps, that are situated in various locations throughout the utility tunnel and are used to handle steam distribution condensate loads, are on ongoing point of malfunction and problematic maintenance. These condensate pumps are generally located in hot and wet locations of the tunnel and are subjected to severe service due to the hot condensate that they handle from the high pressure steam drip traps. Seal failures on the pumps are common and electric components do not stand up well to the environmental conditions within the tunnel.

Because of the severe service these tunnel condensate pumps experience, it is recommended that they be replaced throughout the tunnel system with more robust steam powered (non-electric) condensate pump assemblies. Such steam-powered condensate are more or less oversized steam traps and are made of similar materials that can handle steam service, without the weakness inherent in electric motor driven condensate pumps.

Sequence / Category:

Improved Maintenance Efficiencies.

Cost:

SD-2: $200,000

SD-3: Label Piping and Identify Branches & Valves

Project Description: The existing steam (and chilled water) distribution piping system, located in the utility tunnel network, is poorly labeled and branch take-offs and valves are not identified. This project would provide better labeling and identification to help with maintenance and troubleshooting activities.

Project Justification: After spending several days surveying the condition of the existing utility tunnel piping and valving, it is evident that there would be value to the maintenance staff, and to contractors doing future work, if the existing piping system was better labeled and identified. Such labeling could help locate and isolate failures or

problem areas, as well as to better direct traffic for repair or new construction. Likewise, there is a certain amount of abandoned devices (mostly electrical wall switches), that provide confusion over the tunnel lighting circuits. These should be removed and the active light switches better identified (as to which section they serve). Branches take-offs to buildings could be better identified, as could routes to exits or manholes.

Sequence / Category:
Improved Maintenance Efficiencies.

Cost:
SD-3: $150,000

SD-4: Upgrade Piping in Plant Utilities Building (PLU) and/or Repurpose the Space

Project Description: Upgrade the existing steam and chilled water piping and systems inside the PLU building in order to better configure the space usage for storage or other purposes.

Project Justification: The existing steam (and chilled water) distribution piping system, located in the old original central campus steam plant, now the Plant Utilities Building (PLU), has been disturbed over time due to the use of much of this building as an ad-hoc storage space. Pipe insulation jacketing is damaged or missing, much of the old piping is deactivated and abandoned in place, and some of the valving appears to be fairly old. There is some old pneumatic controls and abandoned steam piping still in place but deactivated, and nothing is labeled. Filter boxes and other surplus material is stacked on and around the piping. Access is difficult.

Sequence / Category:
Improved Maintenance Efficiencies.

Cost:

SD-4: $125,000

CHILLED PLANT PROJECTS

CP-1: Add Chiller Plant Capacity, 2,000 tons

Project Description: Install additional 2,000 ton chiller plant capacity.

The following elements would be installed or upgraded:

- New 2000 ton water-cooled centrifugal chiller with VFD drive.
- New 2000 ton induced-draft open cooling tower with VFD drive.
- New chiller (evaporator) pump.
- New condenser water (tower) pump.
- Upgrade/Replace Campus Loop chilled water pumps with new capacity pumps with VFDs.
- Controls.
- Rozell plant expansion, electrical work and ventilation.

Project Justification: The existing Central Campus Chiller Plant has a total capacity of 4,000 tons (3-1000 ton chillers & 2-500 ton chillers), which matching capacity cooling towers and pumps.

According to the EWU operations staff, the historical peak campus cooling load is somewhere between 3,500 tons (per Dumais & Romans in their 2009 *Campus Chilled Water System Study*) and 2,500 tons (per McKinstry in their *2012 Energy Efficiency & Sustainability Report).* In our interview with the EWU staff, they reported a historical peak cooling load of about 3,000 tons, which is the value that is used in our analysis.

Based on the anticipated master plan campus growth for the New Science I & II projects, the new Gateway Athletic Project and the modernization of the legacy residence halls to include air conditioning, the expected addition of campus chilled water load is approximately 40%.

Based on a peak historic capacity of 3,000 tons, a 40% increase would put the future campus load at over 4,200 tons, which is greater than the present total plant capacity of only 4,000 tons.

In order to meet the future cooling needs of the campus growth plan, it will be necessary to add cooling capacity, with sufficient redundancy to allow operational flexibility and to allow for break-downs. At minimum a 1000 ton chiller plant expansion would be needed, although a larger, 2000 ton expansion, as proposed here, would provide a higher degree of redundancy, future growth allowance and flexibility, at only a slightly greater incremental cost.

Sequence / Category:
Capital Master Plan.

Cost:
CP-1: $3,600,000

CP-2: Upgrade Campus Chilled Water Pumps

Project Description: Upgrade campus distribution loop chilled water pumps to increase system capacity and to provide VFD control for each pump.

- Upgrade/Replace Campus Loop chilled water pumps CWP-2 & CWP-3 with new capacity pumps with VFDs. Existing CWP-1 is already controlled by a VFD.
- New Delta Controls.

Project Justification: Depending upon the priority and timing of the above proposed chiller plant expansion, the upgrade of the existing campus distribution pumps may not be necessary, as they are also included in the above scope.

However, until such time as the chiller plant capacity is increased, it would be beneficial to upgrade the existing campus distribution chilled water pumps for two reasons.

First of all, these existing pumps (CWP-2 & 3) are two-speed pumps, without VFD speed/capacity control. Two-speed pumps are not as efficient as pumps that are run with VFDS, and controllability is not as good for varying flow demands.

Secondly, based on the results of the chilled water system flow model that was prepared with this report, there are likely times when the existing campus chilled water distribution piping system is being "under pumped". In other words, it appears at times there may be a shortage of campus chilled water flow to some of the remote buildings. This is indicated by the results of the flow model that suggests that during times of peak historic campus cooling demand, that drop-off pressures (and therefore flows) to many of the buildings is greater than the capacity of the existing pumping plant (based on available flow and head pressures).

The present operational setpoint of 15 psig (35 ft head) pressure differential between the campus supply main and return main, does not seem to produce sufficiently strong flow conditions to necessarily satisfy all flow demands. This condition of possible under-pumping is also indicated by a reported high Delta T (nearly 20 deg. F) on the campus chilled water loop, compared to a design Delta T for most buildings of around 10 deg. F. Further analysis of the chilled water distribution system is needed to better understand the dynamics suggested by the flow model and field observations, however, the recommendation to upgrade the existing chilled water distribution pumps (install VFDs and possibly increase capacity with larger pumps) is still valid.

Sequence / Category:

Capital Master Plan.

Cost:

CP-2: $300,000

CP-3: Install VFDs on the Chiller Compressors and on the (3) 1,000 ton Cooling Towers

Project Description: Upgrade the existing centrifugal chiller compressors to add new VFD drives. Replace the 2-speed fan motors on the (3) largest cooling towers with VFD duty motors and install new VFD drives. Update controls to map drives to building automation system.

Project Justification: Per *McKinstry 2012 Energy Efficiency & Sustainability Report, Item 2.00-ROZ*, analysis: Annual electrical energy savings due to more efficient part load operation of equipment. Better able to match equipment capacity with campus cooling loads.

Sequence / Category:
Improved Operational Efficiencies.

Cost:
CP-3: $1,000,000

CP-4: Install 2 New Energy Efficient Cooling Towers

Project Description: Replace the existing, aging and inefficient 500 ton cooling towers with new, energy efficient, open circuit, induced draft cooling towers, with VFDs on their fan motors.

Project Justification: Per *McKinstry 2012 Energy Efficiency & Sustainability Report, Item 2.40-ROZ* , analysis: The new cooling towers will be sized for supplying 75 deg F water to the chillers during peak load conditions, thereby improving chiller efficiency. Annual electrical energy savings are anticipated.

Sequence / Category:
Improved Operational Efficiencies.

Cost:
CP-4: $500,000

CHILLED WATER DISTRIBUTION PROJECTS

CD-1: Replace/Upsize a Portion of the 12" West-Side Chilled Water Piping

Project Description: Replace the existing 12" chilled water piping that feeds the west-side (Washington Street) of the campus loop, with 16" size pipe, from the Rozell plant junction, up to the HPE branch, past the existing Science Building. This section of piping will see significantly increased flow demands when the future Gateway and residence hall cooling projects are completed.

Project Justification: Analysis of the future chilled water flow rates as developed by the computerized flow model, indicates a flow split of roughly 50-50 between the west-side (12") and east-side (16") chilled water loops when accounting for future flow conditions. Under this condition the 12" pipe branch will see a fluid velocity of roughly 50% greater than the 16" branch, and approaching the recommended peak design velocity of 10 feet per second.
Changing this section of piping from 12" to 16" size will reduce expected peak flow velocities to be within normal limits and reduce pumping head pressure requirements.

Sequence / Category:
Capital Master Plan.

Cost:
CD-1: $1,000,000

SNOW MELT PROJECTS

SN-1: Expansion of Campus Snowmelt System - Phases 1 - 5

Project Description: Install hydronic type (hot water anti-freeze) snowmelt systems to the sidewalks and entrances (ramps and stairways) to the major academic and residence hall facilities on campus. A phased multi-year installation is proposed with selected buildings prioritization based on student traffic levels and the degree of present manual snow removal effort/difficulty.

Project Justification: During the winter months, when periods of snow fall can be at times both heavy and unpredictable, significant campus maintenance staff resources are devoted to manual snow removal efforts. Where possible on sidewalks and pathways, snow removal can be accomplished with tractors and snow-blowers. While this is certainly more efficient that manual shoveling of snow, there is a certain amount of wear and tear to the hardscape surfaces, in the form of mechanical snowplow blade damage and sweeper erosion. Elsewhere, such as on narrow lanes or on building entrance ramps and steps, snow removal is done manually with snow shovels, which is much more labor intensive.

In order to reduce the amount of staff resources that need to be periodically, and unexpectedly, devoted to winter snow removal efforts, the University has begun to invest in the installation of snowmelt systems in its first few buildings, notably the University Recreation Center and the recently renovated Patterson Hall. In early operations over the last few years, these automatic snowmelt systems have significantly reduced manual snowmelt efforts and enhanced student and staff safety. Because of this positive experience and good resource efficiencies, it is the University's desire to expand the snowmelt to eventually include all major buildings on campus. Also, the design and operation of these snowmelt systems will be more energy efficient than traditional systems, by capturing so-called "free" heat energy available in each individual building's steam heat condensate return water, as a first source of heat input, before

new steam is used. This approach further enhances the optimization of precious campus resources for snow removal efforts.

Sequence / Category:

Improved Maintenance Efficiencies. Phased Implementation.

Phase 1: PUB, JFK, Showalter Hall N & S, Kingston Hall, Senior Hall.

Phase 2: Dressler, Dryden, Hargreaves, Monroe, Pearce, Sutton, URC, Tawanka Commons.

Phase 3: Aquatics, Art, CEB, Cheney Hall, Speech, ECC, Louise Anderson, Martin, Morrison, Music, Pavilion, Science, Streeter Hall.

Phase 4: Huston, Isle, Jim Thorpe Field House, PE Activities, PE Classroom, Radio TV, Theater, Williamson.

Phase 5: Archives, Cadet, Plant Utilities, Rozell, Robert Reid School, WSP Crime Lab.

Cost:

Implementation in Five (5) Phases:

Phase 1:	$ 2,000,000
Phase 2:	$ 2,500,000
Phase 3:	$ 4,000,000
Phase 4:	$ 2,500,000
Phase 5:	$ 1,800,000
***SN-1*:**	**$12,800,000**

ENERGY MANAGEMENT PROJECTS

EM-1: Migrate Legacy Staefa BAS Network to Fiber-Optic BACnet Network

Project Description: Migrate legacy Staefa BAS Data-MUX and Smart II controls to Alerton (ATS) communication controllers and utilize existing campus CAT 6 fiber-optic network for BACnet communication to Rozell Central Plant.

Project Justification: The existing older generation legacy Staefa control systems installed in 13 of the existing campus buildings (6 dorms, 6 academic, 1 utility) communicate to the Rozell Central HVAC control room by way of a unreliable twisted-shielded pair daisy-chained wiring pathway that is run in the utility tunnels. Building BAS systems communication speeds are slow due to the nature of this older technology. The head-end workstation in Rozell utilizes a proprietary Staefa software package that is no longer supported. Although each campus building is capable of stand-alone control, the out-of-date and unreliable network that ties them together and feeds information to the HVAC control shop is a risk of permanent failure. This would greatly compromise the ability of the campus maintenance staff to respond to problems and alarms. Migrating the legacy Staefa network to the more modern Alerton BACnet based network has already been successfully accomplished in a number of buildings, most notably the HPE complex and the Arts complex. The migration involves replacing the existing Staefa Data-MUX panels, and in some cases the more distributed Smart II controllers, with new Alerton devices that communicate via BACnet. Existing field mounted sensors, thermostats, relays, damper and valve actuators, are reused.

Staefa Legacy Buildings:

Residence Halls (Dorms):

Dressler Hall

Dryden Hall

Louise Anderson Hall

Morrison Hall

Pearce Hall

Streeter Hall

Academic & Other Buildings:

JFK Library

Pence Union Building (PUB)

Science Building

Sutton Hall

Williamson Hall

Cadet Hall

Plant Utilities

Sequence / Category:

Improved Maintenance & Energy Efficiencies. Implementation sequence and priorities yet to be determined.

Cost:

EM-1 Total: $3,350,000

ELECTRICAL & COMMUNICATIONS PROJECTS

EL-1 Medium-voltage Electrician

Project Description: While this proposal is not a capital expenditure, it is seen as an operating necessity. Because the University owns its 15-kV electrical distribution system, it is responsible for operating and maintaining the system. Special procedures and skills are required of electricians responsible for electrical systems greater than 600-VAC. The University should consider filling one of its Electric Shop positions with a licensed electrician experienced in the operation and maintenance of 15-kV, medium-voltage power distribution equipment and circuits.

Project Justification: This proposal is driven by the need for operational efficiencies and worker safety.

Sequence: This proposal should be implemented as soon as possible.

Cost: There is no capital cost associated with this proposal. All costs are operational related to the employment of the specialty electrician.

EL-2 Electrical System Modeling

Project Description: Each time EWU submits a new or remodeled building for electrical plan review, the Department of Labor & Industries requires a load analysis of the entire medium-voltage distribution system associated with the project. EWU should commission an electronic model of the distribution system and should obtain software capable of updating the model as projects are completed on the campus. The model should document information such as load flow and short-circuit information. The model could also contain information related to arc-flash hazard levels which are important for worker safety. Currently, EWU does not have this information available.

Project Justification This proposal is driven by the need for operational efficiencies related to electrical calculations for new capital projects and major renovations to existing facilities. Having an up-to-date model with Arc-Flash data would also improve worker safety.

Sequence: This proposal should be implemented prior to the next major capital project.

Cost: There are no capital costs associated with this proposal. Retaining an engineering firm to prepare the initial model would cost approximately $50,000. Software to maintain the model would cost approximately $6,000. EWU should allocate funds to update the model each time a capital project is executed.

EL-3 Distribution Switching

Project Description: EWU should plan for the eventual replacement of the medium-voltage vacuum switches with above-ground, fusible air switches. Air switches provide a number of advantages over the existing vacuum switches. Because air switches are not insulated with an inert gas, there is no environmental concern as there is with the existing SF_6 insulating gas. Located on concrete pads on grade, air switches provide better worker safety with respect to approach clearances and exit routes. Air switches can be provided in multiple configurations with up to two (2) input/outputs and four (4) branch connections thus increasing the quantity of connection points available on the distribution system.

Project Justification: This proposal is driven by the need of the Master Plan to eventually require more connections to the medium-voltage distribution system. It also addresses worker safety issues and possible future environment restrictions related to the existing insulating gas.

Sequence: The conversion to above-grade air-insulated switches can be accomplished in small increments or as new building projects dictate.

Cost: The cost to implement this proposal for any segment of the campus is obviously proportional to the amount of switches being replaced at any one time. The cost to replace a single vacuum switch with a single above-grade air switch is approximately $70,000. The cost to replace all 27 existing switches is approximately $1,800,000.

