



Preliminary Wind Consulting

Coal Creek Innovation Center

Superior, Colorado

CPP 17145

Date	Revision	Prepared	Checked	Approved
11 July 2022	R01	Kevin Bauman, P.Eng. Project Engineer kbauman@cppwind.com	Albert Brooks, P.Eng. Senior Project Engineer abrooks@cppwind.com	Albert Brooks, P.Eng. Senior Project Engineer abrooks@cppwind.com

INTRODUCTION

CPP was retained to assess wind conditions around the proposed Coal Creek Innovation Center development in Superior, Colorado.

An assessment of the acceptability of the wind environment around a development can inform designers about the suitability of outdoor areas for their intended uses. Where necessary, design modifications can be made or intervention measures added to mitigate areas with the potential for excessive wind speeds.

The intention of this assessment is to:

- Identify the wind flow mechanisms that may result in more frequent strong winds than desired for passive pedestrian use spaces, such as near building entrances, patio / dining spaces and amenity terraces; and,
- Provide a range of wind mitigation measures that can be used to improve conditions, if required. These can take the form of larger scale features, as well as more localized, targeted mitigation.



Site / Concept Plan of Coal Creek Innovation Park Masterplan

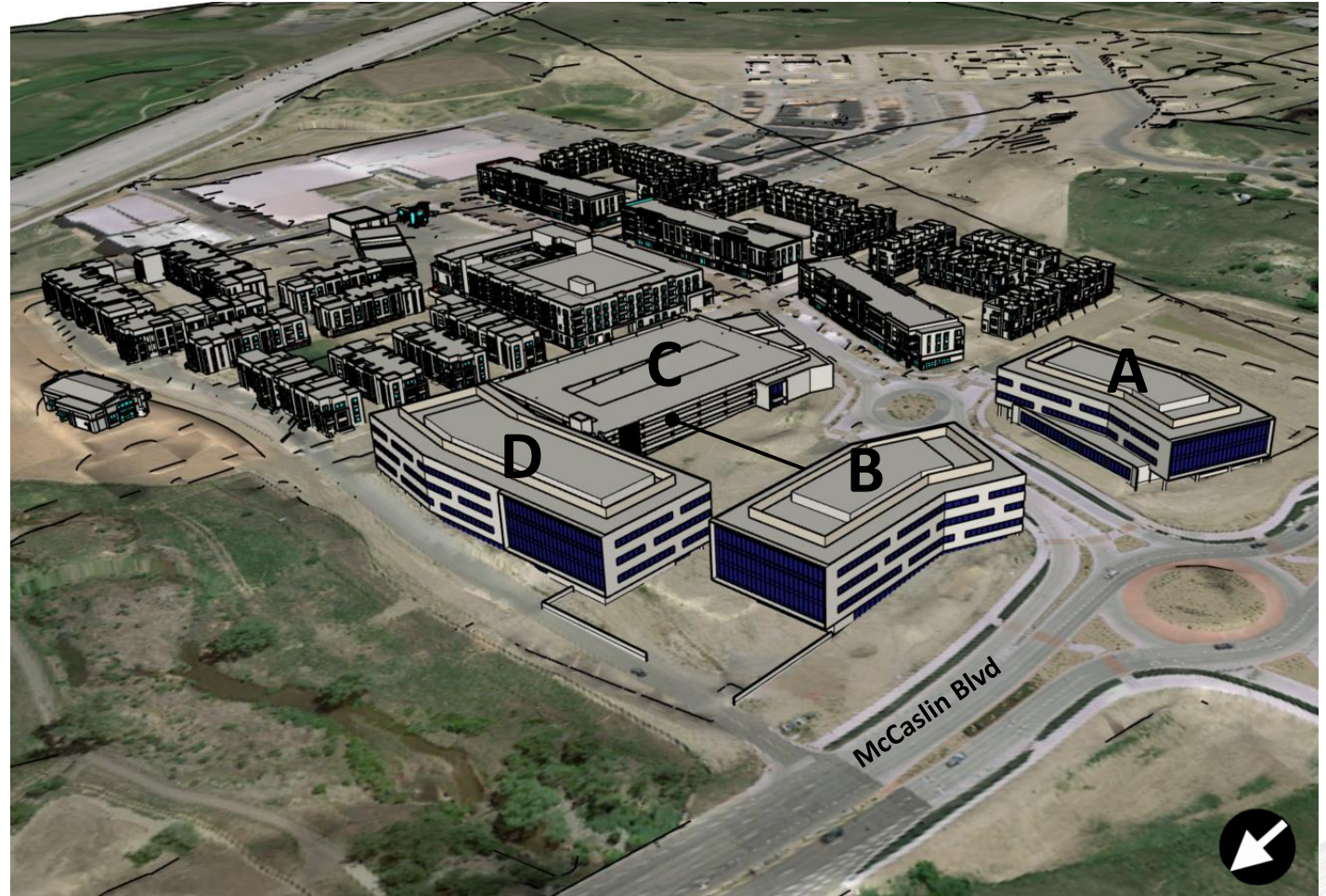
SITE AND BUILDING INFORMATION

The proposed Coal Creek Innovation Center development involves the construction of four buildings on the east side of McCaslin Blvd. The buildings comprising the development will be the furthest west of the Coal Creek Innovation Park Masterplan development south of Downtown Superior, CO.

The four buildings (Buildings A – D) range in height from 3 to 5 stories and will include a mix of residential, office and retail use as well as parking.

