D19 FIU SITE CHARACTERIZATION: SUMMARY

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See Configuration Management System for approval history.

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	12/02/2010	NEON.FIU.000272.CRE _ D19 FIU Site Characterization Reports	INITIAL RELEASE
B	09/26/2011	ECO-00279	Update to new document number's/template throughout document.

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1 DESCRIPTION

1.1 Purpose

The data summarized here is used to inform the site design activities for NEON project Teams, EHS (permitting), FCC, ENG and FSU. This document summarizes the FIU site characterization data collected, analyzed, and described in the FIU D19 Site Characterization: Supporting Data (AD[01]).

1.2 Scope

This document summarizes the FIU site characterization data for four D19 tower locations: Caribou Poker - Core site (Advanced), Delta Junction site (Relocatable 1), Caribou Poker – Relocatable (Relocatable 2), and Eight Mile Lake site (Relocatable 3). Issues and concerns for each site that need attention are also addressed in this document according to our best knowledge.

Disclaimer: all latitude and longitude points are subject to the tolerances of our measurement system, i.e., GPS

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

AD[01]	NEON.DOC.011051 _ D19 FIU Site Characterization Supporting Data.docx
AD[02]	NEON.DOC.011018 _WID between FIU and FCC
AD[03]	NEON.DOC.011008 _ FIU Tower Science Requirements
AD[04]	NEON.DOC.011029 _ FIU Precipitation Collector Site Design Requirements

2.2 Reference Documents

RD[01]	NEON.DOC.000008	NEON Acronym List
RD[02]	NEON.DOC.000243	NEON Glossary of Terms
RD[03]		
RD[04]		

2.3 Acronyms

m.a.s.l.	Meters above sea level
m.a.g.l.	Meters above ground level

2.4 Verb Convention

"Shall" is used whenever a specification expresses a provision that is binding. The verbs "should" and "may" express non-mandatory provisions. "Will" is used to express a declaration of purpose on the part of the design activity.

3 CARIBOU CREEK - POKER FLATS WATERSHED (CARIBOU POKER) ADVANCE TOWER SITE

3.1 Desired ecosystem

Table 1. Ecosystem at the Caribou Poker - Core Advanced tower site.

Ecosystem Type	Management activity
Spruce forest on permafrost	None, natural ecosystem

The ecosystem inside the tower airshed and around tower is dominant by black spruce- tussock tundra woodland (Figure 3). This is black spruce forest on permafrost. Forest canopy is open without the typical conifer cone-shape. Canopy ground projection coverage is ~50% - 60%. Max canopy height is ~10 m, and the mean canopy height is ~10 m. Tree density is 120-200 stems ha^{-1}. LAI is ~ 1 for the black spruce forest. Birch, horsetail and other shrubs forms an understory layer with height ~1.2 m. Moss layer (sphagnums, reindeer lichen, etc.) is very thick (can be >40 cm), dense, and forms another understory at ground level (Figure 4). Relief of sphagnum ground cover is ±20 cm without compression of the spongy structure. Tussock tundra grass is also one of the major components at ground level. The height of the individual tussock can be >50 cm. Canopy heights for grass and other annuals is ~ 0.2 m. The LAI is ~1.3 for the understory, making a total LAI of 2.3.

Table 2. Ecosystem and site attributes for Caribou-Poker advance tower site.

Ecosystem attributes	Measure and units
Mean canopy height	8 m
Surface roughness[a]	1.2 m
Zero place displacement height[a]	4.7 m
Structural elements	Open black spruce forest with dense understory at ground level
Time zone	Alaska Standard Time
Magnetic declination	20° 59' E changing by 0° 22' W/year

Note, [a] From field observation.

3.2 Site Design and Tower Attributes

The site layout is summarized in the table below. Assume the projected area of the tower is square. **Anemometer/temperature boom arm direction** is ***from*** the tower ***toward*** the prevailing wind direction or designated orientation. **Instrument hut orientation vector** is parallel to the long side of the instrument hut. **Instrument hut distance z** is the distance from the center of tower projection to the center of the instrument hut projection on the ground. The numbering of the **measurement levels** is that the lowest is level one, and each subsequent increase in height is numbered sequentially.

Table 3. Site design and tower attributes for Caribou-Poker Advanced site.

0° is true north with declination accounted for. Color of Instrument hut exterior shall be tan to best match the surrounding environment.

Attribute	lat	long	degree	meters	notes
Airshed area			245° to		Clockwise from first

			295°		angle
Tower location	65.15401°	-147.50258°	--	--	
Instrument hut	65.15412°	-147.50266°			
Instrument hut orientation vector	--	--	90° - 270°		
Instrument hut distance z	--	--	--	13	
Anemometer/Temperature boom orientation	--	--	180°	--	
DFIR	65.15601°	-147.48950°			
Height of the measurement levels					
Level 1				0.15	m.a.g.l.
Level 2				1.5	m.a.g.l.
Level 3				4.0	m.a.g.l.
Level 4				10.0	m.a.g.l.
Level 5				18.0	m.a.g.l.
Tower Height				18.0	m.a.g.l.

See AD 03 for technical requirement to determine the boom height for the bottom most measurement level.

Eddy covariance, sonic wind and air temperature **boom arms** orientation toward the south will be best to capture signals from all major wind directions. **Radiation boom arms** should always be facing south and similar to the setup at other NEON sites, even it cannot totally avoid shadowing effects from the tower structure during summer season due to the sun circles the sky > 20 hours a day.

DFIR (Double Fenced International Reference) will be used for bulk precipitation collection. We cannot find any adequate open area within 500 m radius from tower location that can meet USCRN class 1 or 2 criteria. The location we proposed is at 65.15601, -147.48950, which is ~650 m on northeast to tower. It is currently a clear cut open area. It will need to be maintained open in the whole life time of DFIR to meet USCRN criteria. This location is next to access dirt road, and should be close to power is NEON will bring line power along access dirt road to tower site. **Wet deposition collector** will collocate at the top of the tower. See AD 04 for further information and requirements for bulk precipitation collection and wet deposition collection.

Boardwalks. Ultimately, the decision to use a boardwalk will be, in part, based on owner's preferences. There are strong science requirements that minimize site disturbance to the surrounding area, which will be difficult to manage over a 30-y period. Traffic control is key to minimizing the site disturbance. Confining foot traffic to boardwalks minimizes site impact; this is particularly true in places where wear caused by foot traffic becomes noticeable and grows. For example, in places with snow part of the year, worn footpaths tend to have low places that collect water, or places where the snow pack becomes uneven causing personnel to walk farther and farther around the sides of the original path, causing the path to grow in width. This is a very common phenomenon. Here, FIU assumes that all conduits will be either buried, or placed inside the boardwalk such that it does not extend beyond the 36" (0.914 m). wide footprint. The boardwalk to access the tower is not on any side that has a boom.
Specific Boardwalks at this site:

- Boardwalk from access dirt road to instrument hut. Boardwalk need to be wide enough only for ATV.
- Boardwalk from the instrument hut to the tower to intersect on north face of the tower
- Boardwalk to soil array
- Boardwalk from soil array boardwalk to individual soil plots
- Boardwalk from access road to DFIR site

The relative locations between tower, instrument hut and boardwalk can be found in the Figure below:

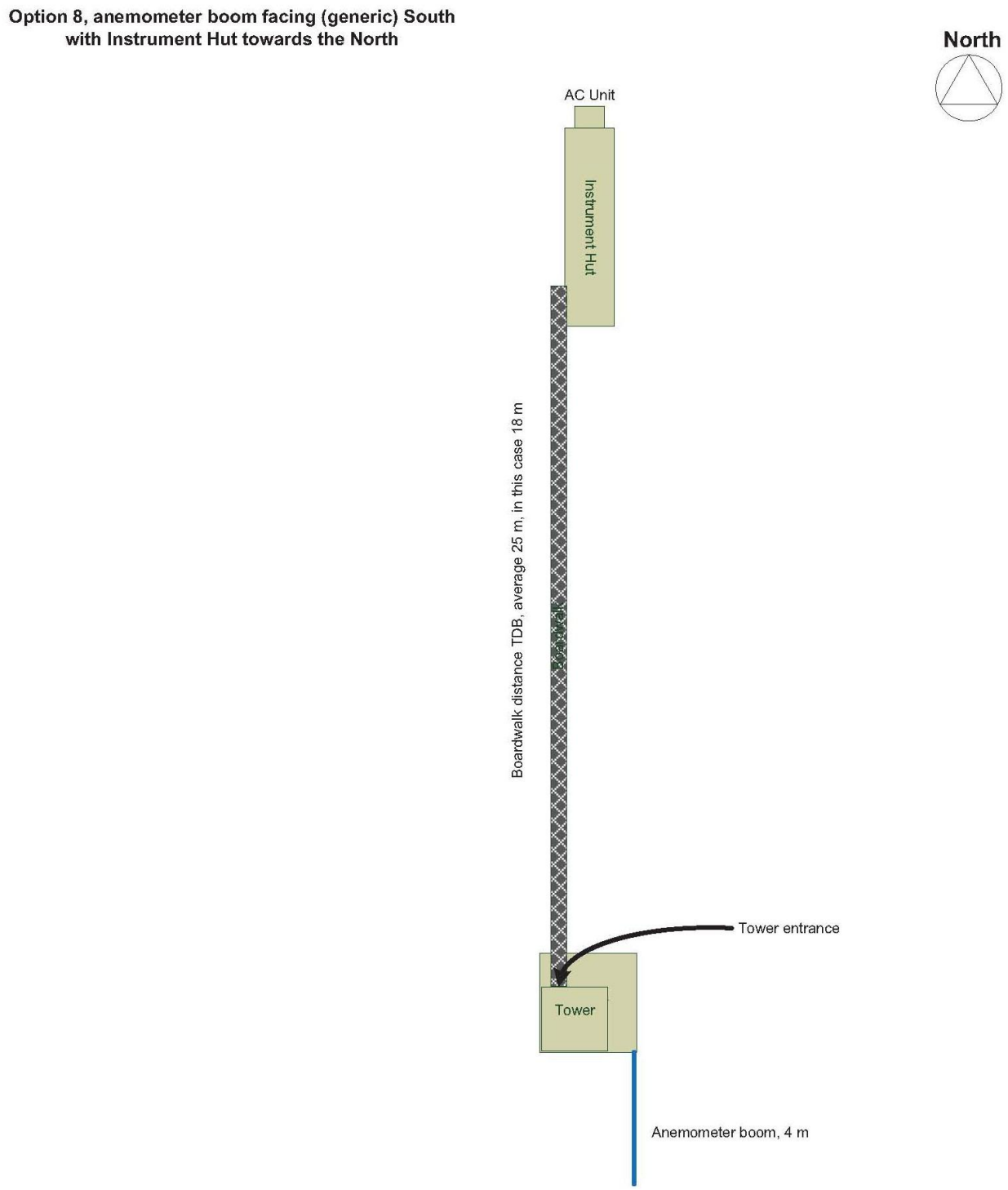


Figure 1 Generic diagram to demonstration the relationship between tower and instrument hut when boom facing south and instrument hut on the north towards the tower.

This is a generic diagram. The actual layout of boardwalk (or path if no boardwalk required) and instrument hut position will be the joint responsibility of FCC and FIU. At this site, the boom angle will

be 180°, instrument hut will be on the north towards the tower, the distance between instrument hut and tower is ~13 m. The instrument hut vector will be E-W (90° - 270°, longwise).

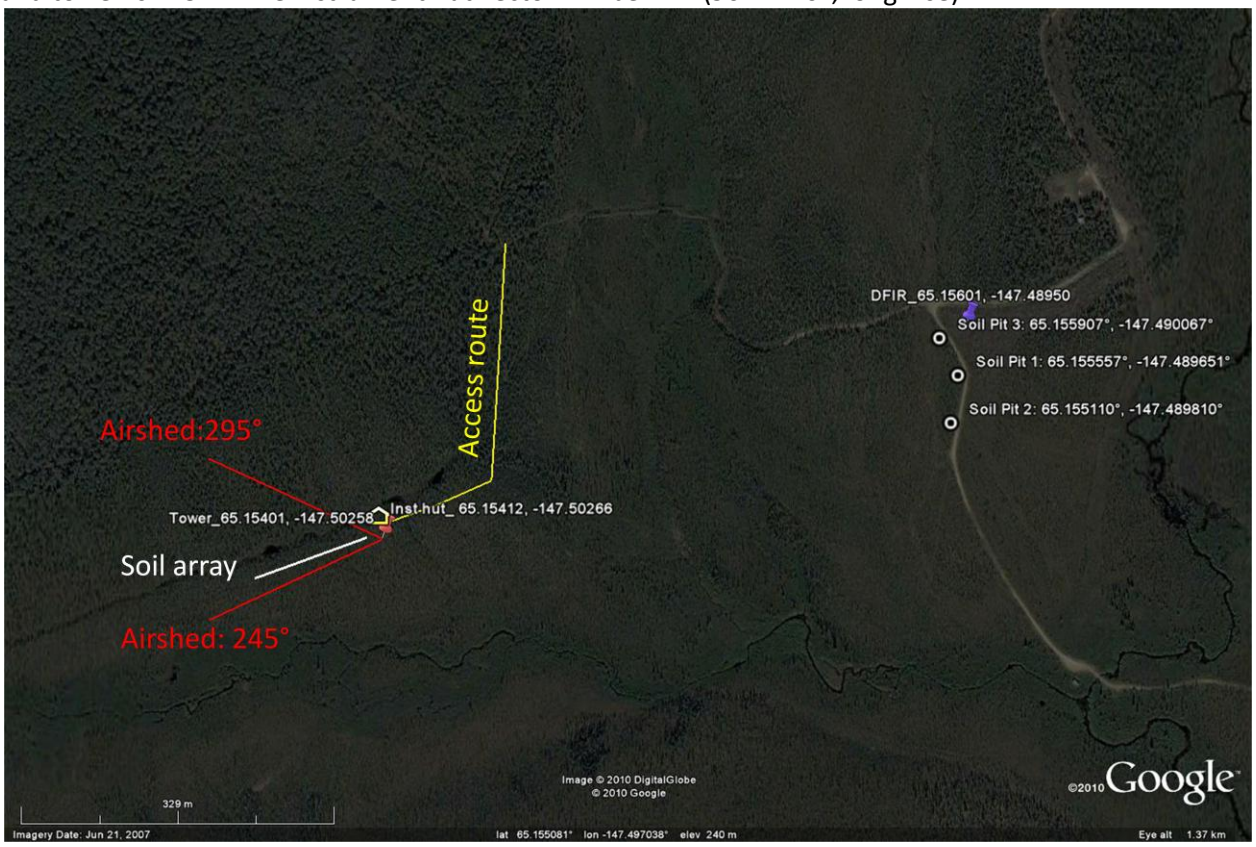


Figure 2. Site layout for Caribou Poker Advance tower site.
i) Tower location is presented (red pin), ii) red lines indicate the airshed boundaries. Vectors from 245° to 295° (major airshed, clockwise from 245°) is the airshed areas that would have quality wind data without causing flow distortions, respectively. iii) Yellow line is the suggested boardwalk access to instrument hut. iv) Purple pin is the DFIR location.

3.3 Soil Attributes

The soil array vector is ***from*** the soil plot closest to the tower ***toward*** the farthest soil plot. The exact location of each soil plot will be chosen by an FIU team member during site construction to avoid placing a soil plot at an unrepresentative location (e.g., rock outcrop, drainage channel, large tree, etc).

Dominant soil series at the site: Histic Pergelic Cryaquepts, fans, 1 to 20 percent slopes. The taxonomy of this soil is shown below:
Order: Inceptisols
Suborder: Aquepts
Great group: Cryaquepts
Subgroup: Histic Pergelic Cryaquepts
Family: Not available from NRCS
Series: Histic Pergelic Cryaquepts, fans, 1 to 20 percent slopes

Table 4. Summary of soil array and soil pit information at Caribou Poker Core. 0° represents true north and accounts for declination.

