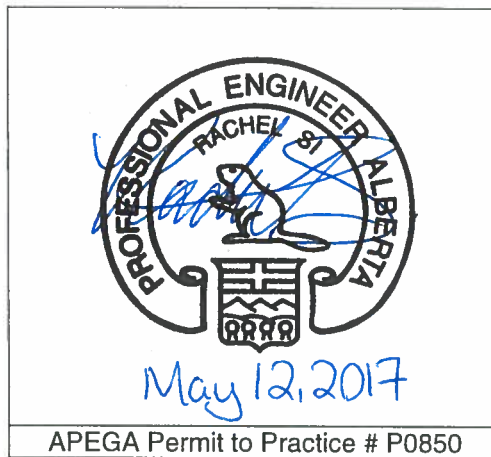


APPENDIX E DFO DISTRIBUTION DEFICIENCY REPORT



Distribution Deficiency Report

Muir 2018S POD



Approvals		Signature	Date
Author	Rachel Si, P.Eng.		May 12, 2017
Supervising Engineer, Central Planning	Julian Tong, P.Eng.		May 12, 2017
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May 12, 2017

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Revision History:

R0	Original SASR Submission	Rachel Si	December 1, 2015
R1	Implementing comments	Julian Tong	May 17, 2016
R2	Revised with forecast updates	Rachel Si	Jan 31, 2017
R3	Implementing comments	Rachel Si	Feb 28, 2017
R4	Address additional comments	Rachel Si	March 30, 2017
R5	Address additional comments	Rachel Si	May 12, 2017

1 Executive Summary

Fox Creek 741S is located approximately 2 km west of the Town of Fox Creek in AESO Planning Area 24 of the Northeast AESO planning region. This POD is equipped with two 25/33.3/41.6 MVA, 144 – 25 kV transformers and provides electric services to the Town of Fox Creek and the surrounding area. ATCO Electric Distribution Division (AE DFO) has received multiple requests to serve oilfield, industrial, residential, and commercial loads in and around the Town of Fox Creek. These requests are forecast to violate AE DFO's planning criteria at Fox Creek 741S in Q2 2018.

AE DFO has considered the following distribution-based alternatives:

Alternative 1: Offload Fox Creek 741S to Goose River 725S

Alternative 2: Offload Fox Creek 741S to Benbow 397S

AE DFO has considered the following transmission-based alternatives

Alternative 3: Increase the capacity at Fox Creek 741S

Alternative 4: Build a new POD (Muir 2018S)

AE DFO has determined Alternative 4 is the only alternative that meets the needs of the customers in the area and eliminates all planning criteria violations.

Should Alternative 4 become the approved transmission development, AE DFO requests a Demand Transmission Service (DTS) with a contract capacity of 19 MW at the proposed Muir 2018S POD on April 1, 2018.

The requested in-service date (ISD) of the proposed Muir 2018S POD is April 1, 2018.

2 Serving Customer Requests

2.1 Customer Request

AE DFO has received requests from multiple customers for approximately 39 MW of new operating load in the Fox Creek 741S area. These requests include new and existing customers' increases. The majority of this load is located west of Fox Creek 741S. Table 2.1-1 details the customer requests and requested ISDs.

Table 2.1-1: Fox Creek Area New Customer Requests

Location	Load Description	Requested Operating Load (MW)	Requested ISD
Multiple Townships	Miscellaneous loads	2.5	Q3 2017 - 2019
Multiple Townships	Well pad loads	6.7	Q3 2017 - Q3 2018
63-20-W5M	Industrial Loads	3.6	Q3 2017
62-20-W5M	Plant Expansion	3.5	Q3 2017
63-21-W5M	Pump station	0.9	Q3 2017
62-20-W5M	Plant Expansion	14.4	Q3 2017 – Q2 2018
Town of Fox Creek	Residential, commercial, light industrial	7.1	2017 - 2023
Total Load		38.7	

2.2 AE DFO Planning Criteria

AE DFO has developed planning criteria to ensure the safe and reliable connection of new loads and requests to our distribution system. Criteria applicable in this study are highlighted below:

POD Capacity Planning – System Normal: Under system normal conditions, AE DFO must ensure sufficient substation transformer capacity exists to carry all peak loads. In high growth areas, loading on substation transformers must remain below 95% of the total nameplate rating of the POD transformers.

POD Capacity Planning – Contingency Response: AE DFO's criteria for contingency response is to restore service to all critical loads within four hours of the failure of supply at a POD.

25 kV Voltage Levels: the voltage threshold on AE DFO's 25 kV systems, under normal conditions, at large, customer sites must remain above **0.97 Vpu** and below **1.04 Vpu**.

