Primary Electrical Service and Distribution System Replacement Study

Performed at:
Wisconsin School for the Deaf
Delavan, WI

Performed for:
Mr. Rick Cibulka
Wisconsin Department of Administration
Division of Facilities Development
Madison, WI

DFD Project No. 16A2B

Performed by:

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LPA Project #8289

Date:
June 13, 2016

Introduction

This report is provided at the request of DFD to study the primary electrical service and distribution system at the Wisconsin School for the Deaf (WSOD), Delavan, Wisconsin. The study shall determine capacity, condition, reliability, and improvement options.

Background Information

All of the buildings at the facility, except the new Walker Hall, are served from a 12,470 volt primary electrical distribution system owned by WSOD. The new Walker Hall is served at secondary voltage from Alliant Energy.

The utility typically will only bring one type of service to a customer per their rules and regulations. A decision will need to be made to continue with a customer-owned primary electrical system or convert to Alliant Energy secondary electrical services. With primary service WSOD is responsible for all costs of primary equipment and its operation and maintenance.

Since WSOD does not employ staff trained in operation and maintenance of a primary distribution system conversion to a secondary system would be safer and more reliable. Costs and maintenance for the primary would then be deferred to the utility. To compensate for this secondary utility rates are slightly higher.

Existing Primary Electrical Service and Distribution System

General

The WSOD electric power system is served electric power by Alliant Energy at 12,470 volts, three phase via one primary overhead line to a service pole with metering transformers on the northeast corner of the campus. Service drops from the pole underground through a manhole system to main distribution switchgear in the basement of Huff Hall. From there primary power is distributed underground through the manhole system in a radial scheme to additional switchgear and transformers that serve secondary electrical power to each of the campus buildings. See attached Existing Primary Electrical Service Site Plan and Existing Primary Electrical Service One Line Diagram in Appendix.

Loading vs Capacity

Demand load history from Alliant Energy for WSOD campus primary service shows a 12 month peak customer demand of 431KW (20A). See Alliant customer demand summary attached in Appendix.

The primary switches are rated 600A.
The primary feeders are 4/0 AWG capable of 295A
Total primary transformer capacity for the campus is 2400KVA

Based on the above capacity we consider the primary electrical system very lightly loaded.

It is perhaps this light load that has allowed the primary electrical system to function reliably while exceeding its life expectancy.

Age of Equipment vs Life Expectancy

The primary electrical distribution system dates back to approximately 1973 and is 43 years old and has exceeded its normal design life expectancy. Ongoing reliability is diminished. This system is considered functional but obsolete and in need of repair or replacement.

Equipment Condition

The switchgear, transformers and cabling we observed appeared to be in good condition for their age. Equipment located indoors was in very clean rooms.

A 2012 electrical survey from A.C. Engineering Company noted some water in a manhole, cobwebs in transformers and pad mount switchgear, and other general maintenance or cleaning requirements.

Frequency of annual maintenance and testing should be increased due to equipment age. It is important to have a continued program of regularly schedule maintenance, adjustment, lubrication, and calibration for primary service switchgear, power transformers, and cables in order to maintain electric power system reliability.

Improvement Options

Option 1 - Primary Electrical Service and Distribution

Due to its age we would recommend a complete replacement of the primary distribution equipment. Also, we would recommend some reconfiguration to improve reliability and safety so the system is similar to other state facilities primary systems. See New Primary Electrical Service One Line Diagram in Appendix.

Improvements recommended are as follows:

1. Replace incoming overhead service lateral and pole mounted fuse and metering with new underground service to metal enclosed primary switchgear lineup. Underground service with new metal enclosed equipment will improve safety and reliability by enclosing medium voltage components and protecting them from the environment and any accidental contact. Also, this will provide a separate customer owned switch for isolating from the utility and fusing for feeder protection. The current system is vulnerable to vandalism, rodents, and weather and has been compromised in the past.

2. We propose removing the main primary distribution switchgear from the basement of Huff Hall. Instead of the current radial feed configuration from this gear to serve buildings we would propose installing pad mounted switchgear outside the building and adding a second primary line in a loop configuration. This new configuration would add the ability to sectionalize in the event of a fault and increase reliability.

3. Redesign the service entrance to the Powerhouse Building to move the medium voltage equipment outside of the building. This will free up space within the building which can be reclaimed for new electrical distribution and help with phasing this project to minimize downtime to the building. This redesign would include removing the primary switch and oil filled transformers from in the building and replacing them with a new exterior pad mounted transformer. The existing primary vault does not have oil containment, fire suppression, and does not appear to meet current requirements for this type of space.

Option 2 - Secondary Electrical Service and Distribution

Replace existing WSOD owned primary metered overhead and underground electrical distribution with new Alliant Energy secondary metered underground electrical services. Furnish and install new equipment for service termination at each building per New Secondary Electrical Services Site plan and New Secondary Electrical Services One Line Diagram in Appendix.

Provide new secondary services as follows:

Huff Hall	1200A. 480Y/277V
Power House	1200A. 208Y/120V
Gym	1200A. 208Y/120V
School	400A. 208Y/120V
Cochrane Hall	800A. 208Y/120V

Reconnect existing secondary equipment to new secondary service main distribution panels. Upon completion of cutover to secondary services all WSOD primary transformers, switchgear, and primary cabling will be disconnected and removed.

Opinion of Costs for Electrical Systems Improvements

Total Project Costs

Based on what we observed, our opinion of probable electrical project costs anticipated to renovate/update the equipment outlined elsewhere in this report is broken down as line items below:

Option 1 - Primary Service Improvements Cost: $1,221,635.

Option 2 - Secondary Service Improvements Cost: $ 714,265.

See attached spreadsheets in Appendix for breakdown of costs.

The cost opinions above are based on past experience on similar projects, construction industry cost guides, and information from local equipment vendors and electrical contractors.

Please be aware that actual construction costs can vary greatly due to the overall scope of the work when design is established, the time of year, and general economic conditions of the local construction industry.

Costs are based on construction in 2016-2017 time frame. If project is performed at a later date project costs should be escalated per inflation.

Energy Costs

Based on information from the electric utility Alliant Energy the current annual cost of electricity for WSOD CP-1 Primary service is $142,627.26.

Alliant Energy has projected that costs would increase to $155,439.96 for CG-2 3PH 12 HR TOD Secondary service.

This would result in a yearly increase in electric utility costs of approximately $12,812.70 if facility switches from primary electric service to secondary electric service.

See attached Alliant Energy CP-1 Primary, and CG-2 3PH 12 HR TOD Secondary Rate Comparison spreadsheets in Appendix for breakdown of costs.

Cost Comparison

The cost difference between replacing the primary service and installing a new secondary service is $507,370. Based on increased annual utility costs of $12,812.70 payback is roughly 40 years for the primary service and strongly favors installation of Option 2, the secondary service.

Recommendations

Our professional recommendation is to implement Option 2, the replacement of the primary electrical service with new secondary electrical services to feed all of the buildings at WSOD. We propose this for the following reasons:

- Cost of new secondary electrical services is significantly less than replacing the primary system. Energy costs only slightly increase resulting in lengthy payback.
- Maintenance and operation of the primary electrical equipment overall will be the responsibility of the utility company and therefore safer for the WSOD personnel.

- The newer devices will be more reliable, faster acting, and be equipped with options allowing for increased adjustment and safety.
- The new equipment located outside will relieve space within the building.
- Capacity of the equipment will be sized appropriately for current and future loads; in regards to amperage, and physical breaker mounting.

