ATCO Wildfire Risk ID Update 2025

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# Introduction

Forsite Consultants Ltd (Forsite) has supported ATCO Electric (ATCO) in wildfire risk management since 2019. Services include the completion of wildfire risk identification, including both Wildfire Risk FROM Powerlines and Wildfire Risk TO Infrastructure. Forsite also supports ATCO in the detailed understanding of tree intrusion hazards across their network through individual tree inventory and intrusion analysis. To ensure the currency of ATCO’s wildfire risk identification information, and in response to ATCO’s maturing wildfire risk management program, Forsite has been asked to provide an update to ATCO’s wildfire risk identification method and data, which will include three components:

1. **Component 1 - Wildfire Risk TO Infrastructure** – identifying areas of highest threat of wildfire impact to infrastructure and consequence to ATCO’s operation across the service area based on a current (static) understanding of wildfire risk,
2. **Component 2 - Wildfire Risk FROM Powerlines** – identifying and ranking potential ignitions caused by ATCO infrastructure that can impact Values at Risk (VAR) on the landscape based on a current (static) understanding of wildfire risk,
3. **Component 3 - Wildfire Risk in Support of Siting** **and Upgrade Decisions (“Landscape Risk”)** – understanding wildfire risk across the broader landscape (from both potential powerline ignitions and from other wildfire) to support the location and design of new or upgraded powerlines and rights of way.

This document outlines the approach and costs related to the proposed work. All three project components are outlined below independently, with the recognition that coordination between the different initiatives is anticipated to realize efficiencies in the process (including engagement with ATCO, project workshops, etc.) and in data/analysis (such as the preparation and use of data related to fuels, fire weather, VAR, etc.), both of which are reflected in this document.

The work and associated costs outlined below assumes that ATCO has already completed the Fuel ID project as submitted under separate cover. The Fuel ID project would generate a multi-resolution updated Fire Behaviour Prediction (FBP) fuels layer across ATCO’s operating area and surrounding land base.

In addition, Forsite is aware that ATCO is implementing a series of associated or aligned projects, pilots and other processes, including risk quantification and dynamic risk and alert systems, that could support, be supported by or integrated with the work that Forsite has outlined in this document. These potential connections will be discussed and confirmed during Project Initiation.

## Management Across Projects

Forsite will employ project management systems to ensure that quality products are delivered on-time and on­ budget. The project initiation stage will establish the Planning Team (including Forsite staff, ATCO representatives and others as outlined by ATCO), and will determine the interim and final project deliverables as well as project timelines.

Planning Team and Key Contacts

A Planning Team will be established of the key team members within Forsite and within ATCO. This team will provide strategic guidance to the project overall. In addition, key contacts (one individual within each of Forsite and ATCO) will be confirmed to ensure clarity of responsibility and efficiency in communications and coordination.

### Progress Reporting

The method and frequency of progress reporting, typically defined by project size, will be confirmed during project initiation. Forsite recommends the Project Team meet at least every two weeks to discuss tasks, new developments, and actions assigned to keep the project moving. Discussion notes and actions for these meetings are maintained for reference. To ensure that tasks are completed on time and budget, progress will be reported against work plans established in the initiation/planning stage.

Project Workshops

The proposed wildfire risk modelling is intended to be an integrated project with significant input and contributions from the Planning Team. Workshops are anticipated to be held for each phase of the project. Forsite will prepare and provide materials for all workshops or meetings required to share context information. The workshops will include both conference calls/web-meetings as well as in-person meetings.

### Client FTP Site and WebMap

Forsite will dedicate a secure FTP folder that provides access to up-to-date, complete and consistent material (version control) for all project components, including immediate access to all:

• Project team discussion notes,

• Background or reference material,

• Detailed descriptions of key assumptions,

• Presentation and interpretation of analysis results, and

• Pertinent tables and reports describing results.

In addition, Forsite will set up a secure project WebMap to communicate spatial inputs, outputs and other concepts within the Forsite Team and with ATCO for the duration of the project.

# Approach: Project Component 1 - Wildfire Risk TO Infrastructure

The following process summary is provided to describe the approach that will be used to implement the work.

## Objectives

Understanding wildfire risk to ATCO’s infrastructure requires a thorough understanding of the following to efficiently plan and implement risk reduction mitigation activities:

1. Generally, what is the risk from wildfires on the adjacent land base to ATCO infrastructure (powerlines, substations, telecom towers, and isolated generations) and operations?
2. How significant or critical are the individual pieces of ATCO infrastructure?
3. Is the identified critical infrastructure vulnerable to specific wildfire behaviour?
   * i.e. is a piece of infrastructure vulnerable to embers, and/or radiant heat, and/or direct flame contact?
   * What is the limiting or most vulnerable component of the piece of infrastructure and what are the manufacturer’s exposure limitations (e.g. transformer insulation thermally ages in heat >50˚C and loses insulation capabilities)?
4. Could the critical infrastructure be exposed to fire behaviour that could result in the loss of that infrastructure?
   * i.e. will the potential wildfire behaviour be significant enough to impact a piece of infrastructure under defined weather conditions?
5. What system hardening (wildfire risk reduction) actions can be taken to protect infrastructure and where should these be prioritised?

To meet this need, Forsite is proposing an update to the Wildfire Risk TO Infrastructure that steps significantly beyond the work originally completed in 2020 to provide a more detailed and structured risk identification process, albeit building on the work originally completed for ATCO.

## Phase 1 - Initiation and Planning

Project Initiation and Planning will involve a structured process to ensure that the project meets the specific and documented needs and objectives of ATCO. A project kickoff meeting will be used to confirm the following:

* Objectives,
* Approach, timelines and deliverables,
* Key ATCO contacts throughout the project – in general and for specific steps being carried out,
* Project management, communications and project meeting expectations and structure,
* Possible integration or coordination with other projects, programs or pilots that ATCO is involved in,
* Confirmation of data needs from ATCO and initiation of the data requests.

Project management and regular communications will be carried out. It is expected that biweekly virtual update meetings will be conducted to maintain communications with ATCO, provide updates on progress, and to respond to any challenges or unforeseen situations. Regular and formal project tracking, status updates and billing will be carried out every 4 weeks (or set monthly dates if needed by ATCO) to support a clear understanding of project planning and progress.

During project initiation, Forsite will communicate the detailed assumptions that are being proposed here for review and consideration by ATCO. This will allow for a common understanding of these assumptions and the implications they have to the wildfire risk profile that is being analysed. It is expected that there will be adjustments to the assumptions to ensure complete alignment with the desires of ATCO. These changes may or may not impact the overall costs and timeline, but would be discussed at the time with final decision being made by ATCO.

## Phase 2 - Understand Importance of Infrastructure to ATCO Operations

To guide wildfire risk reduction treatments, it is important to understand which pieces of infrastructure are essential to ATCO operations. Forsite will engage with ATCO staff through a series of interview(s) and/or workshops to understand which infrastructure should be prioritized based on the importance to ATCO operations. This work will build from the starting point captured in the original implementation of this project, completed in 2020. Key to this step will be the information that ATCO staff can provide to Forsite to aid in this analysis.

Interviews or workshops will discuss the following:

* ***Impacts to ATCO business*** – i.e. are powerlines, or other infrastructure, essential for the delivery of power to end clients. This would include understanding if alternative power delivery methods can be implemented (i.e. redundancy in power distribution) or the identification of power sources to key infrastructure (i.e. hospitals, emergency services, water treatment plants, etc.) whose loss could immediately impact human life and safety.
* ***Cost of replacement of infrastructure***
* ***Difficulty of replacement of infrastructure*** – i.e. is a piece of equipment rare or require lengthy rebuild periods? Does it require specialist expertise or equipment to install?

Infrastructure will be ranked based on criticality (assuming a wildfire impact will result in complete loss). Ranking of infrastructure will used to develop a wildfire risk map that incorporates the infrastructure criticality weighting/score with wildfire vulnerability and exposure in the final phase of this project. Data provided by ATCO will be assessed by Forsite to ensure that the data is accurate and complete. This includes ensuring locations of infrastructure are as accurate as possible. A summary of the findings of this phase will be provided for confirmation by ATCO.

We have made the assumption that ATCO will be providing the necessary electrical engineering expertise for the completion of this phase, and the workplan reflects this assumption. If that is not possible, Forsite is able to provide electrical engineering expertise in support of the work that is needed in this phase, with corresponding adjustment to the cost estimate for the work.