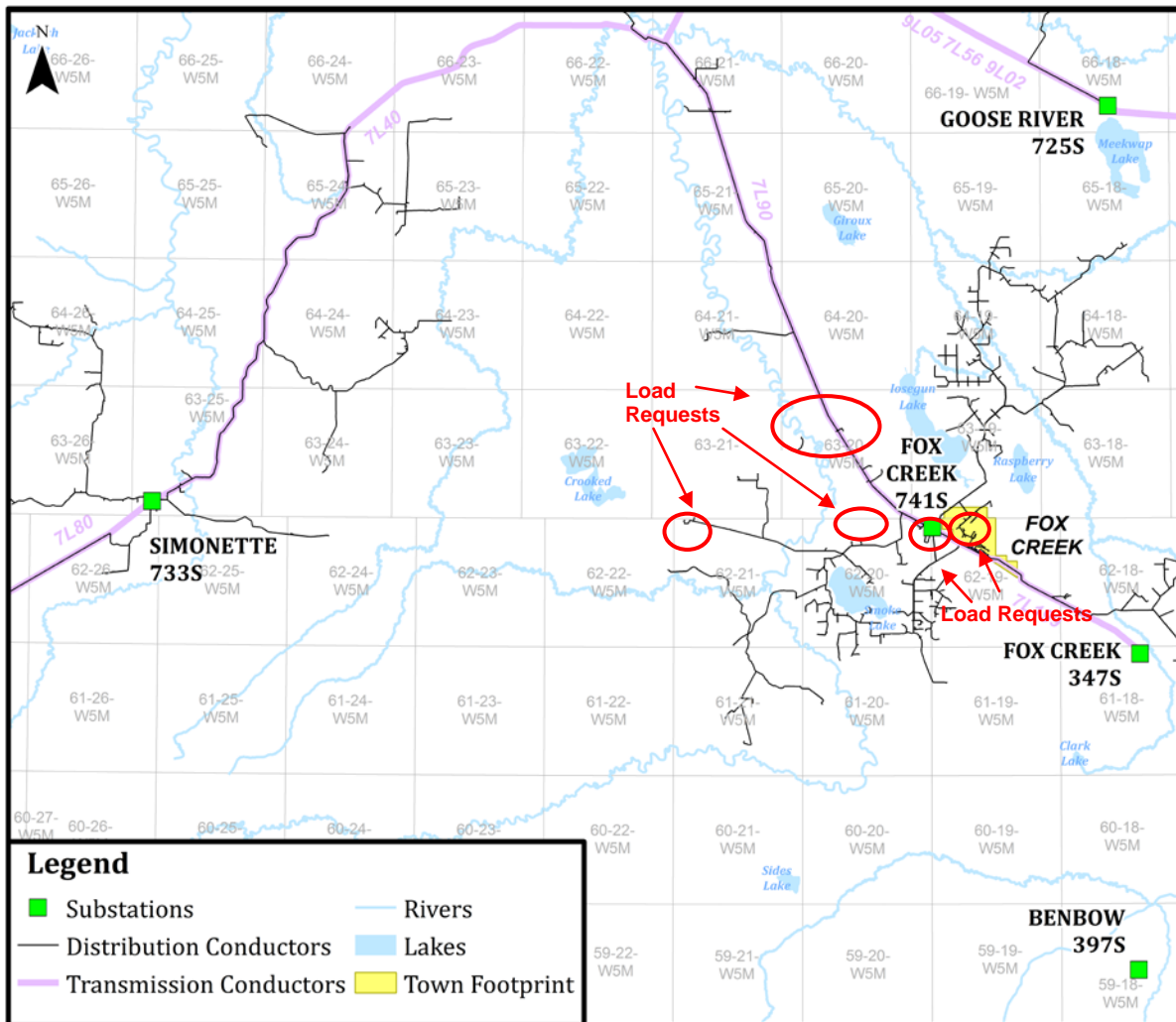
Guideline for Adding 25 kV Breakers – Feeder Loading: the maximum loading on rural 25 kV feeders should not exceed **15 MVA**.

3 Existing Distribution and Transmission System

3.1 Existing System

Figure 3.1-1 shows the existing Transmission and Distribution systems near the load requests. Fox Creek 741S is the closest existing substation to the requested loads. Goose River 725S and AltaLink's Benbow 397S, both 35 km away from Fox Creek 741S, are the two other nearest substations in this area. Simonette 733S has not been considered, as it is approximately 60 km away from the load request. This is too distant to achieve adequate site voltage levels (0.97 Vpu). The Fox Creek 347S substation (not shown in Figure 3.1-1), owned and operated by AltaLink, is located more than 40 km away from the load requests. Fox Creek 347S was also not considered because it does not presently provide 25 kV service, and even if it did, adequate voltage level (0.97 Vpu) cannot be achieved on the distribution feeders required to serve the requested load centers.

Figure 3.1-1 – Locations of Existing and Proposed PODs

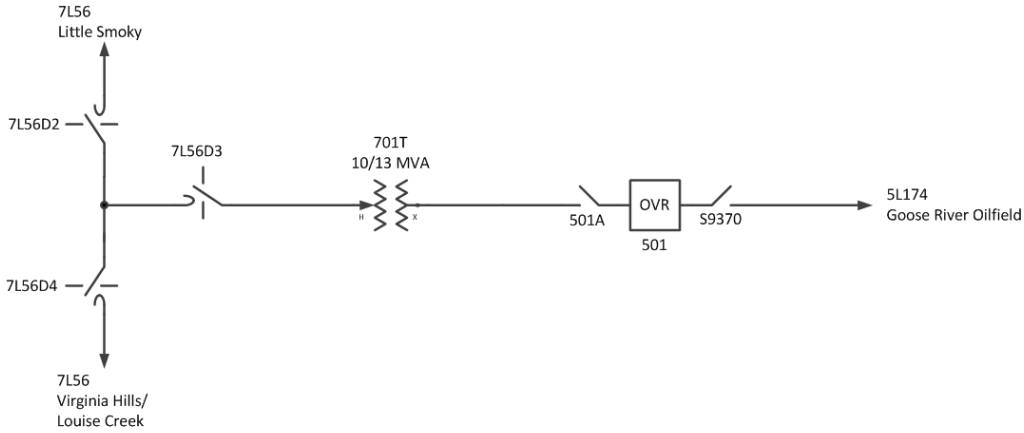


3.2 Goose River 725S

Table A1, in Appendix A, shows the load forecast for Goose River 725S with existing customer loading and forecasts.