Soil plot dimensions	5 m x 5 m
Soil array pattern	B
Distance between soil plots: x	25 m
Distance from tower to closest soil plot: y	16 m
Latitude and longitude of 1st soil plot OR direction from tower	65.15402°, -147.50293°
Direction of soil array	250°
Latitude and longitude of FIU soil pit 1	65.155557°, -147.489651° (primary location)
Latitude and longitude of FIU soil pit 2	65.155110°, -147.489810° (alternate 1)
Latitude and longitude of FIU soil pit 3	65.155907°, -147.490067° (alternate 2)
Dominant soil type	Histic Pergelic Cryaquepts, fans, 1 to 20 percent slopes
Expected soil depth	0.20-0.99 m
Depth to water table	0-0.15 m

Expected depth of soil horizons	**Expected measurement depths***
0-0.33 m (Peat)	[a]0.17 m
0.33-0.48 m (Silt loam)	0.41 m
0.48-0.66 m (Silt loam)	[a]0.57 m
0.66-1.83 m (Silt loam)	1.25 m
1.83-1.83 m (Bedrock)	1.83 m
1.83-3.00 m	[a]3.00 m

*Actual soil measurement depths will be determined based on measured soil horizon depths at the NEON FIU soil pit and may differ substantially from those shown here. At the NEON Alaska sites soil temperature and moisture sensors will be inserted up to 3 m deep in order to characterize permafrost dynamics. [a]Notes the current understanding of the measurement depths to be applied by the soil array.

3.4 Information for ecosystem productivity plots.

The tower at this site has been positioned to optimize the collection of the air/wind signals both temporally and spatially over the desired ecosystem (black spruce on permafrost). Tower airshed areas are from 245° to 295° (major airshed, clockwise from 245°), and 90% signals for flux measurements are in a distance < 500 m from tower during summer and >1200 m during the winter, and 80% within 350 m during the summer and >700 m during the winter. We suggest FSU Ecosystem Productivity plots be placed within the boundaries of 245° to 295° (major airshed, clockwise from 245°) from tower.

3.5 Issues and attentions

Power is ~ 2 miles from tower site.

Tower site is at a foothill valley that conjoin the mountain slopes on north, south and east directions (Figure 3). Mountain terrain is complicated here. Cold air drainages converge at tower site area. Caribou Creek runs east-west direction next to tower site. The airflow is channeled by the north-facing and south-facing slopes and blows dominantly along the creek from west to east. These make it not ideal for absolute flux measurements here, but will be still valid to catch inter-seasonal trend and inter-annual variation. Additional experimentation with advection measurements may be appropriate here.

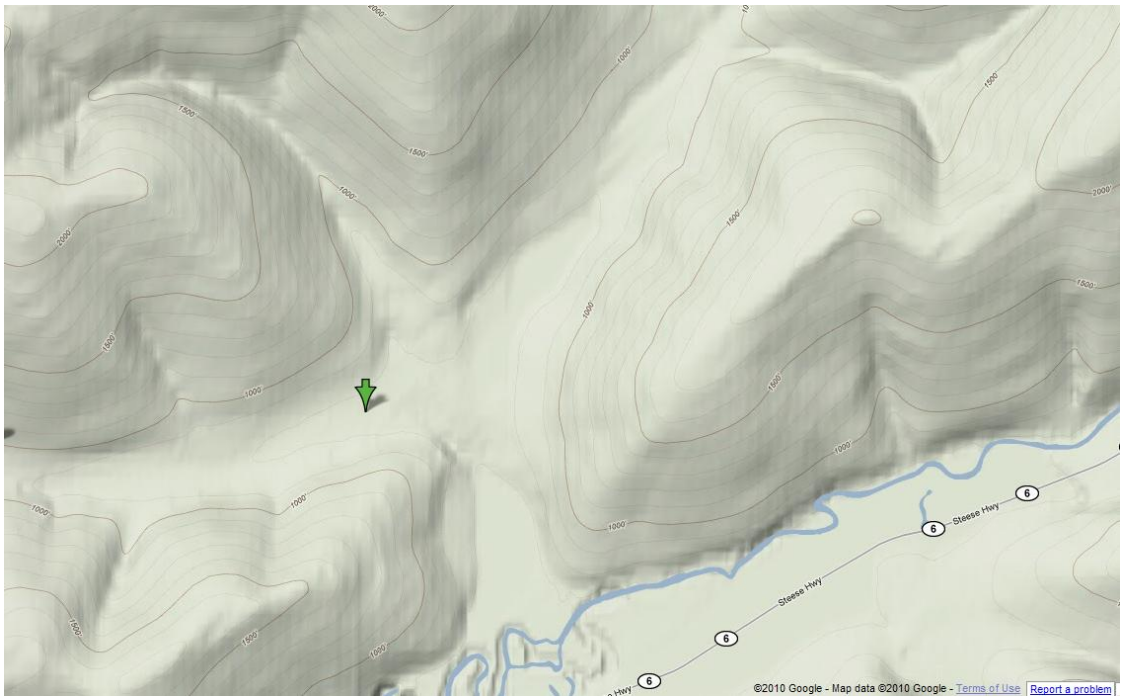


Figure 3. Caribou Poker advance tower site locates at a foothill valley that conjoin the mountain slopes on north, south and east directions

4 DELTA JUNCTION RELOCATABLE TOWER 1

4.1 Desired ecosystem

Table 5. Ecosystem at the Delta Junction tower site.

Ecosystem Type	Management activity
Spruce forest, non-permafrost	Mostly unmanaged, but some military training nearby

The representative ecosystem around NEON site is black spruce on well drained non-permafrost. This ecosystem is semi-open forest. Canopy height is ~ 10 m (mean), and max at 14 m around tower site and in airshed. Stem diameter is ~ 10 cm. Black spruce canopy has nice, healthy cone-shape looking at this site than the one found on permafrost. Recruit black spruce and birch form an understory with height ~ 1.5 m. Moss and lichen form another understory at ground level with height ~ 20 cm. Moss and lichen layer is thick (>20 cm without compression). Terrain is flat and ecosystem is homogenous.

Table 6. Ecosystem and site attributes for Delta Junction Relocatable site.

Ecosystem attributes	Measure and units
Mean canopy height	10 m
Surface roughness[a]	1.2 m
Zero place displacement height[a]	7.0 m
Structural elements	black spruce on well drained non-permafrost, homogenous
Time zone	Alaska standard time
Magnetic declination	21° 10' E changing by 0° 22' W/year

Note, [a] From field survey.

4.2 Site Design and Tower Attributes

The site layout is summarized in the table below. Assume the projected area of the tower is square. **Anemometer/temperature boom arm direction** is ***from*** the tower ***toward*** the prevailing wind direction or designated orientation. **Instrument hut orientation vector** is parallel to the long side of the instrument hut. **Instrument hut distance z** is the distance from the center of tower projection to the center of the instrument hut projection on the ground. The numbering of the **measurement levels** is that the lowest is level one, and each subsequent increase in height is numbered sequentially.

Table 7. Site design and tower attributes for Delta Junction Relocatable site

0° is true north with declination accounted for. Color of Instrument hut exterior shall be tan to best match the surrounding environment.

Attribute	lat	long	degree	meters	notes
Airshed			75° to 125°(major) and 190° to 290°(secondary)		Clockwise from first angle
Tower location	63.88112,	-145.75136	--	--	

Instrument hut	63.88120,	-145.75119			
Instrument hut orientation vector	--	--	105°-285°		
Instrument hut distance z	--	--	--	13	
Anemometer/Temperature boom orientation	--	--	200°	--	
Height of the measurement levels					
Level 1				0.15	m.a.g.l.
Level 2				1.0	m.a.g.l.
Level 3				6.0	m.a.g.l.
Level 4				13.0	m.a.g.l.
Level 5				19.0	m.a.g.l.
Tower Height				19.0	m.a.g.l.

See AD 03 for technical requirement to determine the boom height for the bottom most measurement level.

Eddy covariance, sonic wind and air temperature **boom arms** orientation toward the SSE will be best to capture signals from all major wind directions. **Radiation boom arms** should always be facing south similar to the setup at other NEON sites, even it cannot totally avoid shadowing effects from the tower structure during summer season due to the sun circles at the sky >20 hours a day.

Secondary **precipitation collector** for bulk precipitation collection will be located at the top of tower at this site. No w**et deposition collector** will be deployed at this site. See AD 04 for further information and requirements for bulk precipitation collection and wet deposition collection.