## Phase 3 – Understand the Vulnerability of Infrastructure

This phase is intended to identify the impact to ATCO and its customers if infrastructure is destroyed during a wildfire event. It aims to quantify the vulnerability of infrastructure to wildfire so our analysis can determine if estimated wildfire behaviour will destroy it or render it ineffective. A workshop (or series of interviews) will be facilitated by Forsite to further understand the specific vulnerability of infrastructure.

This discussion will focus on the ***Ignitability and/or vulnerability of infrastructure to wildfire*** – i.e. what is the mechanism that could ignite or severely damage infrastructure and at what threshold of wildfire behaviour (e.g. at what temperature). Loss of infrastructure will likely be from one (or several) of the following:

* Direct flame contact,
* Radiant heat exposure,
* Ember ignition (spotting), and/or
* Heavy smoke.

Gradients related to each of these four mechanisms through which wildfire impact can be delivered, will be considered and developed in support of the proposed work. These gradients will be as refined as possible, mostly driven by the availability and resolution of the data being used to support the wildfire hazard assessment.

A summary of the findings of this phase will be provided for confirmation by ATCO.

We have made the assumption that ATCO will be providing the necessary electrical engineering expertise for the completion of this phase, and the workplan reflects this assumption. If that is not possible, Forsite is able to provide electrical engineering expertise in support of the work that is needed in this phase, with corresponding adjustment to the cost estimate for the work.

## Phase 4 – Wildfire Hazard Analysis

A wildfire hazard analysis will be carried out across the project area to identify if the potential fire behaviour in an area threatens ***identified infrastructure*** (Phase 2) at the level at which is it ***vulnerable*** (Phase 3) to wildfire. This will be carried out with attention to the natural sub-regions that exist across Alberta and across ATCO’s operating area to inform an overall understanding of wildfire behaviour.

To understand the potential wildfire behaviour in an area, Forsite will use a range of foundational tools:

1. ***Fuel Mapping*** – It is assumed that the provincial Alberta fuel type map will be updated during a separate Fuel ID project. If not, some rudimentary work on the fuels data can be completed, including the review of fuels data that is currently available and augmenting (where data supports) to understand potential wildfire behaviour. This could include some satellite-based data use, imagery review and fuels classification efforts to improve current mapping, although the bulk of this step can be completed using a range of fuel and vegetation datasets that are widely available. Cost for this effort is not included in this project workplan
2. ***Fire Weather Analysis*** – Historic fire weather data will be analyzed to understand fire weather potential in the Service Area. This information will be used to categorize wildfire weather into 99th, 95th, 90th and 80th percentile daily Fire Weather Index (FWI) datasets for each season. The province will be divided into analogous weather zones for this analysis. These datasets characterize extreme, very high and high wildfire behaviour conditions and describe weather features such as predominant wind speed and fuel availability (i.e. degree of grass curing).
3. ***Wildfire Exposure Assessment –*** Using updated fuels mapping, fire weather data and infrastructure vulnerability thresholds, Forsite will conduct a wildfire exposure assessment for each identified piece of infrastructure for each weather scenario. Fire behaviour will be modelled using Fire Behaviour Prediction System calculations with wind modelling accounting for terrain adjustments across the ATCO service area to generate wildfire hazard outputs (e.g. flame length). This data will then be used to quantify impact to individual infrastructure considering if direct flame impact is possible, ember exposure, radiant heat exposure and smoke/ash exposure.

## Phase 5 – Wildfire Risk to Infrastructure Analysis and Reporting

The final wildfire risk mapping products and accompanying documentation will be generated based on infrastructure criticality scoring, as well as wildfire hazard and impacts inputs - all outlined above. Discussions with ATCO will guide this development in alignment with ATCO current risk management processes and protocols, as well as the ISO 31000 Risk Management Standard. This phase is effectively a GIS exercise combining the results from the overall process outlined above, into an Infrastructure Risk Scoring Matrix and designing the process to represent the risk spatially. The specific risk matrix used to complete this effort and the resulting risk quantification approach (calculation) will be reviewed and agreed to by ATCO in support of their overall wildfire risk mitigation program.

Preliminary draft risk identification results will be produced, and these will undergo an internal (Forsite) professional review and QC.

## Phase 6 – Climate Change Implications Assessment

In support of the overall risk assessment process and scan of climate change futures and implications to the risk being identified through this project. Effectively the process will support the overall understanding of wildfire hazard, and how this may be changing over time. The process will summarizing the projected effects that would impact ATCO infrastructure in a wildfire context. The results of this assessment will be used to inform the understanding of the hazard, and ultimately risk.

In general the process will involve the following steps

* Review of possible climate futures that are the focus of this assessment, including a discussion about the assumptions that will link this future to any wildfire risk implication analysis that is completed
* Complete the analysis of implications, ideally to fire weather, fire hazard (including fuels) and ultimately wildfire risk
* Document the assumptions, analysis and results/conclusions of the assessment to support either an adjustment to the risk ID or as context to the overall understanding of the wildfire risk

The scope of this phase has been estimated by Forsite through the effort/cost attributed to this work. This will be used to guide the completion of work, with the realization that through discussions with ATCO, a more robust of deep dive into the analysis of climate change implications may be warranted. Despite this, Forsite does feel that the effort/budgets allocated to the “Climate Change Implications Analysis” phases for each of the three proposed risk assessment projects will be coordinated and provide adequate budgets to complete a high level but meaningful assessment of climate change implications.

## Phase 7 – Reporting and Wildfire Risk Reduction Strategy Support

Following this, draft results and reporting will be provided to ATCO for review and comment and to support any further review that ATCO may be interested in completing. Input will be incorporated into the final results and report. The report will include recommendations for adapting or updating the results in the future, including recommended timeframe for renewal and how to best respond to a significant fire season or large fires that result in changes to fuels and related changes to wildfire risk.

The outputs of the overall process will inform ATCO on the nature of wildfire risk to their infrastructure, considering the criticality of this infrastructure to operations. This phase is intended to be a combined effort where ATCO and Forsite will work together to develop sound management practices to protect ATCO infrastructure from wildfire. This will involve a series of workshops to analyze where treatments can be most effective based on the potential wildfire behavior identified and the location of critical pieces of infrastructure that are vulnerable, this includes:

* Understanding which treatment types are available to ATCO (and which have connections with existing programs outlined in the 2022 Wildfire Risk Management Plan),
* Understanding where different treatment options will have the most impact reducing wildfire hazard,
* Understanding the extent to which mitigation strategies will be effective.

Where possible, connections between previous projects completed on behalf of ATCO will be considered to identify synergies. This includes how the results of this proposal integrate with the 2020 Wildfire Risk Identification project that analysed wildfire risk from fires ignited by ATCO powerlines, the 2022 Wildfire Risk Management Plan, and various work completed on behalf of other Albertan utilities from 2019 to present.

## Key Assumptions

All key assumptions are shared here for clarity and for the purposes of developing a cost estimate for the work. Each assumption could be modified as needed and the cost estimate updated accordingly.

* ***Likelihood*** - This project does not necessarily incorporate the likelihood of a wildfire occurring. Rather, it includes assessments of wildfire behaviour, infrastructure exposure, values at risk and their vulnerability. This is a purposeful decision to ensure that all wildfire possibilities are considered, and the results are not confounded by wildfire probability that is constantly changing. The occurrence of wildfire on the landscape depends on many factors, each with their own likelihood factors to consider, such as the likelihood of weather and likelihood of ignition. By considering all areas within the ATCO network that contain hazardous fuels to be equally possible to burn in a wildfire, we are removing the need to predict exactly where a future wildfire will happen, and the inaccuracies that such assumptions would bring into the project. Potential linkages to the proposed Project 3 below, which considers the likelihood of ignition, will be discussed with ATCO.
* ***Vulnerabilities -*** To gather required information on infrastructure vulnerabilities, Forsite will need to access ATCO experts to pass on the information or consult the manufacturer so these details can be found.
* ***Fuel ID*** - The importance of the FBP fuel classification layer to wildfire risk mitigation for utilities in Alberta is recognized. Note linkage to Fuel ID process being addressed through a separate process.
* ***Risk Quantification*** - The quantification of wildfire risk, in response to the recent (June, 2024) AltaLink AUC decision, is continuing to develop within the utilities in AB and by ATCO. We anticipate the Risk TO Infrastructure project will contribute to risk quantification; however, the scope of which may not be fully captured here (in approach and cost). This process will be determined with ATCO through the implementation of the project and in response to the additional effort ATCO is undertaking on “absolute risk quantification.”