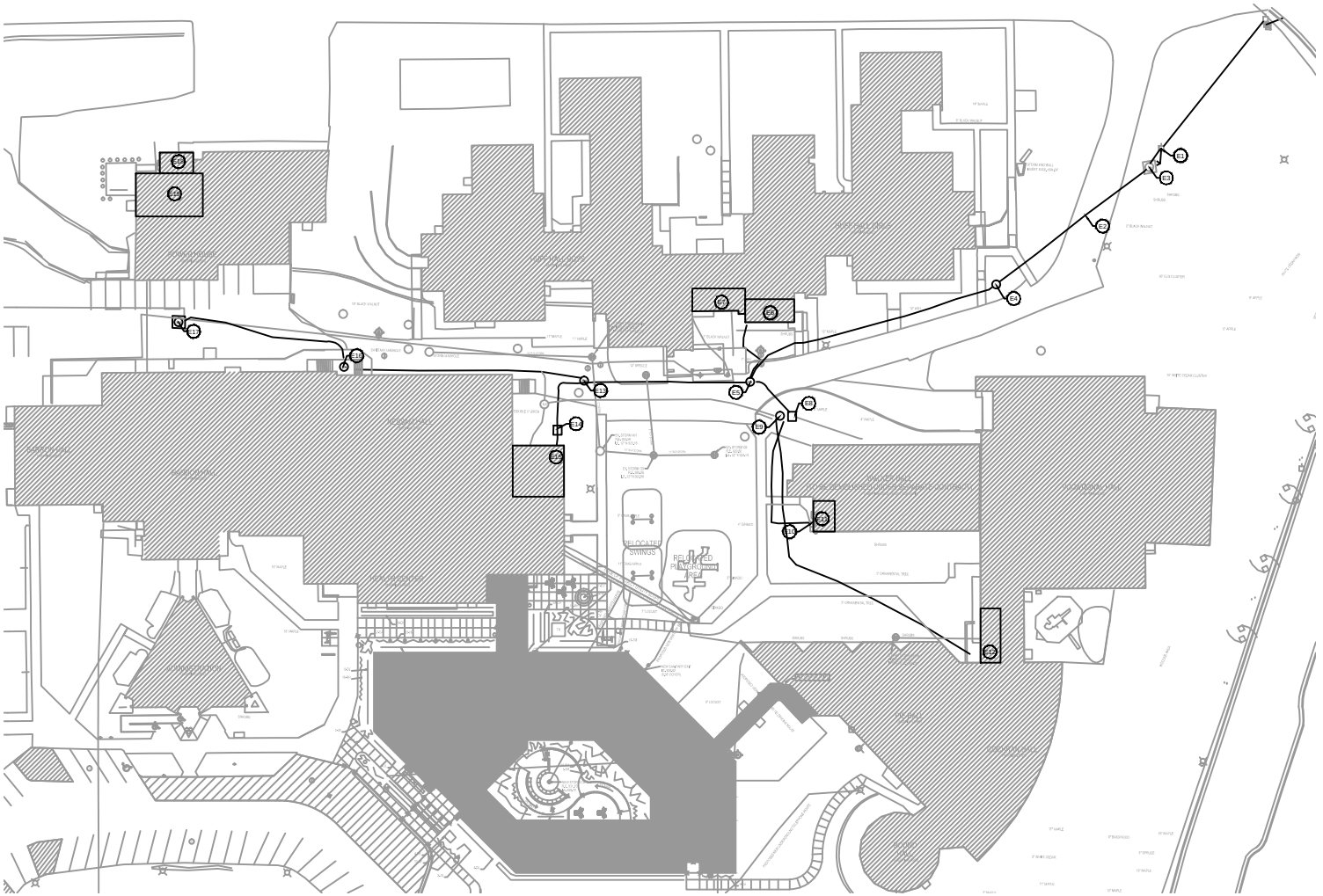
We believe this is the best economic option and will provide longevity of the electrical system for the WSOD Campus. These improvements will ensure the usefulness of the buildings for years to come. We recommend implementing this option as soon as practical since the existing primary system is past its life expectancy and its reliability is diminished.

Appendix

See attached diagrams showing proposed distribution modifications. Diagrams are shown on subsequent pages. Below is the listing of attachments which follow.

1: Site Plan. Existing Primary Electrical Service.
2: One Line Diagram. Existing Primary Electrical Service.
3: One Line Diagram ï Option 1. New Primary Electrical Service.
4: Site Plan - Option 2. New Secondary Electrical Services.
5: One Line Diagram ï Option 2. New Secondary Electrical Services.
6: Partial Floor Plan. Huff Hall Electrical Rooms.
7: Partial Floor Plan. Powerhouse Electrical Rooms.
8: Partial Floor Plan. Walker Hall / Cochrane Hall Electrical Rooms.
9: Partial Floor Plan. New Gym Electrical Room.
10: Primary Electrical Service Improvements Budget. Option 1.
11: Secondary Electrical Service Improvements Budget. Option 2.
12: Alliant Energy 12 Month Energy Usage.
13. Alliant Energy CP-1 Primary Rate Comparison.
14. Alliant Energy CG-2 Secondary Rate Comparison.

- End of Report -



KEYED ELECTRICAL NOTES

- E1 EXISTING INCOMING OVERHEAD SERVICE LINES AND METER POST 200A. 12.47KV, 3Ø
- E2 EXISTING UNDERGROUND DUCTBANK
- E3 EXISTING MANHOLE #1
- E4 EXISTING MANHOLE #2
- E5 EXISTING MANHOLE #3
- E6 EXISTING PRIMARY SWITCHGEAR 600A. 13.8KV, 3Ø
- E7 EXISTING HUFF HALL DISTRIBUTION EQUIPMENT 2000A, 480Y/277V, 3Ø
- E8 EXISTING PAD MOUNTED TRANSFORMER 300KVA 12470-208Y/120V, 3Ø
- E9 EXISTING MANHOLE #7
- E10 EXISTING JUNCTION BOX AND METER
- E11 EXISTING WALKER HALL DISTRIBUTION EQUIPMENT 400A, 208Y/120V, 3Ø
- E12 EXISTING COCHRANE HALL DISTRIBUTION EQUIPMENT 800A, 208Y/120V, 3Ø
- E13 EXISTING MANHOLE #4
- E14 EXISTING PAD MOUNTED SWITCH
- E15 EXISTING GYM DISTRIBUTION EQUIPMENT 1200A. 208Y/120V, 3Ø
- E16 EXISTING MANHOLE #4.5
- E17 EXISTING MANHOLE #5
- E18 EXISTING POWER HOUSE VAULT, TRANSFORMER AND SWITCH 300KVA 12470-208Y/120V, 3Ø
- E19 EXISTING POWER HOUSE DISTRIBUTION EQUIPMENT 1200A. 208Y/120V, 3Ø

SITE PLAN
EXISTING PRIMARY ELECTRICAL SERVICE

1 / APP1

SCALE: 1" = 30'-0"