Areas sensitive to frequent strong winds and therefore the focus of this assessment include:

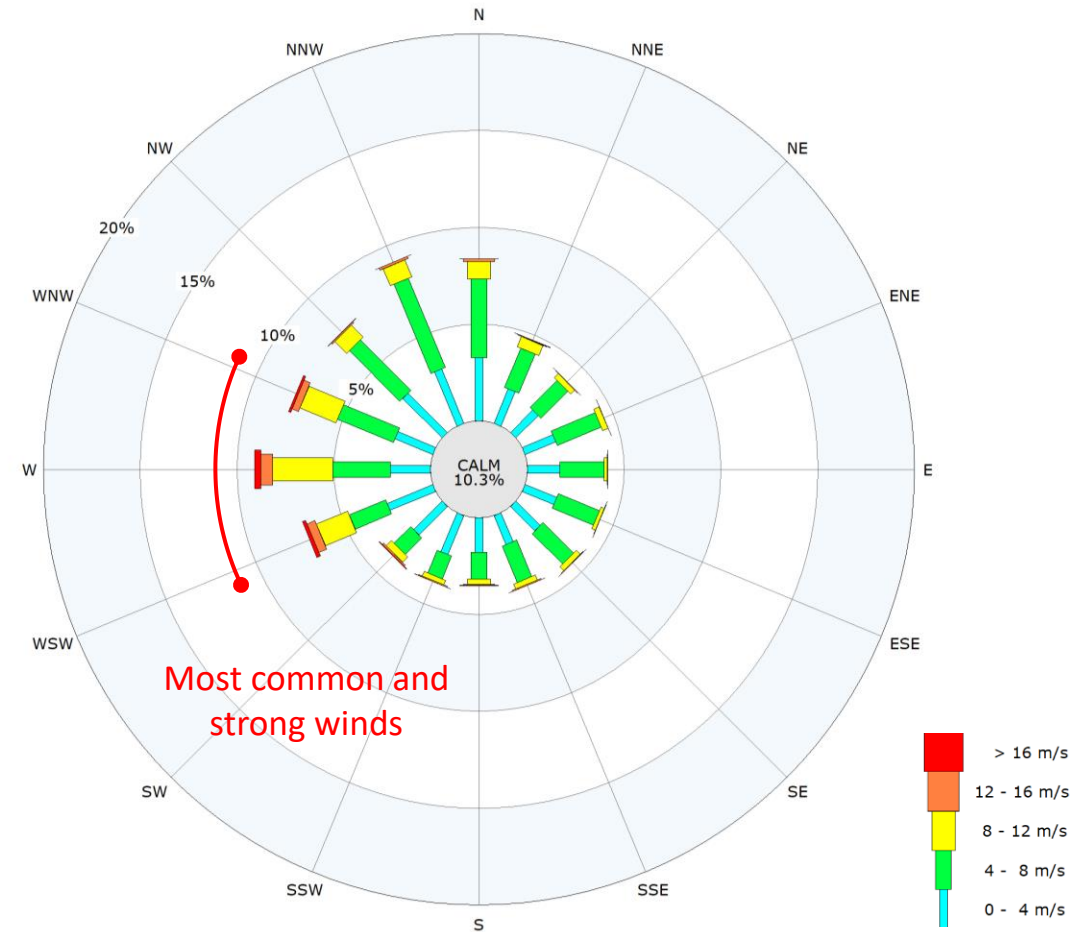
- Entrances to the buildings;
- The central pedestrian courtyard;
- Parks and green spaces; and,
- Areas known to have unique wind flow conditions (i.e. building corners, passages between adjacent massings, recessed areas etc.)



3D Model of Coal Creek Innovation Park Masterplan with Study Buildings of Focus Identified

METEOROLOGICAL DATA

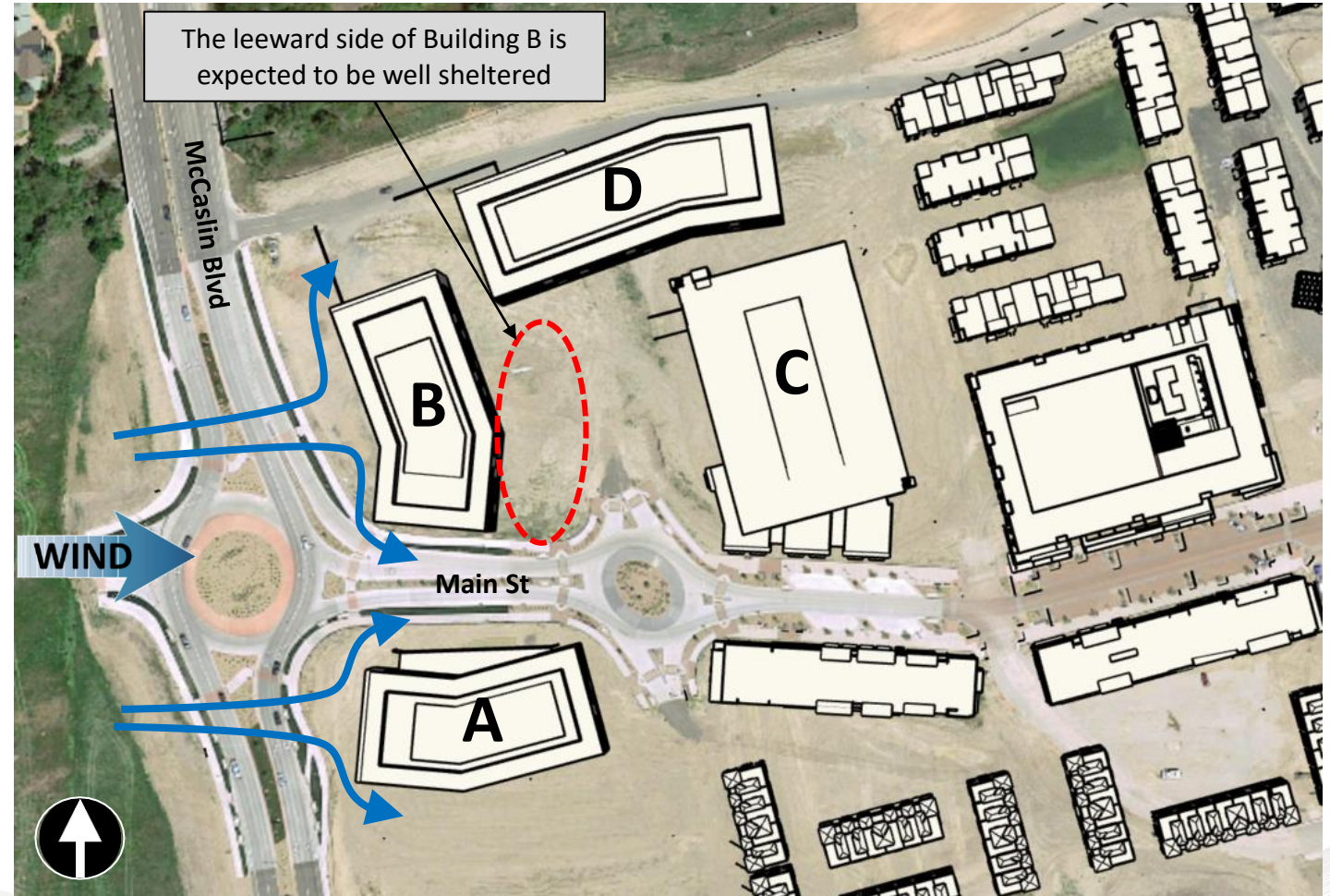
- Meteorological data recorded at Rocky Mountain Metropolitan Airport from 1981 – 2016 was used for this assessment. This wind data is depicted in the adjacent wind rose shown.
- The Rocky Mountain Metropolitan Airport is located approximately 4 miles southeast of the project site and is considered an accurate representation of the winds at the project site. The wind data was corrected to account for the differences between the airport surroundings and site surroundings (i.e. approach roughness correction).
- The arms of the wind roses point in the direction from where the wind is blowing, the width and color of the arm represent the wind speed, and the length of the arm indicates the percent of the time that the wind blows for that combination of speed and direction.
- As can be seen, predominant winds occur from the west-southwest through west-northwest directions.
- Stronger winds (depicted by the yellow and orange bands) are also associated with these prevailing directions.
- CPP’s analysis of the predicted wind conditions will focus on the winds from these prevailing westerly directions as these winds have the greatest likelihood to result in the most adverse wind conditions at the project site.