Figure 3.2-1 shows the simplified single-line diagram (SLD) for Goose River 725S.

Figure 3.2-1 – Simplified SLD of Goose River 725S

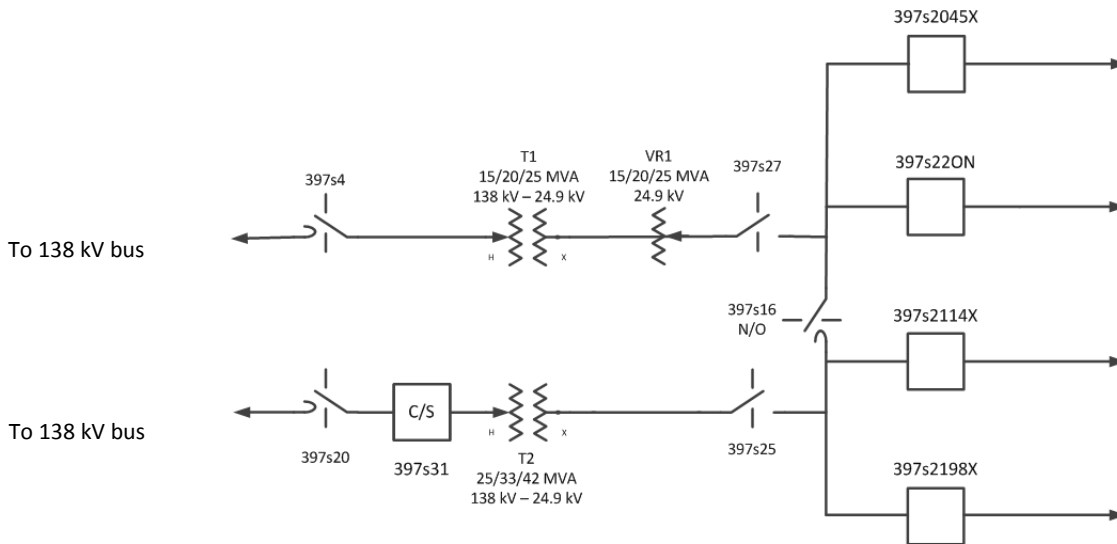


3.3 Benbow 397S

Benbow 397S is owned by Altalink. It is located at NE15-59-18-W5M, approximately 35 km away from Fox Creek 741S. AE DFO does not have access to the load forecast for Benbow 397S.

Figure 3.3-1 shows the simplified SLD for Benbow 397S.

Figure 3.3-1 – Simplified SLD of Benbow 397S



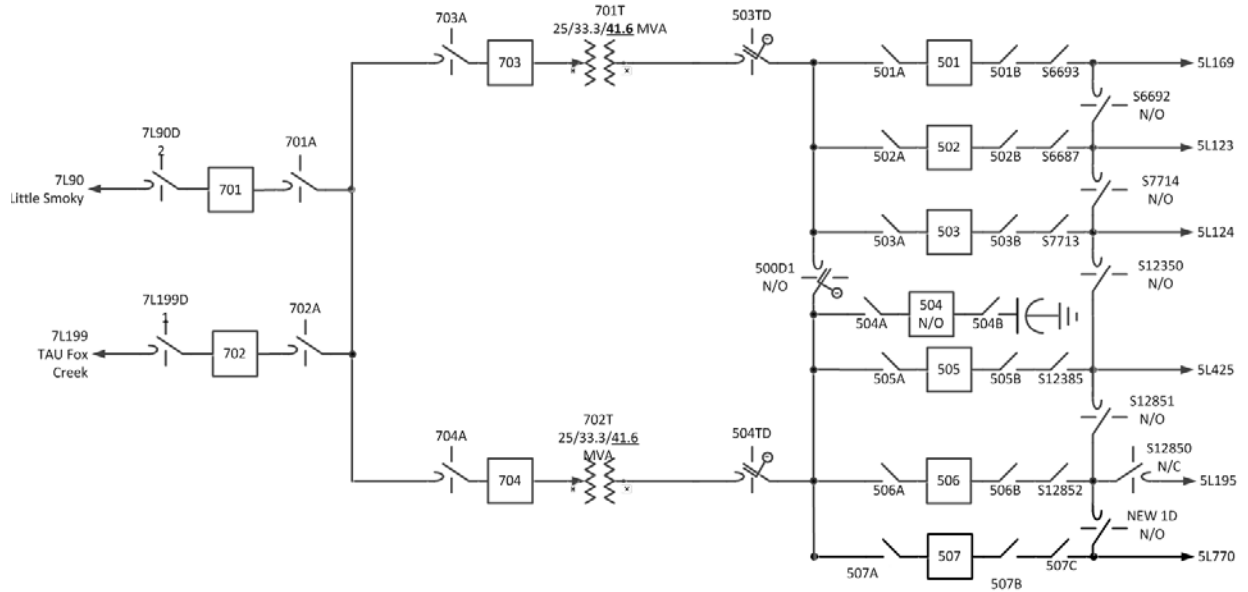
3.4 Fox Creek 741S

Table A2, in Appendix A, shows the load forecast for Fox Creek 741S with existing customer loading and forecasts.