0 7.5 15 30 60 120

APPENDIX
ATTACHMENT #1
SITE PLAN
EXISTING PRIMARY ELECTRICAL SERVICE

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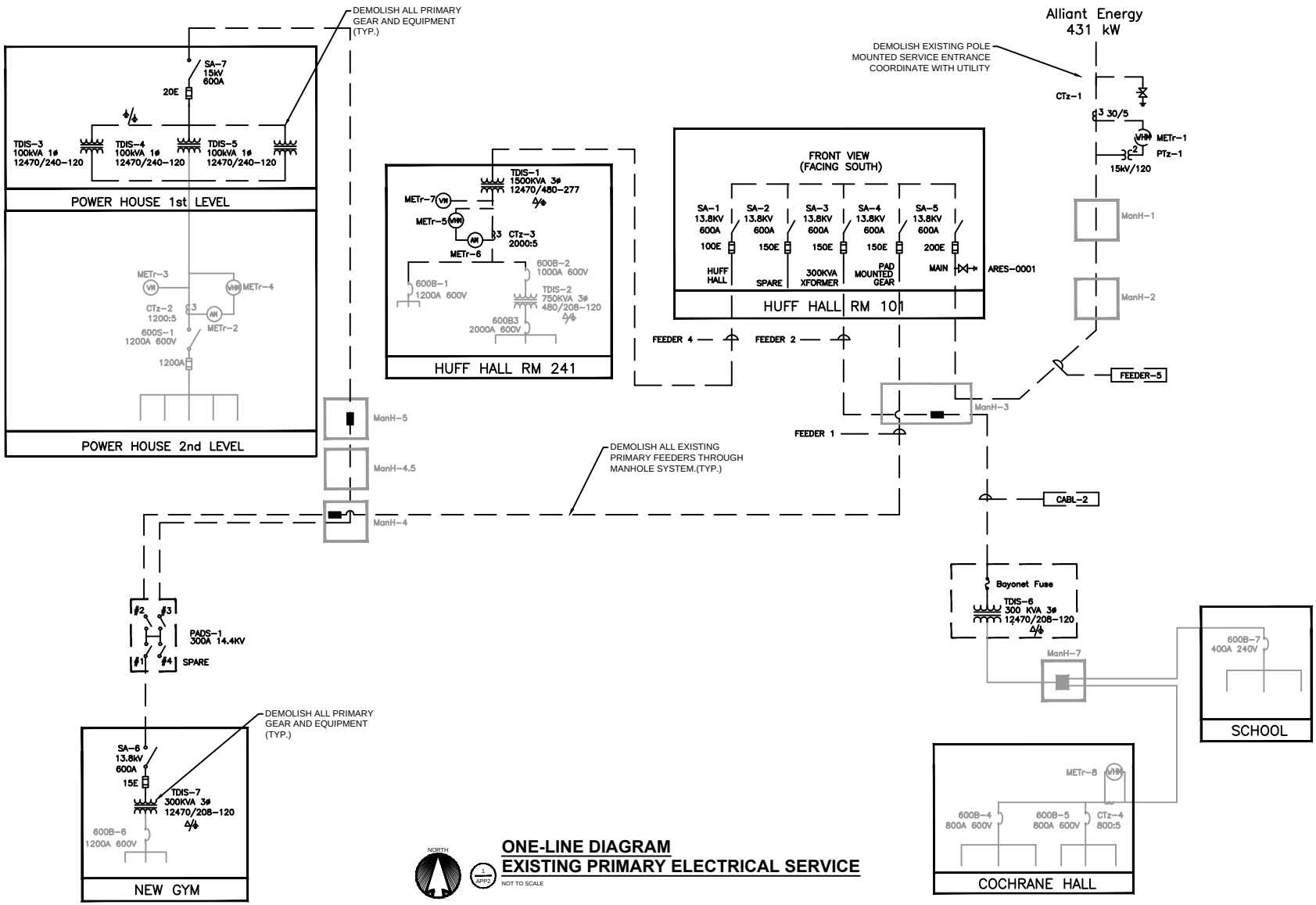

APPENDIX
ATTACHMENT #2
ONE-LINE DIAGRAM
EXISTING PRIMARY ELECTRICAL SERVICE

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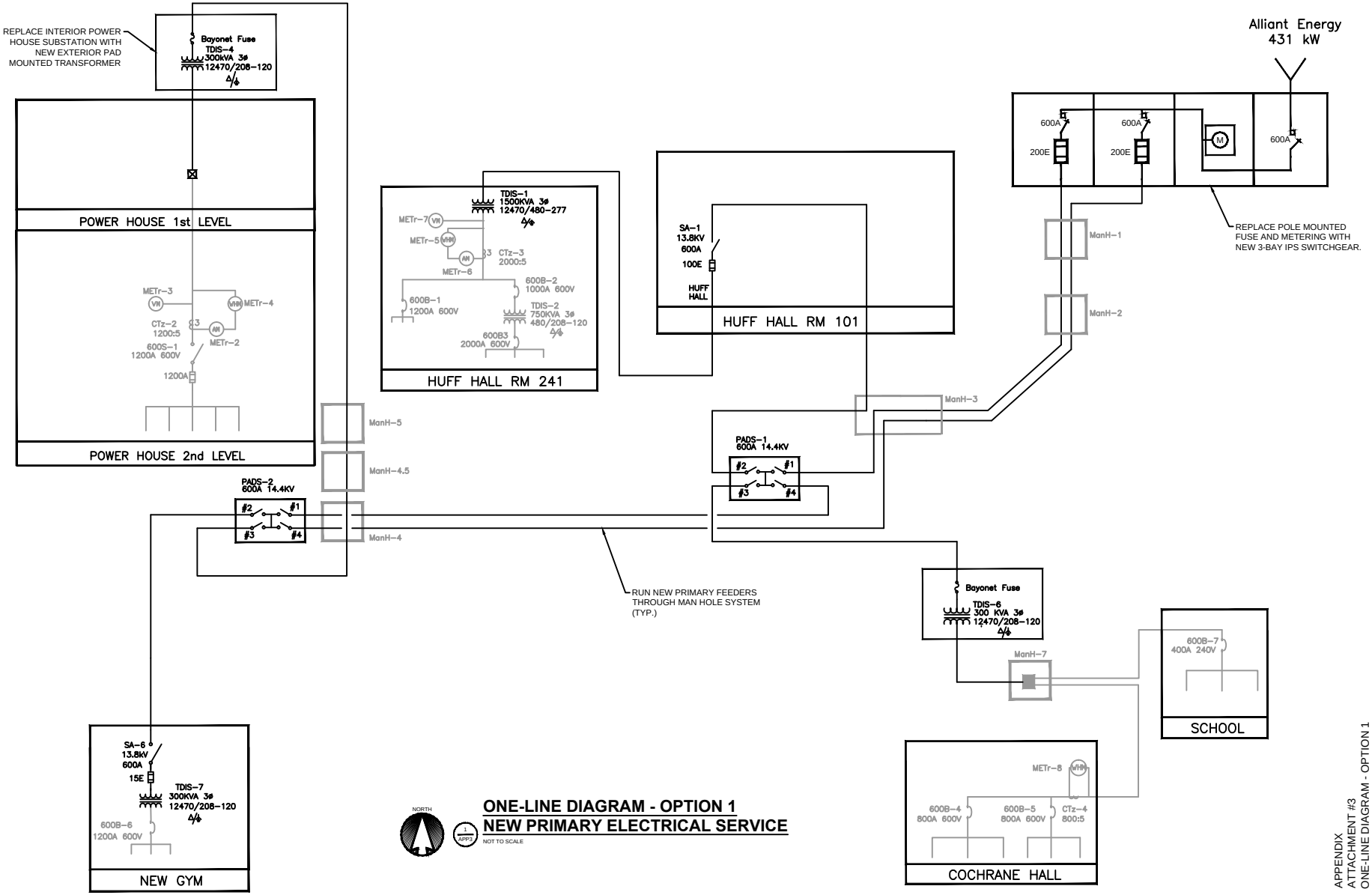