## Deliverables

The following deliverables are intended to guide ATCO decision-making for risk reduction practices:

* Spatial data generated for each infrastructure type for each of the following variations:
  + Season (spring, summer, and fall), and
  + Percentile (e.g. 90th, 95th, and 99th percentile daily FWI weather).
* Data will be arranged into the following datasets:
* Individual feature classes for each infrastructure type, including all risk components, to support analysis of components by ATCO and respond to changes in the components over time.
* A merged feature class containing all infrastructure types in a single dataset,
* Rasters (100m and 1000m resolution) for each Risk category (e.g. all infrastructure with a ‘High’ risk ranking for spring and 99th percentile daily FWI). The rasters are used to visualise where higher densities of ‘High’ risk infrastructure occurs within the same cell.
* A detailed report describing our approach, the data and how to use the results, including
  + Overall risk calculation, including how components rolled up to the final risk ranking (ATCO will be involved in defining this through the project).

## Connections

* ***Probability of Fire*** - This project does not consider the likelihood of ignition, by design (see discussion above). However, this probability is taken into consideration within Project 3 (Wildfire Risk in Support of Siting and Upgrade Decisions) below. There is a potential to integrate this “probability of wildfire” into the *Risk TO Infrastructure* risk rankings. This will be discussed with ATCO and may be contingent on ATCO’s decision to complete all three projects, and the timing of each.
* ***Risk Quantification*** – ATCO is investing in significant risk quantification efforts, that will spill over into the update to the risk identification project outlined here. See further discussion in “Assumptions” above.

# Approach: Project Component 2 - Wildfire Risk FROM Powerlines

The following process summary is provided to understand the general approach that will be used to implement the work.

## Introduction

Forsite has developed this proposal to support the update to the wildfire risk identification (Wildfire Risk FROM Powerlines) related to ATCO’s infrastructure and operations. This work is in support of ATCO in their ongoing wildfire risk mitigation program and builds upon a suite of wildfire risk initiatives completed on behalf of ATCO (which began in 2019).

## Objectives

The project component will support ATCO business processes in general, as well as regulatory requirements and commitments regarding wildfire risk mitigation. The project will respond to the following key objectives:

* Update the understanding of wildfire risk from ATCO operations or infrastructure igniting wildfires. This refers to wildfire(s) ignited from ATCO infrastructure or operations spreading to and potentially impacting values on the landbase.
* Understand any changes to the wildfire risk when compared to the original analysis completed in 2019/2020.
* Design the risk identification update to support a response to the recent AUC Decisions regarding AltaLink's wildfire risk mitigation program that is focused on the overall likelihood component of wildfire risk from powerlines.
* Support the determination of a quantitative measure of wildfire risk, which can be adjusted as the various input parameters change (this is related to the point above). See discussions under “Assumptions” below.

Related to a portion of the project objectives, and due to recent regulatory proceeding results (AUC Decision June 19, 2024) additional work will be needed to understand and model the likelihood of ignition and how this influences an assessment of wildfire risk. Forsite anticipates adjustments to the design of the risk identification process in order to support ATCO in responding to the AUC’s concerns. The overall assumptions and design of the risk identification update will involve collaboration and confirmation with ATCO on the approach that will be taken. This collaboration is necessary, as the risk quantification process requires integration of the likelihood of ignition sources from assets, which will require further work, data and process to be completed ATCO teams. This item and the process overall is included in this workplan at a high level, but this scope of work and the associated costs is not expected to fully capture this component of work. ATCO will need to determine if additional work will be desired to refine this component of their risk assessment process, if it will be done within this risk identification update or as a separate process that is implemented. Forsite is able to facilitate these conversations to expand the risk identification process accordingly.

Forsite will employ a structured risk assessment approach based on ISO 31000 risk management processes to complete the wildfire risk identification, building from the process employed during 2019/2020 wildfire risk assessment. The project team will further incorporate lessons learned from various wildfire risk related projects completed by Forsite on behalf of ATCO and other utility companies in Alberta and across Canada since 2019. In addition, this workplan has been informed by a wildfire risk workshop held earlier in 2024.

## Phase 1 - Initiation and Management

Project Component Initiation and Planning will involve a structured process to ensure that the project meets the specific and documented needs and objectives of ATCO. A project kickoff meeting will be used to confirm the following:

* Objectives,
* Approach, timelines and deliverables,
* Key ATCO contacts throughout the project – in general and for specific steps being carried out,
* Project management, communications and project meeting expectations and structure,
* Possible integration or coordination with other projects, programs or pilots that ATCO is involved in,
* Confirmation of data needs from ATCO and initiation of the data requests.

Project management and regular communications will be carried out. It is expected that biweekly virtual update meetings will be conducted to maintain communications with ATCO, provide updates on progress, and to respond to any challenges or unforeseen situations. Regular and formal project tracking, status updates and billing will be carried out every 4 weeks (or set monthly dates if needed by ATCO) to support a clear understanding of project planning and progress.

During project initiation, Forsite will communicate the detailed assumptions that are being proposed here for review and consideration by ATCO – within the context of Phase 2 below. It is expected that there will be adjustments to the assumptions to ensure complete alignment with the desires of ATCO. These changes may or may not impact the overall costs and timeline, but would be discussed at the time with final decision being made by ATCO.

## Phase 2- Methodology Review, Confirmation of Approach

With the initial delivery of the 2019/2020 wildfire risk results, ATCO has continued to better understand and incorporate wildfire related learnings into their evolving wildfire mitigation program. In addition, a wildfire risk workshop was held with members of the ATCO and Forsite Teams involved in their wildfire risk mitigation programs. This workshop supported the development of this workplan. Within this context and in support of continuous improvement and adaptive management, a facilitated review of the risk identification methodology is proposed to move from the overall guidance provided in the workshop to detailed assumptions that will be implemented in the project.

The purpose of the methodology review is to discuss and confirm where the fire spread and risk modeling process can be improved, modified, or simplified based on ATCO's business needs, lessons learned from supporting work completed since the original analysis and outcomes from recent regulatory proceedings.

The scope of the review includes:

### ATCO requirements:

* Confirmation of the intended uses of the wildfire risk modelling results,
* Updates based on Alberta Utilities Commission (AUC)/regulatory processes and results, including the discussion related to relative risk rankings vs absolute and/or quantitative risk calculations,
* Implications of the projects implemented by ATCO since the original work, including incident investigations, suppression, support for the risk register, bowtie analyses, etc.,
* Operational challenges with the interpretation of wildfire risk results,
* Relationship to previous risk identification results and linkages to other utilities in AB, and
* Specific learnings from 2023 wildfire season.

### Wildfire spread modelling process and assumptions, including:

* Fuels
* Fire weather inputs
* Seasonality
* Grass curing and green-up
* Wind grids and topography
* Modelling parameters (i.e. number, longevity, and frequency of simulated fires)
* High Risk Fire Area roll-up process
* Ignition Point Risk roll-up process
* Multi-day fire-based wildfire risks
* Wildfire probability
* Ignition source- asset, tree intrusion
* Sustained ignition
* Likelihood of spread and impact
* Magnitude of impact

### Values at Risk data and assumptions, including:

* Scope of VAR layer,
* How communities are reflected, including community extent and potentially vulnerability
* How egress routes and evacuation related challenges and risk – this is a significant factor in Alberta and how this is captured in the risk identification should be reviewed
* Impact Rankings overall, and
* Consideration of economic impact attribution, and potential to collaborate with other Alberta utilities in this effort.

### Deliverables review:

* Confirm which data and deliverables are most relevant to ATCO's business needs, and
* Can additional deliverables and/or data be provided by the Forsite Team,
* Can the format of deliverables be changed to improve the integration of results with ATCO systems?

Phase 2 is intended to set the project trajectory for all subsequent phases. Depending on the outcomes of the methodology review, the project may change in scope. The following four phases have been scoped and costed assuming that significant changes to the project methodology are not required. If there are adjustments to the overall approach, the workplan will be updated and provided to ATCO for approval.