Fox Creek 741S has undergone transmission upgrades in recent years. Appendix B details the background for transmission development projects at Fox Creek 741S.

Figure 3.4-1 shows the simplified SLD for Fox Creek 741S.

Figure 3.4-1 – Simplified SLD of Fox Creek 741S in 2016



4 Need for Development

4.1 Driver

The need for development in the Fox Creek area is driven by load growth. Fox Creek 741S has a total transformer nameplate capacity of 83.2 MVA (77.4 MW). The recorded 2016 peak for existing load served by Fox Creek 741S is 41.9 MW. This leaves Fox Creek 741S with approximately 32 MW of capacity to serve new loads, before a violation of AE DFO's POD Capacity Planning Criteria would occur. With approximately 39 MW of new load to be added in the area, loading at Fox Creek 741S is forecast to violate AE DFO's POD Capacity Planning Criteria in Q2 2018 based on the Q2 2018 load addition of 14.4 MW. AE DFO is therefore requesting an in-service date of April 1, 2018. Multiple feeders are also forecast to be loaded above 15 MVA, causing a violation in AE DFO's Feeder Loading Guideline.

A load transfer between 701T and 702T at Fox Creek 741S does not eliminate the AE DFO planning criteria violation, as total POD loading still exceeds 95% of nameplate rating.

Distribution-based and Transmission-based alternatives have been investigated to eliminate these violations.

4.2 Distribution-Based alternatives:

The following distribution based alternatives were considered and are described below:

<u>Alternative 1</u>	Offload Fox Creek 741S to Goose River 725S
<u>Alternative 2</u>	Offload Fox Creek 741S to Benbow 397S

Alternative 1: Offload Fox Creek 741S to Goose River 725S

Goose River 725S is situated north of Meekwap Lake, in an area with limited existing industrial and infrastructure development. Access to the Goose River area is limited to helicopter or Off-Highway-Vehicles during non-frozen conditions. As a result, existing restoration of outages in this area currently take longer than 4 hours due to the difficult access.

Offloading critical oil and gas processing sites, currently served by Fox Creek 741S, to Goose River 725S would cause a violation in AE DFO's Contingency Planning Criteria. Service to these critical sites would not be restored within the 4 hour limit in case of a single element failure at Goose River 725S.

Any distribution development to offload Fox Creek 741S to Goose River 725S would compound the effect of the outages, and lower the reliability of service to critical sites offloaded to Goose River 725S to an unacceptable level.

Distribution expansion at Goose River 725S is therefore not technically viable, and no further analysis was completed.

Alternative 2: Offload Fox Creek 741S to Benbow 397S

Serving the load from Benbow 397S will require building distribution feeders to serve the load requests.

The following distribution system development would be required for this alternative:

- Build 50 km of 3x477 ACSR from Benbow 397S to load center
- Install two voltage regulators

Additionally, a new 25 kV breaker will be required at Benbow 397S. Current loading information at Benbow 397S cannot be obtained AE DFO, so it is not known whether transformer capacity additions at Benbow 397S are required.

AE DFO modelled this scenario in a load flow simulation. Acceptable voltage levels (0.97 Vpu) cannot be obtained at the load centers in this scenario. This is a violation AE DFO's Guideline for 25 kV Voltage Limits. Distribution line lengths are too long to support the requested loads. For this reason, this alternative has been rejected and no further analysis was completed.

4.3 Assessment of Distribution-Based Alternatives

Alternative 1 and 2 are not technically viable. A distribution based solution cannot be developed to serve the loads identified in Table 2.1-1 and offload Fox Creek 741S. Given that there are no viable distribution-based alternatives, transmission system development is required to meet the load requests.

5 Transmission-Based alternatives:

The following transmission based alternatives were considered and are described in Sections 5.1 and 5.2.

<u>Alternative 3</u>	Increase Capacity at Fox Creek 741S
<u>Alternative 4</u>	Build New POD (Muir 2018S)

5.1 Alternative 3: Increase Capacity at Fox Creek 741S

Fox Creek 741S has six existing 25 kV distribution lines, serving load in all four directions from the POD. The POD currently serves the Town of Fox Creek and the area's industrial loads. The substation is located on Highway 43 and surrounded by multiple major pipeline facilities and corridors.

Increasing substation capacity at Fox Creek 741S would entail a 144-25 kV transformer addition along with associated 25 kV bus apparatus. Three (3) additional 25 kV breakers and feeders would also be developed.

This alternative would create the following constraints on the distribution system:

Distribution Development: The 25 kV circuits required to serve the load requests would be longer than those of the preferred solution. The new distribution development in this alternative would also require multiple additional corridors to cross Highway 43 and the pipelines surrounding Fox Creek 741S. These corridors would have to run to the west and the south to serve the requested customer loads.

Serving the requests from the Fox Creek 741S distribution system will result in higher system losses, higher line exposure to planned and unplanned outages.