APPENDIX
ATTACHMENT #3
ONE-LINE DIAGRAM - OPTION 1
NEW PRIMARY ELECTRICAL SERVICE

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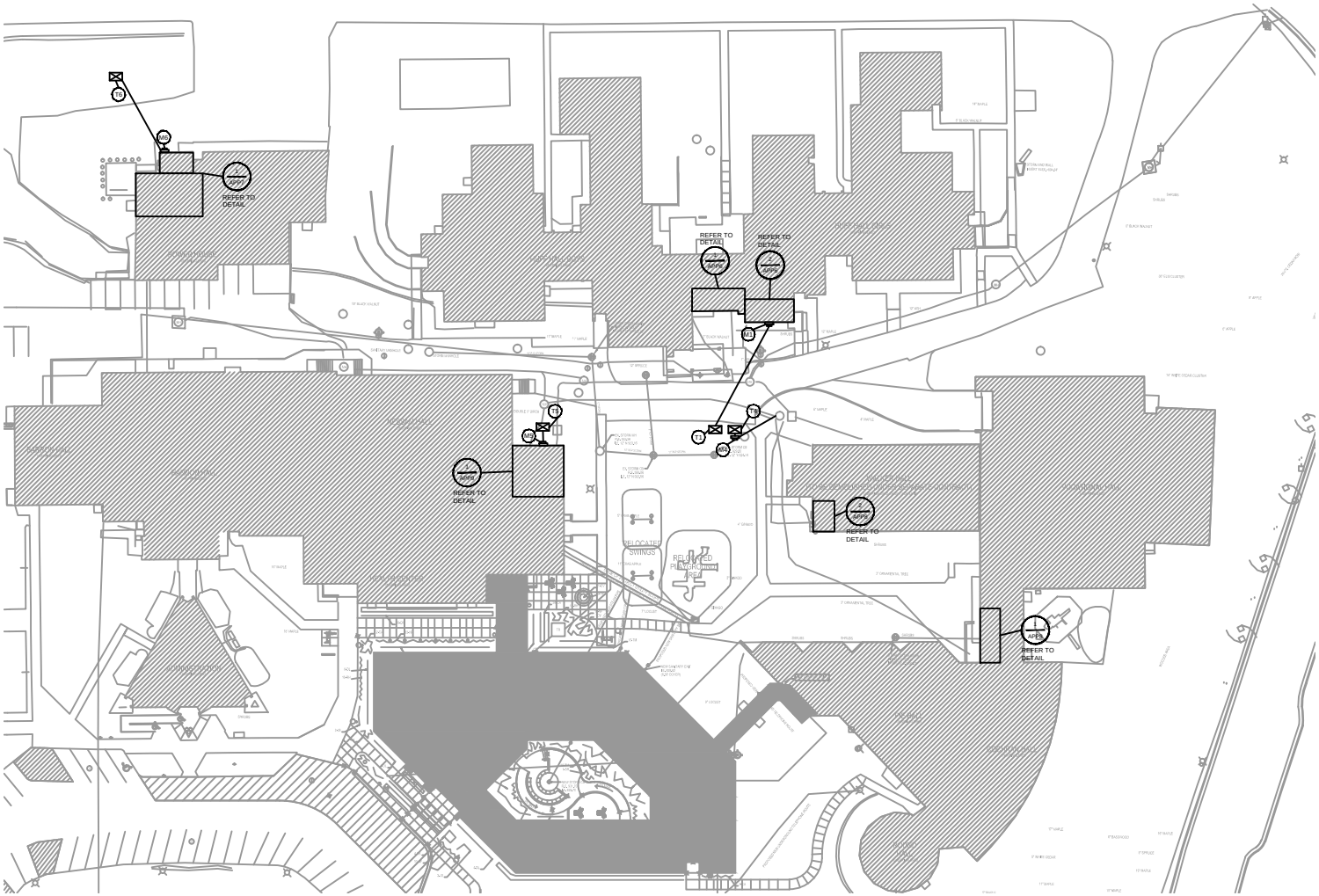

SITE PLAN - OPTION 2
NEW SECONDARY ELECTRICAL SERVICES

SCALE: 1" = 30'-0"

0 7.5 15 30 60 120

NEW SCHOOL OF THE DEAF ELECTRICAL SERVICE TERMINATION LOCATIONS

- MS1 WSOD METER, 1200A. 480Y/277V SERVICE. (HUFF HALL POWER)
- MS2 NOT USED.
- MS3 NOT USED.
- MS4 WSOD METER, 800A. 208Y/120V SERVICE. (COCHRANE/ WALKER HALL)
- MS5 WSOD METER, 1200A. 208Y/120V SERVICE. (GYM)
- MS6 WSOD METER, 1200A. 480Y/277V SERVICE. (POWER HOUSE)

NEW SCHOOL OF THE DEAF TRANSFORMER LOCATIONS

- T1 HUFF HALL POWER UTILITY TRANSFORMER, 1200A, 480Y/277V. LOCATION TO BE VERIFIED IN FIELD WITH UTILITY AND OWNER.
- T2 NOT USED.
- T3 NOT USED.
- T4 COCHRANE/ WALKER HALL UTILITY TRANSFORMER, 800A, 208Y/120V. LOCATION TO BE VERIFIED IN FIELD WITH UTILITY AND OWNER.
- T5 GYM UTILITY TRANSFORMER, 1200A, 480Y/277V. LOCATION TO BE VERIFIED IN FIELD WITH UTILITY AND OWNER.
- T6 POWER HOUSE UTILITY TRANSFORMER, 1200A, 480Y/277V. LOCATION TO BE VERIFIED IN FIELD WITH UTILITY AND OWNER.

GENERAL NOTES

1. THIS PROJECT SHALL REPLACE EXISTING ALLIANT ENERGY PRIMARY SERVICE AND WSOD OVERHEAD AND UNDERGROUND DISTRIBUTION WITH NEW ALLIANT ENERGY SECONDARY METERED ELECTRICAL UNDERGROUND SERVICES. THE ELECTRICAL CONTRACTOR WILL BE REMOVING EXISTING UNDERGROUND SERVICES TO THE IDENTIFIED BUILDINGS OR LOCATIONS AND INSTALLING NEW ELECTRICAL SERVICE EQUIPMENT AS DETAILED ON THE RESPECTIVE DRAWINGS. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE ELECTRICAL SERVICE WORK WITH ALLIANT REPRESENTATIVE AND BUILDING DOWNTIME SCHEDULE.

APPENDIX
ATTACHMENT #4
SITE PLAN - OPTION 2
NEW SECONDARY ELECTRICAL SERVICES

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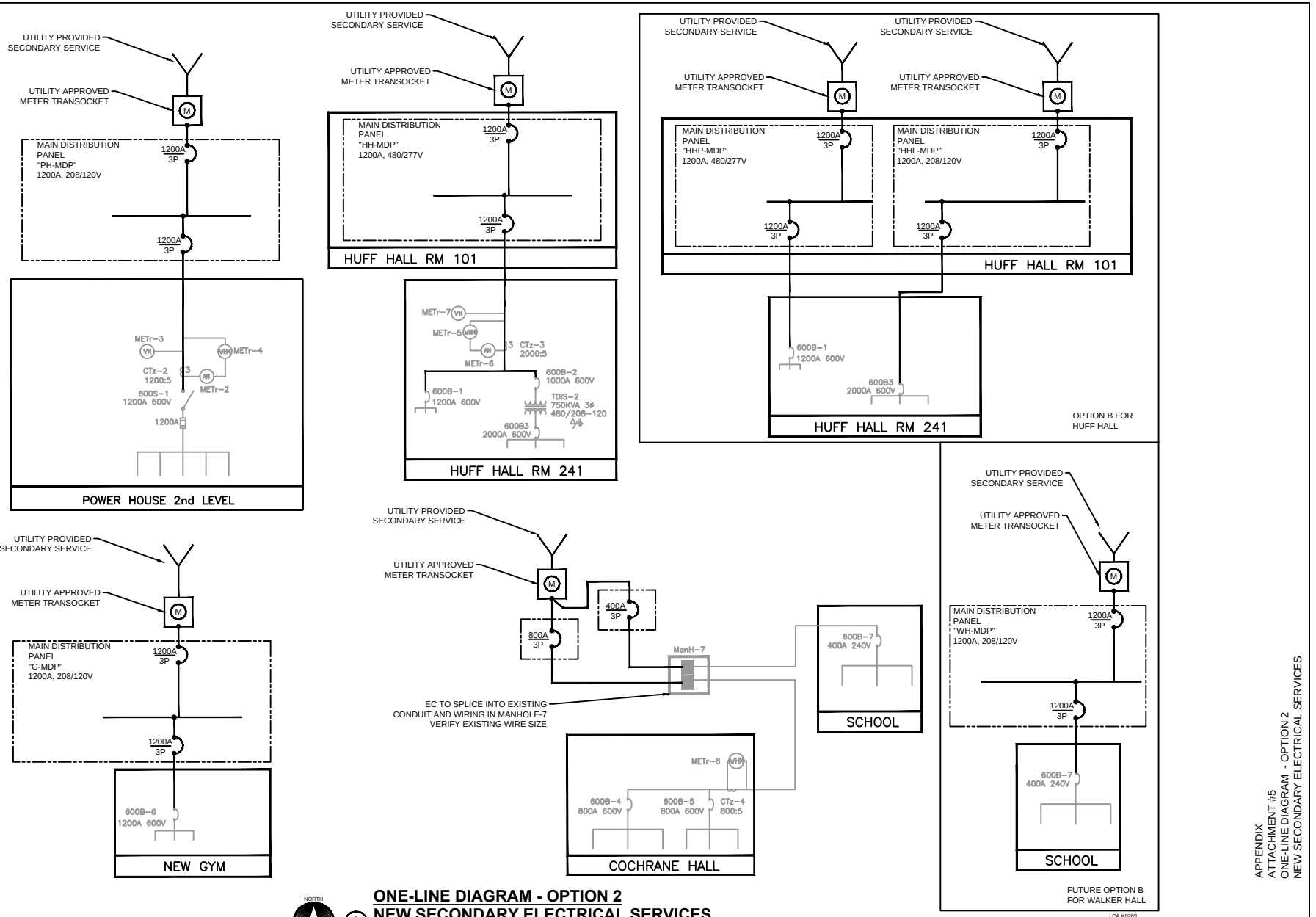