We note that ATCO has identified a specific interest in better understanding the wildfire risk related to more complex multi-day fires on the landscape. Forsite has identified a series of potential options through which this could be addressed, and this will be confirmed as a key part of Phase 2 outlined here. In advance of this, Forsite has identified options that may influence the overall scope and costs of this workplan, that include:

1. ***Modeling of multi-day fires***. Assumptions around the weather streams used to support modeling would need to be determined along with impact to the overall computing capacity and related costs to model these fires. It is also possible to model historical fire conditions by selecting a series of known and understood wildfire spread conditions that have occurred (e.g. specific days of the 2023 fire season) and model fires from ATCO powerlines that reflect these days or weeks of actual fire weather.
2. ***An understanding of landscape wildfire risk*** - as proposed under a Project 3 below, effort could be taken to avoid significant simulations of wildfire but rely on a more landscape level approach to risk. This would then be completed through that project workplan, with the results used to inform overall understanding of Wildfire Risk FROM Powerlines as outlined here. In addition, this could be used in concert with the expanded fire spread modeling (both ‘multi-day spread’ or ‘historical fire conditions’) as proposed above, to further enhance the understanding of wildfire risk. Comparison of these different views of risk can have significant value to ATCO.

The deliverables related to this phase will include:

* Report documenting the final assumptions and direction for wildfire risk identification work,
* Detailed Minutes/Records of Discussion supporting the final assumptions/approach, and
* Updated project workplan, if needed.

## Phase 3- Data Gathering and Consolidation

Data will be gathered and consolidated to support the modeling work. Although this work will be started at Project Initiation, it will not be completed until the approach and modeling assumptions have been confirmed (Phase 2). A series of focused virtual workshops will be used to support these steps - with specific ATCO representatives relevant to the data needs.

Data requirements include: ATCO powerlines, fuels (see note below), fire weather data, and Values at Risk.

Within this phase, the data will be gathered and confirmed with a series of quality control steps applied to ensure datasets are complete and reliable. These data sets will also be analysed to support an understanding of the conditions overall as well as changes that may have occurred since the previous analysis. This includes, but is not limited to, changes and trends in fire weather since last analysis and changes in spatial reflection of potential impacts considering the likelihood components.

Fuels Note: It is proposed that Forsite FuelID Fuel Layer be used to support the completion of the wildfire risk identification work proposed here. The cost of establishing this layer is not included in this workplan, but has been submitted to ATCO, AltaLink and FortisAlberta under separate cover, and is seen as an important updated layer for the ongoing wildfire risk identification work. If the Forsite FuelID layer is not expected to be in place for this project, additional work on the current fuels layer will need to be added to this scope or work and cost estimate.

The deliverables for this phase include:

* Consolidated data inputs (fuels, DEM, fire weather data, impacts).
* Documentation of the Climate change scan summary and FWI trends analysis along with implications.

## Phase 4 – Climate Change Implications Assessment

In support of the overall risk assessment process and scan of climate change futures and implications to the risk being identified through this project. Effectively the process will support the overall understanding of wildfire hazard, and how this may be changing over time. The process will summarizing the projected effects that would impact ATCO infrastructure in a wildfire context. The results of this assessment will be used to inform the understanding of the hazard, and ultimately risk.

In addition, a specific assessment of the FWI Trends over time will be complete for ecological zones in Alberta to support a general understanding of the trends in fire weather and from that, to understand implications to overall wildfire potential and wildfire risk overall.

In general the process will involve the following steps

* Review of possible climate futures that are the focus of this assessment, including a discussion about the assumptions that will link this future to any wildfire risk implication analysis that is completed
* Complete the analysis of implications, ideally to fire weather, fire hazard (including fuels) and ultimately wildfire risk
* Document the assumptions, analysis and results/conclusions of the assessment to support either an adjustment to the risk ID or as context to the overall understanding of the wildfire risk

The scope of this phase has been estimated by Forsite through the effort/cost attributed to this work. This will be used to guide the completion of work, with the realization that through discussions with ATCO, a more robust of deep dive into the analysis of climate change implications may be warranted. Despite this, Forsite does feel that the effort/budgets allocated to the “Climate Change Implications Analysis” phases for each of the three proposed risk assessment projects will be coordinated and provide adequate budgets to complete a high level but meaningful assessment of climate change implications.

## Phase 5- Wildfire Spread Modelling

Once the fire weather, fuels, and topographical information have been gathered, the wildfire modeling will be completed from the identified ignition points spaced along ATCO transmission lines. Parameters for wildfire modelling such as the number of ignition points, length of fire simulation, ignition point spacing, and grass curing/seasonal modelling parameters will be confirmed in the methodology summary.

Note that we have included a significant increase in the processing costs as we anticipate that we will be modeling wildfires under a full range of FWI conditions (and not just 95th percentile) to support a more all encompassing understanding of wildfire risk, better supporting full risk quantification. Although the specific nature of this modeling will not be confirmed until the confirmation of assumptions in Phase 2, Forsite has attempted to reflect this expected increase in fire spread modeling.

The deliverables from this phase include the following outputs provided for ATCO powerlines in accordance with the assumptions:

* Burn likelihood (as reflected in ‘Burn Count’ of the modelled fires from each ignition point),
* Wildfire Intensity (kW/m),
* Rate of Spread,
* Crown Fraction Burned (%) (forested fuels).

## Phase 6 - Characterisation of Likelihood[[1]](#footnote-2)

Wildfire risk assessment includes a consideration of ‘likelihood’. The likelihood component of risk related to powerline fires involves the likelihood of:

* the ignition source being generated, e.g. from asset failure, tree intrusion, etc.,
* wildfire spread, and
* the impact to Values at Risk.

ATCO has embarked on a separate process through which more detailed probability calculations related to risk and risk quantification will be determined. The scope and effort included in this workplan is related to the information being internalized and incorporated into the overall risk identification process, not necessarily the generation of this detailed information. Forsite is aware that ATCO is embarking on a separate process through which detailed identification of ignition source, sustained ignition and spread probabilities will be determined. Forsite will facilitate the incorporation of these results into the overall risk identification process, under the guidance and input of ATCO

Note the linkage between this task and the proposed climate change scan and FWI trends analysis that is being proposed as a part of the Wildfire Risk TO Infrastructure project (discussed above). The climate change scan would be an important step to inform the understanding of the likelihood of ignition, spread and impact as it is informed by trends in fire weather due to climate change. Full integration of climate change influences on fire and fire weather is not proposed here. Alternatively, the understanding of climate change and its expected influence on fire, fire weather and ATCOs risk will be provided as supporting context or commentary.

Although not included in the proposed work/cost estimate, further work can be undertaken to provide greater detail on the magnitude of the impacts caused by wildfires, including assigning dollar values to the risk dataset that is currently used to support risk identification. Forsite has developed processes/approaches to generate this and will have conversations with ATCO during project initiation to gauge interest in completing this task. We are aware that this scope of work is also a part of separate projects/processes that ATCO is embarking on.

The deliverables for this phase include the following:

* Probability/likelihood arrangements as supported by ATCO and Forsite analytics and information; and
* Characterization of the current and forecasted likelihood of ignition source, sustained ignition, spread and impact to the extent possible with information made available.
* Documentation of the process through which the likelihood information will be incorporated into that overall risk identification (ranking) process.

## Phase 7- Wildfire Risk Modelling

The Forsite Team will then model wildfire risk through the integration of the impact layer (Phase 3) and the fire spread modeling results (Phase 4). Forsite anticipates using a similar methodology as 2019/20 to create the High Risk Fire Area (HRFA) and Ignition Point Risk mapping products; however, it is acknowledged that ATCO wants to revise the risk model and that some adjustments to the risk process (beyond data updates) are expected. Forsite will work with ATCO to confirm the desired adjustments to the approach. In addition, the understanding of likelihood (Phase 5) could also be fully integrated into the risk mapping, although Forsite has not currently included this in the proposed scope and cost. The potential for this will be discussed with ATCO during Phase 2.

A series of quality control and validation steps will be undertaken including:

* Use of internal experts for review, confirmation and quality control,
* Use of external experts and contacts in the Government of Alberta where available and willing, to review and discuss the preliminary results (similar to 2019/2020 project),
* Joint Forsite and ATCO field validation of a cross-section of the modelled results to support overall confirmation and validation of the risk modeling, and
* The results of the quality control and validation steps will be considered and incorporated in any adjustments to the risk model as deemed necessary. Preliminary Ignition Point Risks and HRFAs will then be produced.