EL-4 Distribution System Expansion

Project Description: The existing switchgear feeds the entire campus with four (4) feeders; two (2) ‘A’ feeders connected to Service #1 and two (2) ‘B’ feeders connected to Service #2. Each half of the switchgear has provisions for one (1) new circuit breaker. This would allow for the establishment of two (2) ‘C’ feeders.

Project Justification: Providing a third set of medium-voltage feeders for the campus will support large future loads, such as the proposed science complex and the Gateway project, without adding load to the existing two sets of medium-voltage feeders. This addition to the electrical distribution system will support the Master Plan.

Sequence: The distribution system expansion should occur before or in conjunction with the planned science building project and prior to the Gateway project.

Cost: $1,800,000

EL-5 Site Lighting Upgrade

Project Description: EWU previously developed a master plan for replacing existing site lighting with new, more efficient luminaires. The first phase of the master plan, which was primarily road lighting improvements, has been implemented. This project would continue the implementation of the site lighting master plan which is subdivided into parking lot lighting, plaza and walkway lighting, building perimeter lighting and centralized lighting controls.

Project Justification: Continuing the implementation of the site lighting master plan benefits the University in two ways. New luminaires will save maintenance and operational costs due to higher efficiencies and longer lamp life. Enhanced lighting will also address safety concerns in areas identified as having insufficient lighting levels.

Sequence: Site lighting upgrades can occur when convenient to the University. New site lighting installed as part of new facilities or building renovations should conform to the recommendations of the lighting master plan.

Cost: Costs identified in the lighting master plan are as follows:

Phase 2 $ 3,500,000

Phase 3 $12,000,000

Phase 4 $ 3,500,000

EL-6 Optical Fiber System Upgrade

Project Description: EWU wins and operated an optical fiber, outside-plant system for distributing of voice and data to campus buildings. A separate optical fiber network for acquiring building data and for automated systems control exists on the campus. A

number of additional fiber links for connecting buildings together have been identified. This project will add the additional links that have been identified by the Information Technology Operations group at EWU.

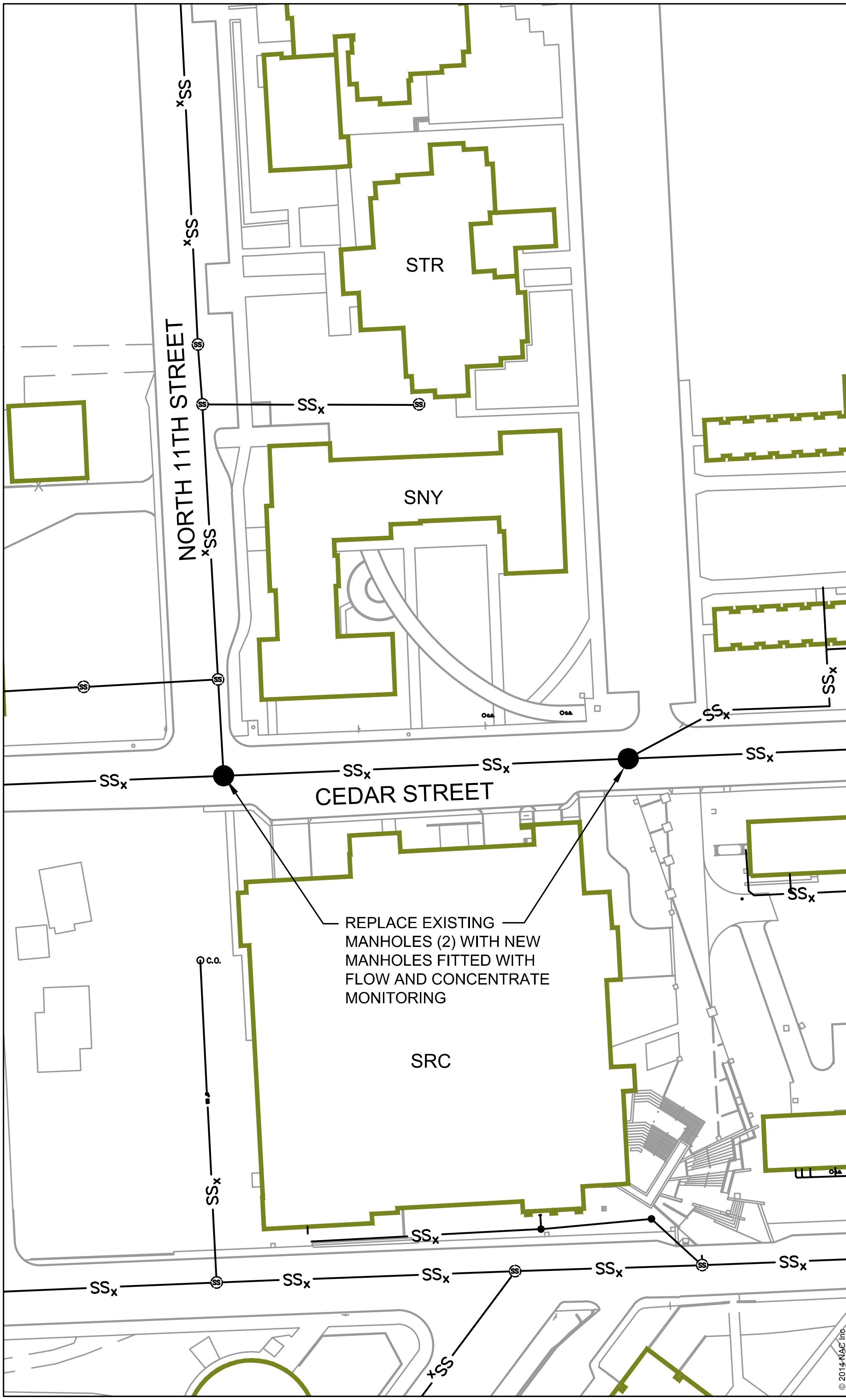
Project Justification: Additional optical fiber circuits that would increase the reliability of the network and provide additional communication paths have been identified. EWU has also identified the need to connect existing, off-site housing to the University network. Additionally, the University intends to transition from the current building automation system (BAS) software to new software intended to operate over an optical fiber network. Refer to proposed project EM-1. Upgrading the optical fiber system will allow the University to realize the full capabilities of the upgraded software.

Sequence: Optical fiber system upgrades can occur when convenient to the University. There may be advantages to implementing portions of the network in conjunction with proposed project EM-1, implementation of optical fiber BACnet.

Cost: $2,200,000

DIAGRAMS

The following diagrams illustrate the proposed improvements for selected projects.



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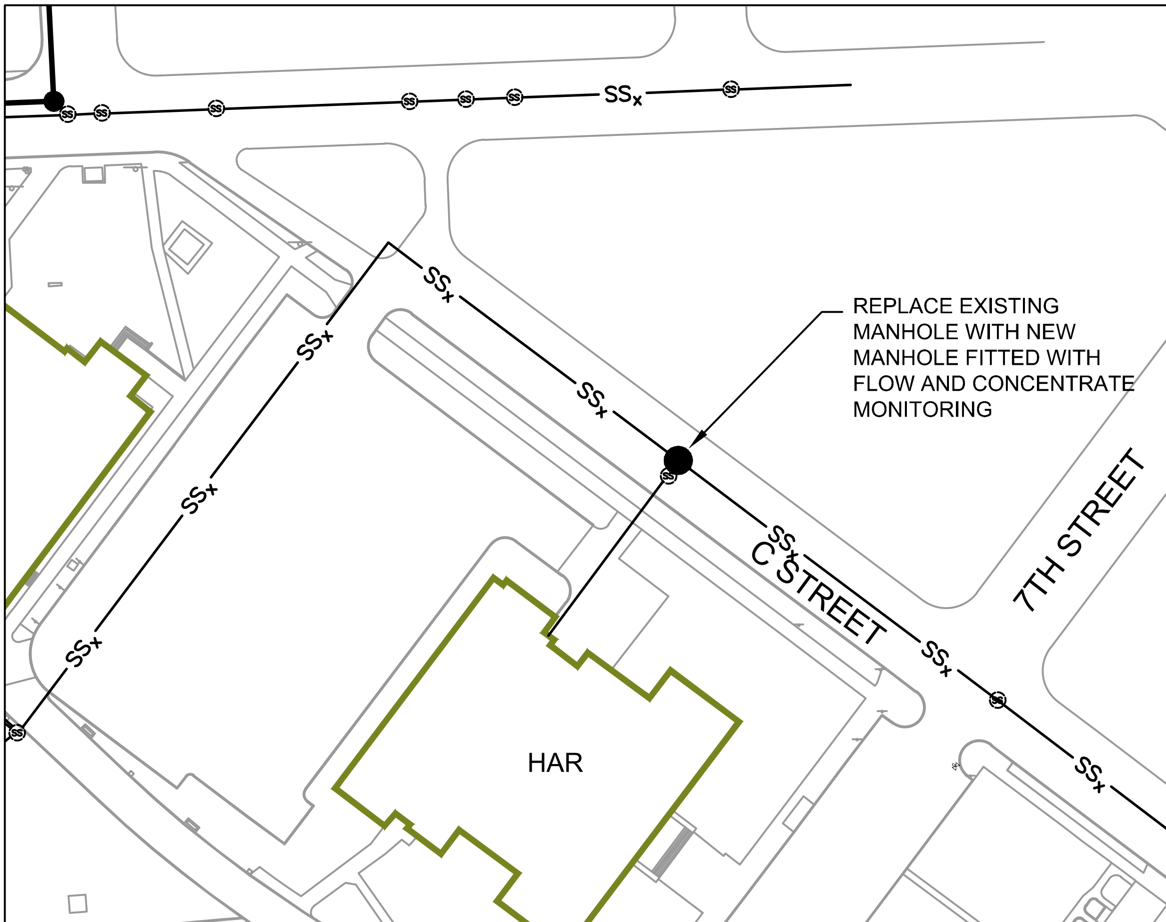

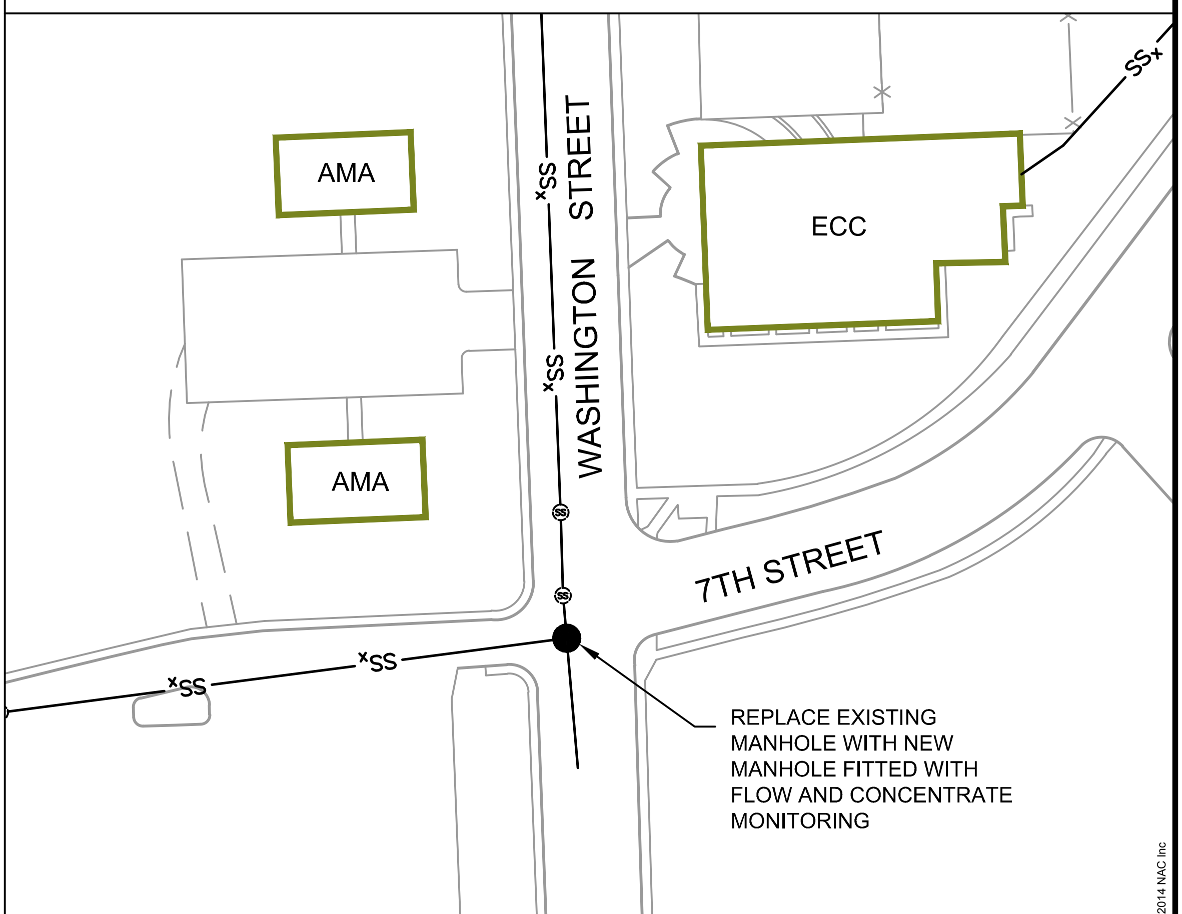

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CW-1□

TAW

CSB

PLU

SHW

KGS

SUT

HOL

VIS

GOV

C STREET

D STREET

E STREET

5TH STREET

6TH STREET

G STREET

F STREET

PIPE BURST AND REPLACE EXISTING SEWER LINE BETWEEN MANHOLES ESS-54/ESS-55 AND ESS-55/ESS-56

ESS-54

ESS-55

ESS-56

ESS-59

REPLACE EXISTING MANHOLE WITH NEW MANHOLE FITTED WITH FLOW AND CONCENTRATE MONITORING

INTERCEPT FLOW AT MANHOLE ESS-56 AND REROUTE TO MANHOLE ESS-59

CAP EXISTING SEWER LINE OUTSIDE MANHOLE ESS-56

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CEB
CAD
RTV
CMC
ART
THE
MUS
AMA
RRL
SUT
HOL
WASHINGTON STREET
7TH STREET
G STREET
H STREET
I STREET
CSS-37
ESS-64
NEW SEWER MAIN
INSTALL NEW MANHOLE ON EXISTING SEWER LINE. EXTEND NEW SERVICE TO HOLTER HOUSE. CAP EXISTING SEWER LINE OUTSIDE NEW MANHOLE
REPLACE EXISTING MANHOLE WITH NEW MANHOLE FITTED WITH FLOW AND CONCENTRATE MONITORING
NEW SEWER MAIN
SENT NEW MANHOLE ON EXISTING SEWER LINE
NEW SEWER MAIN
NEW SEWER MAIN
INTERCEPT FLOW AT MANHOLE CSS-41 AND REROUTE TO NEW MANHOLE. CAP EXISTING SEWER LINE OUTSIDE MANHOLE
INTERCEPT FLOW AT MANHOLE ESS-64 AND REROUTE TO MANHOLE CSS-37. CAP EXISTING SEWER LINE OUTSIDE MANHOLE