ONE-LINE DIAGRAM - OPTION 2
NEW SECONDARY ELECTRICAL SERVICES

NOT TO SCALE

APPENDIX
ATTACHMENT #5
ONE-LINE DIAGRAM - OPTION 2
NEW SECONDARY ELECTRICAL SERVICES

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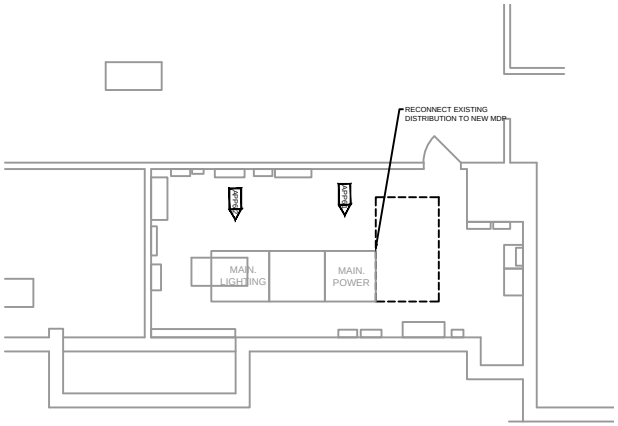


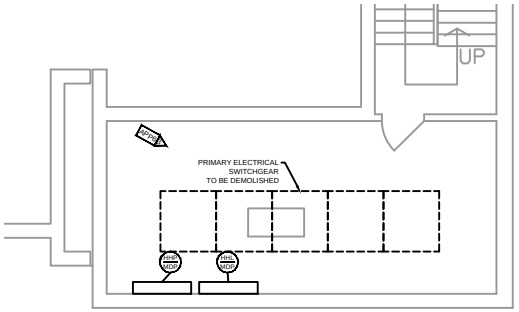
NORTH

1 / APP6

HUFF HALL
ELECTRICAL ROOM B241

SCALE: 1/4" = 1'-0"

0 1 2 4 8 16



NORTH

2 / APP6

HUFF HALL
ELECTRICAL ROOM G101

SCALE: 1/4" = 1'-0"

0 1 2 4 8 16

GENERAL NOTES

1. DISCONNECT EXISTING SERVICE. NEW UTILITY FEED TO CONNECT TO EXISTING DISTRIBUTION EQUIPMENT. COORDINATE TRANSFER WITH UTILITY AND OWNER.

APP6

MAIN-POWER DISTRIBUTION

NO SCALE

APP6

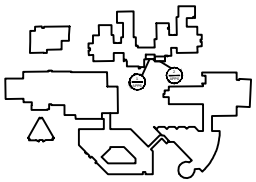
MAIN-LIGHTING DISTRIBUTION

NO SCALE

APP6

12.47KV SWITCHGEAR

NO SCALE



APPENDIX
ATTACHMENT #6
PARTIAL FLOOR PLAN
HUFF HALL ELECTRICAL ROOM

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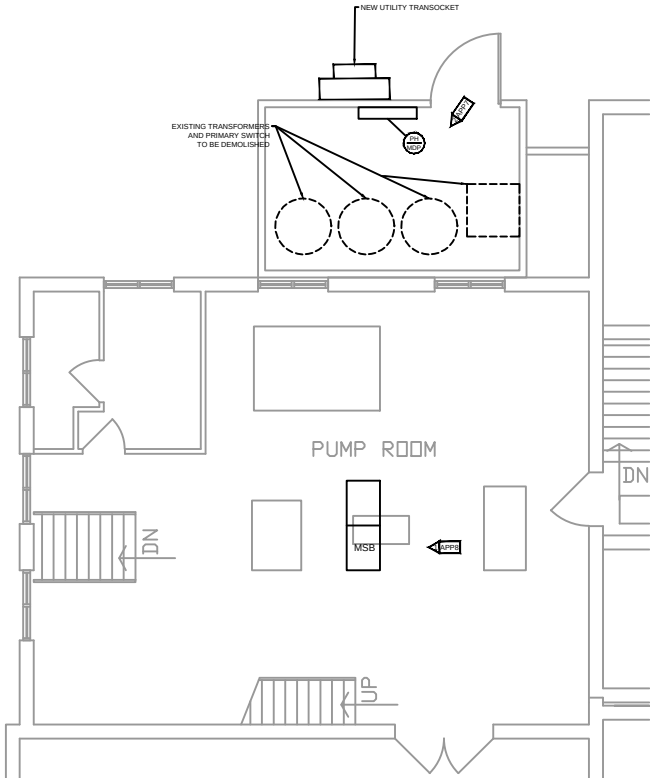


NORTH

POWER HOUSE
PUMP ROOM

SCALE: 1/4" = 1'-0"

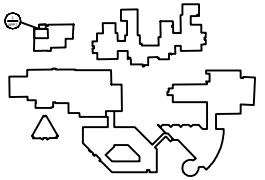
0 1 2 4 8 16

GENERAL NOTES

1. DISCONNECT EXISTING SERVICE. NEW UTILITY FEED TO CONNECT TO EXISTING DISTRIBUTION EQUIPMENT. COORDINATE TRANSFER WITH UTILITY AND OWNER.