The deliverables of this phase include the following

* Ignition Point Risk Data: Per Season Ignition Point Risk and All Season Combined.
* High Risk Fire Areas (HRFAs): Highest Risk Fire Areas and Additional Areas of Interest.

## Phase 8- Risk Results Interpretation

The preliminary risk results will be reviewed and analysed with ATCO, to compare to and understand the differences that may exist between the preliminary results and the work originally completed in 2019/2020. Consideration and understanding of the implications of assumption changes will also be discussed. Feedback on the draft results will be incorporated into final risk products.

The deliverables for this phase include:

* Final Ignition Point Risks for ATCO Powerlines; and
* Final HRFAs for ATCO’s Operating Area.

## Phase 9- Final Results, Reporting and Implementation

The final risk results will be developed and shared with ATCO. The results will be accompanied by a draft report documenting the context, approach and results. Input on the draft report and results will be incorporated into a Final Report and deliverables package.

The report will include recommendations for adapting or updating the results in the future, including recommended timeframe for renewal and how to best respond to a significant fire season or large fires that result in changes to fuels and related changes to wildfire risk.

The deliverables for this phase include the following:

Final Geospatial data:

* High Risk Fire Areas
* Ignition Point Risk
* Modelling Inputs

Draft and Final Written Reports discussing:

* Context
* Methodology
* Results.

Forsite will provide a formal “training session” with ATCO staff on the use of the results to ensure a) common understanding of the results including what they represent and what they do not represent) and some “use cases” as to how the results could be used to support understanding of wildfire risk and prioritization of risk mitigation.

In addition, Forsite will be available beyond this project to support ATCO with results interpretation as needed. A set amount of time has been added to the workplan to reflect this, although we will intend to be available over the longer term to support ATCO in ongoing implementation upon request.

## Assumptions

The following key assumptions are shared to support common understanding of the overall approach, scope and costs being proposed here by Forsite. All of these assumptions can be changed or adjusted if desired by ATCO, with updates to the workplan as needed.

* ***Definitive Risk Quantification/Calculation*** – a definitive absolute calculation of wildfire risk is a process that is currently being flushed out by ATCO through a series of projects. The proposed risk identification update documented here, is one component of this, and will provide information that will be a part of the risk quantification process overall. For example:
  + A full integration of the *probability of faults* (from assets, tree intrusions or other sources) that will cause sparks significant enough to start a fire, could be combined with the results being developed through this project to support risk quantification efforts related to Risk FROM Powerlines. It is anticipated that this information would be provided by ATCO, potentially facilitated by Forsite, through a separate process or project.
  + Structured understanding of the *total societal costs* ($) related to the potential impacts and linking this to the probability of spark, fire, spread and impact would need to be completed. Detailed estimation of the $ related to potential impacts is a process that ATCO is embarking on through separate project processes and could integrate into the results of the project proposed here.
* ***Values at Risk –*** there are a number of “continuous improvement” items related to the layers reflected the key values at risk, specifically communities (extent, significance and potentially vulnerability) as well as egress or evacuation routes and how this is reflected in the overall VAR model. Each of these factors and others that may be generated through the Phase 2 Assumptions review will require specific processes, effort and cost that may not be fully captured in the workplan – as it is dependent on ATCO interests in these items and the level of detail in which they will be determined or adjusted.

# Approach: Project Component 3 – Wildfire Risk in Support of Siting and Upgrade Decisions (Landscape Risk)

## Overview

ATCO needs to inform their decisions around the location and structure of lines, rights-of-way, and other infrastructure with wildfire risk information. Forsite has developed this project workplan to support the characterization of ATCO’s service area with respect to fire behaviour and likelihood. The outputs of this project will inform the location of new powerlines or other infrastructure, and possible construction specifications (e.g. right of way widths and under-grounding decisions).

## Objectives

The following questions will be answered through the proposed work:

1. Where on the landbase is wildfire more likely to occur within the next number of years? (various timeframes supported)?
2. Where should new powerlines be located to reduce or optimize results from *Risk TO* and *Risk FROM* wildfire risk assessments?
3. How will this landscape level risk information be updated over time?
4. How can this understanding of risk be systemized into ATCO planning processes?

Understanding long-term wildfire risk on the landbase requires a thorough understanding of the following components:

* What is the expected lifespan of above-ground infrastructure components?
* What is the fire recurrence interval within ATCO’s service area? How is this changing?
* How intense are the fires? How is this changing?
* How often do weather conditions support wildfire ignition and spread? How is this changing?
* How is climate change expected to change the available fuel types and what effects will this have?
* What other ecological and environmental factors will influence this over time?

The outcomes of this proposed project are intended to guide ***long-term strategic planning initiatives*** to reduce wildfire risk rather than guide real-time wildfire response actions. This work is intended to support ATCO business processes and meet internal business objectives related to climate change readiness and resilience, and more specifically wildfire resilience. It is expected that the results of the proposed work will provide ATCO with guidance on new and replacement construction for 5-25 years (and potentially beyond), depending on changes to the landscape, the wildfire environment and utility infrastructure and technology.

In summary, the approach for Project 3 is structured around the following:

* ***Undergrounding Decisions*** – related to fire regime, return internals, and likelihood at a landscape level– we propose using a *Landis II* modeling approach,
* ***Siting Decisions – Risk TO Infrastructure*** – where to locate lines to reduce the likelihood that they will be impacted by fire - we propose to build off the *Landis II* modeling approach, supported by a series of fuel, forest cover and connectivity interpretations,
* ***Siting Decisions – Risk FROM Powerlines*** – we propose a GIS based approach based on fuels, connectivity, wind and VAR.
* ***Overall Risk Map*** – combining the above information into a strategic risk map[[2]](#footnote-3).

The approach using Landis II modeling provides a clear and definitive understanding of wildfire potential on the landscape. Although the proposed approach and associated effort is a significant investment, due to the cost, liability and maintenance implications to ATCO, we feel it provides a more comprehensive and structured understanding of wildfire risk to support significant investment decisions. If this investment is not possible, alternative approaches could be used that are more simplistic, that build off the processes and descriptions Forsite provided to ATCO this summer (following an urgent request to support operational decisions being made in July, 2024).

## Phase 1 - Initiation and Management

Project Initiation and Planning will involve a structured process to ensure that the project meets the specific and documented needs and objectives of ATCO. A project kickoff meeting will be used to confirm the following:

* Project objectives,
* Approach, timelines and deliverables,
* Key ATCO contacts throughout the project – in general and for specific steps being carried out,
* Project management, communications and project meeting expectations and structure,
* Possible integration or coordination with other projects, programs or pilots that ATCO is involved in,
* Confirmation of data needs from ATCO and initiation of the data requests, and
* General presentation of the proposed analysis including a review and presentation on the LANDIS II model and modeling approach.

Project management and regular communications will be carried out. It is expected that biweekly virtual update meetings will be conducted to maintain communications with ATCO, provide updates on progress, and to respond to any challenges or unforeseen situations. Regular and formal project tracking, status updates and billing will be carried out every 4 weeks (or set monthly dates if needed by ATCO) to support a clear understanding of project planning and progress.

## Phase 2 – Landscape Modelling – Fire Regime Analysis

We are proposing the use of the LANDIS-II model, to complete the analysis of wildfire disturbance, to support ATCOs understanding of landscape level fire return intervals, fire regime and fire likelihood over a range of timeframes. This will support both:

1. the understanding of how likely assets will be exposed to fire across specific time periods, e.g. 10 years, 20 years, including information on likelihood, frequency and severity/intensity, and
2. support an understanding of areas in which powerline siting decisions can be made to reduce wildfire risk to new assets in the future.

A diagram of a forest

Description automatically generatedLandis-II (Figure 1) is a widely accepted open-source simulation model, developed by several authors from around the world. LANDIS-II is a stochastic process model that can model spatial and temporal interactions of vegetation within a site, with adjacent sites, and in response to various types of spatial disturbances. The model is probabilistic, therefore model outputs are random in nature and represent one possible range of possibilities. LANDIS is very well suited to modelling natural processes on a landscape, and visualising outcomes. When we create model scenarios over many centuries, and many model runs, we can use the model outputs to understand the range of outcomes that are possible on a land base, and therefore the range of fire risk in the short, medium and long term we could expect to encounter.