Distribution System Operation: The operation and the maintenance of these distribution feeders become challenging when all area load is served from a single POD. Distribution system switching for planned and unplanned outages becomes complex and impractical. This will negatively impact the service availability to customers in the Fox Creek area.

Reliability: ATCO Electric's planning guidelines defines the Town of Fox Creek as 'rural critical' load due to the loads served in this community (i.e.: Hospital). The acceptable restoration time for rural critical load is targeted to less than 4 hours following a disruption. Fox Creek 741S POD currently provides this level of reliability to the community.

In preliminary discussions with AE-TFO, it was determined that the addition of a third 144-25 kV transformer would also require expansions of the radially-served 144 kV bus at Fox Creek 741S and the addition of multiple transmission elements at this POD.

The additional transmission elements at Fox Creek 741S increase the probability of a single element failure at the POD, as well as the consequences of a failure, especially when serving over 80 MW of load from a single point of delivery. In addition, Fox Creek

741S facility's age compounds the impact of a single element failure and restoration processes.

After the expansion, a single element failure of the following elements would result in a complete facility outage to the POD; a 144 kV breaker failure, 144 kV bus fault, 144 kV protection failures, 25 kV bus or feeder protection failure, and/or control building loss or structural failure. Further investigation with the AE-TFO has revealed the mean time to repair certain contingencies listed above will exceed 4 hours.

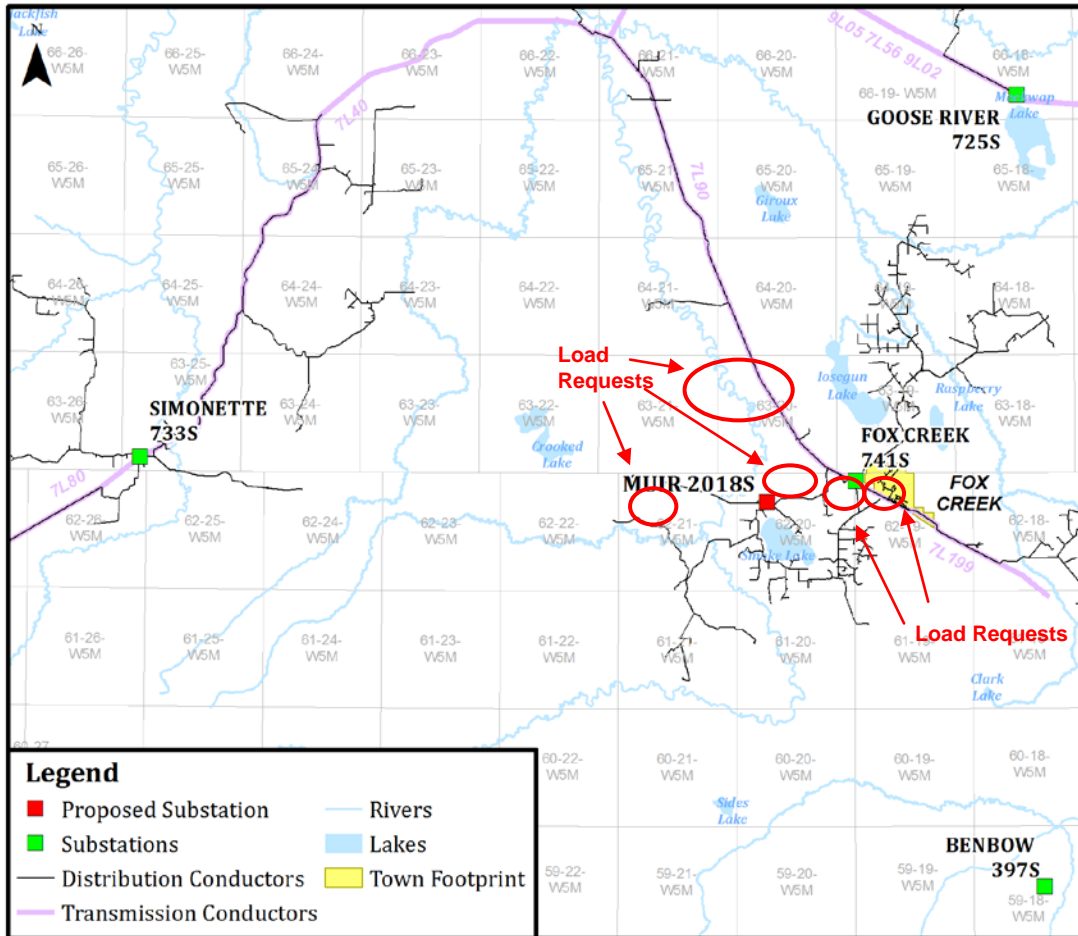
AE DFO will not be able to maintain a restoration time of less than 4 hours to the Town of Fox Creek if Fox Creek 741S is expanded. There are currently no 25 kV alternate feeds from adjacent PODs, to restore load to the community. Technical evaluations of new 25 kV alternative feeds were studied. The 25 kV circuit distances required to serve the community from existing, adjacent PODs are too great, and acceptable voltages cannot be obtained in the community.

Increasing capacity at Fox Creek 741S will result in a violation of AE DFO's planning guidelines. This alternative is not technically viable and has been rejected. No further analysis of this alternative was completed, and load forecasts were not prepared.