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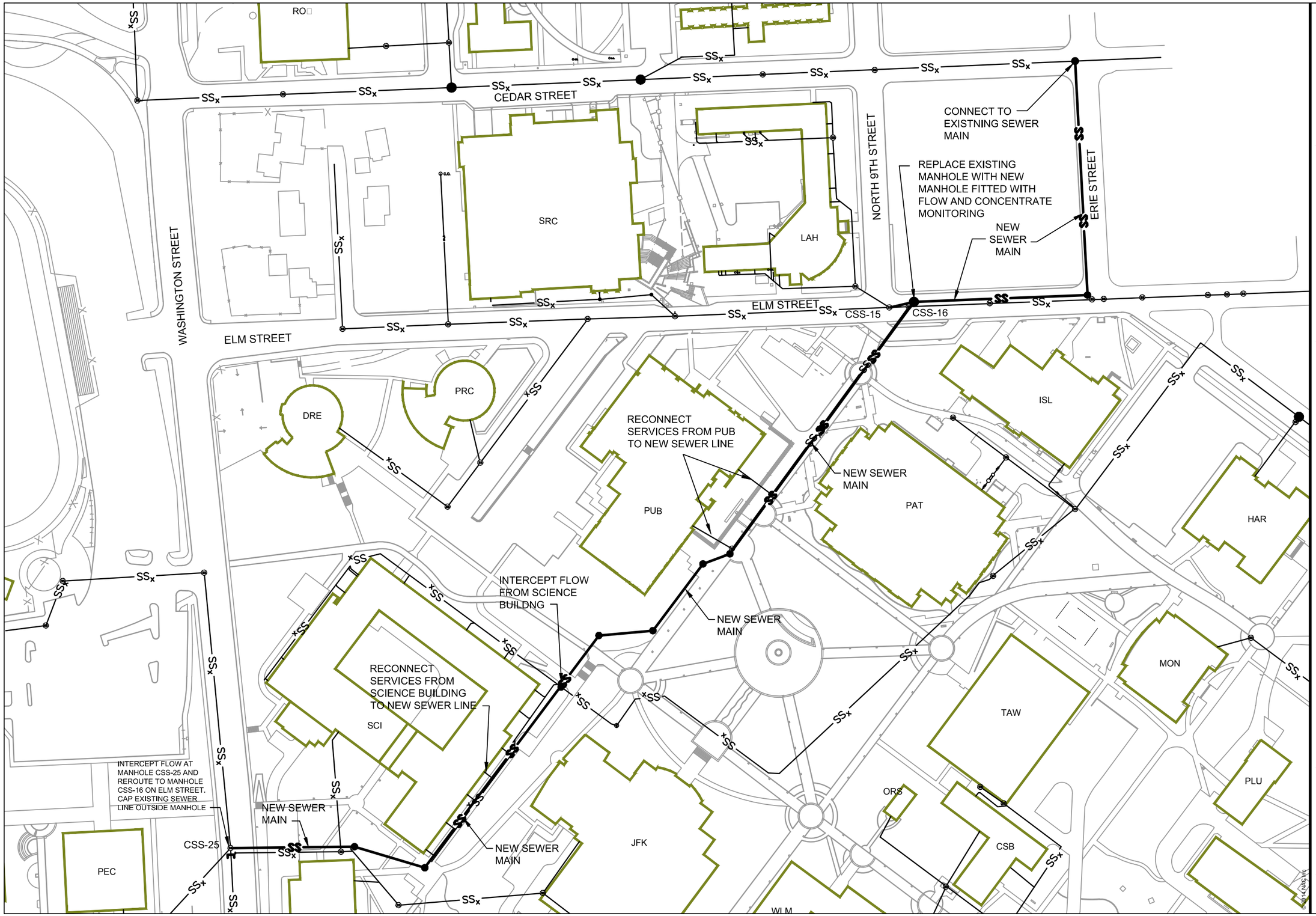

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PAT

HAR

EXISTING PATTERSON STORAGE TANK

RE-ROUTE MONROE SUMP PUMPS THROUGH TUNNEL TO NEW PUMP VAULT

REPLACE EXISTING IRRIGATION PUMP WITH LARGER 150 GPM PUMP AND CONNECT TO NEW CAMPUS IRRIGATION SYSTEM IN TUNNEL

MON

PRH

SNR

6TH STREET

C STREET

KGS

TAW

NEW PUMP VAULT TO PUMP OVERFLOW FROM PATTERSON TANKS TO SHOWALTER TANKS.

NEW OVERFLOW LINE FROM THE PATTERSON STORAGE TANKS ROUTED IN TUNNEL.

PLU

ORS

CONNECT IRRIGATION PUMP LINE TO NEW CAMPUS IRRIGATION MAIN TO BE INSTALLED IN THE TUNNEL.

NEW IRRIGATION SUPPLY LINE FROM THE SHOWALTER STORAGE TANKS.

NEW OVERFLOW LINE FROM THE PATTERSON STORAGE TANKS.

CSB

SHW

INSTALL 150 GPM IRRIGATION PUMP AND VALVE VAULT.

D STREET

NEW STORM OVERFLOW LINE.

MAR

RECONDITION EXISTING CONCRETE STORAGE TANKS. (4) 25,000 GAL TANKS

INSTALL NEW MANHOLE ON EXISTING STORM LINE FOR STORAGE TANK OVERFLOW.

SUT

5TH STREET

E STREET

HOL

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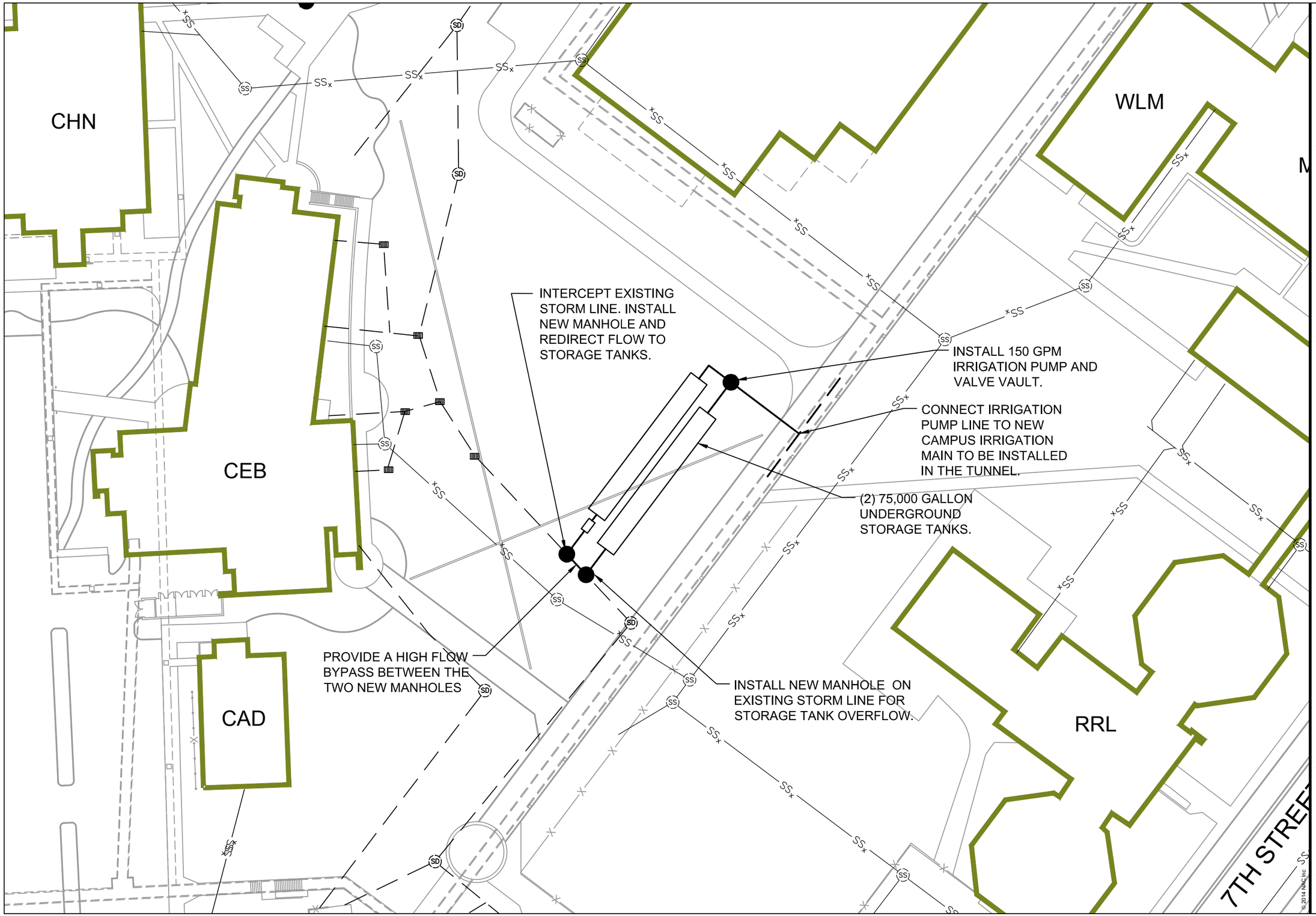

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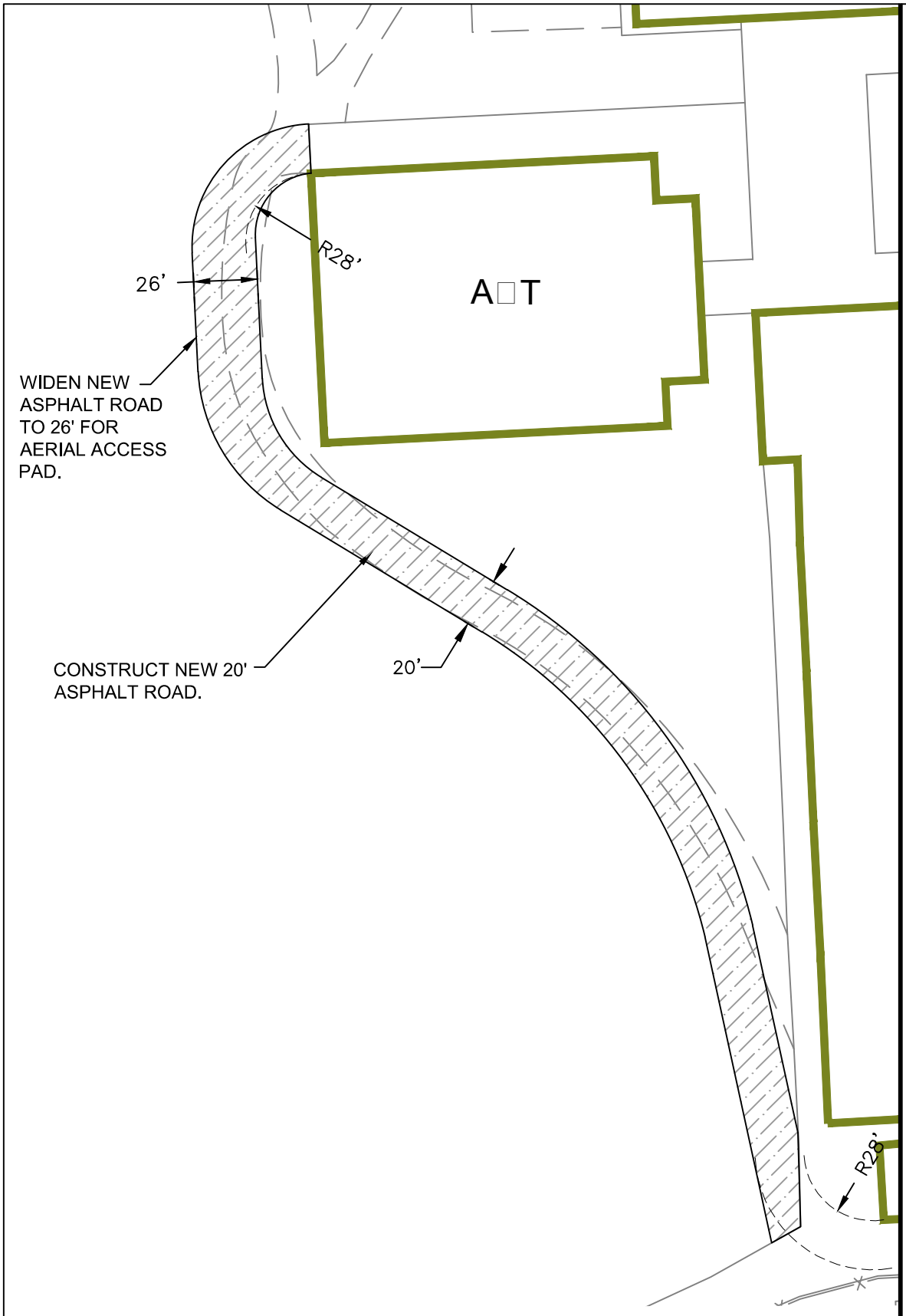

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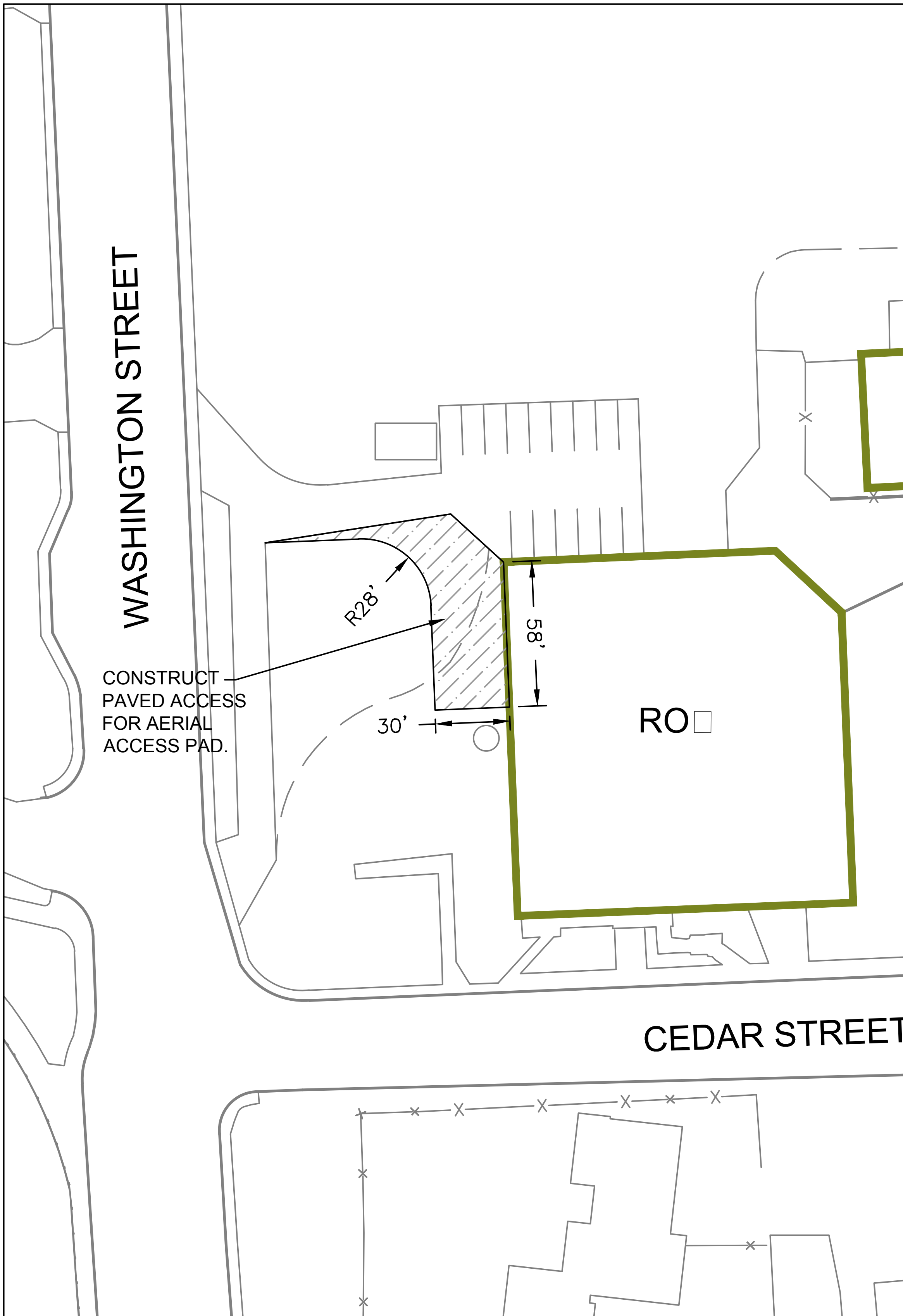