*Probability of Occurrence of Wind Speed by Direction
Rocky Mountain Metropolitan Airport (All Seasons, All Hours, 1981 - 2016)*

DISCUSSION OF WIND FLOWS

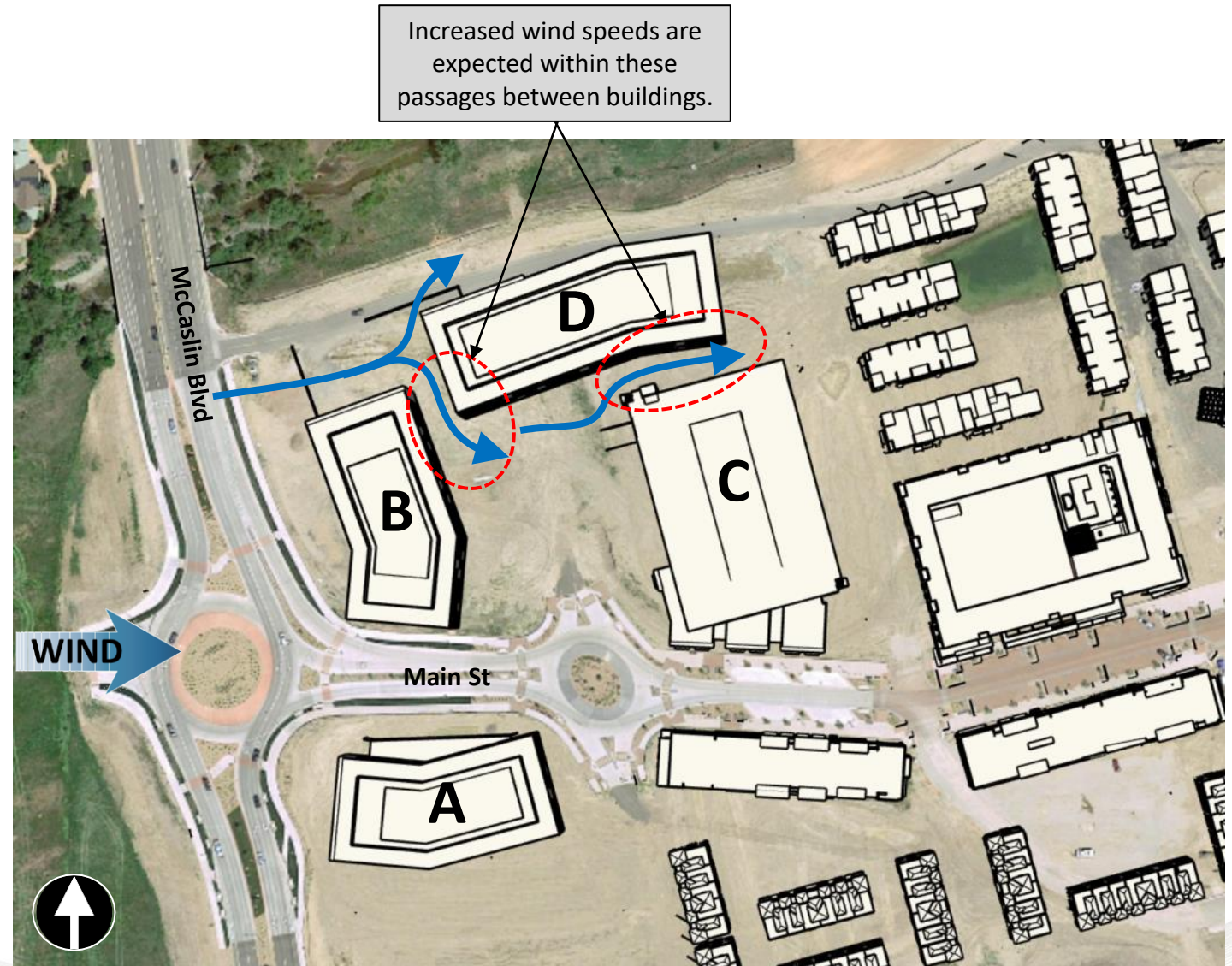
- The upwind terrain to the west of the site is fairly open and comprised only of smaller residential buildings that are not expected to block or redirect wind flows.
- Buildings A and B are expected to intercept the brunt of approaching winds. The two buildings are separated enough from one another that winds are not expected to channel between the massing's to an adverse extent.
- Building A is aligned parallel to the westerly winds. This is beneficial as it will limit the total façade area that winds are able to intercept and therefore the extent to which they are able to be redirected and accelerate.
- Building B is aligned perpendicular to the westerly winds. Winds are expected to intercept its façade and accelerate around the northwest and southwest corners.
- The leeward (east) side of Building B is expected to be well sheltered by the massing and calm wind conditions conducive for passive pedestrian activities are expected in this space.
- As CPP understands, much of the central area between Buildings B, C and D is intended as a pedestrian focused courtyard.