MAIN SWITCHBOARD
NO SCALE

VAULT TRANSFORMERS
NO SCALE



APPENDIX
ATTACHMENT #7
PARTIAL FLOOR PLAN
POWER HOUSE ELECTRICAL ROOMS

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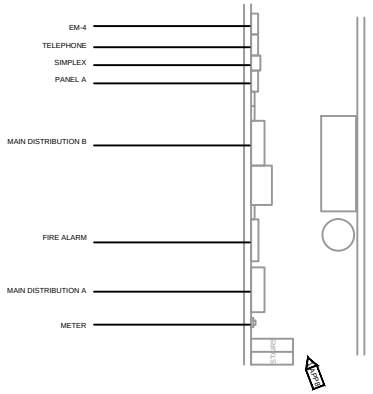


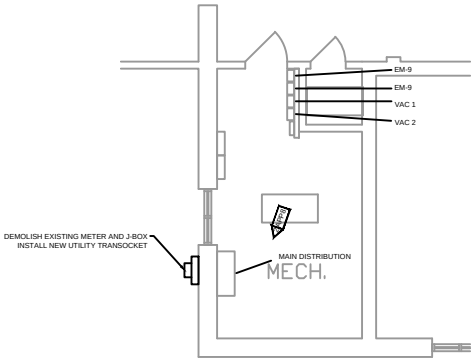
NORTH

1 APPB

COCHRANE HALL
ELECTRICAL TUNNEL

SCALE: 1/4" = 1'-0"

0 1 2 4 8 16



NORTH

2 APPB

WALKER HALL
ELECTRICAL ROOM

SCALE: 1/4" = 1'-0"

0 1 2 4 8 16

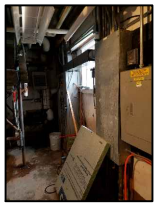
GENERAL NOTES

1. DISCONNECT EXISTING SERVICE. NEW UTILITY FEED TO CONNECT TO EXISTING DISTRIBUTION EQUIPMENT. COORDINATE TRANSFER WITH UTILITY AND OWNER.

APPB

COCHRANE HALL
MAIN DIST. PANELS

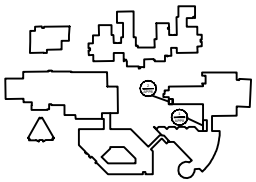
NO SCALE



APPB

WALKER HALL
MAIN DIST. PANEL

NO SCALE



APPENDIX
ATTACHMENT #8
PARTIAL FLOOR PLAN
WALKER HALL/ COCHRANE HALL ELECTRICAL ROOMS

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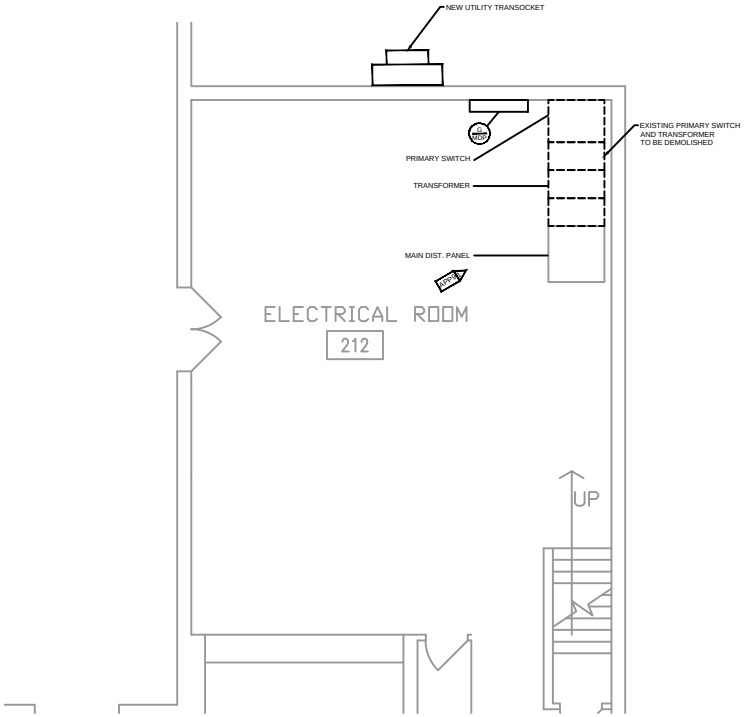


NORTH

NEW GYM ELECTRICAL ROOM

SCALE: 1/4" = 1'-0"

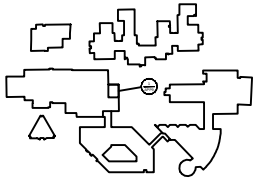
0 1 2 4 8 16

MAIN DISTRIBUTION

NO SCALE

GENERAL NOTES

1. DISCONNECT EXISTING SERVICE. NEW UTILITY FEED TO CONNECT TO EXISTING DISTRIBUTION EQUIPMENT. COORDINATE TRANSFER WITH UTILITY AND OWNER.



APPENDIX
ATTACHMENT #9
PARTIAL FLOOR PLAN
NEW GYM ELECTRICAL ROOM

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WSOD Delevan 16A2B - Primary Electrical Service Improvements Budget Estimate					
Option 1					
6/10/2016					
Item	**Qty**	**Unit**	**Unit Cost**	**Total Cost**	**Comments**
Incoming Service Revisions					
New 15KV IPS Metal Enclosed Switchgear (4 Bays)	1	LOT	160,000	$160,000	
New UG Ductbank to MH-1	75	LF	200	$15,000	
Switchgear Pad and Base	1	EA	10,000	$10,000	
Switchgear Grounding System	1	EA	3,500	$3,500	
Replace 3-4/0 15KV Feeder 5 to Huff Hall Switchgear	800	LF	150	$120,000	1
Alliant Energy Charges	1	EA	15,000	$15,000	
Landscape Repair	1	LOT	5,000	$5,000	
Demolition	1	LOT	10,000	$10,000	
Huff Hall	1	EA		$0	
New 15KV Metal Enclosed Switchgear (1 Bay)	1	LOT	35,000	$35,000	
New 15KV Pad Mount Switchgear	1	LOT	40,000	$40,000	
Switchgear Pad and Base	1	EA	5,000	$5,000	
Switchgear Grounding System	1	EA	2,000	$2,000	
Replace 3-4/0 15KV Feeder 2 to TDIS-6	150	LF	150	$22,500	1
Replace 3-4/0 15KV Feeder 1 to PADS-2	500	LF	150	$75,000	1
Replace 3-4/0 15KV Feeder 4 to TDIS-1	100	LF	150	$15,000	1
Replace 1500KVA Xfmr TDIS-1 Core and Coil	1	EA	75,000	$75,000	
Landscape Repair	1	LOT	5,000	$5,000	
Demolition	1	LOT	25,000	$25,000	
Cochrane and School	1	EA		$0	
Replace 300KVA Xfmr TDIS-6	1	EA	30,000	$30,000	2
Reconnect Xfmr	1	EA	2,000	$2,000	
Demolition	1	LOT	7,500	$7,500	
	1	EA		$0	
New Gym	1	EA		$0	
Replace 15KV Pad Mount Switchgear	1	EA	35,000	$35,000	2
Replace 3-4/0 15KV Feeder 1 to TDIS-7	100	LF	150	$15,000	1
Replace 300KVA Xfmr TDIS-7 Core and Coil	1	EA	45,000	$45,000	
Demolition	1	LOT	12,500	$12,500	
	1	EA		$0	
Power House	1	EA		$0	
New UG Ductbank from MH-5 to Powerhouse	250	LF	200	$50,000	
Concrete Pad and Base	1	EA	5,000	$5,000	
Grounding System	1	EA	2,000	$2,000	
New 300KVA, 480Y/277V Pad Mount Transformer	1	EA	25,000	$25,000	
New Underground Secondary	100	LF	200	$20,000	
New 1200A Secondary Main Switch	1	EA	30,000	$30,000	
Landscape Repair	1	LOT	15,000	$15,000	
Demolition	1	LOT	12,500	$12,500	
Acceptance Testing	1	LOT	15,000	$15,000	
Total Construction Cost				**$959,500**	
Project Budget					
Construction				$959,500	
Contingency (15%)				$143,925	
A/E Fees (8%)				$76,760	
DFD Fee (4%)				$41,450	
Total Project Cost				**$1,221,635**	
Notes:					
1. Reuse existing underground ductbank					
2. Reuse existing concrete pad					