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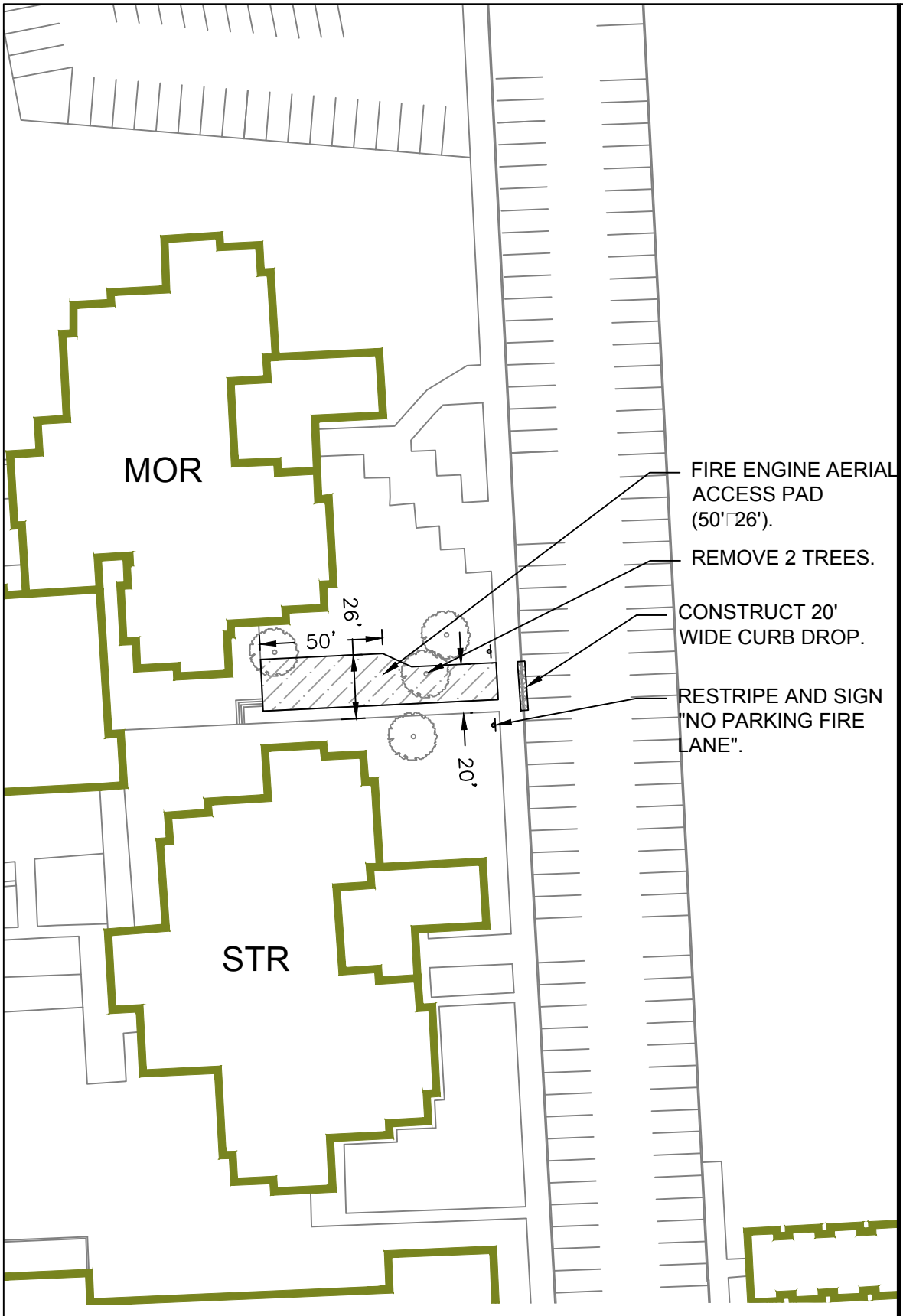

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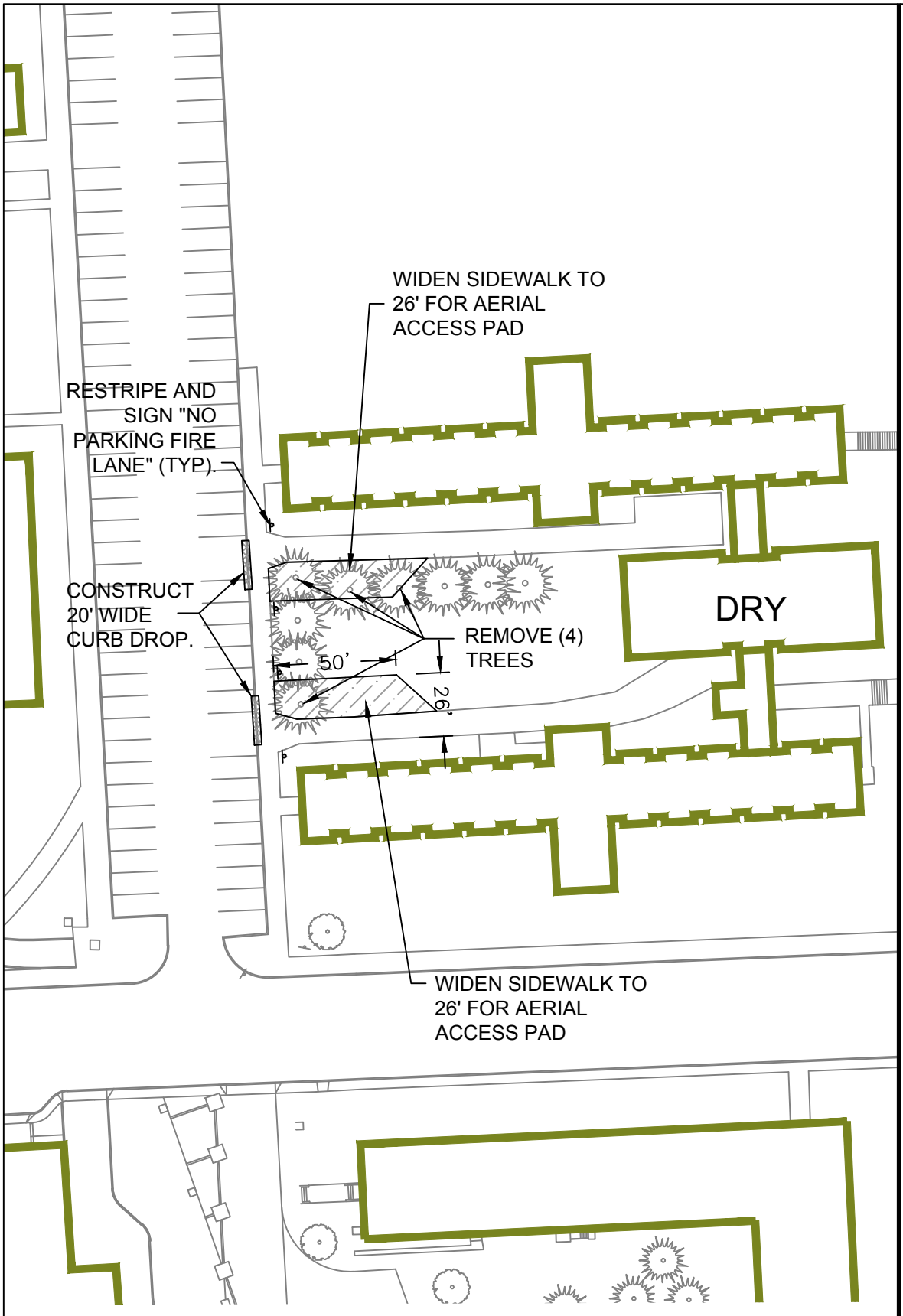

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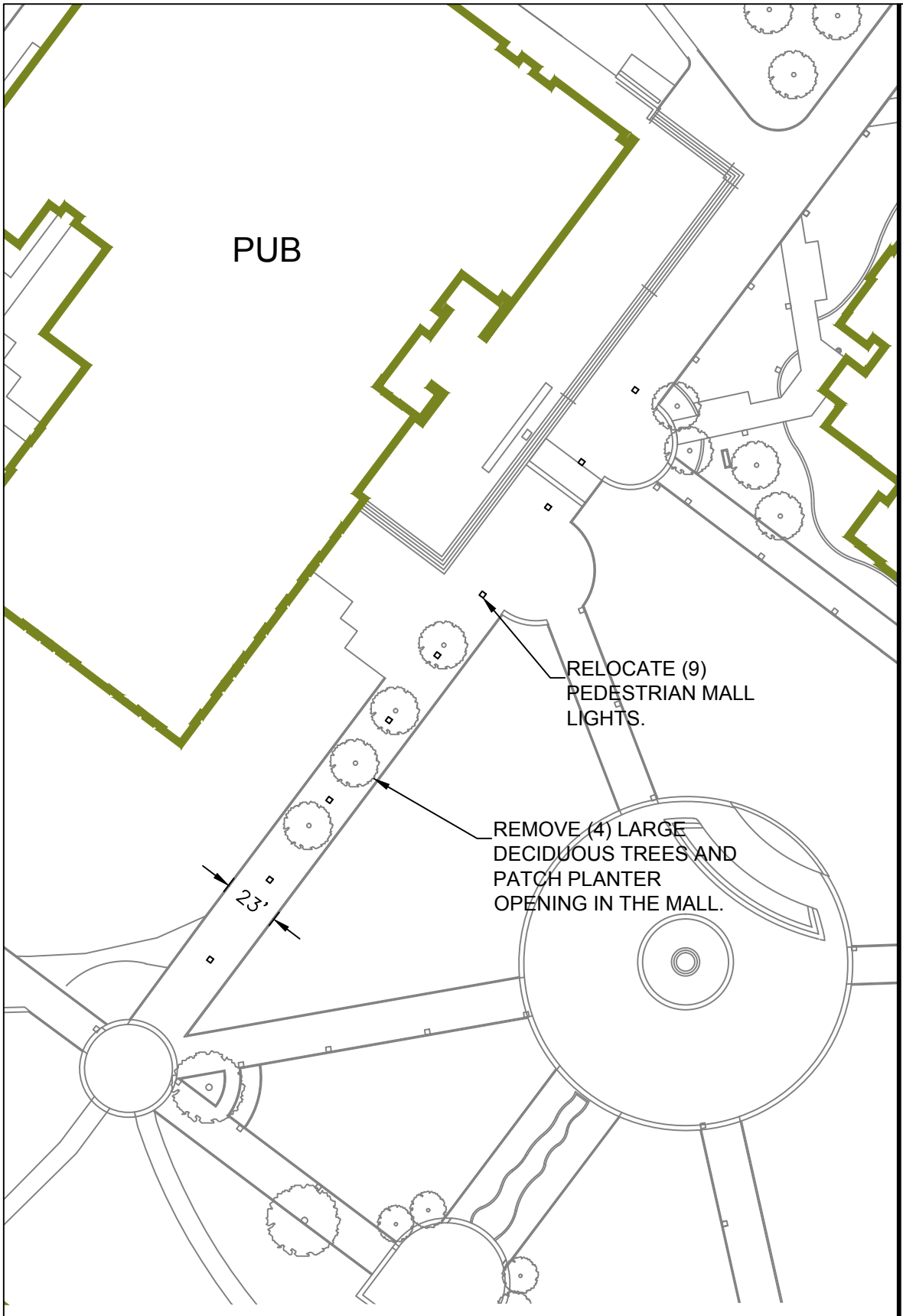

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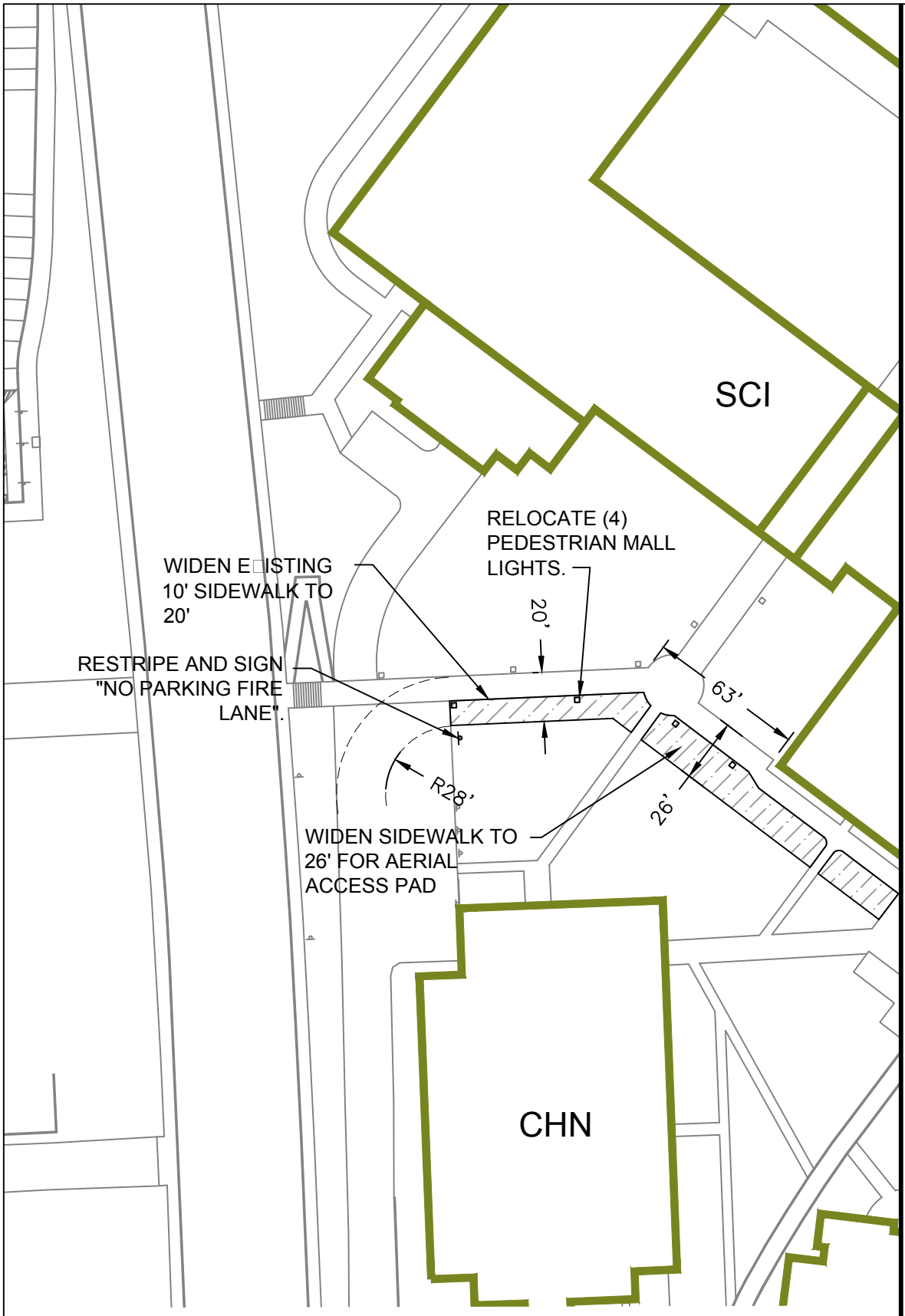