Site Plan of Project Site Relative to Approaching Prevailing Westerly Winds

DISCUSSION OF WIND FLOWS

- Although Building D is aligned parallel to the prevailing westerly winds, winds are expected to channel and accelerate through the narrow passage between Buildings B and D.
- It is recommended that the design team avoid programming this space for passive pedestrian use. If this space is intended only for pedestrians to transit through, these wind conditions are likely considered appropriate.
- A similar channeling of winds is also expected to occur in the narrow passage between Buildings C and D.
- As CPP understands, the design of the development will include an extensive landscaping plan that will include a mix of tall trees, hedges, planters etc.
- This variety of landscaping elements is expected to promote a more comfortable wind environment by intercepting and removing energy from wind flows.



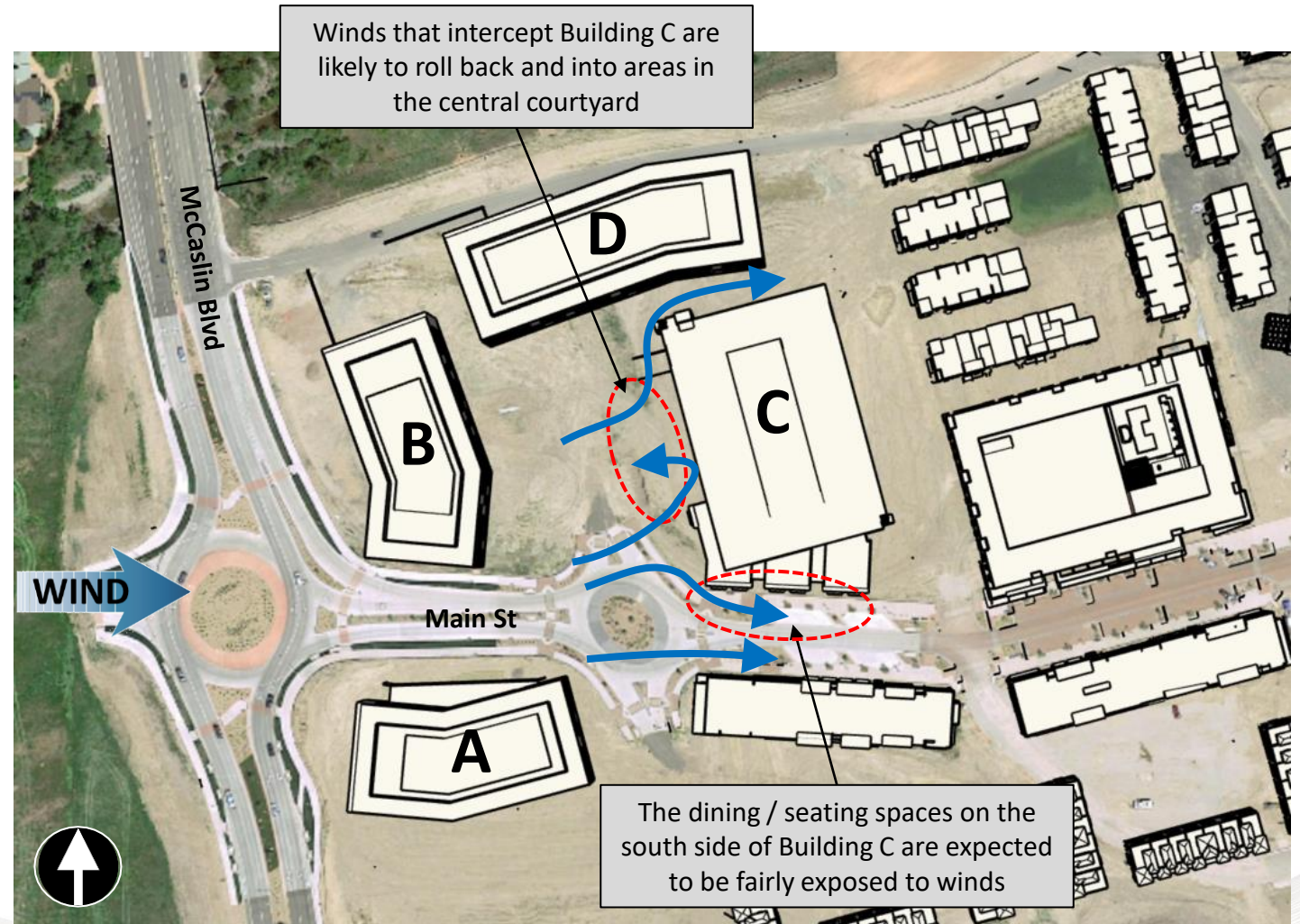
Site Plan of Project Site Relative to Approaching Prevailing Westerly Winds

DISCUSSION OF WIND FLOWS

- Winds that approach and intercept Building C have the potential to roll back and into areas in the central courtyard.
- Several dining / seating spaces are planned on the south side of Building C. These areas are expected to be fairly exposed to winds approaching from the west and stronger winds than may be desired for these spaces are expected.
- Consideration should be given to interspersed wind control elements within the dining / seating areas on the south side of Building C to offer localized shelter to pedestrians. Examples of these forms of wind control are provided in on the following page for reference.