WSOD Delevan 16A2B - Secondary Electrical Service Improvements Budget Estimate					
Option 2					
6/10/2016					
Item	**Qty**	**Unit**	**Unit Cost**	**Total Cost**	**Comments**
Incoming Service					
Demolition	1	LOT	10,000	$10,000	
Alliant Energy Service Charges	1	LOT	150,000	$150,000	
Landscape Repair	1	LOT	24,000	$24,000	
Huff Hall		EA		$0	
Demolition	1	LOT	25,000	$25,000	
Utility Transocket Pad Mounted	1	LOT	15,000	$15,000	
1200A 480Y/277V MDP	1	EA	25,000	$25,000	
1200A 208Y/120V MDP	1	EA	25,000	$25,000	
1200A Feeder	300	LF	150	$45,000	
Grounding System	2	EA	2,000	$4,000	
		LF		$0	
Cochrane		LF		$0	
Demolition	1	LOT	7,500	$7,500	
Utility Transocket Pad Mounted	1	EA	15,000	$15,000	
800A 208Y/120V MB	1	EA	20,000	$20,000	
800A Feeder	400	LF	100	$40,000	
Grounding System	1	EA	2,000	$2,000	
		EA		$0	
		EA		$0	
School		EA		$0	
Demolition	1	LOT	2,500	$2,500	
Utility Transocket Wall Mounted	1	EA	10,000	$10,000	
400A 208Y/120V MB	1	EA	6,000	$6,000	
400A Feeder	50	EA	50	$2,500	
New Gym		EA		$0	
Demolition	1	LOT	12,500	$12,500	
Utility Transocket Wall Mounted	1	EA	10,000	$10,000	
1200A 208Y/120V MDP	1	EA	25,000	$25,000	
1200A Feeder	100	EA	150	$15,000	
		EA		$0	
Power House		EA		$0	
Demolition	1	LOT	12,500	$12,500	
Utility Transocket Wall Mounted	1	LF	10,000	$10,000	
1200A 208Y/120V MDP	1	EA	25,000	$25,000	
1200A Feeder	150	Lot	150	$22,500	
		Lot		$0	
Total Construction Cost				**$561,000**	
Project Budget					
Construction				$561,000	
Contingency (15%)				$84,150	
A/E Fees (8%)				$44,880	
DFD Fee (4%)				$24,235	
Total Project Cost				**$714,265**	
Notes:					
1. XX					

Wisconsin School for the Deaf

Fuel Type	E

Meter by Year Month	Read Month	# Records	Days	kWh	kWh on_peak	kWh off_peak	Demand kW	KW On_Peak	kW Off_Peak	RKvaH	Avg Power Factor	Bill $	$ / kWh
WI SCHOOL FOR THE DEAF Acct 6785030000 Premise 6780448142 309 W WALWORTH AVE													
710422323		13	395	1,859,581	893,950	965,631	0.0	431	382	0	0.00	$30,589.11	$0.0164
2016	1	1	30	119,106	54,461	64,645	0.0	284	265	0	0.00	$9,992.42	$0.0839
2015	12	1	32	129,179	60,606	68,573	0.0	281	272	0	0.00	$10,435.22	$0.0808
2015	11	1	30	120,176	62,276	57,900	0.0	290	278	0	0.00	$10,161.47	$0.0846
2015	10	1	28	149,040	75,667	73,373	0.0	398	349	0	0.00	$0.00	$0.0000
2015	9	1	30	190,800	88,190	102,610	0.0	431	382	0	0.00	$0.00	$0.0000
2015	8	1	32	186,120	84,886	101,234	0.0	349	329	0	0.00	$0.00	$0.0000
2015	7	1	33	181,440	84,509	96,931	0.0	390	378	0	0.00	$0.00	$0.0000
2015	6	1	29	144,000	68,244	75,756	0.0	381	373	0	0.00	$0.00	$0.0000
2015	5	1	29	130,680	67,464	63,216	0.0	348	338	0	0.00	$0.00	$0.0000
2015	4	1	31	127,800	65,423	62,377	0.0	291	285	0	0.00	$0.00	$0.0000
2015	3	1	31	135,000	62,198	72,802	0.0	275	266	0	0.00	$0.00	$0.0000
2015	2	1	28	120,960	61,103	59,857	0.0	275	268	0	0.00	$0.00	$0.0000
2015	1	1	32	125,280	58,923	66,357	0.0	277	272	0	0.00	$0.00	$0.0000
Grand Total		13	395	1,859,581	893,950	965,631	0.0	431	382	0	0.00	$30,589.11	$0.0164

Wisconsin Power and Light Company
Commercial and Industrial Annual Rate Comparison
Scenario: 29 Description: UR-119 + FR-107
Rate: **CP-1 14HR PRIMARY**

RATES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CUSTOMER CHARGE	$7.67	$7.67	$7.67	$7.67	$7.67	$7.67	$7.67	$7.67	$7.67	$7.67	$7.67	$7.67	
ON-PEAK KWH	$0.06	$0.06	$0.06	$0.06	$0.06	$0.07	$0.07	$0.07	$0.07	$0.06	$0.06	$0.06	
ON-PEAK KWH SURCHARGE	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
OFF-PEAK KWH	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	
OFF-PEAK KWH SURCHARGE	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
FIRM ON-PEAK KW	$10.12	$10.12	$10.12	$10.12	$10.12	$11.53	$11.53	$11.53	$11.53	$10.12	$10.12	$10.12	
INTERRUPT. ON-PEAK KW	$10.12	$10.12	$10.12	$10.12	$10.12	$11.53	$11.53	$11.53	$11.53	$10.12	$10.12	$10.12	
CUSTOMER DEMAND CHARGE	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	
REACTIVE COMPONENT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
LOAD FACTOR ENERGY CREDIT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PRIMARY VOLTAGE DISCOUNT	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	
PRIMARY CUST DMD DISCOUNT	$0.22	$0.22	$0.22	$0.22	$0.22	$0.22	$0.22	$0.22	$0.22	$0.22	$0.22	$0.22	
ENERGY LIMITER	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15	

BILLING DATA	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ON-PEAK KWH	61,103	62,198	65,423	67,464	68,244	84,509	84,886	88,190	75,667	62,276	60,606	54,461	835,027
OFF-PEAK KWH	59,857	72,802	62,377	63,216	75,756	96,931	101,234	102,610	73,373	57,900	68,573	64,645	899,274
TOTAL KWH	120,960	135,000	127,800	130,680	144,000	181,440	186,120	190,800	149,040	120,176	129,179	119,106	1,734,301
ON-PEAK DEMAND	275	275	291	348	381	390	349	431	398	290	281	284	3,993
FIRM DEMAND	275	275	291	348	381	390	349	431	398	290	281	284	3,993
INTERRUPTIBLE DEMAND	0	0	0	0	0	0	0	0	0	0	0	0	0
CUSTOMER DEMAND	275	275	291	348	381	390	349	431	398	290	281	284	3,993
BILLED REACTIVE ENERGY	0	0	0	0	0	0	0	0	0	0	0	0	0
DAYS IN MONTH	31	28	31	30	31	30	31	31	30	31	30	31	365
MONTHLY LOAD FACTOR	59%	73%	59%	52%	51%	65%	72%	60%	52%	56%	64%	56%	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CUSTOMER CHARGE	$237.77	$214.76	$237.77	$230.10	$237.77	$230.10	$237.77	$237.77	$230.10	$237.77	$230.10	$237.77	$2,799.55
ON-PEAK KWH	$3,567.80	$3,631.74	$3,820.05	$3,939.22	$3,984.77	$5,753.37	$5,779.04	$6,003.98	$5,151.41	$3,636.30	$3,538.78	$3,179.98	$51,986.44
ON-PEAK KWH SURCHARGE	$197.30	$200.84	$211.25	$217.84	$220.36	$272.88	$274.10	$284.77	$244.33	$201.09	$195.70	$175.85	$2,696.30
OFF-PEAK KWH	$2,381.11	$2,896.06	$2,481.36	$2,514.73	$3,013.57	$3,855.92	$4,027.09	$4,081.83	$2,918.78	$2,303.26	$2,727.83	$2,571.58	$35,773.12
OFF-PEAK KWH SURCHARGE	$193.28	$235.08	$201.42	$204.12	$244.62	$312.99	$326.88	$331.33	$236.92	$186.96	$221.42	$208.74	$2,903.76
FIRM ON-PEAK KW	$2,783.00	$2,783.00	$2,944.92	$3,521.76	$3,855.72	$4,496.70	$4,023.97	$4,969.43	$4,588.94	$2,934.80	$2,843.72	$2,874.08	$42,620.04
INTERRUPT. ON-PEAK KW	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
CUSTOMER DEMAND CHARGE	$550.00	$550.00	$582.00	$696.00	$762.00	$780.00	$698.00	$862.00	$796.00	$580.00	$562.00	$568.00	$7,986.00
REACTIVE COMPONENT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
LOAD FACTOR ENERGY CREDIT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
PRIMARY VOLTAGE DISCOUNT	($218.30)	($232.77)	($231.16)	($249.39)	($271.35)	($352.65)	($345.75)	($376.38)	($316.48)	($221.86)	($227.76)	($215.64)	($3,259.49)
PRIMARY CUST DMD DISCOUNT	($60.50)	($60.50)	($64.02)	($76.56)	($83.82)	($85.80)	($76.78)	($94.82)	($87.56)	($63.80)	($61.82)	($62.48)	($878.46)
SUBTOTAL	$9,631.47	$10,218.21	$10,183.58	$10,997.83	$11,963.64	$15,263.51	$14,944.32	$16,299.89	$13,762.44	$9,794.52	$10,029.98	$9,537.88	$142,627.26