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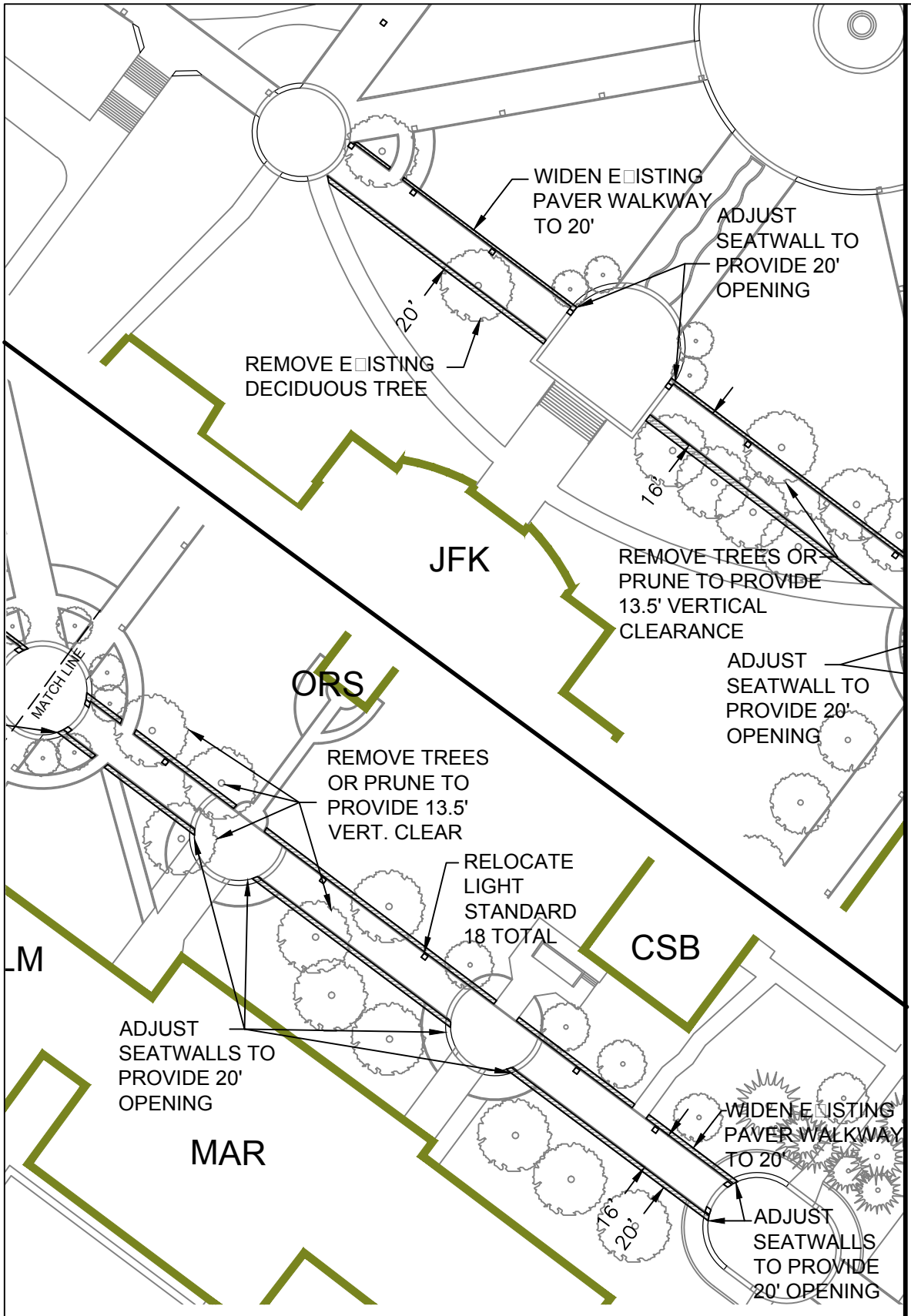

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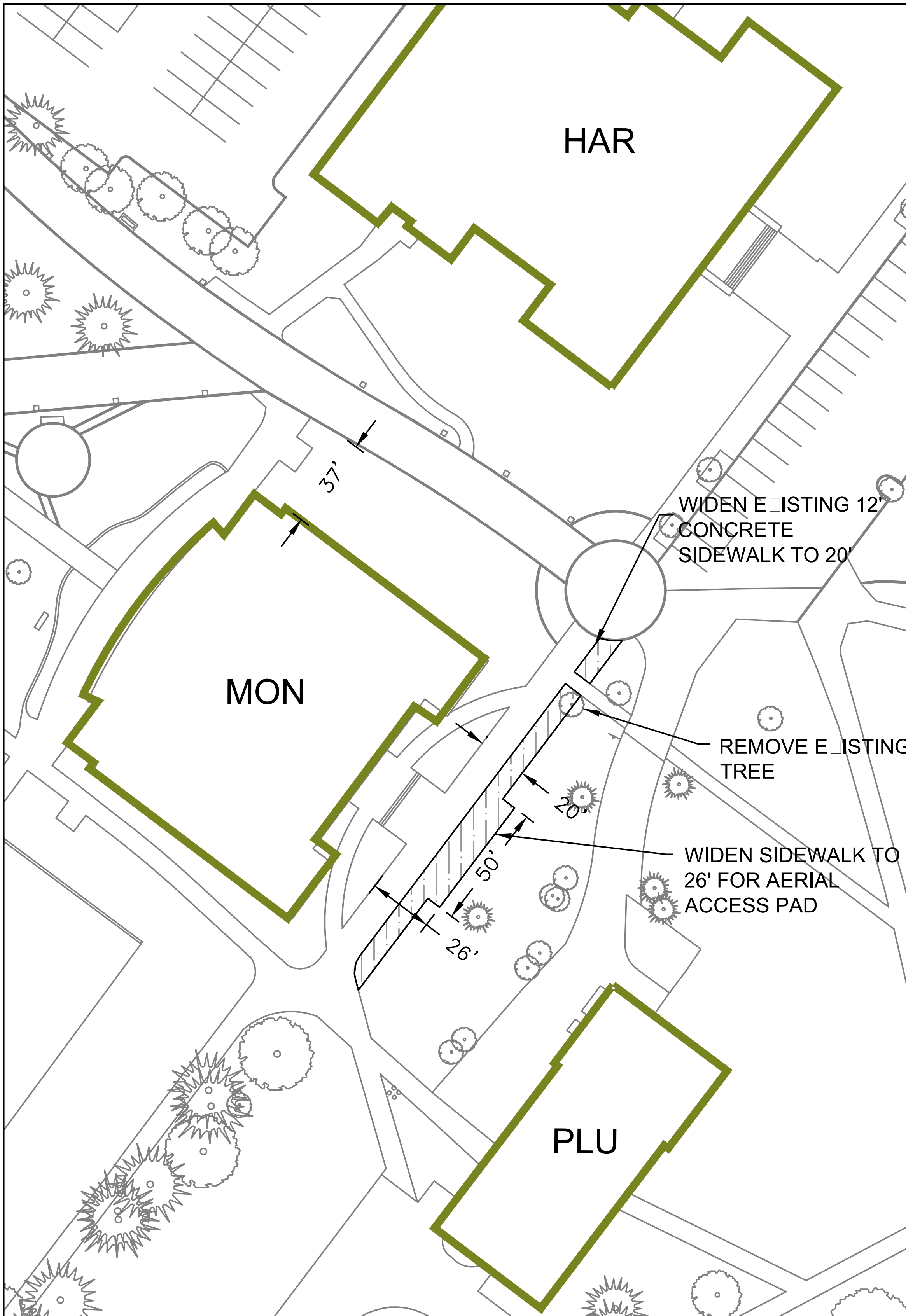

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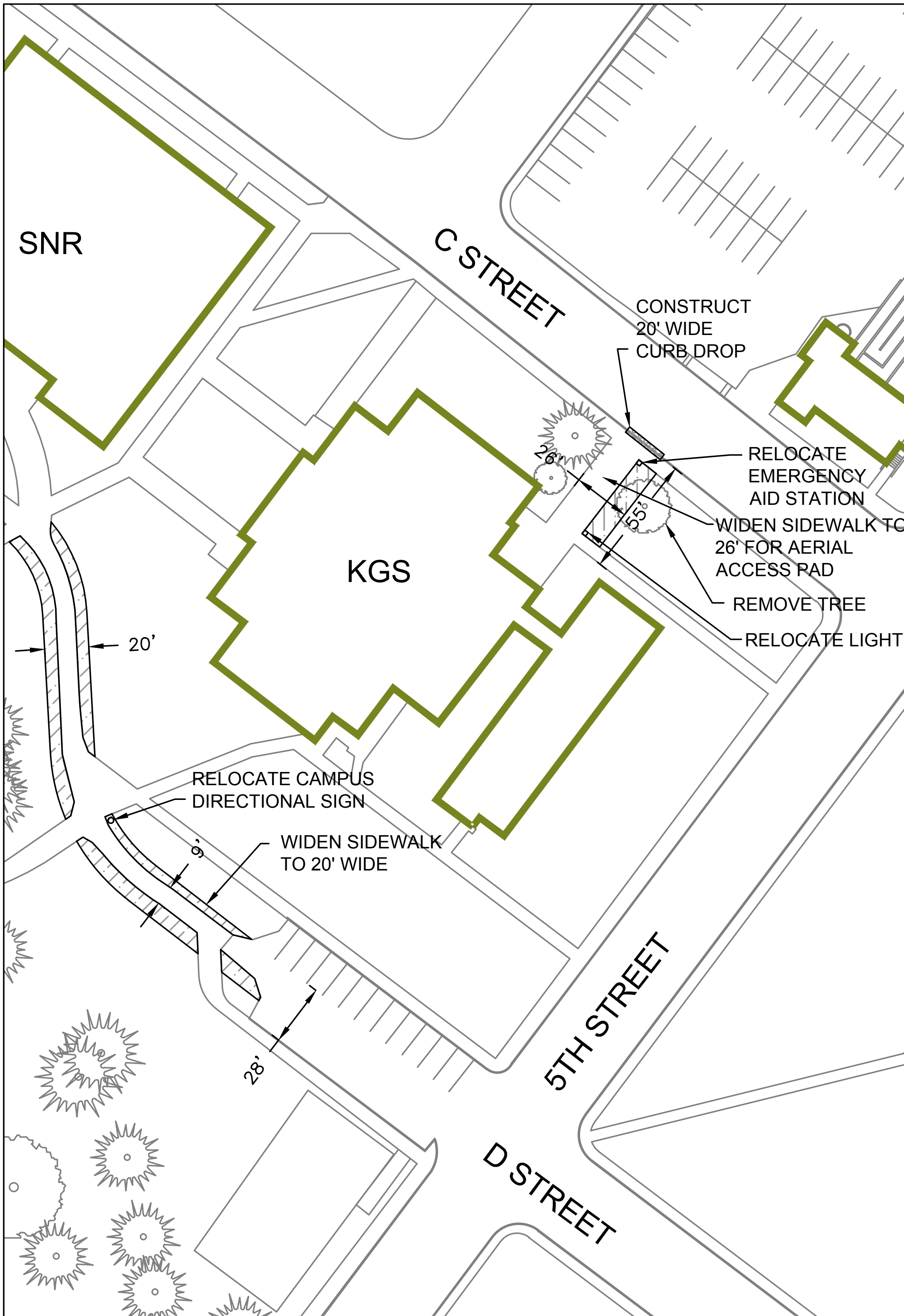

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CAMPUS INFRASTRUCTURE RENEWAL PROJECT AE1368

CHENEY, WASHINGTON

NAC NO	111-13508
FILE	
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CHECKED	KMG
DATE	07-31-2014

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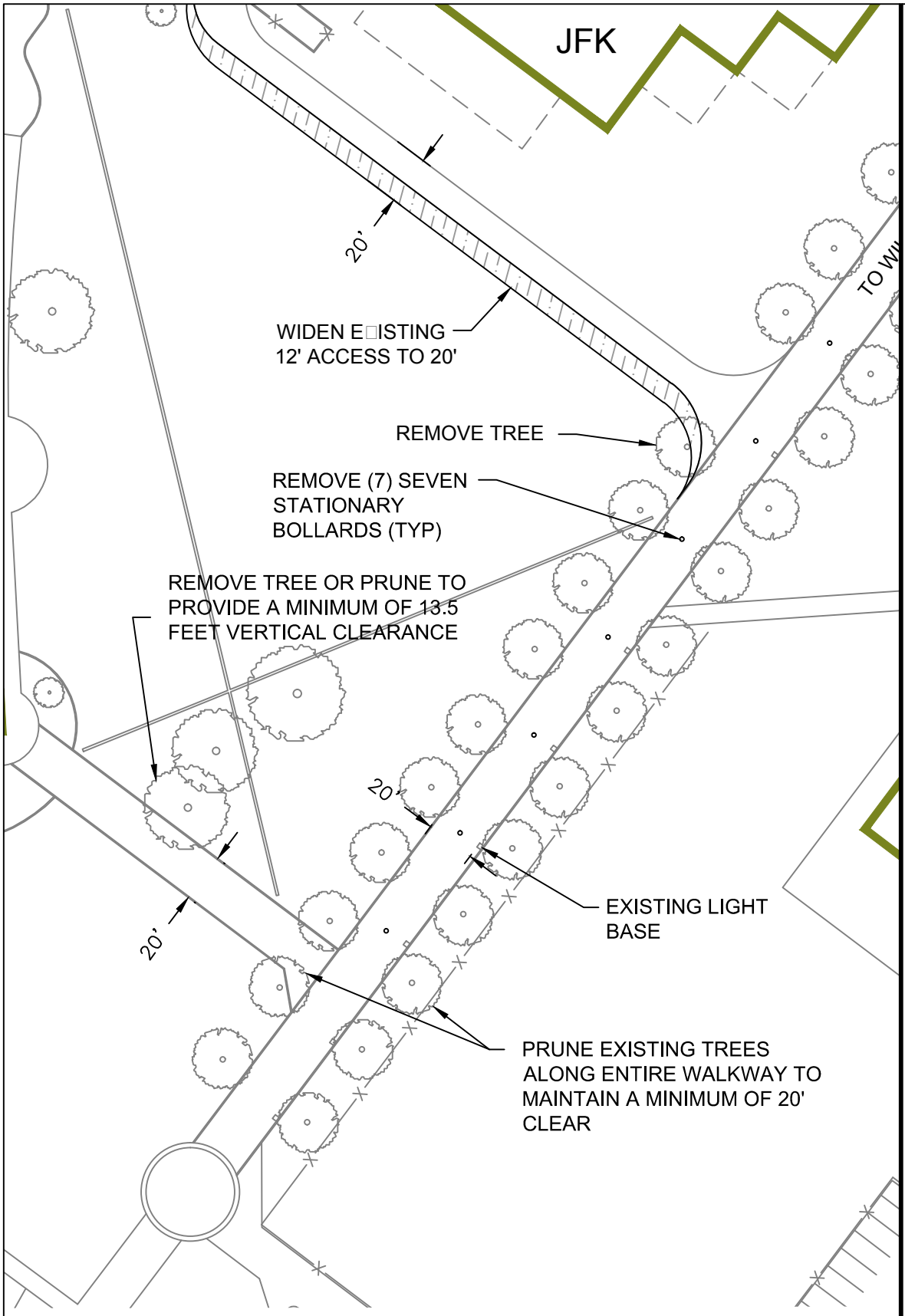

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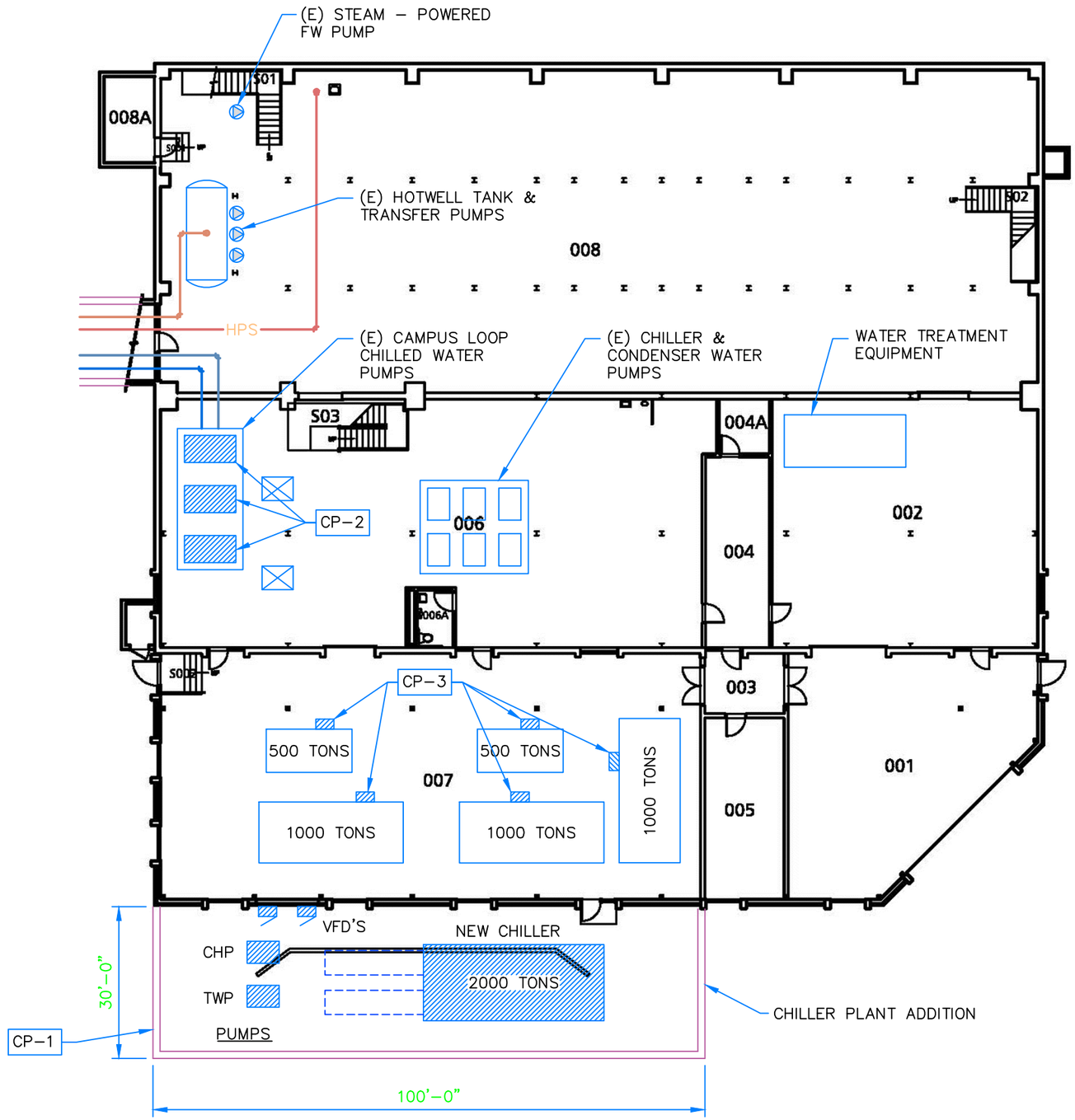
CAPITAL MASTER PLAN PROJECTS