Boardwalks. Ultimately, the decision to use a boardwalk will be, in part, based on owner's preferences. There are strong science requirements that minimize site disturbance to the surrounding area, which will be difficult to manage over a 30-y period. Traffic control is key to minimizing the site disturbance. Confining foot traffic to boardwalks minimizes site impact; this is particularly true in places where wear caused by foot traffic becomes noticeable and grows. For example, in places with snow part of the year, worn footpaths tend to have low places that collect water, or places where the snow pack becomes uneven causing personnel to walk farther and farther around the sides of the original path, causing the path to grow in width. This is a very common phenomenon. Here FIU assumes that all conduits will be either buried, or placed inside the boardwalk such that it does not extend beyond the 36' wide footprint. While the final design is not yet known, there are some general criteria that can be outlined. We assume that the boardwalk width is 36" (0.914 m). Material is not known, but must be fire proof, and in some locations the site is seasonally flooded and inundated with water. Boardwalks may also provide a scratching structure for grazing animals that in turn, would wear and unduly impact the site. Site by site evaluations must be done.
Specific Boardwalks at this site:

- Boardwalk from access dirt road to instrument hut.
- Boardwalk from the instrument hut to the tower to intersect on north face of the tower
- Boardwalk to soil array.
- Boardwalk from soil array boardwalk to individual soil plots

The relative locations between tower, instrument hut and boardwalk can be found in the diagram below:

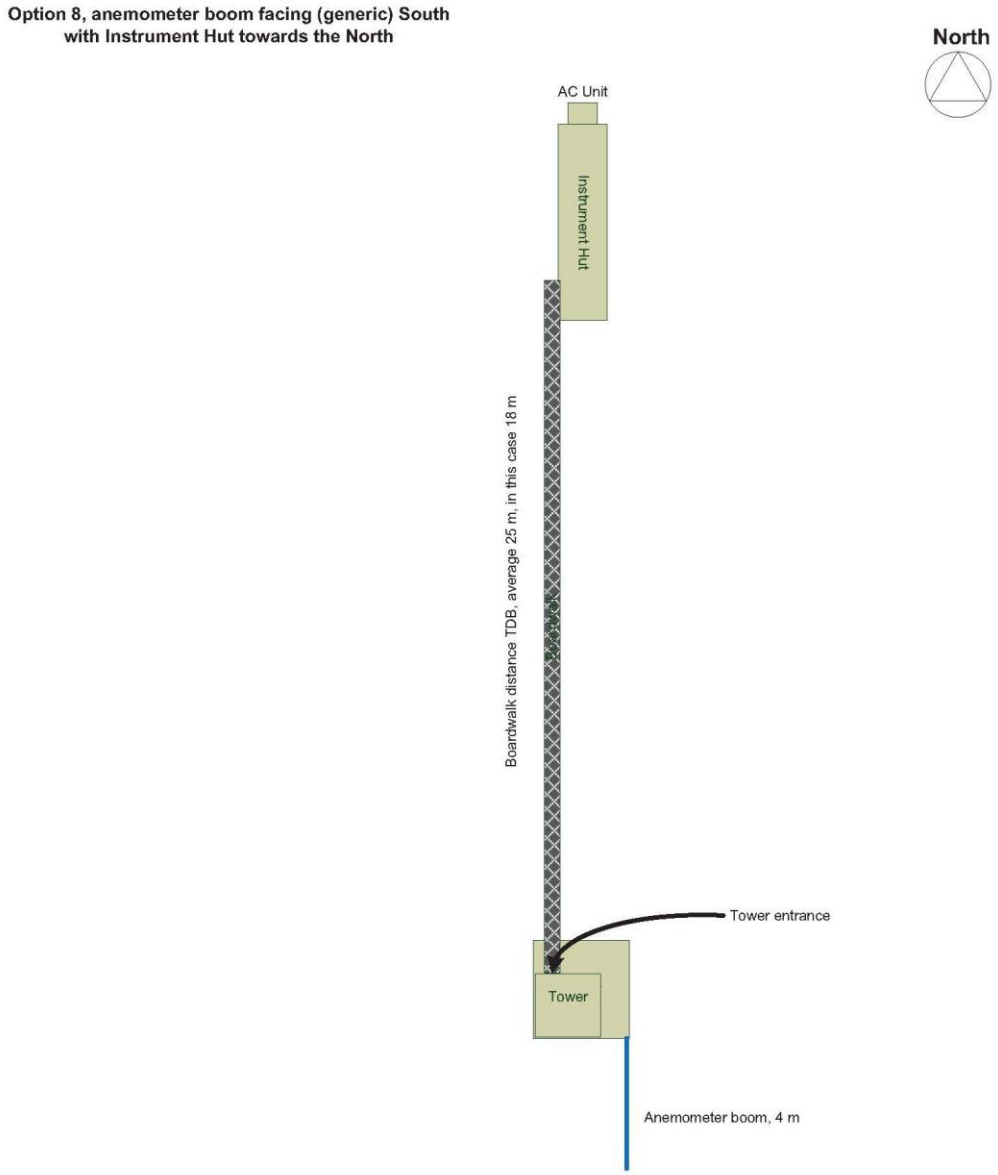


Figure 4. Generic diagram to demonstration the relationship between tower and instrument hut when boom facing south and instrument hut on the north towards the tower.

This is just a generic diagram. The actual design of boardwalk (or path if no boardwalk required) and instrument hut position will be the responsibility of FCC following FIU's guidelines. At this site, the boom angle will be 200 degrees. Instrument hut will be on the northeast towards the tower, and boardwalk will access tower on north. The distance between instrument hut and tower is ~13 m. The instrument hut vector will be ESE-WNW (105^{o}-285^{o}, longwise).

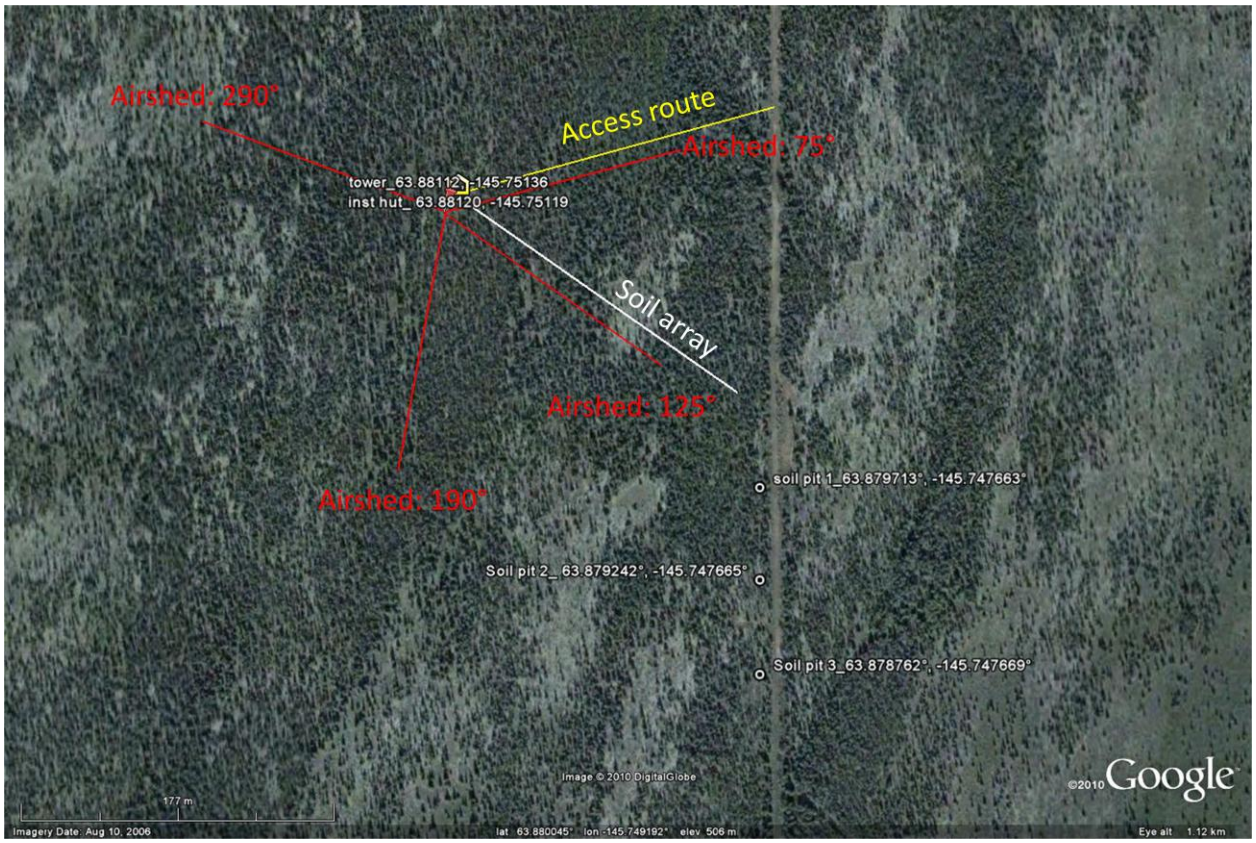


Figure 5. Site layout for Delta Junction Relocatable site.
i) new tower location is presented (red pin), ii) red lines indicate the airshed boundaries. Vectors from 75° to 125° (major airshed, clockwise from 75°) and 190° to 290° (secondary, clock wise from 190°) would have quality wind data without causing flow distortions, respectively. iii) Yellow line is the suggested access road to instrument hut.