Perhaps the most important advantage to using LANDIS-II in this project is that it is an open source and readily available model that is very accessible and well-documented. There is a large community of users that also develop the model and maintain the various extensions that accompany it. The broader science and ecological modelling community continues to add and improve model extensions for LANDIS through peer review which makes using this model an ideal platform to enable future modelling and the opportunity to continually improve the work completed in this project. The use of open-source science based ecological modelling extensions will ensure the long-term continuity and maintenance of the fire risk work which is a very important consideration for this type of work that requires ongoing maintenance and updates to remain current with the best available science and forest management direction.

Figure 1 The LANDIS II model is a raster-based, stochastic process model that simulates ecological processes and disturbance agents on sites within the model, over time.

### Assembling Data

A map of the alberta region

Description automatically generatedAssembling data is one of the most critical aspects of this project. To successfully model the forest, we will need to describe the core forest vegetation in its current state to seed the model, the terrain types within the forest, and the broad influences of ecoregions and climate on the forest.

We anticipate data needs to be:

* Forest inventory for the entire area, including provincial parks, private-land, derived from Alberta Vegetation Inventory (AVI),
* Where AVI is unavailable, a starting vegetation type can be derived from imagery classification,
* Soils mapping – to build terrain and sites within the model that influence vegetation regeneration and growth as well as fire regimes,
* Sub-regional mapping to describe climatic variations within Alberta (e.g. **Error! Reference source not found.**),
* Base data (roads, water), and other influences on fire spread and ignition.

Figure 2 Alberta natural Subregions will be a key parameter in the model to guide fire and climate behavior as well as vegetation responses to fire disturbance.

Creating a LANDIS-II model for the entirety of Alberta will be a challenging undertaking in terms of balancing a model that has sufficient detail for modelling and drawing conclusions from, relative to a model that can run efficiently to allow for troubleshooting and several model iterations to provide enough data and variation for reporting. Initially, we are anticipating a model that might have a 10 ha cell size, giving over 6 million unique cells for the province. The model may need to be run for over 100 to 500 iterations to create a meaningful fire risk surface and measure variability within the results.

### Model Parameters

The LANDIS-II model is a complete model that requires the user to provide a few adjustable parameters. This functionality is attained by having a library of ecological processes that have previously been tested, applied, published and peer reviewed. Each ecological process in the model is well documented and requires parametrization using localized ecoregional data. The following table, Table 1, summarizes some of the key parameters required by the core ecological processes relevant to an Alberta Fire Risk study.

Table 1. Key parameters required for LANDIS-II using processes relevant to this project

|  |  |
| --- | --- |
| Ecological and Anthropogenic Process | Model Process |
| Succession | Cohort Ageing and Mortality  Shade Calculation  Cohort Reproduction & Disturbance Interactions |
| Fire | Fire Ignition  Initiation and Spread  Fuel Type  Event Size  Fire Severity  Fire Damage  Fire Rotation Period (calibration) |
| Wind | Wind Rotation Period  Event Intensity  Event Size  Event Spread  Wind Damage |
| Insect | Defoliation Intensity  Initiation and Spread  Growth Reduction  Mortality |
| Harvest | Timber Harvesting Rate  Targeted Stand Types, Geographies/Zones  Regeneration and Silviculture |

The following sections provide a more detail regarding each ecological process as well as some sample parameters from recent and relevant studies. In this project, key model parameters will be adapted from existing studies and data analysis for each ecological region in the study area. Model parameters will be refined further by expert opinion and input from experts and specialists identified by the project team. Developing an understanding of key model inputs, their influence and opportunities for calibration and adjustment by the project team is integral to the success of this proposed project and confidence in the results.

### Base Succession

Tree species life history is at the core of how a process model like LANDIS-II functions at the site level. Each site in the model (a cell composed of vegetation and terrain characteristics) will be modelled for all the species succession processes that occur locally. Succession is influenced by the species present on a site, and their abilities to respond to each other, to shade, to disturbance, to terrain, and to disperse seed and regenerate. These processes are modelled at each cell, and then are spatially modelled across all neighbouring sites as each species grows, spreads, and responds through time. Species life history attributes are key assumptions in the model.

We will test the functioning of the model at the site level with a base scenario that runs over many centuries, in the absence of disturbance. This will help us to calibrate species life history assumptions and ensure the basic process are functioning as we would expect a boreal forest to function in the absence of disturbance. In the results, we would expect to see mean ages increase over time (relative to the present), and stabilize. We would also expect to see climax species, such as spruce, become more dominant on the landscape, and other species possibly become rare.

### Introduce Wind and Insects

We will then introduce disturbances into the model that influence and modify the vegetation over the course of time. These factors influence landscape pattern and therefore can influence fire behaviour and risk in our final model formulation. We will begin with smaller and more endemic disturbances like wind and insects, parameterizing these extensions to LANDIS. These may include parametrization of mountain pine beetle, forest tent caterpillar and other large scale biota with periodic large scale outbreaks.

### Introduce Fire Disturbance

Fire is the largest event that will shape the landscapes of Alberta and shape related fire risk. The Alberta Natural Subregions will be a key building block to model fire regimes that are influenced by vegetation, fuel, climate and weather. We anticipate that fire parameters, like fire return interval and mean fire size will vary across ecoregions and influence the landscape and fire risk accordingly. Fire in LANDIS requires 2 modules, the Dynamic Biomass Fuels and the Dynamic Fire System where fuel types are derived from species and site conditions, and the fire regimes are influenced by fuels, weather and parametrization expected fire size, frequency and spread.

The model will be run to test the outputs and fire disturbance sizes, to be sure they are falling with in the desired sizes and frequency.

### Introduce Anthropogenic Disturbance

Harvest is a major contributor to shaping landscape patterns and future vegetation associations. Timber harvest will be simulated into the model using the Base Harvest extension to simulate harvest activities over time. Harvest will strongly influence standing biomass and fuel types, and patterns and will play a role in modifying fire risk across the province.

### LANDIS Outputs to Support Risk Ranking and Mapping

Key model outputs are the spatial reflection of expected fire likelihood within specific timeframes, as well as expected fire frequency and fire severity/intensity.

One of the advantages of LANDIS is that we can retain all species level detail and disturbance within the model for every scenario and for each period into the future. This means that we can take the model results, and aggregate them in whatever means is necessary to visualize our outcomes. For Alberta, we can aggregate results by extracting fire events from the model in each period and each iteration to build a surface of fire frequency or fire risk for the province. Some examples of how we might aggregate results will be combinations of:

* Vegetation Type,
* By Natural Subregion, to align with the wildfire modeling zones used in previous projects,
* By Management Zone. ATCO may have geographic or operating zones that can influence decision-making with respect to assets and wildfire risk.

LANDIS will allow us to model and spatially retain fire location and fire severity across the entire province. A continuous surface of fire risk index will be produced from the model iterations, that will present a continuous index of risk from infrequent, low severity fires, to frequent, high-severity fires. We can use the same data across iterations of the model to tell us about the range of variability within the results.

Results will be shared with and presented to ATCO for preliminary input and feedback on the landscape modeling results. This information will then be combined with the additional modeling and analysis outlined below to create the risk products to support ATCOs understanding of the risk and ensuring risk informed operational decisions related to siting and asset upgrade/undergrounding. before final products and reporting is completed.

## Phase 3 –Landscape Level Wildfire Risk Characterization

In addition to the landscape modeling through LANDIS II as proposed above, to fully meet all project objectives, there are two additional GIS-based wildfire hazard and risk analysis steps that Forsite is proposing, that in concert with the LANDIS-II outputs will provide ATCO with the needed wildfire risk mapping as outlined. These two additional analysis pathways include:

* ***Sub-Landscape Level Understanding of Wildfire Exposure*** – through an analysis of fuels, forest cover and potential connectivity, a ranking of the potential of exposure of a given location to fire can be understood. This process will build on the modeling assumptions inherent within the Project 1 - Risk TO Infrastructure, and look to apply them to ATCOs operating area and surrounding lands. Analysis will focus on inherent fuel conditions, fuel connectedness and potential ember exposure. The results of this analysis will be combined with the LANDIS II results (fire regime analysis) in order to generate an understanding of wildfire risk TO powerlines to support siting decisions.
* ***Potential Wildfire Pathways to Values at Risk*** – the connectivity between a given location (which could represent a future powerline location) and value on the landscape can be estimated through the modeling of wildfires from all locations on the landscape (mimicking the fire modeling being completed in Project 2 Risk From Powerlines as outlined above). Given the prohibitive nature of the related processing, we are proposing a cellular FBP modeling approach that starts from the key VAR on the landscape. Models potential fire “upstream” from these locations, out on the landscape, including consideration of wind/topography, to understand rate of spread, intensity and overall fire spread/pathways. The individual VAR based raster outputs would be amalgamated and the result would reflect locations that are more or less likely to be associated with more impactful fires, thus supporting siting decisions related to risk FROM potential powerline locations.