CP–1: ADD CHILLER CAPACITY (2000 TONS)

CP–2: UPGRADE CAMPUS CHILLED WATER PUMPS

MAINTENANCE/ENERGY EFFICIENCY PROJECTS

CP–3: INSTALL VFD'S ON CHILLER COMPRESSORS & COOLING TOWERS



STEAM PLANT □ CHILLER PLANT PROJECTS
EWU - RO□ELL CENTRAL PLANT - LOWER LEVEL

N

Scale: NTS

STEAM PLANT □ CHILLER PLANT PROJECTS

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SP□CP

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STEAM PLANT □ CHILLER PLANT PROJECTS

CAPITAL MASTER PLAN PROJECTS

SP–1: REPLACE BOILER #3

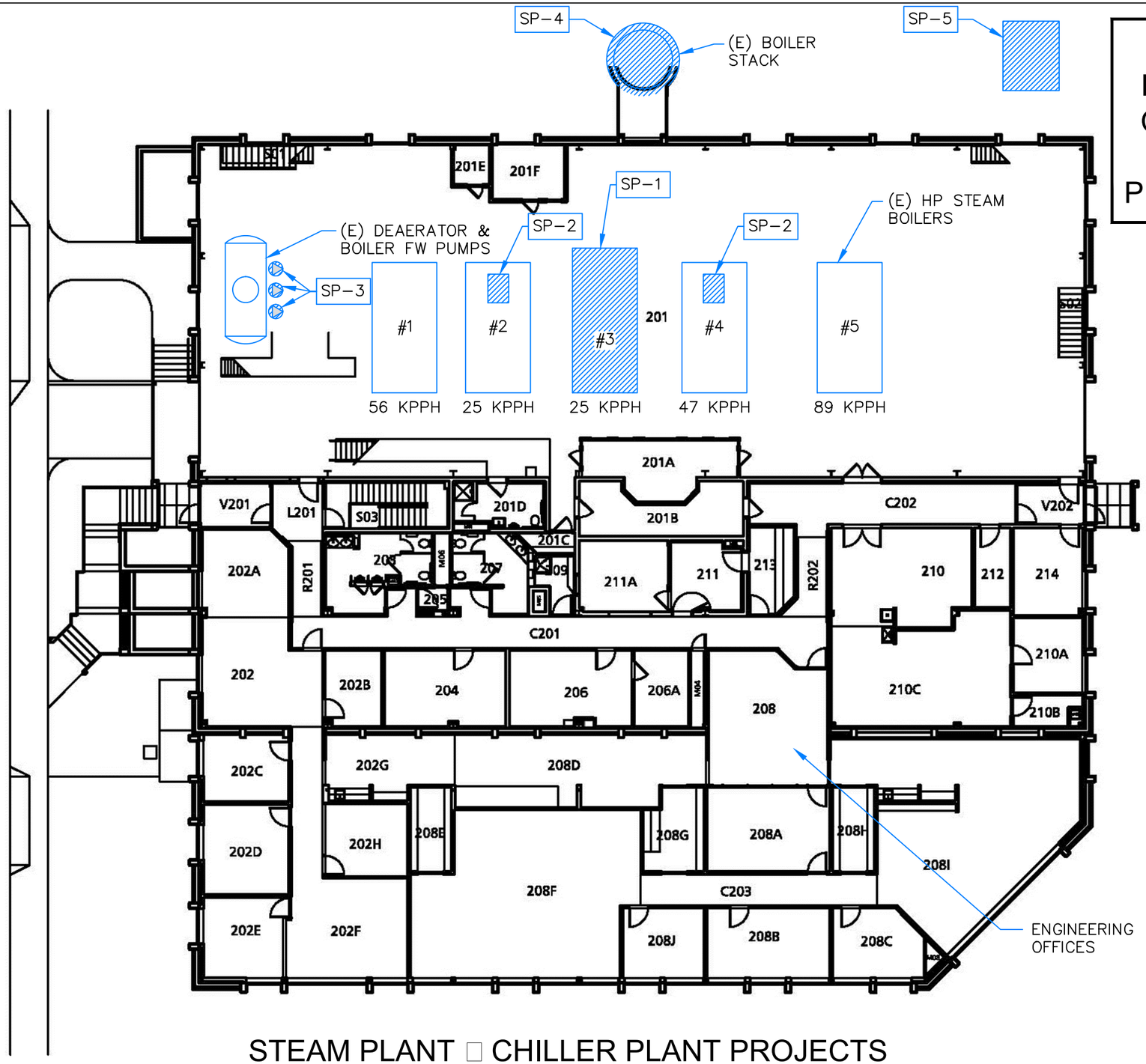
SP–3: UPGRADE BOILER FEEDWATER PUMPS

MAINTENANCE PROJECTS

SP–2: BOILER FEEDWATER STACK ECONOMIZERS

SP–4: REPAIR ROZELL HEATING PLANT BOILER STACK

SP–5: UPGRADE NATURAL GAS SERVICE



STEAM PLANT □ CHILLER PLANT PROJECTS
EWU - RO□ELL CENTRAL PLANT - MAIN FLOOR

N

Scale: NTS

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STEAM PLANT □ CHILLER PLANT PROJECTS

EWU - RO□ELL CENTRAL PLANT - ROOF

Scale: NTS

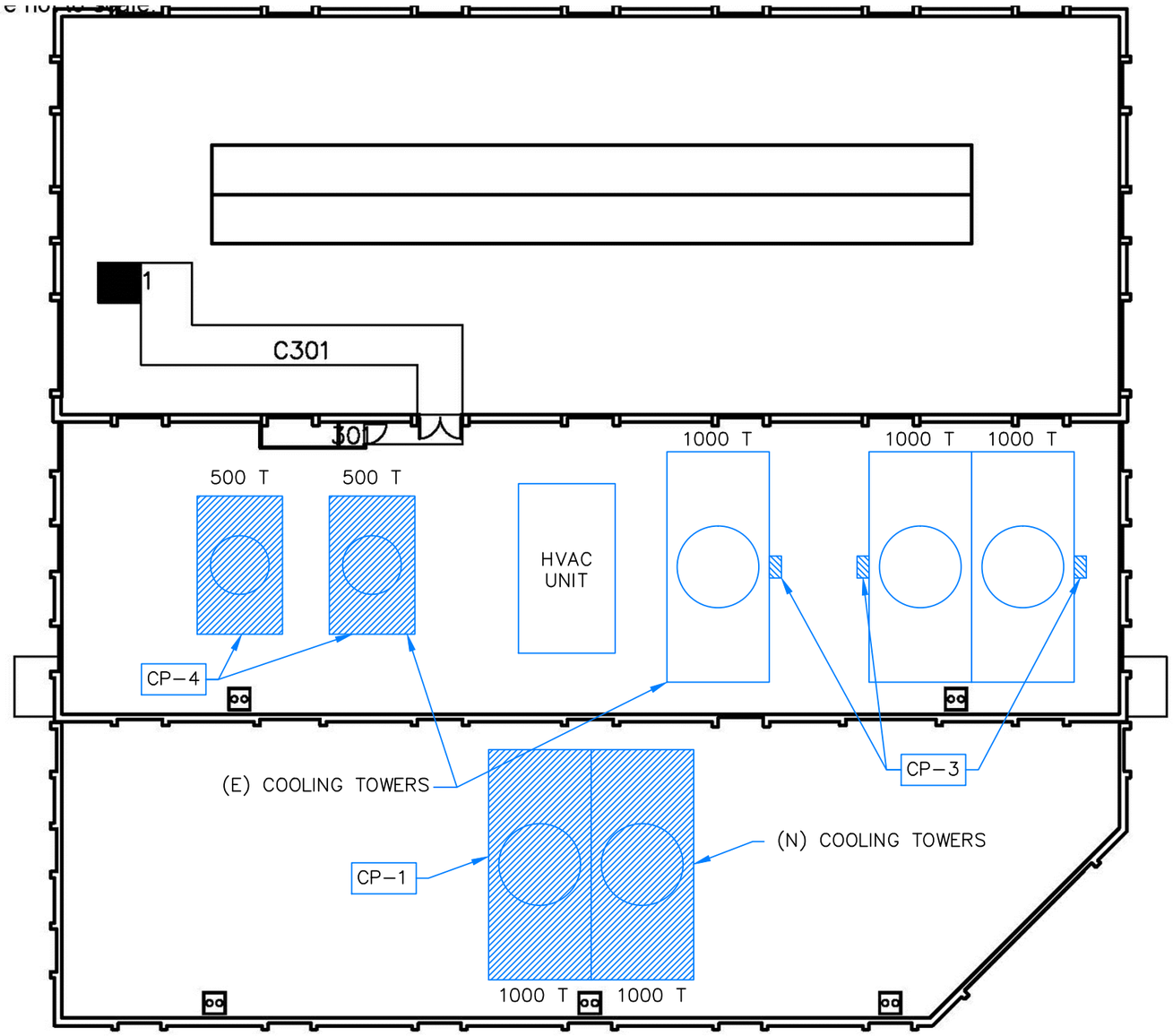
CAPITAL MASTER PLAN PROJECTS

CP–1: ADD CHILLER CAPACITY (2000 TONS)

MAINTENANCE/ENERGY EFFICIENCY PROJECTS

CP–3: INSTALL VFD'S ON CHILLER COMPRESSORS & COOLING TOWERS

CP–4: INSTALL (2) NEW ENERGY EFFICIENT COOLING TOWERS



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STEAM DISTRIBUTION PROJECTS

MAINTENANCE PROJECTS

SD-1: REPLACE UTILITY TUNNEL CONDENSATE PIPING

UTILITY TUNNEL

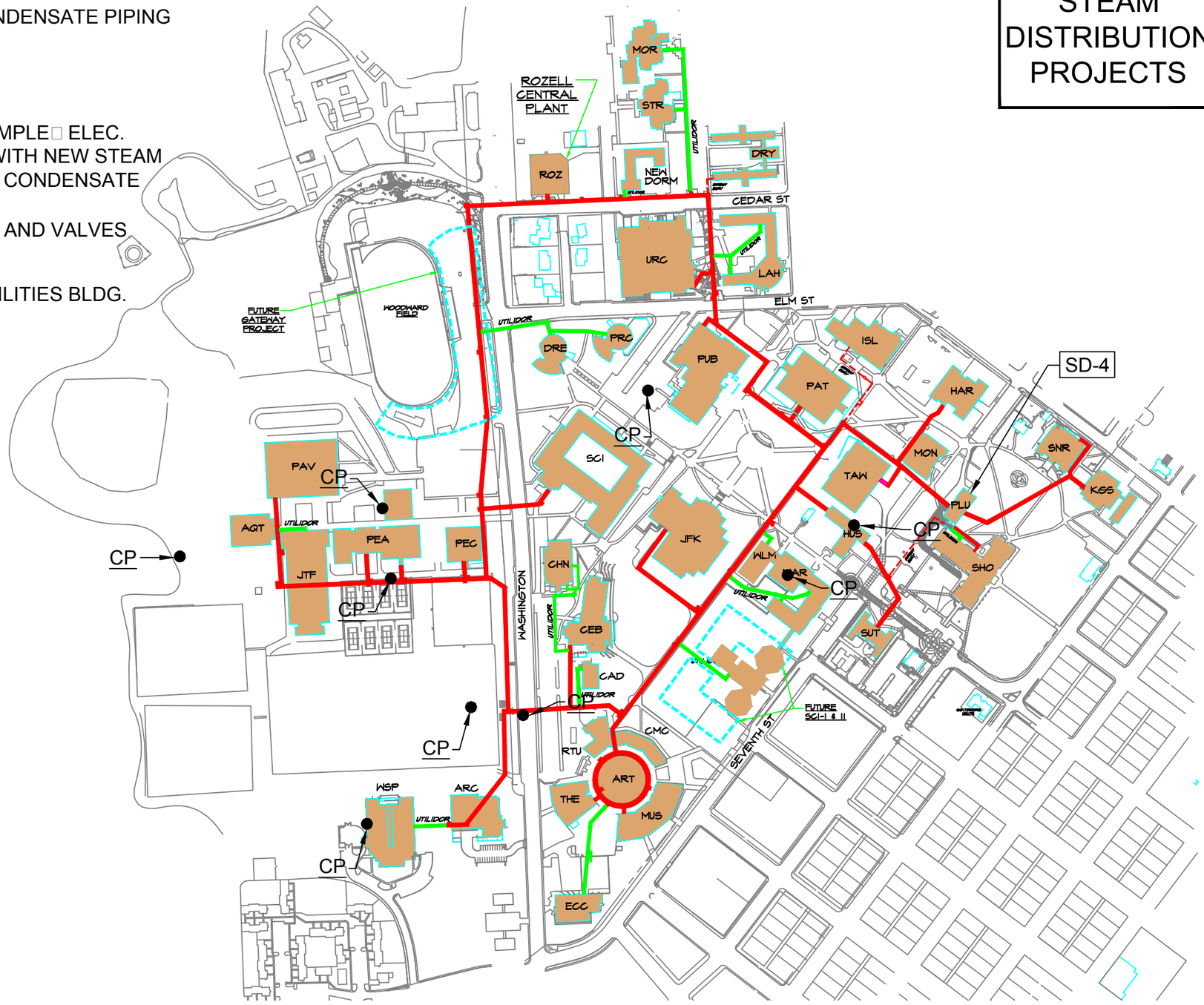
SD-2: CP

REPLACE E□ISTING SIMPLE□ ELEC. CONDENSATE PUMP WITH NEW STEAM PRESSURE POWERED CONDENSATE PUMPS

SD-3: LABEL UTILITY TUNNEL PIPING AND VALVES

UTILITY TUNNEL

SD-4: UPGRADE PIPING IN PLANT UTILITIES BLDG.