4.3 Soil Attributes

The soil array vector is ***from*** the soil plot closest to the tower ***toward*** the farthest soil plot. The exact location of each soil plot will be chosen by an FIU team member during site construction to avoid placing a soil plot at an unrepresentative location (e.g., rock outcrop, drainage channel, large tree, etc).

Dominant soil series at the site: Butchlake-Southpaw complex, 0 to 12 percent slopes. The taxonomy of this soil is shown below:
Order: Inceptisols
Suborder: Cryepts
Great group: Haplocryepts
Subgroup: Typic Haplocryepts
Family: Loamy-skeletal, mixed, superactive Typic Haplocryepts-Coarse-loamy, mixed, superactive Typic Haplocryepts
Series: Butchlake-Southpaw complex, 0 to 12 percent slopes

Table 8. Summary of soil array and soil pit information at Delta Junction. 0° represents true north and accounts for declination.

Soil plot dimensions	5 m x 5 m
Soil array pattern	B
Distance between soil plots: x	40 m
Distance from tower to closest soil plot: y	17 m
Latitude and longitude of 1st soil plot OR direction from tower	63.881148°, -145.751020°
Direction of soil array	125°
Latitude and longitude of FIU soil pit 1	63.879713°, -145.747663° (primary location)
Latitude and longitude of FIU soil pit 2	63.879242°, -145.747665° (alternate 1)
Latitude and longitude of FIU soil pit 3	63.878762°, -145.747669° (alternate 2)
Dominant soil type	Butchlake-Southpaw complex, 0 to 12 percent slopes
Expected soil depth	>2 m
Depth to water table	>2 m

Expected depth of soil horizons	**Expected measurement depths***
0-0.10 m (Slightly decomposed plant material)	[a]0.05 m
0.10-0.33 m (Silt loam)	0.22 m
0.33-0.56 m (Fine sandy loam)	0.43 m
0.56-0.91 m (Gravelly sandy loam)	[a]0.74 m
0.91-1.52 m (Very gravelly loamy sand)	1.23 m
1.52-3.00 m	[a]3.00 m

*Actual soil measurement depths will be determined based on measured soil horizon depths at the NEON FIU soil pit and may differ substantially from those shown here. At the NEON Alaska sites soil temperature and moisture sensors will be inserted up to 3 m deep in order to characterize permafrost dynamics. [a]Notes the current understanding of the measurement depths to be applied by the soil array.

4.4 Information for ecosystem productivity plots.

The tower at this site has been positioned to optimize the collection of the air/wind signals both temporally and spatially over the desired ecosystem (black spruce forest on well drained non-permafrost). The prevailing wind consistently blows from 75° to 125° (clockwise from 75°, major airshed) throughout the year. However, during the warmer seasons (April to September), winds also blow between south and northwest with higher frequency from 190° to 290° (clockwise from 190°, secondary airshed). 90% signals for flux measurements are within a distance of 1000 m from tower, and 80% within 600 m from tower. We suggest FSU Ecosystem Productivity plots to be placed within the major airshed boundaries of 75° to 125° (clockwise from 75°) from tower.

4.5 Issues and attentions

Access dirt road can be very muddy and soft during the storm and snow melting season. Either good road maintenance or powerful 4 –wheel drive vehicle is required for field visit.

Power and communication cable are < 200 m from tower site along the dirt road.

Military training is conducted nearby. NEON personnel must be informed which areas have restricted access.

5 CARIBOU POKER RELOCATEABLE TOWER 1

5.1 Desired ecosystem

Table 9. Ecosystem at the Caribou Poker - Relocatable tower site.

Ecosystem Type	Management activity
Spruce forest, permafrost, burned	Unmanaged

The representative ecosystem around this alternative site is burned black spruce forest on permafrost terrain. The forest was burned in 2004. It was a hot burn. The motility of black spruce was 100%. ~ 60 % burned stems are still standing (mean height 8-9 m, density ~ 400 ha^{-1}). Top soil was burned as well. This site has active recruitments during FIU site characterization in June, 2010. The recruitment is currently dominant by birch, mixed with some willows. Mean height is currently ~ 1.5 m, and expected to increase ~ 0.3 m per year with the rapid growth of birch. Black spruce recruitment is rarely found. Moss, forbs and grass form understory at ground level with height ~ 40 cm. They are patchy and shallow.

Table 10. Ecosystem and site attributes for Caribou Poker Relocatable site.

Ecosystem attributes	Measure and units
Spruce stems:	
Mean canopy height*	8.0 m
Surface roughness[a]	1.5 m
Zero place displacement height[a]	4.0 m
Mean canopy height (Recruitments)	1.2 m
Structural elements	Burned standing spruce stems, active birch recruitments, homogenous
Time zone	Alaska standard time
Magnetic declination	20° 59' E changing by 0° 22' W/year

Note, [a] From field survey.

*: Although the recruitment of birch is currently the living dominant ecosystem type at this site, the standing burned spruce stems have large influence on the surface roughness with regarding to aerodynamics at this site. Therefore, canopy height of the standing burned spruce stems will be used when design the tower at this site.

5.2 Site Design and Tower Attributes

The site layout is summarized in the table below. Assume the projected area of the tower is square. **Anemometer/temperature boom arm direction** is ***from*** the tower ***toward*** the prevailing wind direction or designated orientation. **Instrument hut orientation vector** is parallel to the long side of the instrument hut. **Instrument hut distance z** is the distance from the center of tower projection to the center of the instrument hut projection on the ground. The numbering of the **measurement levels** is that the lowest is level one, and each subsequent increase in height is numbered sequentially.

Table 11. Site design and tower attributes for Caribou Poker Relocatable site

0° is true north with declination accounted for. Color of Instrument hut exterior shall be tan to best match the surrounding environment.

Attribute	lat	long	degree	meters	notes
Airshed			245° to 295° (airshed from windroses)		Clockwise from 245°, but likely dominant by NE-SW wind direction, and see some winds from west
Tower location	65.11298,	-147.42274	--	--	
Instrument hut	65.11288,	-147.42244			
Instrument hut orientation vector	--	--	60^o-240^o		
Instrument hut distance z	--	--	--	17	
Anemometer/Temperature boom orientation	--	--	360°	--	
Height of the measurement levels					
Level 1				0.2	m.a.g.l.
Level 2				1.5	m.a.g.l.
Level 3				5.0	m.a.g.l.
Level 4				10.0	m.a.g.l.
Level 5				20.0	m.a.g.l.
Tower Height				20.0	m.a.g.l.

See AD 03 for technical requirement to determine the boom height for the bottom most measurement level.

Eddy covariance, sonic wind and air temperature **boom arms** orientation toward the N will be best to capture signals from all major wind directions. **Radiation boom arms** should always be facing south similar to the setup at other NEON sites, even it cannot totally avoid shadowing effects from the tower structure during summer season due to the sun circles at the sky >20 hours a day.

Secondary **precipitation collector** for bulk precipitation collection will be located at the top of tower at this site. No w**et deposition collector** will be deployed at this site. See AD 04 for further information and requirements for bulk precipitation collection and wet deposition collection.

Boardwalks. Ultimately, the decision to use a boardwalk will be, in part, based on owner's preferences. There are strong science requirements that minimize site disturbance to the surrounding area, which will be difficult to manage over a 30-y period. Traffic control is key to minimizing the site disturbance. Confining foot traffic to boardwalks minimizes site impact; this is particularly true in places where wear caused by foot traffic becomes noticeable and grows. For example, in places with snow part of the year, worn footpaths tend to have low places that collect water, or places where the snow pack becomes uneven causing personnel to walk farther and farther around the sides of the original path, causing the path to grow in width. This is a very common phenomenon. Here FIU assumes that all conduits will be either buried, or placed inside the boardwalk such that it does not extend beyond the 36' wide footprint. While the final design is not yet known, there are some general criteria that can be outlined. We assume that the boardwalk width is 36" (0.914 m). Material is not known, but must be fire proof,

and in some locations the site is seasonally flooded and inundated with water. Boardwalks may also provide a scratching structure for grazing animals that in turn, would wear and unduly impact the site. Site by site evaluations must be done.