## Phase 4 – Climate Change Implications Assessment

In support of the overall risk assessment process and scan of climate change futures and implications to the risk being identified through this project. Effectively the process will support the overall understanding of wildfire hazard, and how this may be changing over time. The process will summarizing the projected effects that would impact ATCO infrastructure in a wildfire context. The results of this assessment will be used to inform the understanding of the hazard, and ultimately risk.

In general the process will involve the following steps

* Review of possible climate futures that are the focus of this assessment, including a discussion about the assumptions that will link this future to any wildfire risk implication analysis that is completed
* Complete the analysis of implications, ideally to fire weather, fire hazard (including fuels) and ultimately wildfire risk
* Document the assumptions, analysis and results/conclusions of the assessment to support either an adjustment to the risk ID or as context to the overall understanding of the wildfire risk

The scope of this phase has been estimated by Forsite through the effort/cost attributed to this work. This will be used to guide the completion of work, with the realization that through discussions with ATCO, a more robust of deep dive into the analysis of climate change implications may be warranted. Despite this, Forsite does feel that the effort/budgets allocated to the “Climate Change Implications Analysis” phases for each of the three proposed risk assessment projects will be coordinated and provide adequate budgets to complete a high level but meaningful assessment of climate change implications.

## Phase 5 – Reporting and Wildfire Risk Reduction Strategy

Forsite will facilitate a review of the project deliverables and outputs with the team at ATCO, including a deep dive into the *LANDIS II* modeling approach to support a robust understanding by ATCO of the analysis completed and how the results can be interpreted and used. These facilitated conversations (or a workshop) will be used to support ATCO in understanding the products and how they can be used to support operational decisions that are wildfire risk informed. Key to the usefulness of the risk identification is to understand how the information can be used to prioritize and direct wildfire risk mitigation efforts. These discussions will be incorporated into the project reporting to provide a ‘how to’ guide on the interpretation and use of the data.

Two reports will be developed for ATCO, including a *detailed analysis report* and *summary report,* each of which will beprovided to ATCO for review and comment. Input from ATCO will be incorporated in final reports. A full suite of data inputs and intermediate and final outputs will also be provided to ATCO to support the use and internalization of the project.

The report will include recommendations for adapting or updating the results in the future, including recommended timeframe for renewal and how to best respond to a significant fire season or large fires that result in changes to fuels and related changes to wildfire risk.

Deliverables

The following deliverables are intended to guide ATCO decision-making for risk reduction practices:

* Draft & final reports and summary presentation documenting the context, approach and results
* Series of mapping products related to the project inputs and outputs.
* Spatial data generated from this process to display the information within internal ATCO GIS systems.

Key spatial deliverables will include

* Fire return intervals and expected fire frequency and severity/intensity by management zone and across ATCOs operating area
* Wildfire risk ranking across the landscape to support powerline siting to reduce future risk to these assets
* Wildfire risk ranking across the landscape to support powerline siting decisions to reduce future risk from powerline first to Values at Risk

Assumptions

The following key assumptions are shared to support common understanding of the overall approach, scope and costs being proposed here by Forsite. All of these assumptions can be changed or adjusted if desired by ATCO, with updates to the workplan as needed.

* ***Avoided Cost/Risk Spend Efficiency –*** although Forsite will be providing background risk identification to support decisions related to asset improvements, siting and investments in powerline establishment, the work does not include an assessment of overall risk spend efficiency, quantification of mitigation effectiveness or any “avoided cost” analysis that will ultimately be needed by ATCO to make the final decisions around siting and undergrounding of powerlines.

# Project Personnel

Forsite is proposing the following personnel to complete the 2024 wildfire risk identification project. In the event of changes to the planning team, changes will be confirmed with ATCO via the project manager. Given the level of engagement with ATCO throughout project development, it is expected that ATCO will identify an internal planning team to support the work.

ATCO Electric Ltd.

Glenn Buckmaster

Senior Planner

(and others as determined)

**Randy Spyksma, RPF**   
Senior Risk Manager, Project Coordinator

Advisor, Coordinato

**Joseph Rakofsky**  
Spatial Analyst - Wildfire

**Nicole Peters**   
Senior GIS Analyst

**Joanna Wand**   
Wildfire Risk Mgt Specialist



**Florencia Tiribelli, PhD**

Wildfire Behaviour Analyst

**Greg Greene, PhD**   
Fire Behaviour Specialist, Wildfire Modeling



**John Davies, RPF**   
Senior Wildfire Specialist

Wildfire Mgt Advisor



A person smiling at the camera

Description automatically generatedA person in a car

Description automatically generatedA person wearing a hat and backpack

Description automatically generated

**Craig Robinson, RPF**   
Senior Forest Analyst, Landscape Modelling

**Andy Low, RPF**

Senior Wildfire Specialist

**Hailey Sigalet**   
Wildfire Specialist

# Cost Estimate

Cost estimates are provided for each of the three project components. In the event of changes to budget, scope, or timelines these changes will be discussed proactively by Forsite project managers and ATCO planning team members. [[3]](#footnote-4)

Forsite has anticipated that all three projects would be completed and there will be efficiencies realized, and this is captured within the current workplans. We will continue to look for all opportunities to realize further efficiencies during implementation.

Project Component 1 – Risk TO Infrastructure

The table below provides and estimated project costs. Changes to project scope, budgets, or timelines will be discussed with ATCO prior to implementation via the Project Manager. Note, each phase is dependent on ATCO staff availability and the availability of information from ATCO to support the work overall.

|  |  |
| --- | --- |
| Phase | Cost |
| Phase 1: Project Initiation and Management | **$13,360** |
| *Project set up and data gathering from Fortis* | *$4,720* |
| *Ongoing Project Management (bi-weekly)* | *$4,440* |
| *WebMap - setup, maintenance* | *$4,200* |
| Phase 2: Understand Criticality of Infrastructure | **$25,090** |
| *Guidance material development* | *$2,240* |
| *Workshop preparation* | *$4,420* |
| *Workshops* | *$12,880* |
| *Data review, confirmation* | *$5,550* |
| Phase 3: Understand the Vulnerability of Infrastructure | **$23,140** |
| *Guidance material development* | *$2,240* |
| *Workshop preparation* | *$4,420* |
| *Workshops* | *$12,880* |
| *Data review, confirmation* | *$3,600* |

Cost Estimate – Project Component 1 - Risk TO Infrastructure cont’d

|  |  |
| --- | --- |
| Phase | Cost |
| Phase 4: Wildfire Hazard Analysis | **$34,100** |
| *Develop wildfire hazard metrics* | *$11,540* |
| *Weather Analysis* | *$6,070* |
| *Climate Change Scan* | *$4,500* |
| *QC results and review preliminary findings* | *$4,270* |
| *Adjustments based on updated input and analysis* | *$1,800* |
| *Review and confirm results with ATCO/experts* | *$3,520* |
| *Update and incorporate input* | *$2,400* |
| Phase 5: Wildfire Risk to Infrastructure Analysis | **$45,485** |
| *Client Engagement meetings* | *$2,460* |
| *Risk matrix development* | *$5,400* |
| *Wildfire risk to infrastructure analysis* | *$10,305* |
| *GIS Roll-up* | *$2,100* |
| *Field Confirmation* | *$12,500* |
| *Results review reporting development* | *$9,580* |
| *Presentation/Questions* | *$3,140* |
| Phase 6: Climate Change Implications Analysis | **$25,480** |
| *Confirm scenario, discuss assumptions* | *$6,120* |
| *Complete analysis, implications assessment* | *$12,490* |
| *Reporting/documentation* | *$6,870* |
| Phase 7: Wildfire Risk Reduction Strategy Support | **$30,360** |
| *Treatment strategy support* | *$5,080* |
| *Workshop preparation* | *$4,420* |
| *Results and mitigation workshop/presentation* | *$10,080* |
| *Reporting - draft, final, data package* | *$10,780* |
| Total (before taxes) | **$197,015** |