TUNNEL LEGEND

UTILITY TUNNEL

UTILIDOR

DIRECT BURIED PIPE

N

EWU - STEAM DISTRIBUTION PROJECTS

Scale: 1" = 400'

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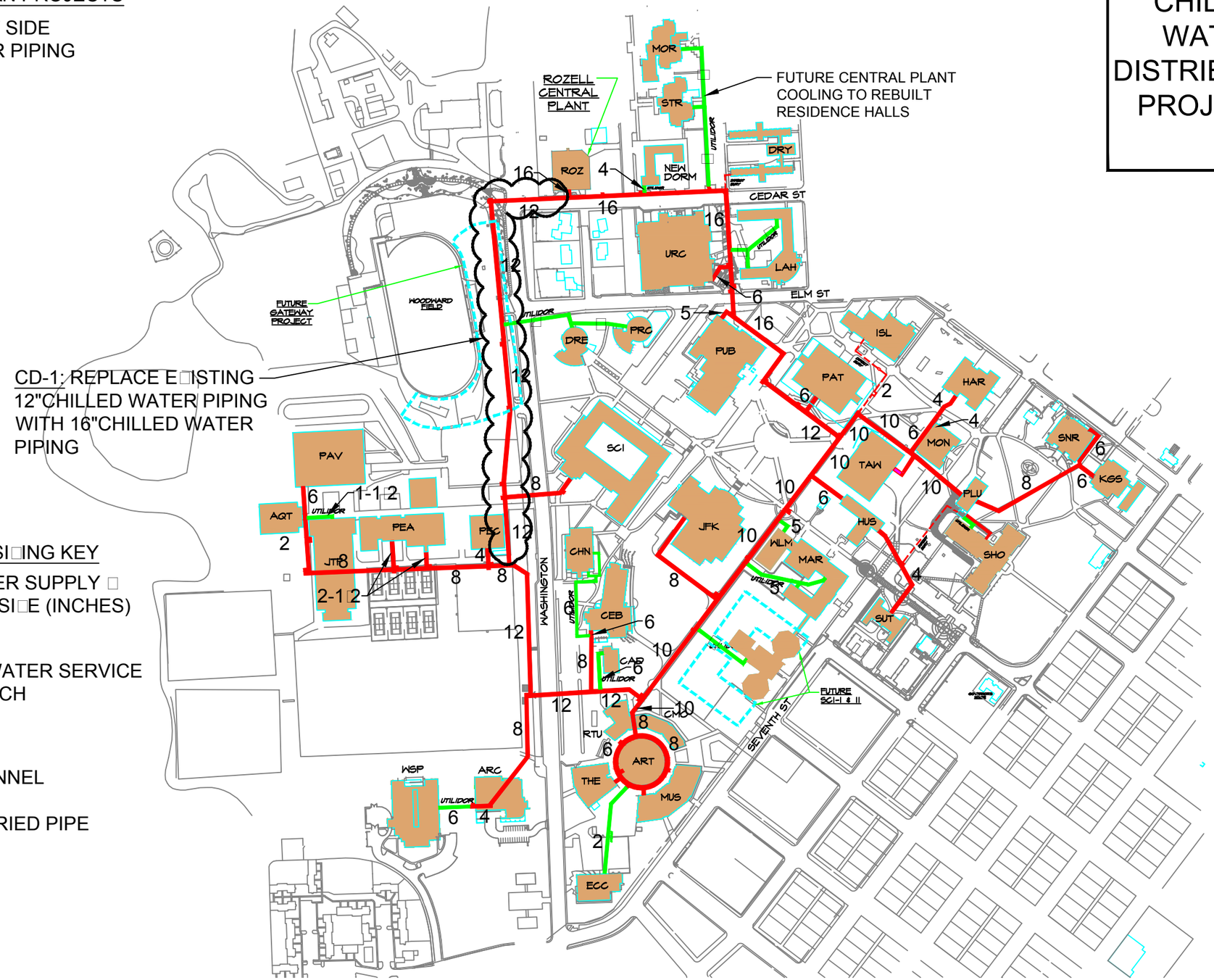
CAPITAL MASTER PLAN PROJECTS

CD-1: REPLACE WEST SIDE CHILLED WATER PIPING

CHILLED WATER DISTRIBUTION PROJECTS



CHILLED WATER PIPE SIZING KEY

12 ← CHILLED WATER SUPPLY & RETURN PIPE SIZE (INCHES)

NO CHILLED WATER SERVICE TO THIS BRANCH

TUNNEL LEGEND

- UTILITY TUNNEL
- UTILIDOR
- DIRECT BURIED PIPE

N

EWU - CHILLED WATER DISTRIBUTION PROJECTS

Scale: 1" = 400'

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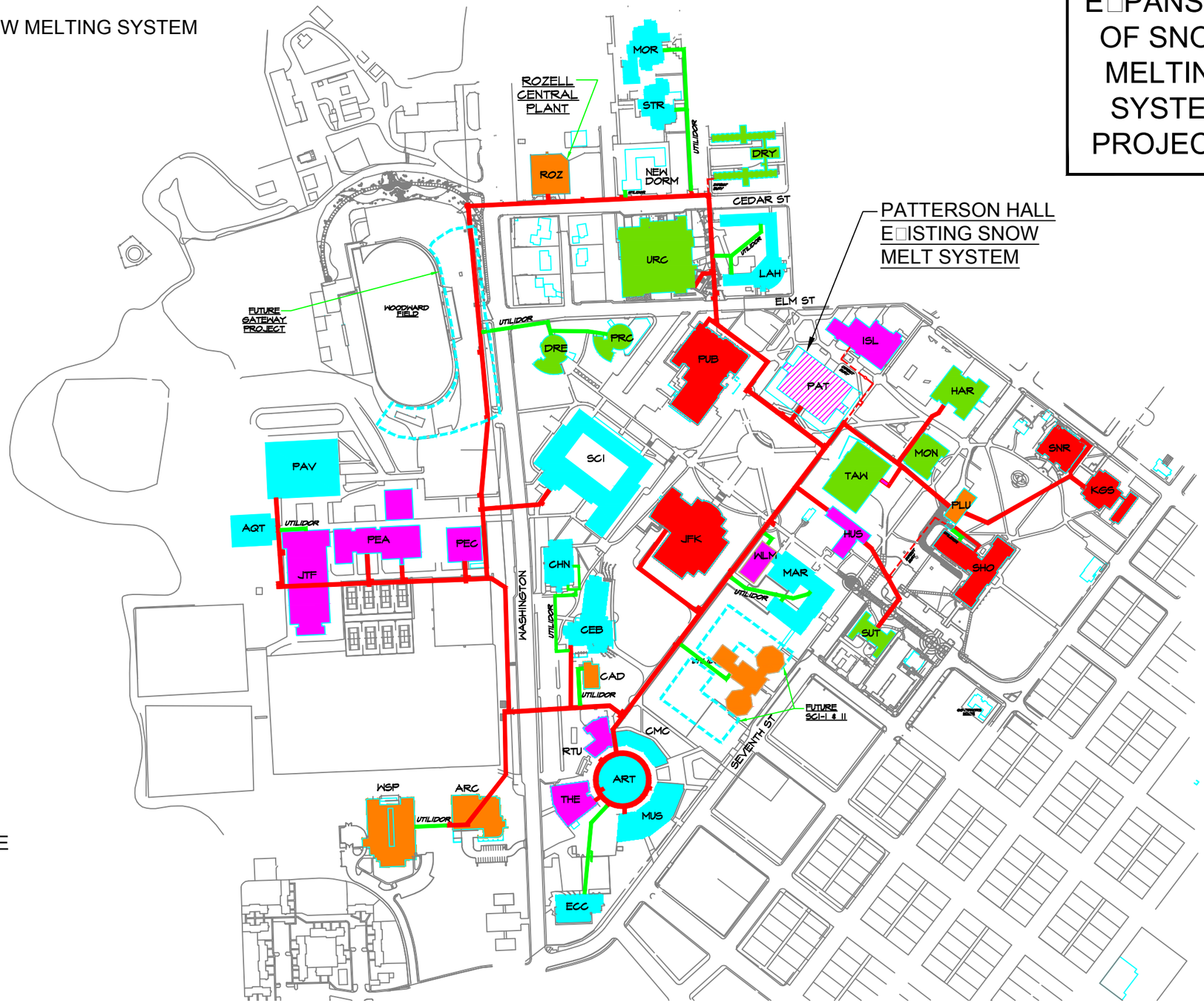
CAPITAL MASTER PLAN PROJECTS

SN-1 TO 5: E□PANSION OF SNOW MELTING SYSTEM
- 5 PHASES

KEY

- PHASE - 1
- PHASE - 2
- PHASE - 3
- PHASE - 4
- PHASE - 5

E□PANSION OF SNOW MELTING SYSTEM PROJECTS



TUNNEL LEGEND

- UTILITY TUNNEL
- UTILIDOR
- DIRECT BURIED PIPE

N

EWU - E□PANSION OF SNOW MELTING SYSTEM PROJECTS

Scale: 1" = 400'

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EMERGENCY MANAGEMENT MIGRATE TO BACNET NETWORK PROJECTS

MAINTENANCE PROJECTS

EM-1: MIGRATE BAS NETWORK TO BACNET NETWORK

= STAEFA (PROPRIETARY)

MIGRATE LEGACY STAEFA BAS NETWORKS TO CAMPUS WIDE BACNET NETWORK

EMCS KEY

= ALERTON (BACNET)

= DELTA (BACNET)

= JCI (BACNET)

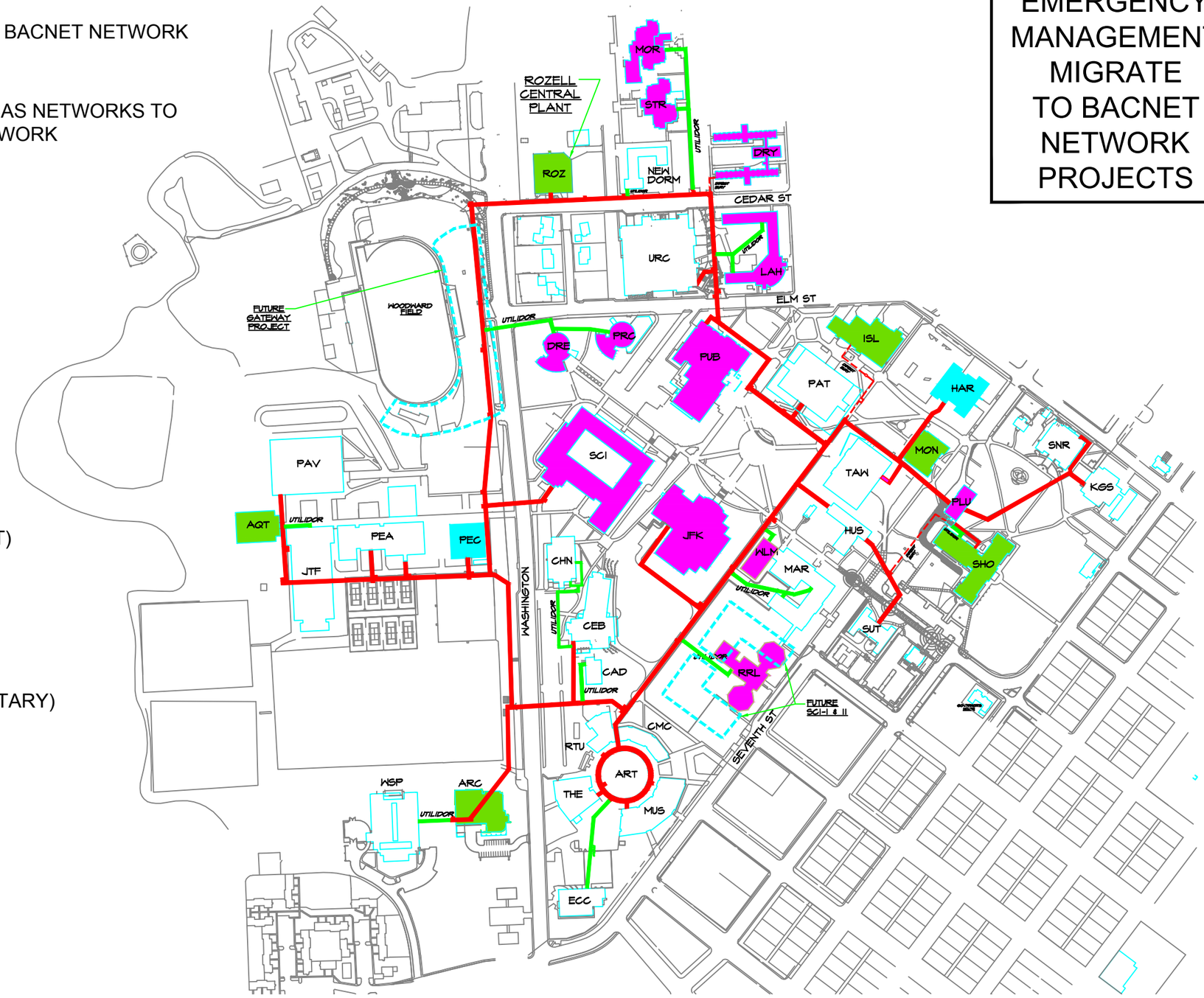
= STAEFA (PROPRIETARY)

TUNNEL LEGEND

UTILITY TUNNEL

UTILIDOR

DIRECT BURIED PIPE



N

EWU - ENERGY MANAGEMENT MIGRATE TO BACNET NETWORK PROJECTS

Scale: 1" = 400'

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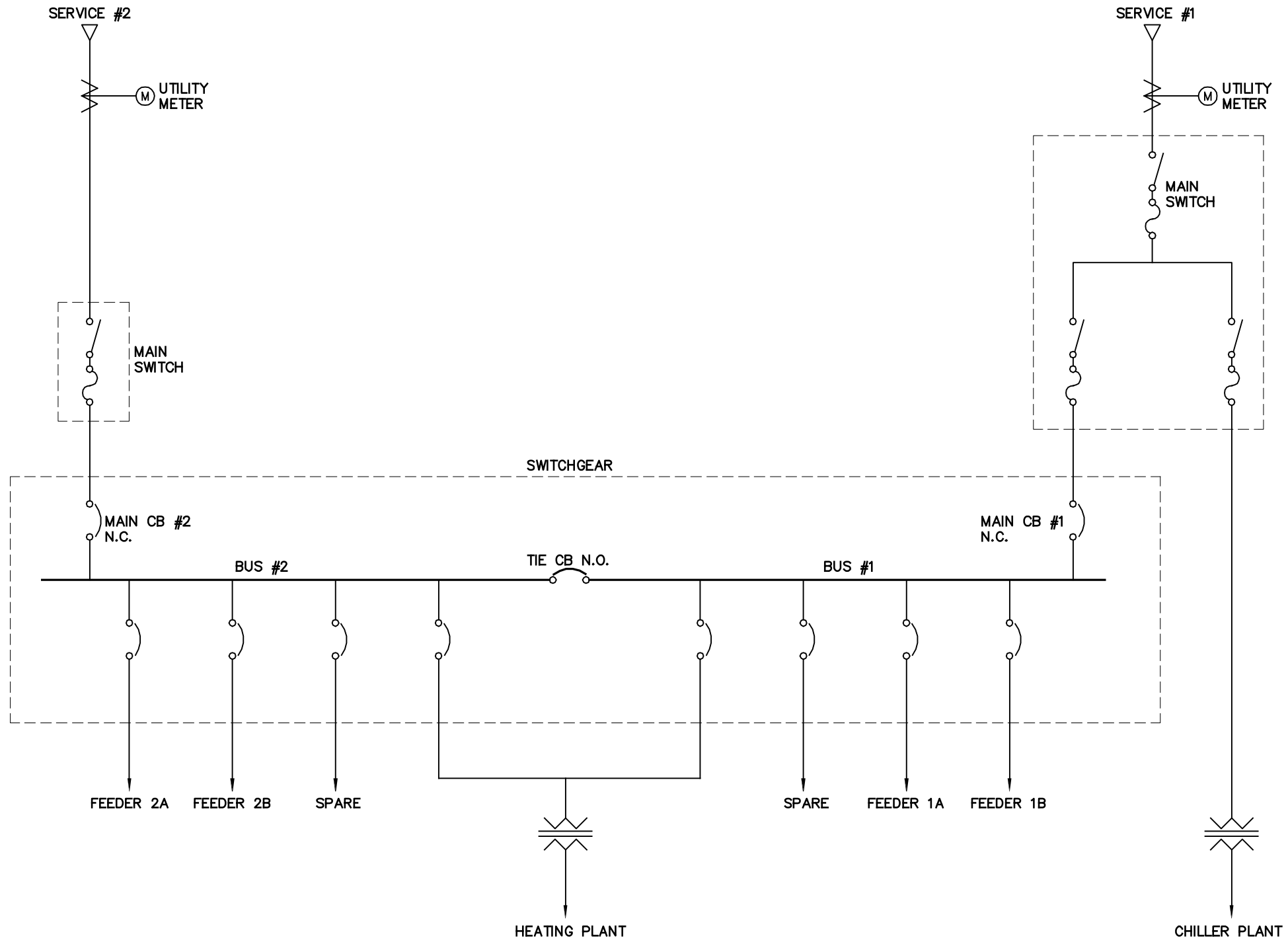