Specific Boardwalks at this site:

- Boardwalk from access point at Davis Science Operation center to instrument hut. This boardwalk should be only wide enough for ATV to access instrument hut.
- Boardwalk from the instrument hut to the tower to intersect on north face of the tower
- Boardwalk to soil array.
- Boardwalk from soil array boardwalk to individual soil plots

The relative locations between tower, instrument hut and boardwalk can be found in the diagram below:

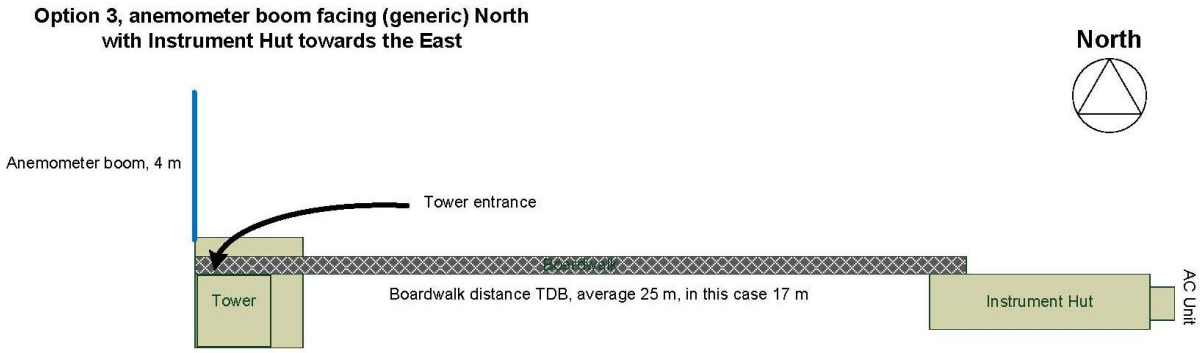


Figure 6. Generic diagram to demonstration the relationship between tower and instrument hut when boom facing north and instrument hut on the south towards the tower.

This is just a generic diagram. The actual design of boardwalk (or path if no boardwalk required) and instrument hut position will be the joint responsibility of FCC and FIU. At this site, the boom angle will be 360°. Instrument hut will be on the southeast towards the tower, and boardwalk will access tower on north. The distance between instrument hut and tower is ~17 m. The instrument hut vector will be NE-SW (60^{o}-240^{o}, longwise).

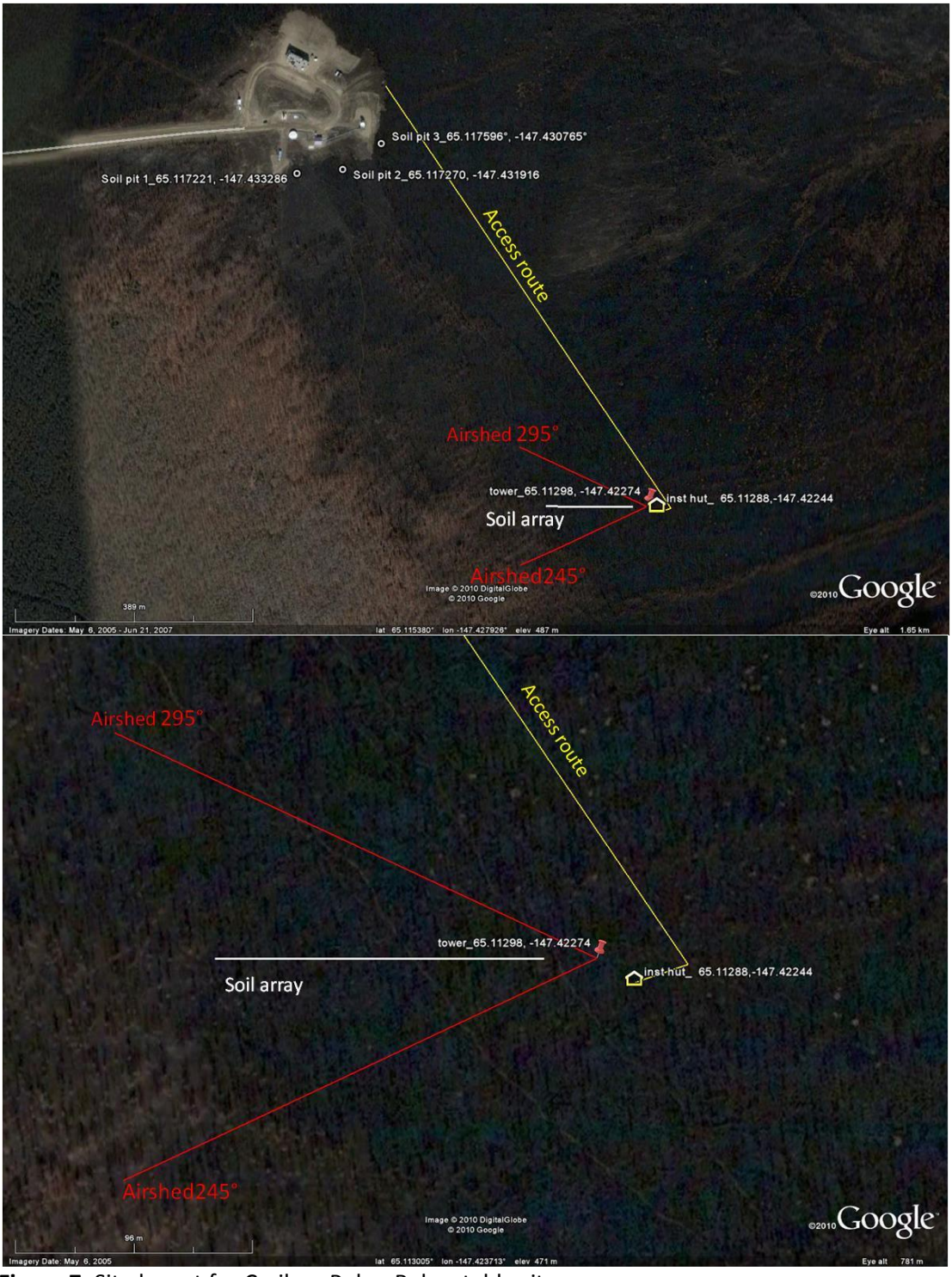


Figure 7. Site layout for Caribou Poker Relocatable site.
Top panel shows the general site layout. Lower panel shows detailed information for tower, instrument hut, soil array and access boardwalk. i) new tower location is presented (red pin), ii) red lines indicate the airshed boundaries. Vectors from 245° to 295° (major airshed, clockwise from 245°) would have

quality wind data without causing flow distortions, respectively. iii) Yellow line is the suggested access road to instrument hut.

5.3 Soil Attributes

The soil array vector is ***from*** the soil plot closest to the tower ***toward*** the farthest soil plot. The exact location of each soil plot will be chosen by an FIU team member during site construction to avoid placing a soil plot at an unrepresentative location (e.g., rock outcrop, drainage channel, large tree, etc).

Dominant soil series at the site: Gilmore-Steese complex, 3 to 15 percent slopes. The taxonomy of this soil is shown below:
Order: Inceptisols
Suborder: Udepts-Cryepts
Great group: Dystrocryepts-Haplocryepts
Subgroup: Typic Dystrocryepts-Typic Haplocryepts
Family: Loamy-skeletal, mixed, superactive, shallow Typic Dystrocryepts-Coarse-loamy, mixed, superactive Typic Haplocryepts
Series: Gilmore-Steese complex, 3 to 15 percent slopes

Table 12. Summary of soil array and soil pit information at Caribou Poker Relocatable. 0° represents true north and accounts for declination.