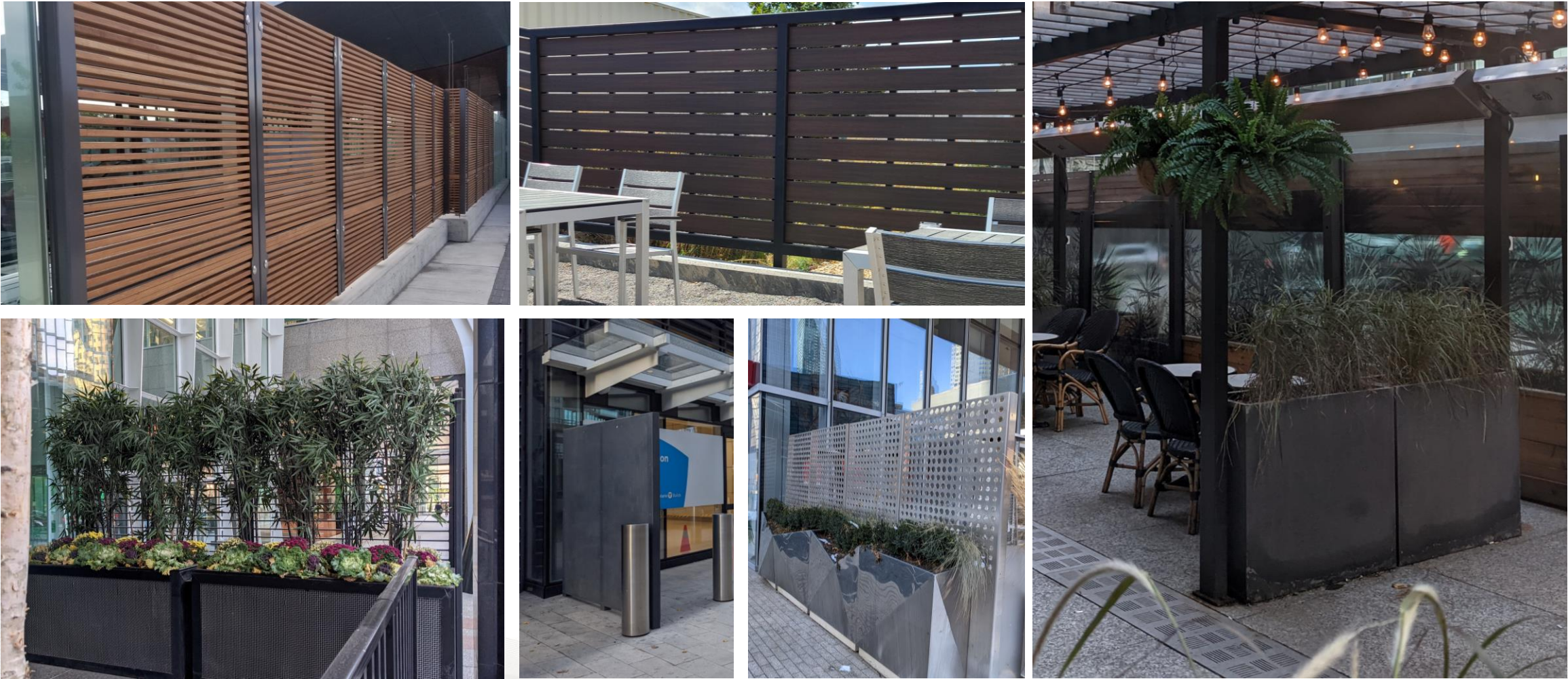


Main Street Rendering – View from South of Building C



Site Plan of Project Site Relative to Approaching Prevailing Westerly Winds

DISCUSSION OF WIND FLOWS



Examples of Vertical Wind Screens / Integrated Landscaping

DISCUSSION OF WIND FLOWS

- As CPP understands, concerns have been raised with regards to the impact of Buildings A through D on the other buildings located further east on the site.
- In general, the four buildings of the development are expected to shelter the Coal Creek Innovation Park Masterplan development further east.
- As winds primarily approach from the westerly direction, Building C is expected to provide shelter to the residential buildings located downwind and adjacent to the site.
- The residential building on the south side of Main St across from Building C is aligned parallel to the prevailing winds. This in combination with the large separation between these 2 buildings is not expected to result in a significant acceleration of winds along Main St that could otherwise affect the areas downwind.