5.2 Alternative 4: Build a new POD (Muir 2018S)

Alternative 4 involves building a new POD in the vicinity of NE29-62-20-W5M. The proposed Muir POD will be strategically located to serve large load requests in Twp. 62-20-W5M and 62-21-W5M. Figure 5.2-1 shows the proposed location of this POD. It would be located approximately 7 km west of Fox Creek 741S.

Figure 5.2-1 – Proposed Location of Muir 2018S



Proposed Transmission System Development

The assumed transmission development for this alternative involves constructing a new transmission connection and a new POD, Muir 2018S.

The transmission line connection from Muir 2018S to Alberta Interconnected Electric System (AIES) will be determined by AESO and ATCO Electric Transmission Division (AE TFO).

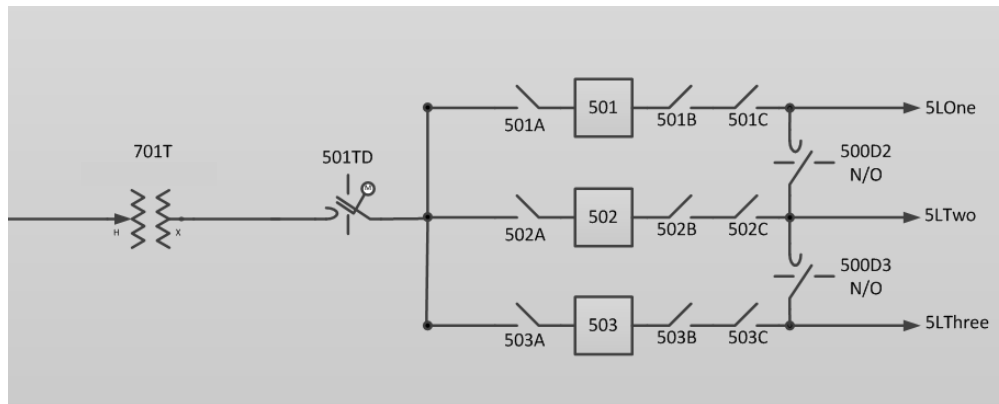
AE DFO is suggesting the following apparatus to be installed at Muir 2018S:

- One (1) 144-25 kV transformer with sufficient capacity to serve the load identified in the load forecast in Table A4 in the Appendix; and
- Three (3) 25 kV breakers complete with associated apparatus;

POD SLD

Figure 5.2-2 shows an assumed SLD of the proposed POD. Three 25 kV breakers are proposed in 2017. Provision for additional transformer and breakers is requested to accommodate future load requests and utilize full transformer capacity.

Figure 5.2-2 – SLD of Proposed Muir 2018S 25 kV Side, Alternative 2



Proposed Distribution System Development

The Muir 2018S system will accommodate three new 25 kV distribution feeders to offload existing and requested loads at Fox Creek 741S. The proposed POD is located near existing 25 kV lines served from Fox Creek 741S.

Feeder 5LOne will serve the large load request and existing load in Twp. 62-21-W5M. Serving this load with Muir 2018S will reduce line losses, as Muir 2018S is closer to the load. Approximately 0.5 km of 3 x 477 ACSR will be required with an estimated cost of \$0.1M (\$2015, +/-50%).

Feeder 5LTwo will serve the existing loads in the area southwest of Muir 2018S. This new line will offload from Fox Creek 741S. Approximately 6 km of 3 x 477 ACSR will be required with an estimated cost of \$1.2M (\$2015, +/-50%).

Feeder 5LThree will serve a large load request in Twp. 62-20-W5M and existing load in the area. Approximately 0.5 km of 3 x 477 ACSR will be required with an estimated cost of \$0.1M (\$2015, +/-50%).

The total distribution system development is estimated at \$1.4M (\$2015, +/-50%). The distribution losses for this option are forecast to be 1.9 MW on the Fox Creek 741S system and 0.9 MW on the Muir 2018S system.

Should Alternative 4 become the approved transmission development, the new load requests will be served by a combination of Fox Creek 741S and Muir 2018S. The Fox Creek 741S system will be consolidated and reorganized to optimize the feeders due to the addition of Muir 2018S. In addition to serving 9 MW of existing load currently being served by Fox Creek 741S, Muir will serve approximately 10 MW of load from Table 2.1-1. Fox Creek 741S will serve the remaining 28 MW of load from Table 2.1-1. This ensures even loading on the Fox Creek 741S and Muir 2018S PODs, and leaves adequate capacity for growth on both systems in the future.

Should the Fox Creek 741S system require a DTS increase, AE DFO will submit a System Access Service Request (SASR) in the future.

Table 5.2-1 details the customer requests from Table 2.1-1 and anticipated load transfers and for both Fox Creek 741S and Muir 2018S.