Project Component 2 – Risk FROM Infrastructure

|  |  |
| --- | --- |
| Phase | Cost |
| Phase 1 - Project Initiation and Management | **$21,790** |
| *Project admin (ongoing e.g. tracking, set up, project mgmt)* | *$13,400* |
| *Project Initiation, Confirmation of data needs, detailed workplanning* | *$4,160* |
| *Webmap* | *$4,230* |
| Phase 2 – Methodology Review | **$40,635** |
| *Planning Team Meetings (estimated 3) and preparation* | *$7,940* |
| *Weather process review (zone resolution)* | *$7,265* |
| *Impacts (best practices and input)* | *$5,390* |
| *Fuels and Topography* | *$2,840* |
| *Review of Results for Fortis Business Applications* | *$3,440* |
| *Likelihood of ignition, spread and impact* | *$4,715* |
| *Wildfire Risk Modelling Approach* | *$4,715* |
| *Reporting* | *$4,330* |
| Phase 3 – Data Gathering and Consolidation | **$41,125** |
| *Planning Team Meeting and Preparation* | *$6,405* |
| *VAR impact Data Gathering* | *$1,960* |
| *Data Processing and Impact Modelling Preparations* | *$5,115* |
| *Impact Quality Control and Testing* | *$3,745* |
| *Fuels review and integration of US/SK/BC sources* | *$2,845* |
| *Analysis of Wildfire Ignition and Fire Weather Likelihood Analysis* | *$10,190* |
| *Weather Zone ID and Data gathering* | *$10,865* |
| Phase 4 – Climate Change Implications Analysis | **$34,700** |
| *Climate change scan* | *$4,500* |
| *Fire weather trends* | *$6,220* |
| *Confirm scenario, discuss assumptions* | *$5,620* |
| *Complete Analysis, implications assessment (integrated with Phases 5-7)* | *$11,990* |
| *Reporting/documentation* | *$6,370* |
| Phase 4 – Wildfire Spread Modeling | **$199,940** |
| *Data Preparation and clipping (Fuels, Impact, DEM, wind grids, ignition points)* | *$4,735* |
| *Processing (217,000 x 400)* | *$186,250* |
| *Results Review* | *$8,955* |
| Phase 5 – Characterization of Likelihood | **$28,780** |
| *Facilitation - Likelihood of ignition source* | *$7,570* |
| *Support incorporation of Likelihood of Fire - Ignition, Spread, Impact* | *$9,590* |
| *Flush out likelihood process, documentation, final results* | *$11,620* |
| Phase 5 – Wildfire Risk Modelling | **$58,795** |
| *Model development* | *$5,020* |
| *Processing* | *$5,315* |
| *IPR Development* | *$3,670* |
| *HRFA Development* | *$5,955* |
| *Quality Control* | *$5,955* |
| *Validation - office, field* | *$26,740* |
| *Final Prelim IPR, HRFA Development* | *$6,140* |

Cost Estimate – Project Component 2 - Risk FROM Infrastructure cont’d

|  |  |
| --- | --- |
| Phase | Cost |
| Phase 6 – Risk Results Interpretation | **$31,150** |
| *Ignition Point Characterization and HRFA description* | *$10,180* |
| *Workshop 1 - Current and Past IPR and HRFAs* | *$9,580* |
| *Documentation of results, direction for the final products, final spatial products* | *$11,390* |
| Phase 7 – Reporting and ATCO Support | **$28,570** |
| *Generating final deliverables* | *$2,010* |
| *Reporting* | *$8,990* |
| *Report Review* | *$6,480* |
| *Training Session/workshop* | *$9,580* |
| *Implementation support - as needed* | *$11,090* |
| Total | **$495,065** |

The cost estimate outlined above, makes the following key assumptions:

* the scope of the wildfire risk modeling will be generally consistent with the work completed in 2019/2020. Although the wildfire risk workshop provided feedback from ATCO on possible additions or adjustments to the overall approach, the specific details of this, and their implications to the overall workplan will need to be confirmed during Phase 2 of this project;
* the Fuel layer will be updated through a separate project and work on the Fuel Layer is not included in this project workplan;
* A review and update to the workplan will be completed and shared with ATCO, following the completion of Phase 2 – Methodology Review; and
* Additional discussions are needed to confirm the approach in which ATCO would like to respond to an expanded analysis and understanding of the probability component of the overall wildfire risk.
* The climate change implications assessment will be scaled to align with the budget for this work or an adjustment will be made to the cost estimate. This will be confirmed during Phase 2 of the project to confirm the scope and depth of the climate change scenario and implications analysis.

Project Component 3 – Landscape Wildfire Risk

|  |  |
| --- | --- |
| Phase | Cost |
| Phase 1 - Project Initiation and Management | **$13,360** |
| *Project set up and data gathering from Fortis* | *$4,720* |
| *Ongoing Project Management (bi-weekly)* | *$4,440* |
| *WebMap - setup, maintenance* | *$4,200* |
| Phase 2 - LANDIS II Modeling – Fire Regime Analysis | **$149,310** |
| *Requirements, Data Gathering, Prep* | *$13,635* |
| *Parameterize Models, Build Resultant, Build Model for Test Area* | *$64,800* |
| *Test, Calibrate, Expand Model, Results, Reporting* | *$70,875* |
| Phase 3 - Landscape Level Wildfire Risk Characterization | **$113,200** |
| *Wildfire Exposure from Potential Fire* |  |
| *Data gathering, finalize approach, review/confirm* | *$10,580* |
| *Complete analysis, prelim results, professional review* | *$36,080* |
| *Finalize results, reporting* | *$12,240* |
| *Wildfire Pathways/Connectivity to VAR* |  |
| *Data gathering, finalize approach, review/confirm* | *$10,580* |
| *Complete analysis, prelim results, professional review* | *$36,080* |
| *Finalize results, reporting* | *$12,240* |
| Phase 4 – Climate Change Implications Analysis | **$22,780** |
| *Confirm scenario, discuss assumptions* | *$5,220* |
| *Complete analysis, implications assessment* | *$11,590* |
| *Reporting/documentation* | *$5,970* |
| Phase 5 - Reporting and Wildfire Risk Reduction Strategy | **$35,130** |
| *Draft document, draft results* | *$15,240* |
| *Workshop prep, delivery, follow-up* | *$11,000* |
| *Reporting - draft, final, data package* | *$8,890* |
| TOTAL | **$333,780** |

Project Cost Summary

The total project costs are summarized as follows:

|  |  |
| --- | --- |
| Project Component | Cost |
| *Project Component 1 - Risk TO Infrastructure* | *$197,015* |
| *Project Component 2 – Risk FROM Powerlines* | *$495,065* |
| *Project Component 3 – Landscape Risk* | *$333,780* |
| Total (before taxes) | **$1,025,860** |

Rates

The following rates were used to generate the workplan. Forsite will be billing hourly based on these rates, reporting against the project budgets. Forsite endeavors to utilize the most applicable individual with the right skills and expertise to complete the work, working to ensure value for ATCO.

|  |  |
| --- | --- |
| Role | Hourly Rate |
| Senior Specialist/Advisors - Risk Mgt, Planning, Wildfire | $225 |
| Project Manager, Coordinator | $185 |
| Wildfire Specialist - Risk, Management, Modelling | $185 |
| Planner, Junior Wildfire Specialist | $160 |
| GIS Specialist | $150 |
| GIS Tech | $110 |
| Expenses | As incurred |

If there is a need for Forsite to provide electrical engineering expertise in support of any of the work, and specifically in Project 1, Forsite will provide a corresponding rate schedule for that work at that time.

# Timelines

The timelines for the proposed work will be discussed with ATCO and confirmed prior to project initiation.

1. More significant attention to the likelihood related to the wildfire risk will be flushed out here, as a result of the recent AUC decision pertaining to AltaLink's wildfire mitigation program. An expansion of this work through separate ATCO projects is likely as the approaches in response to the AUC decision continues to develop and as ATCO invests in risk quantification through a separate project. In addition, Forsite provided a separate more detailed potential scope of work and options for further analysis that may impact this workplan. [↑](#footnote-ref-2)
2. Although we continue to recommend the individual risk component maps should guide different risk priority and mitigation decisions vs trying to create a single risk map to guide all decisions and operations. [↑](#footnote-ref-3)
3. It should be noted that costs and timelines may be subject to changes pending the results of the methodology review (Phase 2 within each project). [↑](#footnote-ref-4)