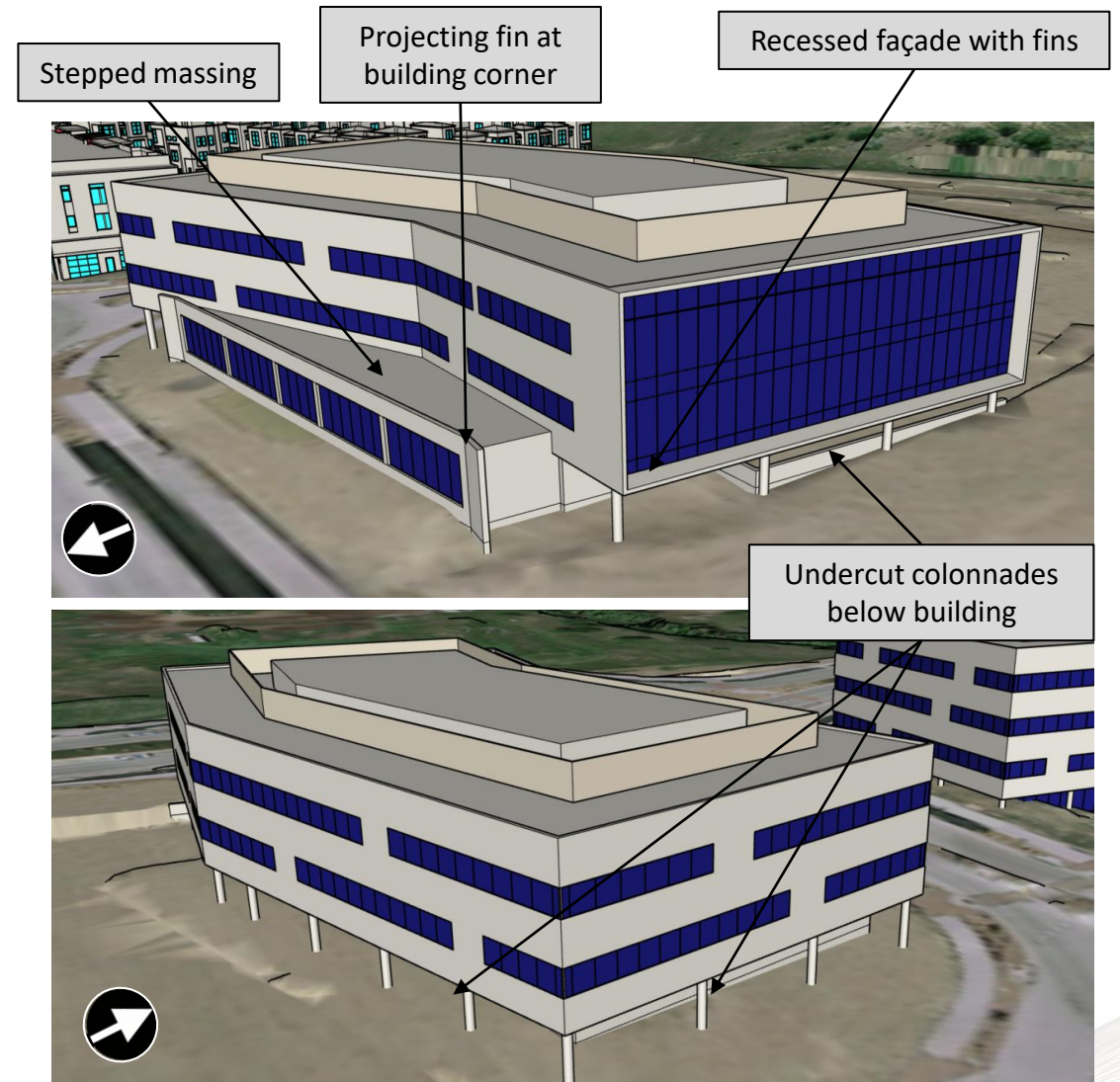
Site / Concept Plan of Coal Creek Innovation Park Masterplan

DISCUSSION OF WIND FLOWS

Building A

Building A of the development has been designed with several massing details that are expected to encourage a more positive wind environment around its perimeter including;

- A stepped podium along the north façade that is expected to intercept winds that descend down the façade and otherwise affect pedestrian spaces at grade;
- The west façade of Building A has been recessed allowing for elements of the façade to project and disrupt winds flowing across the facade. Likewise, the recessed façade allows a bottom shelf / canopy that is expected to intercept descending wind flows.
- The fin that projects from the building at the northwest corner is expected to intercept winds and reduce the extent to which winds accelerate around the corner.
- Much of the perimeter of the building is undercut with colonnades. This is a positive design as these undercut areas will be less susceptible to increased wind speeds and may provide comfortable walkways for pedestrians to traverse around the building.



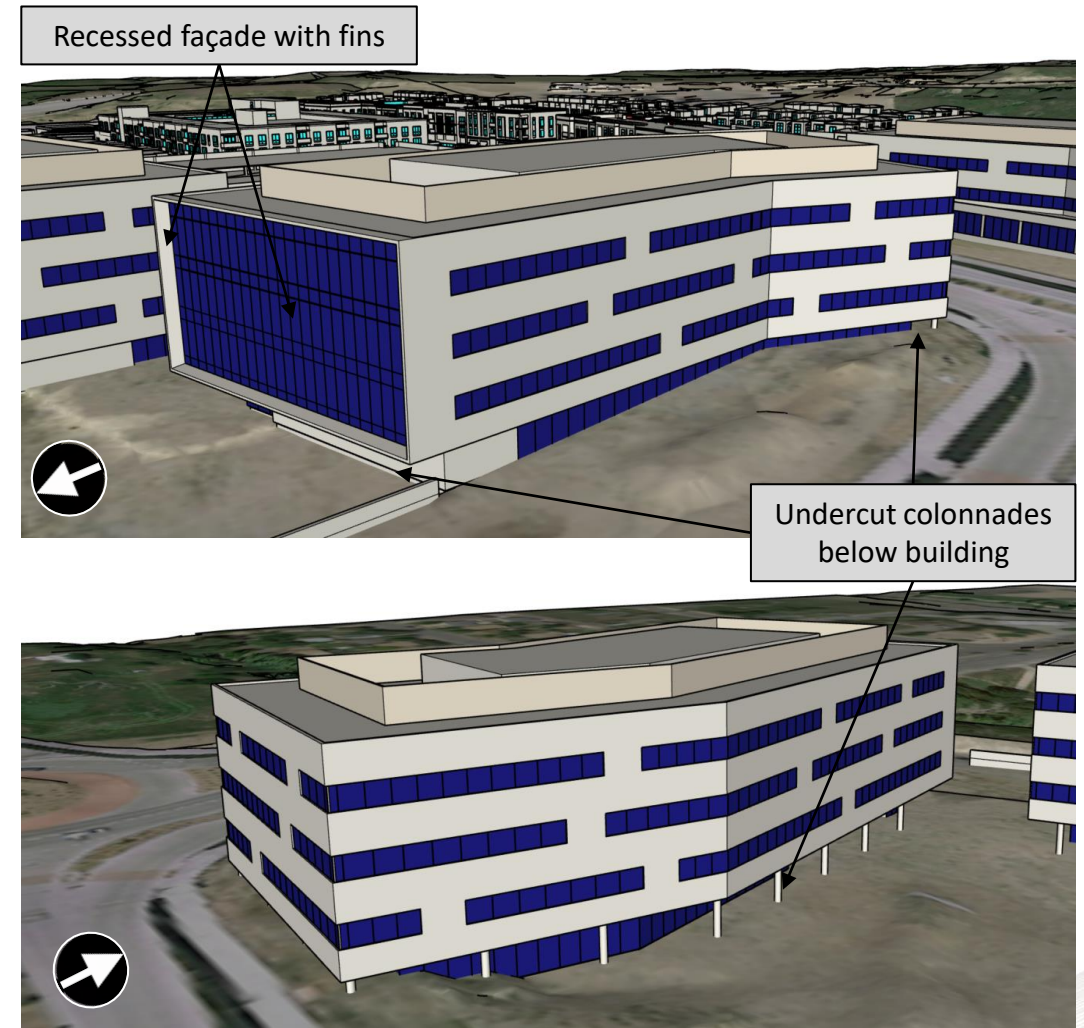
3D Model of Proposed Development – Building A