Table 5.2-1: New Customer Requests and Load Transfers Fox Creek 741S and Muir 2018S

Location	Load Description	Requested Operating Load (MW)	Served By	Requested ISD
Multiple Townships	Well pad loads	6.7	Fox Creek 741S	Q3 2017 - Q3 2018
62-20-W5M	Plant Expansion	14.4	Fox Creek 741S	Q3 2017 - Q2 2018
Town of Fox Creek	Residential, commercial, light industrial	7.1	Fox Creek 741S	2017 - 2023
Existing Fox Creek 741S Load	Various	-9.0	Transfer to Muir 2018S	Q2 2018
Net Total Load Addition at Fox Creek 741S		19.2		
63-20-W5M	Industrial Loads	3.6	Muir 2018S	Q3 2017
62-20-W5M	Plant Expansion	3.5	Muir 2018S	Q3 2017
63-21-W5M	Pump station	0.9	Muir 2018S	Q3 2017
Multiple Townships	Miscellaneous loads	2.5	Muir 2018S	Q3 2017 - 2019
Existing Fox Creek 741S Load	Various	9.0	Muir 2018S	Q2 2018
Net Total Load Addition at Muir 2018S		19.5		

Load Forecast

Tables A4 and A5, in Appendix A, show the load forecasts for Muir 2018S and Fox Creek 741S after development.

As shown in Table 5.1-1, 10.5 MW of new customer load requests and 9 MW of existing Fox Creek load are added to Muir 2018S. Fox Creek 741S will serve the remaining 28

MW of new customer requests, resulting in a new load addition of 19.2 MW at Fox Creek 741S after load transfers to Muir 2018S.

Assessment of Alternative

The requested load additions were modelled by AE DFO in the load flow simulation incorporating the scope of this alternative. The simulation results show this alternative is technically viable from a distribution system perspective. This alternative is preferred by AE DFO for the following reasons:

- This alternative allows greater flexibility in accommodating additional growth on both the Fox Creek 741S and Muir 2018S distribution systems, particularly the Muir distribution system will be able to serve growth west and southwest of Highway 43, while the Fox Creek distribution system serves growth east and northeast of Highway 43.
- The location of the new POD is closer in proximity to new large load centers in the area. This results in lower losses due to shorter distribution line distances.
- The new POD connects to existing 25 kV feeders from Fox Creek 741S, which improves the transfer load capability during contingency. This would improve the distribution system reliability in the area.
- AE DFO's Contingency Response Criteria continues to be met after the installation of the new POD. Due to ties that exist between the two systems, critical load on the new POD can be served by Fox Creek 741S in the event of a single element failure at the new POD.
- The new POD provides the second transmission sources in the area to avoid convoluted operation procedures on congested distribution lines.

6 Recommendation

From a distribution perspective, Alternative 4 is the only viable option. AE DFO prefers this alternative for the following reasons:

- Muir 2018S is located adjacent to the newly identified load requests and results in overall shorter 25 kV feeder lengths, greater future system capacity due to higher distribution system voltages, and the lowest calculated distribution system losses and development.
- This alternative accommodates the requested load growth while positioning greater flexibility for long term growth in the Fox Creek area.
- The addition of a second POD in the area will meet customers' needs, while maintaining an acceptable level of distribution system reliability and avoiding complex distribution operation.

Should Alternative 4 become the approved transmission development, AE DFO requests a DTS with a contract capacity of 19 MW on April 1, 2018.

The requested in-service date for this development is April 1, 2018.

Appendix A – Load Forecasts

Table A1 – Goose River 725S Load Forecast Excluding Load Requests

Sub No.	Feeder	Xfmr	PF	Recorded					Predicted									
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
725S	5L174	701T	83%	1.4	1.3	1.2	1.2	1.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Subtotal (701T rated at 13.3 MVA)			83%	1.4	1.3	1.2	1.2	1.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
725S	Total Station		83%	1.4	1.3	1.2	1.2	1.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

Notes:
 A coincidence factor of 1.000 was applied to 701T feeders, which includes new load additions
 Power factor for all existing feeders were calculated based on the last recorded peak loads and applied to existing loads going forward.
 Power factor for all new load is assumed to be 90%.
 Load growth on feeder 5L174 in 2017 is due to new customer additions on Goose River 725S

Table A2 – Fox Creek 741S Load Forecast with Excluding Load Requests

Sub No.	Feeder	Xfmr	PF	Recorded					Predicted									
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
741S	5L169	701T	91%	5.1	7.2	6.8	11.6	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
741S	5L123	701T	97%	8.3	8.4	9.0	8.8	9.7	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
741S	5L124	701T	97%	5.6	5.5	5.2	5.4	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Sub-total (701T rated at 41.6 MVA)			93%	17.9	19.9	19.7	24.3	25.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4
741S	5L425	702T	91%	6.3	7.5	7.4	7.0	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
741S	5L195	702T	92%	6.8	8.4	9.4	10.2	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4
741S	5L770	702T	90%	-	-	-	-	-	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Sub-total (702T rated at 41.6 MVA)			93%	12.5	15.2	16.1	16.4	16.4	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7
741S	Total Station		93%	30.4	35.1	35.8	40.7	41.9	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1

Notes:
 A coincidence factor of 0.941 was applied to 701T feeders.
 A coincidence factor of 0.959 was applied to 702T feeders.
 Power factor for all existing feeders were calculated based on the last recorded peak loads and applied to existing loads going forward.
 Power factor for all new load is assumed to be 90%.
 Feeder 5L770 is a new feeder/breaker installed as a part of the approved AESO P1616 (AUC Decision 21561-D01-2016)