ALT. BILL LIMITER (IF APPLICABLE)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Energy Limiter	$17,828.29	$19,897.65	$18,836.44	$19,260.93	$21,224.16	$26,742.44	$27,432.23	$28,122.01	$21,967.01	$17,712.74	$19,039.69	$17,555.03	$255,618.62
Other Components	$1,178.35	$1,200.68	$1,232.44	$1,348.07	$1,464.75	$1,595.97	$1,536.75	$1,715.86	$1,507.35	$1,205.82	$1,209.22	$1,190.36	$16,385.61
SUBTOTAL	$19,006.64	$21,098.33	$20,068.88	$20,608.99	$22,688.91	$28,338.41	$28,968.98	$29,837.88	$23,474.36	$18,918.56	$20,248.91	$18,745.40	$272,004.23
TOTAL	$9,631.47	$10,218.21	$10,183.58	$10,997.83	$11,963.64	$15,263.51	$14,944.32	$16,299.89	$13,762.44	$9,794.52	$10,029.98	$9,537.88	$142,627.26

NOTE: Above analysis does not consider taxes or Low Income Assistance charges.

Wisconsin Power and Light Company
Commercial and Industrial Annual Rate Comparison
Scenario: 29 Description: UR-119 + FR-107
Rate: **CG-2 3PH 12 HR TOD SECONDARY**

RATES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CUSTOMER CHARGE	$0.92	$0.92	$0.92	$0.92	$0.92	$0.92	$0.92	$0.92	$0.92	$0.92	$0.92	$0.92	
ON-PEAK KWH	$0.07	$0.07	$0.07	$0.07	$0.07	$0.08	$0.08	$0.08	$0.08	$0.07	$0.07	$0.07	
ON-PEAK KWH SURCHARGE	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
OFF-PEAK KWH	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	
OFF-PEAK KWH SURCHARGE	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
FIRM ON-PEAK KW	$8.87	$8.87	$8.87	$8.87	$8.87	$10.40	$10.40	$10.40	$10.40	$8.87	$8.87	$8.87	
INTERRUPT. ON-PEAK KW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
CUSTOMER DEMAND CHARGE	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	
REACTIVE COMPONENT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
LOAD FACTOR ENERGY CREDIT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PRIMARY VOLTAGE DISCOUNT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PRIMARY CUST DMD DISCOUNT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
ENERGY LIMITER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

BILLING DATA	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ON-PEAK KWH	61,103	62,198	65,423	67,464	68,244	84,509	84,886	88,190	75,667	62,276	60,606	54,461	835,027
OFF-PEAK KWH	59,857	72,802	62,377	63,216	75,756	96,931	101,234	102,610	73,373	57,900	68,573	64,645	899,274
TOTAL KWH	120,960	135,000	127,800	130,680	144,000	181,440	186,120	190,800	149,040	120,176	129,179	119,106	1,734,301
ON-PEAK DEMAND	275	275	291	348	381	390	349	431	398	290	281	284	3,993
FIRM DEMAND	275	275	291	348	381	390	349	431	398	290	281	284	3,993
INTERRUPTIBLE DEMAND	0	0	0	0	0	0	0	0	0	0	0	0	0
CUSTOMER DEMAND	275	275	291	348	381	390	349	431	398	290	281	284	3,993
BILLED REACTIVE ENERGY	0	0	0	0	0	0	0	0	0	0	0	0	0
DAYS IN MONTH	31	28	31	30	31	30	31	31	30	31	30	31	365
MONTHLY LOAD FACTOR	59%	73%	59%	52%	51%	65%	72%	60%	52%	56%	64%	56%	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	7 METERS
CUSTOMER CHARGE	$28.54	$25.77	$28.54	$27.62	$28.54	$27.62	$28.54	$28.54	$27.62	$28.54	$27.62	$28.54	$335.98	$2,351.88
ON-PEAK KWH	$4,174.56	$4,249.37	$4,469.70	$4,609.14	$4,662.43	$6,738.75	$6,768.81	$7,032.27	$6,033.69	$4,254.70	$4,140.60	$3,720.78	$60,854.78	
ON-PEAK KWH SURCHARGE	$197.30	$200.84	$211.25	$217.84	$220.36	$272.88	$274.10	$284.77	$244.33	$201.09	$195.70	$175.85	$2,696.30	
OFF-PEAK KWH	$2,695.36	$3,278.27	$2,808.84	$2,846.62	$3,411.29	$4,364.80	$4,558.57	$4,620.53	$3,303.99	$2,607.24	$3,087.84	$2,910.96	$40,494.31	
OFF-PEAK KWH SURCHARGE	$193.28	$235.08	$201.42	$204.12	$244.62	$312.99	$326.88	$331.33	$236.92	$186.96	$221.42	$208.74	$2,903.76	
FIRM ON-PEAK KW	$2,439.25	$2,439.25	$2,581.17	$3,086.76	$3,379.47	$4,056.00	$3,629.60	$4,482.40	$4,139.20	$2,572.30	$2,492.47	$2,519.08	$37,816.95	
INTERRUPT. ON-PEAK KW	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
CUSTOMER DEMAND CHARGE	$550.00	$550.00	$582.00	$696.00	$762.00	$780.00	$698.00	$862.00	$796.00	$580.00	$562.00	$568.00	$7,986.00	
REACTIVE COMPONENT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
LOAD FACTOR ENERGY CREDIT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
PRIMARY VOLTAGE DISCOUNT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
PRIMARY CUST DMD DISCOUNT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
SUBTOTAL	$10,278.28	$10,978.58	$10,882.91	$11,688.10	$12,708.70	$16,553.04	$16,284.49	$17,641.83	$14,781.74	$10,430.82	$10,727.65	$10,131.95	$153,088.08	$155,439.96

ALT. BILL LIMITER (IF APPLICABLE)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Energy Limiter	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ -	
Other Components	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ -	
SUBTOTAL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ -	
TOTAL	$10,278.28	$10,978.58	$10,882.91	$11,688.10	$12,708.70	$16,553.04	$16,284.49	$17,641.83	$14,781.74	$10,430.82	$10,727.65	$10,131.95	$153,088.08	

NOTE: Above analysis does not consider taxes or Low Income Assistance charges.