DISCUSSION OF WIND FLOWS

Building B

Building B of the development has been designed with several massing details that are expected to encourage a more positive wind environment around its perimeter including;

- The north façade of Building B has been recessed allowing for elements of the façade to project and disrupt winds flowing across the facade. Likewise, the recessed façade allows a bottom shelf / canopy that is expected to intercept descending wind flows.
- Much of the perimeter of the building is undercut with colonnades. This is a positive design as these undercut areas will be less susceptible to increased wind speeds and provide comfortable walkways for pedestrians to traverse around the building.



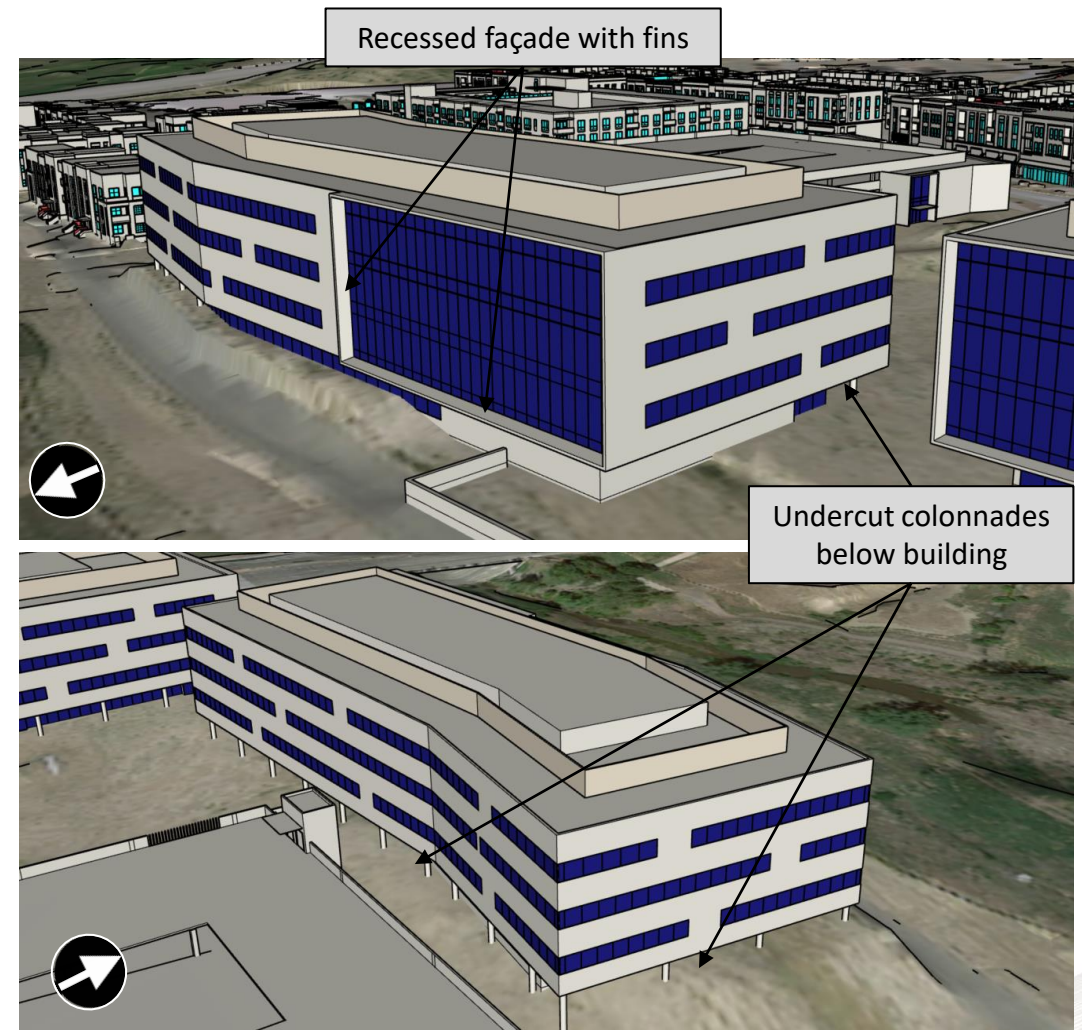
3D Model of Proposed Development – Building B

DISCUSSION OF WIND FLOWS

Building D

Building D of the development has been designed with several massing details that are expected to encourage a more positive wind environment around its perimeter including;

- The north façade of Building D has been recessed allowing for elements of the façade to project and disrupt winds flowing across the facade. Likewise, the recessed façade allows a bottom shelf / canopy that is expected to intercept descending wind flows.
- Much of the perimeter of the building is undercut with colonnades. This is a positive design as these undercut areas will be less susceptible to increased wind speeds and provide comfortable walkways for pedestrians to traverse around the building.