Table A3 – Fox Creek 741S Load Forecast Including Load Requests

Sub No.	Feeder	Xfmr	PF	Recorded					Predicted									
				Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
				MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
741S	5L169	701T	91%	5.1	7.2	6.8	11.6	11.8	15.2	15.3	15.4	15.7	16.3	16.3	16.3	16.3	16.3	16.3
741S	5L123	701T	97%	8.3	8.4	9.0	8.8	9.7	7.2	7.8	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
741S	5L124	701T	97%	5.6	5.5	5.2	5.4	5.5	6.0	9.2	10.5	10.8	10.9	11.2	12.7	12.7	12.7	12.7
Sub-total (701T rated at 41.6 MVA)			93%	17.9	19.9	19.7	24.3	25.4	26.8	30.3	32.2	32.8	33.5	33.7	35.2	35.2	35.2	35.2
741S	5L425	702T	91%	6.3	7.5	7.4	7.0	6.9	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
741S	5L195	702T	92%	6.8	8.4	9.4	10.2	10.4	14.2	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
741S	5L770	702T	90%	-	-	-	-	-	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6
Sub-total (702T rated at 41.6 MVA)			93%	12.5	15.2	16.1	16.4	16.5	37.4	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5
741S	Total Station		93%	30.4	35.1	35.8	40.7	41.9	64.1	73.8	75.7	76.3	77.0	77.3	78.7	78.7	78.7	78.7

Notes:

POD Capacity Planning Criteria Violation

Feeder loading guideline violation

A coincidence factor of 0.941 was applied to 701T feeders, including new load requests

A coincidence factor of 0.959 was applied to 702T feeders, including new load requests

Power factor for all existing feeders were calculated based on the last recorded peak loads and applied to existing loads going forward.

Power factor for all new load is assumed to be 90%.

Feeder 5L770 is a new feeder/breaker installed as a part of the approved AESO P1616 (AUC Decision 21561-D01-2016)

Table A4 – Muir 2018S Load Forecast for Alternative 4

Sub No.	Feeder	Xfmr	PF	Recorded					Predicted									
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2018S	5L_One	701T	90%	-	-	-	-	-	-	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
2018S	5L_Two	701T	90%	-	-	-	-	-	-	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2018S	5L_Three	701T	90%	-	-	-	-	-	-	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Sub-total (701T)			90%	-	-	-	-	-	-	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6
2018S	Total Station		90%	-	-	-	-	-	-	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6

Notes:
 An assumed feeder coincidence factor of 0.95 was applied to the feeders, including new load requests

Table A5 – Fox Creek 741S Load Forecast for Alternative 4 (after offloads to Muir 2018S)

Sub No.	Feeder	Xfmr	PF	Recorded					Predicted									
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
741S	5L169	701T	91%	5.1	7.2	6.8	11.6	11.8	15.2	9.3	9.4	9.7	10.3	10.3	10.3	10.3	10.3	10.3
741S	5L123	701T	97%	8.3	8.4	9.0	8.8	9.7	7.2	13.8	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
741S	5L124	701T	97%	5.6	5.5	5.2	5.4	5.5	6.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Sub-total (701T rated at 41.6 MVA)			93%	17.9	19.9	19.7	24.3	25.4	26.8	26.9	27.5	27.8	28.4	28.4	28.4	28.4	28.4	28.4
741S	5L425	702T	91%	6.3	7.5	7.4	7.0	6.9	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	
741S	5L195	702T	92%	6.8	8.4	9.4	10.2	10.4	14.2	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	
741S	5L770	702T	90%	-	-	-	-	-	14.6	6.7	8.0	8.3	8.4	8.7	10.2	10.2	10.2	
Sub-total (702T rated at 41.6 MVA)			93%	12.5	15.2	16.1	16.4	16.5	37.4	28.2	29.5	29.7	29.9	30.1	31.6	31.6	31.6	31.6
741S	Total Station		93%	30.4	35.1	35.8	40.7	41.9	64.1	55.1	57.0	57.5	58.2	58.5	60.0	60.0	60.0	60.0

Notes:
 Feeder loading guideline violation [redacted]
 A coincidence factor of 0.941 was applied to 701T feeders, including new load requests
 A coincidence factor of 0.959 was applied to 702T feeders, including new load requests
 Power factor for all existing feeders were calculated based on the last recorded peak loads and applied to existing loads going forward.
 Power factor for all new load is assumed to be 90%.
 Feeder 5L770 is a new feeder/breaker installed as a part of the approved AESO P1616 (AUC Decision 21561-D01-2016)

Appendix B – Fox Creek 741S Development Background

In 2015, AE DFO initiated a project with AESO (Project 1616) to add a 25 kV breaker to the Fox Creek substation 741S.

This project was driven by a 15 MW load request for a customer site 20 km west of the Town of Fox Creek. The load request was staged, with 7.5 MW scheduled to be in-service in 2015 and the remaining 7.5 MW scheduled to be in-service in 2017. Stage 1 (7.5 MW) was energized in 2015, and the customer continues to ramp up their load. Project 1616 was approved by the AUC on July 5, 2016 (Decision 21561-D01-2016) and was completed in September, 2016.

Since the NID filing for Project 1616, the customer has postponed the second stage of the load request to 2019. As a result, AE DFO made the decision to remove the second 7.5 MW the load forecasts shown in Table 2.1-1 until the customer gives further confirmation. A number of new load requests and new actual feeder loading values has caused further deviation from the load forecasts submitted in as part of Project 1616.