SIMPLIFIED EXISTING MEDIUM - VOLTAGE DIAGRAM

NO SCALE

111–13508

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EL-4

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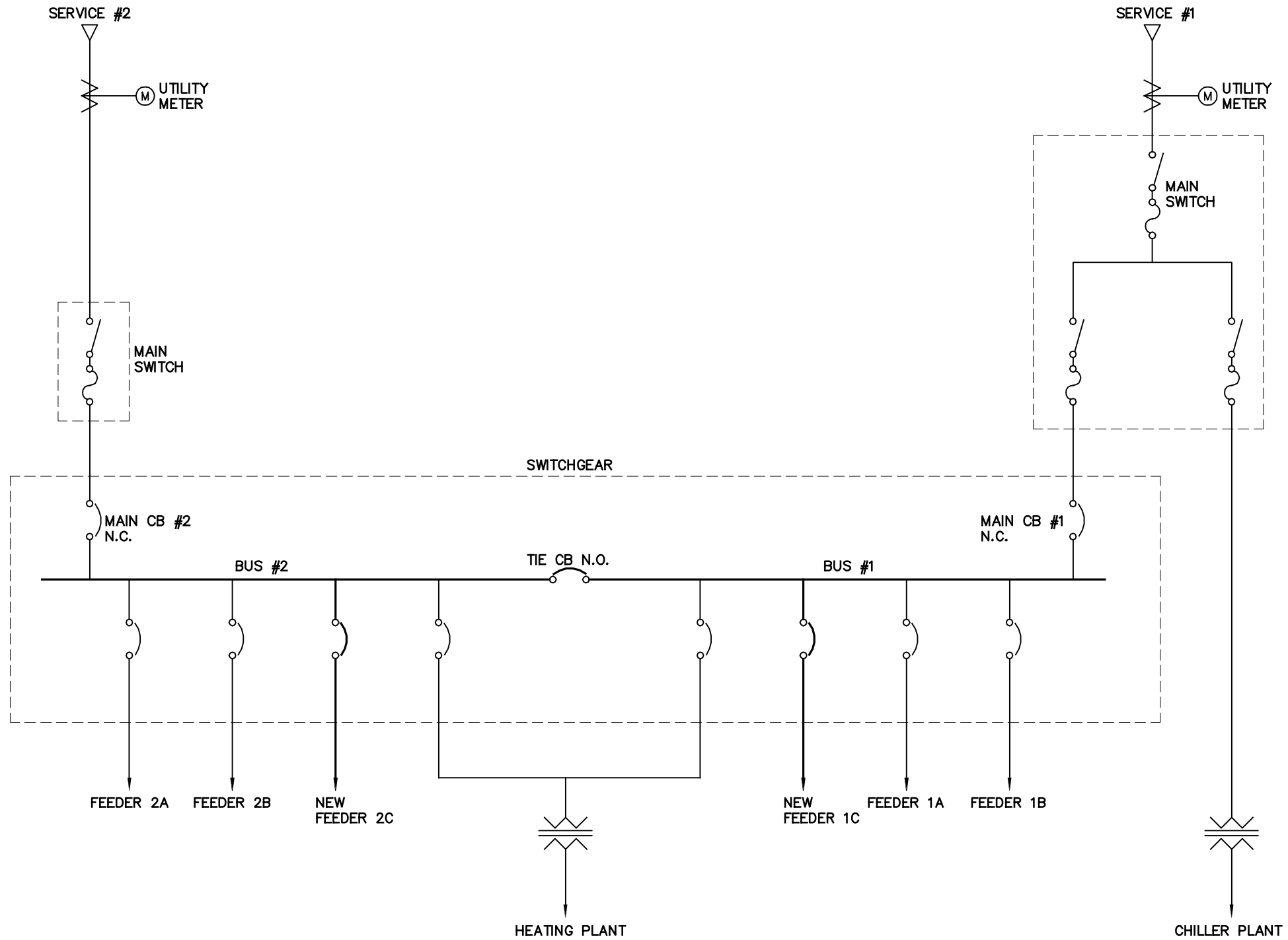

REVISED MEDIUM - VOLTAGE DIAGRAM

NO SCALE

111–13508

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EL-4

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APPENDICIES

Mechanical Systems Overview:

In general the campus infrastructure mechanical systems; campus steam, campus chilled water, and campus-wide EMCS, are in good condition and have been very well maintained over the years. Despite an age of over 40 years, the majority of the campus steam and chilled water distribution systems were installed in the early 1970s, the piping is holding up well and ongoing maintenance and valve/expansion joint replacements, have help to extend the life expectancy well in to the future.

Expected campus growth in new facilities and modernizations will have the biggest impact on the existing mechanical system infrastructure.

Steam Systems:

Overall the existing Central Campus Steam Plant is in good condition, and has been very well maintained, despite running with several boilers that are over 40 years old. Basically the steam plant, and has sufficient capacity to handle the anticipated steam loads for the 10 year master plan growth, but due to one boiler being out of service, redundancy is limited. Several projects have been identified below to provide some added plant reliability/capacity, and to increase system efficiencies.

The existing Central Campus Steam Plant has sufficient spare capacity to handle expected future loads, however, the presence of an aging and broken down boiler somewhat limits the plant's spare capacity and operational flexibility. The high pressure steam distribution piping is mostly run to the campus buildings in a underground tunnel system, which is generally well configured to handle future building connections, and has the advantage of being looped, in order to allow for back-feeding the campus to avoid outages for maintenance or new tie-ins. A computerized flow model of the campus steam network, that was prepared as part of this analysis, indicates that the existing steam supply piping is adequately sized to handle expected future growth. The gravity steam condensate piping system within the utility tunnel network is nearing the end of its life expectancy and is a candidate for replacement.

Overall the existing Campus Steam Distribution System is in good condition, and has been very well maintained; despite piping that is mostly over 40 years old. Assuming that the existing distribution system piping, valves, and insulation jacketing is maintained as well in the future, the system should have a life expectancy of at least 15 to 25 more years.

A computerized flow model of the campus steam network, that was prepared as part of this analysis, indicates that the existing steam supply piping is adequately sized to handle expected future growth. Several projects have been identified below to provide ongoing piping system reliability in to the future.

Chilled Water Systems:

A review of the existing Central Campus Chiller Plant indicates that allowances for future campus growth, as well as the plan to modernize and add air conditioning to the several residence halls, will exceed the chiller plant's present capacity. Because of this expected campus growth, the chiller plant will need to be expanded in order to handle the future cooling needs of the campus. Along with an expansion of the central chiller plant, the computerized network flow model indicates that certain portions of the existing chilled water distribution piping will need to be upsized. The chilled water piping is generally run in the same utility tunnel system as the steam piping, and is also looped in a similar manner. A section of the chilled water piping run along Washington Street, coming from the Rozell Plant, will need to be upsized, in order to handle the increased chilled water flow demands that will be generated by the addition of the proposed new Gateway Center and renovated/new residence halls.

Overall the existing Central Campus Chiller Plant is in good condition, and has been very well maintained, similar to the steam plant equipment. The chiller plant underwent a major expansion in the mid 1990's and as a result the equipment is generally newer than much of the older steam plant equipment. An analysis of the steam plant capacity and past load history indicates that, unlike the steam plant, the existing chiller plant will not have sufficient spare capacity to handle the anticipated new cooling loads for the 10 year master plan growth. As such, several projects have been identified below to

provide added chiller plant cooling capacity, reliability and to increase system efficiencies.

Similar to the steam system, the existing Campus Steam Distribution System is in good condition, and has been very well maintained; despite piping that is mostly over 40 years old. Assuming that the existing distribution system piping, valves, and insulation jacketing is maintained as well in the future, the system should have a life expectancy of at least 15 to 25 more years.

A computerized flow model of the campus chilled water distribution system, that was prepared as part of this analysis, indicates that most of the existing chilled water system piping is adequately sized to handle expected future campus growth and added chilled water production capacity. However, a portion of the existing 12" East-side (Washington street) loop piping will reach the limits of good engineering practice for peak flow/velocities, as the future Gateway and upgraded residence hall cooling projects come on line. Several projects have been identified below to provide ongoing piping system reliability in to the future.

Campus EMCS Network:

The existing campus-wide Energy Management and Control System (EMCS) network ties together the various individual Building Automation Systems (BAS) of the campus academic buildings and residence halls, and delivers the information to the HVAC Control Center located in Rozell Central Plant. Operators in Rozell utilize two (2) head-end PC workstations to monitor critical functions and alarms generated by the individual building BAS systems. The campus maintenance staff responds as necessary for repairs or adjustments in order to keep campus HVAC systems operating properly and efficiency.

The existing campus EMCS network basically consists of two parallel network trunk lines that are routed through the utility tunnel system. The newer EMCS network resides on a CAT 6 Ethernet fiber-optic cable, that connects the more recently installed BAS systems, to the shared PC workstation in Rozell. This newer network communicates via

BACnet IP to the majority of campus buildings that have either Alerton, Delta or Johnson Controls Inc. (JCI) BAS systems installed. This newer network and BACnet communication protocol is in good condition and is considered operating well.

The second, older, legacy network, is a proprietary trunk that serves many of the older buildings that are controlled by Staefa BAS devices. This legacy trunk line consists of a shielded/twisted pair that is daisy-chained from building to building, on the way to the PC workstation head-end in located Rozell. At Rozell the operator workstation consist of a second dedicated PC running an antiquated proprietary Staefa monitoring software package. This system is basically obsolete and no longer supported. If this legacy system fails or the network trunk is damaged, EWU staff would have no way to repair it or remotely monitor the twelve or so legacy Staefa BAS systems on campus. Control monitoring and reaction would be then be lost and would default to the old phone call complaint system. In order to provide for a more stable, and single network architecture, EMCS system in the future as the campus grows, it is highly desirable that the legacy Staefa EMCS network be replaced and the affected building BAS systems migrated to the current BACnet fiber-optic network, with a single head-end in the Rozell Plant. A series of projects are proposed to upgrade the old legacy Staefa building control systems in order to migrate the entire campus network to become a BACnet based system.

Snowmelt Systems:

Presently the existing campus has only one active snowmelt system in service at the recently renovated Patterson Hall. During the past winter this system was operational during several snowfall events and proved to be both effective in terms of eliminating manual snow removal efforts, as well as a positive experience for the students and staff as they transited to and from the building. This system has set the bar for expectations for future campus growth and modernization.

Electrical System Description

The campus medium-voltage distribution system operates at 13,200Y/7620-VAC. The system is fed by the City of Cheney from two separate utility feeders. Both feeders enter the campus system in the switchgear building located north of the Rozell Heating Plant. The service equipment is a double-ended, metal-clad switchgear lineup with a tie-breaker which allows either utility feeder to serve the entire switchgear. Normally, the switchgear is operated with the tie-breaker open and each utility feeder carries a portion of the campus load. The pad-mounted transformer serving the Rozell Heating Plant may be fed from either side of the switchgear. This feature allows the Heating Plant to maintain operation in the event one of the utility company feeders is de-energized. The load is not evenly balanced between the two utility feeders. The feeder that normally includes the heating plant, as well as the Rozell Chiller Plant, had a high demand of 239-amperes in September, 2012. The other utility feeder had a high demand of 148-ampers in January, 2014. Overcurrent protection between each of the two utility feeders and the two sections of the switchgear is rated 540-amperes.

The portion of the distribution system between the switchgear and the campus buildings consists of two separate sets of parallel feeders both of which are rated 220-amperes. The parallel feeders terminate on vacuum switches. Each vacuum switch has two inputs and two outputs and allows both outputs to be connected to one of the two inputs. Typically, the outputs are connected to pad-mounted transformers serving individual buildings. The switches contain sulfur hexafluoride (SF_6) gas as an insulator. According to the Intergovernmental Panel on Climate Change, SF_6 is a very potent greenhouse gas with a global warming potential many times that of carbon dioxide (CO_2). As such, there is potential for use of the gas to be limited or prohibited in the future. Occasionally, it is necessary for EWU's Electric Shop to add SF_6 to some switches in order to maintain the recommended pressure.

<u>Electrical Service Loads</u>

Electrical Service #1 recorded a high demand of 5,181-kW on September, 2012. Assuming 95% power factor, this equates to a system load of 5,454-kVA or 239-amperes. This value represents 45% of the rated capacity of the service conductors.

Electrical Service #2 recorded a high demand of 3,200-kW on January, 2014. Assuming 95% power factor, this equates to a system load of 3,369-kVA or 148-amperes. This value represents 28% of the rated capacity of the service conductors.

If the two service loads are combined, the current high demand is expected to be less than the arithmetic sum of the high demands since the peaks occur at different times. However, summing the measured loads is a good starting point for determining the current design load for the abnormal situation when the entire campus is fed from a single service. Combined, the two high demands represent 73% of the rated capacity of the service conductors at each service point.

The load for Electrical Service #1 includes the Chiller Plant. Adjusting the demand data for the Chiller Plan shows that the electrical service load on the half of the switchgear fed from Electrical Service #1 is 3,192-kVA which is comparable to the load on Electrical Service #2. This indicates that the two halves of the service switchgear would be evenly loaded were it not for the chiller load.

The Compressive Campus Master Plan projects a 22% growth of academic building area by the year 2023. The Plan also projects a 28% increase in the amount off beds for student housing. Extrapolating the existing demands by these increases, indicates the capacity of the two electrical services is sufficient for this 10-year period. The exception is the occasion in which the campus must be fed from a single service. For this situation, the size of either existing services would be marginal for serving the entire campus.

Electrical Feeder Loads

The medium-voltage distribution system serving the campus contains four (4) feeders designated as Feeder 1A, Feeder 2A, Feeder 1B and Feeder 2B. Feeders 1A and 1B are normally connected to Electrical Service #1. Feeders 2A and 2B are normally connected to Electrical Service #2. Each feeder has a rated capacity 220-amperes and is protected by its own circuit breaker in the service switchgear. High demand on each of the feeders has been recorded as follows:

Feeder 1A	1,458-kW/1,519-kVA – May, 2013
Feeder 1B	1,619-kW/1,704-kVA – November, 2013
Feeder 2A	1,737-kW/1,828-kVA – October, 2013

Feeder 2B 1,420-kW/1,543-kVA – January, 2013

The loads are fairly well balanced between the feeders. Feeder 2A, the feeder with the highest load, represents 37% of the feeder conductor capacity. Thus from a capacity standpoint, the existing feeders are capable of supplying the growth projected for the next 10-years as long as that load is uniformly distributed across the feeders. The Science I and Science II projects will likely connect to Feeders 1A and 2A and may result in a wider variation of loads across the four feeders. If necessary, it may be possible to mitigate this situation by reconnecting existing loads to different feeders.

Electrical Power Distribution

The campus electrical power distribution system is divided into two general areas each of which is served by one medium-voltage feeder from each of the two electrical services. Connections are provided by vacuum switches located mainly in the underground tunnel system. Each vacuum switch is capable of serving two buildings. Many switches are currently serving the maximum two buildings while a few switches have one spare connection point. When buildings are replaced with a new building, the existing vacuum switch can usually be used for the replacement building. For new buildings, a new connection point is required. It is conceivable that the existing distribution system may have sufficient capacity for project load increases but not have the necessary connection points. The vacuum switches have been problematic in the past in that it is difficult to maintain the required gas pressure levels within some switches. This condition has been resolved for the most part. However, the SF_6 gas required by the switches may become more expensive and less available as environmental regulations become more restrictive. The location of the switches presents a potential safety concern for EWU maintenance personnel. Working space around some switches is very limited and routes away from the switches are provided primarily by the tunnel system.

Non-campus System Loads

There are a number of campus facilities that are not connected to EWU's medium-voltage distribution system. These tend to be special facilities around the campus perimeter. The Family Housing complex in the southwest portion of the campus is one example. The buildings in this area are connected to the local utility's distribution system

and are not reflected in the demand loads included here in. The Anna Maria apartment complex is another example of a facility fed directly by the local utility. A couple of the projects included in the Comprehensive Campus Master Plan may be served in this manner due to their location on the campus periphery and the potential difficulty in extending underground facilities to the proposed locations. The construction of additional family housing and the addition of the Center for Alternate Energy and Sustainability are two such examples.