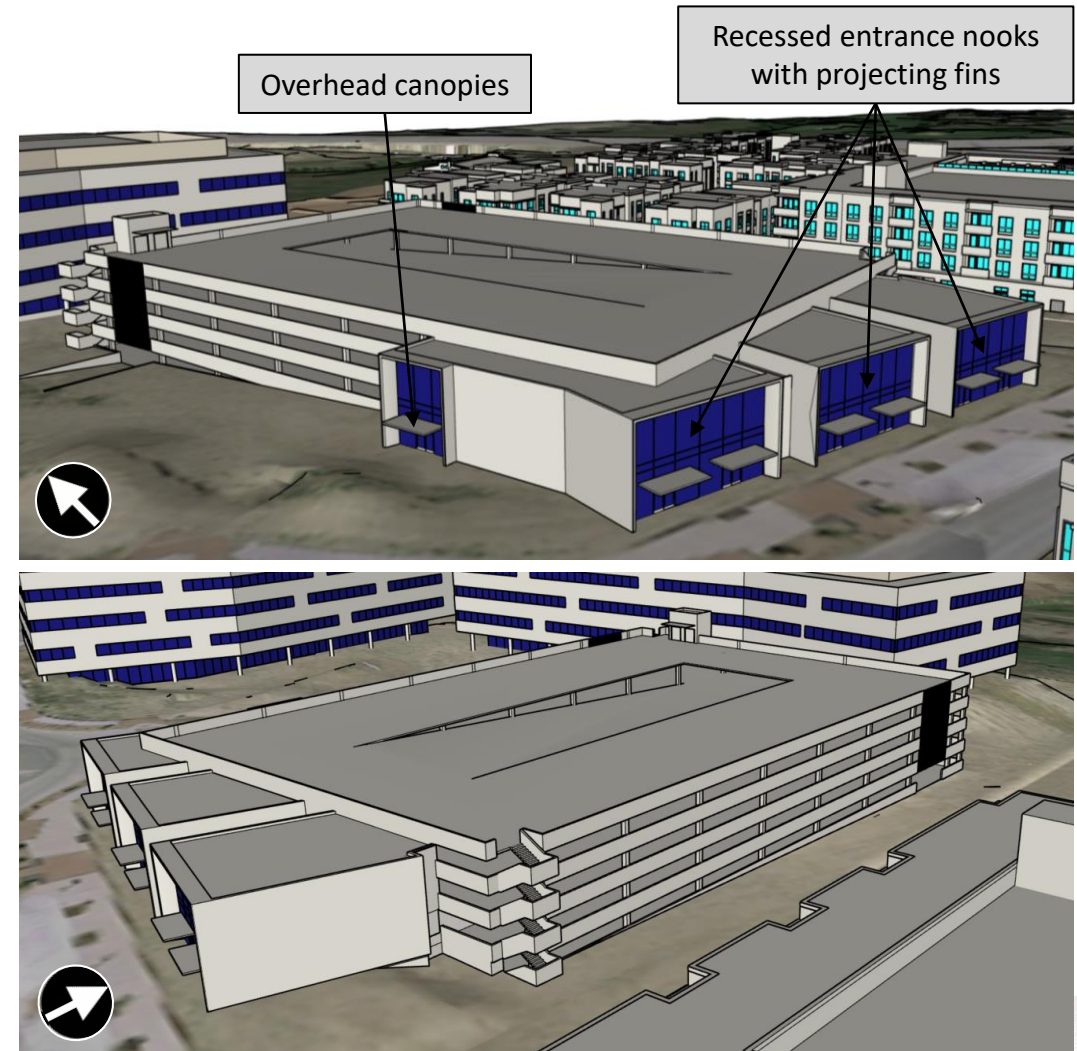


3D Model of Proposed Development – Building D

DISCUSSION OF WIND FLOWS

Building C

- Building C of the development is shorter than the other buildings and will therefore intercept winds to a lesser extent.
- Additionally, as Building C is primarily a parking structure, it is relatively open and will allow a portion of the winds to blow through, limiting the extent to which winds accelerate around the massing.
- The west and south facades with the primary entrances have been recessed. Due to this recessed design there are also elements that project from these facades that are expected to further shelter the entrances from approaching winds.
- This design is expected to not only encourage comfortable wind conditions at the entrances but also limit the potential for door operability concerns (ie. challenges opening doors or doors being caught by winds once opened etc.).



3D Model of Proposed Development – Building C

SUMMARY

CPP was retained to assess and provide preliminary recommendations to improve wind conditions at sensitive pedestrian areas around the proposed Coal Creek Innovation Center development in Superior, Colorado.

Our assessment of wind comfort are based on analysis of the local meteorological climate and our experience as developed through extensive study of wind flows within the built environment.

CPP recommends further evaluation through Computational Wind Engineering (CWE) to visualize the general wind conditions across the entire masterplan and project site and the impact of the various phasing of the development. Once the design of each of the buildings becomes more detailed, CPP recommends wind tunnel testing of each of the buildings to provide a more detailed evaluation of wind comfort and safety conditions around the site and allow a more detailed investigation of the conceptual wind control approaches, if required.

The assessment of the development is based on the 3D design information received on 5 July 2022. In the event of any significant changes to the design, use, or operation of the building or surrounds, it is the responsibility of others to contact CPP to initiate a review process.