Soil plot dimensions	5 m x 5 m
Soil array pattern	B
Distance between soil plots: x	25 m
Distance from tower to closest soil plot: y	20 m
Latitude and longitude of 1st soil plot OR direction from tower	65.112980°, -147.423166°
Direction of soil array	270°
Latitude and longitude of FIU soil pit 1†	65.117221, -147.433286 (primary location) †
Latitude and longitude of FIU soil pit 2†	65.117270, -147.431916 (alternate 1) †
Latitude and longitude of FIU soil pit 3†	65.117596°, -147.430765° (alternate 2) †
Dominant soil type	Gilmore-Steese complex, 3 to 15 percent slopes
Expected soil depth	0.33-1.02 m
Depth to water table	>2 m

Expected depth of soil horizons	**Expected measurement depths***
0-0.08 m (Slightly decomposed plant material)	0.04 m
0.08-0.15 m (Silt loam)	[a]0.12 m
0.15-0.30 (Silt loam)	0.23 m
0.30-0.48 m (Very channery silt loam)	0.39 m
0.48-1.83 m (Weathered bedrock)	[a]1.16 m
1.83-3.00 m	[a]3 m

*Actual soil measurement depths will be determined based on measured soil horizon depths at the NEON FIU soil pit and may differ substantially from those shown here. At the NEON Alaska sites soil

temperature and moisture sensors will be inserted up to 3 m deep in order to characterize permafrost dynamics.

[†]Soil pit locations should be away from obvious sign of disturbance relating to the Poker Flat Research Range.

[a]Notes the current understanding of the measurement depths to be applied by the soil array.

5.4 Information for ecosystem productivity plots.

The tower at this site has been positioned to optimize the collection of the air/wind signals both temporally and spatially over the desired ecosystem (burned spruce forest). Airshed at this site is from 245° to 295° (major airshed, clockwise from 245°) according to windroses from a weather station at a nearby valley. Our site is at a mountain ridge, which may have different wind pattern compared to the valley windroses. According to the experience, we also expect to see winds from NE and SW along the river and valley direction (~ 60° and 240°), and some winds from west direction. 90% signals for flux measurements are within a distance of 500 m from tower, and 80% within 350 m from tower during summer season. While in winter, 90% flux signals are from a footprint with distance >1200 m, and 80% signals are from a footprint with distance > 700 m from tower. Since above airshed is from the only available data set for us, we suggest FSU Ecosystem Productivity plots to be placed within the major airshed boundaries of 245° to 295° (clockwise from 245°) from tower.

5.5 Issues and attentions

Available wind data is from a weather station ~ 3.5 miles away in a valley, which may not be representative for our site at ridge. But this is the only available data we can get by the time we analyze data and write this report.

Power, communication cable and access point are ~ 700 m from tower location along the ridge, where Poker Flat Research Range facility Davis Science Operations Center locates.

Electronically controlled gate access provides excellent security.

Poker Flat Research Range launch rockets to study aurora between September to next April. Site access may be restricted on the launch dates.

Range Operation Manager K. Rich expressed great interests in having NEON site inside Poker Flat Research Range and willing to provide lab, office space, clean room, storage room and other local supports.

6 EIGHT MILE LAKE RELOCATABLE TOWER 1

6.1 Desired ecosystem

Table 13. Ecosystem at the Eight Mile Lake tower site.

Ecosystem Type	Management activity
Alpine tundra	Mostly unmanaged

The representative ecosystem around NEON site is dominant by tussock alpine tundra on thermokasting and discontinued permafrost terrain (Figure 67). Besides tundra grass, other plants include salmon berry, dwarf birch, etc. The canopy height for the tundra grass is 30 cm. The height of the tussocks is ~ 20 cm. Moss layer is thick and reaches 30-40 cm. Water table is shallow and close to surface. Some water pits appear at site. Scrub birch-Willow shrub islands are distributed on the tundra with height < 1.5 m. Black spruce scatters at some islands with height < 8 m. Terrain is flat and ecosystem is homogenous.

Table 14. Ecosystem and site attributes for Eight Mile Lake Relocatable site.

Ecosystem attributes	Measure and units
Mean canopy height	0.3 m
Surface roughness[a]	0.04 m
Zero place displacement height[a]	0.2 m
Structural elements	Tussock tundra on thermokarsting terrain, homogenous
Time zone	Alaska standard time
Magnetic declination	19° 54' E changing by 0° 20' W/year

Note, [a] From field survey.

6.2 Site Design and Tower Attributes

The site layout is summarized in the table below. Assume the projected area of the tower is square. **Anemometer/temperature boom arm direction** is ***from*** the tower ***toward*** the prevailing wind direction or designated orientation. **Instrument hut orientation vector** is parallel to the long side of the instrument hut. **Instrument hut distance z** is the distance from the center of tower projection to the center of the instrument hut projection on the ground. The numbering of the **measurement levels** is that the lowest is level one, and each subsequent increase in height is numbered sequentially.

Table 15. Site design and tower attributes for Eight Mile Lake Relocatable site

0° is true north with declination accounted for. Color of Instrument hut exterior shall be tan to best match the surrounding environment.

Attribute	lat	long	degree	meters	notes
Airshed			180° to 270° (major) 90° to 180°		Clockwise from first angle

			(secondary)		
Tower location	63.87569,	-149.21334	--	--	
Instrument hut	63.87584,	-149.21347			
Instrument hut orientation vector	--	--	45°-225°		
Instrument hut distance z	--	--	--	18	
Anemometer/Temperature boom orientation	--	--	180°	--	
Height of the measurement levels					
Level 1				0.2	m.a.g.l.
Level 2				1.0	m.a.g.l.
Level 3				4.5	m.a.g.l.
Level 4				8.0	m.a.g.l.
Tower Height				8.0	m.a.g.l.

See AD 03 for technical requirement to determine the boom height for the bottom most measurement level.

Eddy covariance, sonic wind and air temperature **boom arms** orientation toward the south will be best to capture signals from all major wind directions. **Radiation boom arms** should always be facing south similar to the setup at other NEON sites, even it cannot totally avoid shadowing effects from the tower structure during summer season due to the sun circles at the sky >20 hours a day.

Secondary **precipitation collector** for bulk precipitation collection will be located at the top of tower at this site. No w**et deposition collector** will be deployed at this site. See AD 04 for further information and requirements for bulk precipitation collection and wet deposition collection.

Boardwalks. Ultimately, the decision to use a boardwalk will be, in part, based on owner's preferences. There are strong science requirements that minimize site disturbance to the surrounding area, which will be difficult to manage over a 30-y period. Traffic control is key to minimizing the site disturbance. Confining foot traffic to boardwalks minimizes site impact; this is particularly true in places where wear caused by foot traffic becomes noticeable and grows. For example, in places with snow part of the year, worn footpaths tend to have low places that collect water, or places where the snow pack becomes uneven causing personnel to walk farther and farther around the sides of the original path, causing the path to grow in width. This is a very common phenomenon. Here FIU assumes that all conduits will be either buried, or placed inside the boardwalk such that it does not extend beyond the 36' wide footprint. While the final design is not yet known, there are some general criteria that can be outlined. We assume that the boardwalk width is 36" (0.914 m). Material is not known, but must be fire proof, and in some locations the site is seasonally flooded and inundated with water. Boardwalks may also provide a scratching structure for grazing animals that in turn, would wear and unduly impact the site. Site by site evaluations must be done.
Specific Boardwalks at this site:

- Boardwalk from access dirt road to instrument hut. Boardwalk should be only wide enough for ATV to access instrument hut.
- Boardwalk from the instrument hut to the tower to intersect on north face of the tower

- Boardwalk to soil array.
- Boardwalk from soil array boardwalk to individual soil plots

The relative locations between tower, instrument hut and boardwalk can be found in the diagram below:

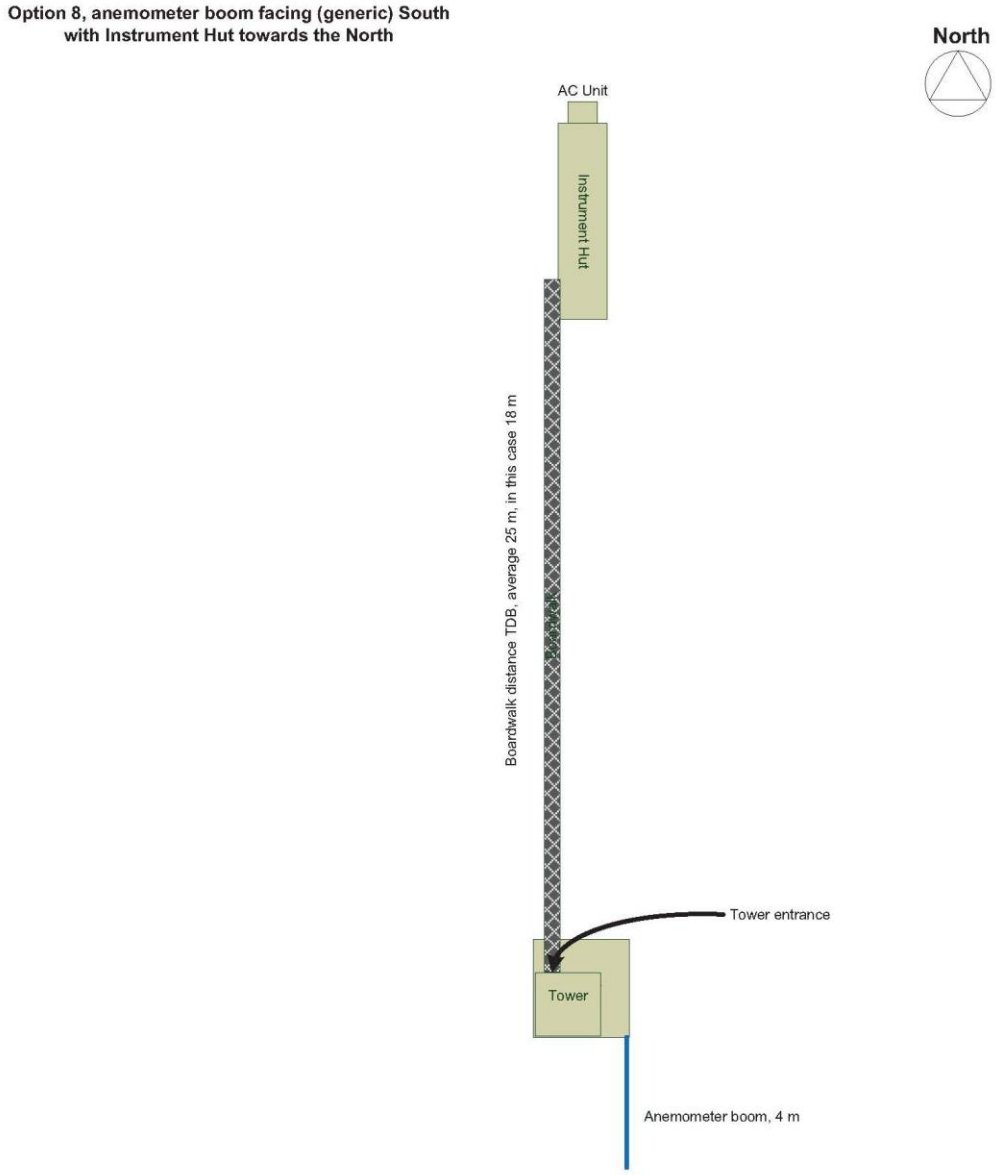


Figure 8. Generic diagram to demonstration the relationship between tower and instrument hut when boom facing south and instrument hut on the north towards the tower.

This is just a generic diagram. The actual design of boardwalk (or path if no boardwalk required) and instrument hut position will be joint responsibility of FCC and FIU. At this site, the boom angle will be 180°. Instrument hut will be on the northwest towards the tower, and boardwalk will access tower on north. The distance between instrument hut and tower is ~18 m. The instrument hut vector will be NE-SW (45°-225°, longwise).

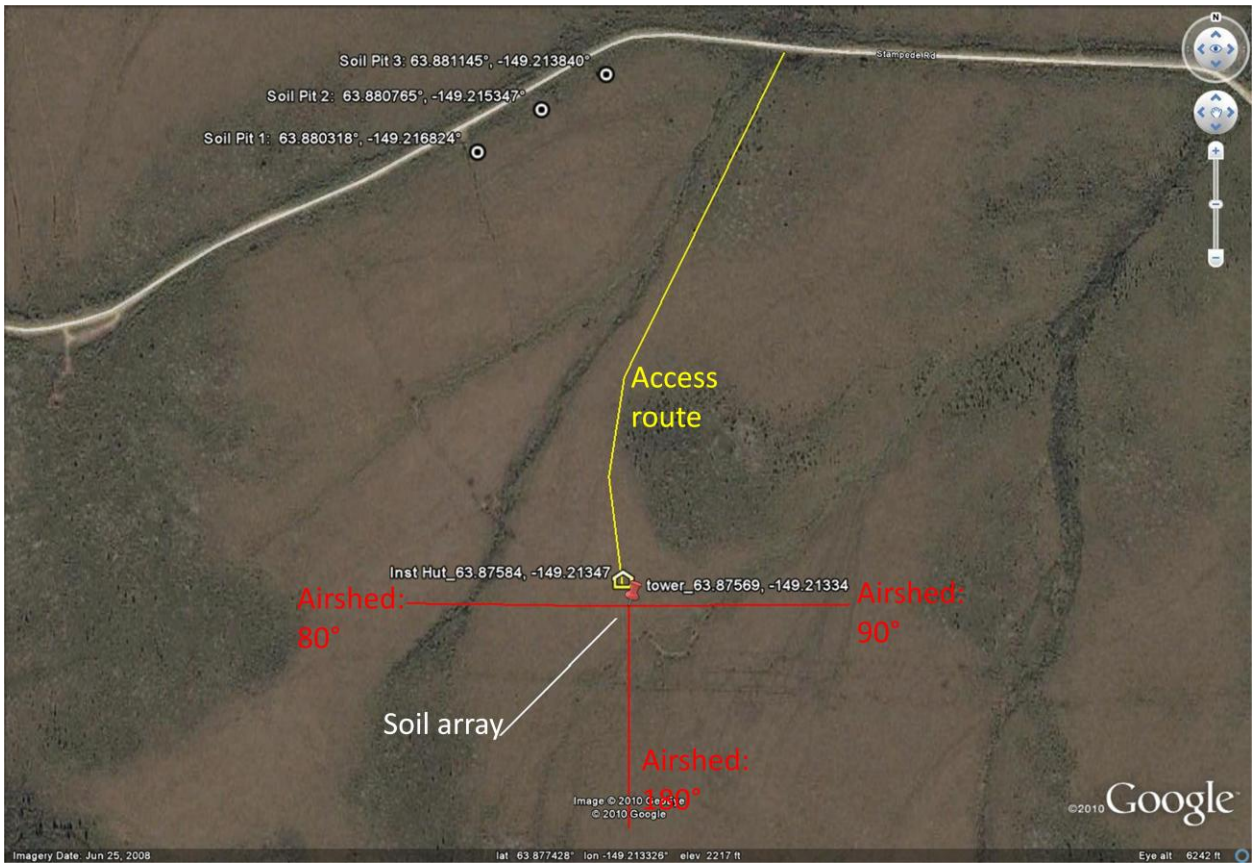


Figure 9. Site layout for Eight Mile Lake Relocatable site.

i) new tower location is presented (red pin), ii) red lines indicate the airshed boundaries. Vectors from 180° to 270° (major airshed, clockwise from 180°), 90° to 180° (secondary airshed, clockwise from 90°) would have quality wind data without causing flow distortions, respectively. iii) Yellow line is the suggested access road to instrument hut.

6.3 Soil Attributes

The soil array vector is ***from*** the soil plot closest to the tower ***toward*** the farthest soil plot. The exact location of each soil plot will be chosen by an FIU team member during site construction to avoid placing a soil plot at an unrepresentative location (e.g., rock outcrop, drainage channel, large tree, etc).

Dominant soil series at the site: Not available from NRCS. The taxonomy of this soil is shown below:
Order: Not available
Suborder: Not available
Great group: Not available
Subgroup: Not available
Family: Not available
Series: Not available

Table 16. Summary of soil array and soil pit information at Eight Mile. 0° represents true north and accounts for declination.

Soil plot dimensions	5 m x 5 m
Soil array pattern	B
Distance between soil plots: x	40 m
Distance from tower to closest soil plot: y	19 m
Latitude and longitude of 1st soil plot OR direction from tower	63.875569°, -149.213614°
Direction of soil array	225°
Latitude and longitude of FIU soil pit 1	63.880318°, -149.216824° (primary location)
Latitude and longitude of FIU soil pit 2	63.880765°, -149.215347° (alternate 1)
Latitude and longitude of FIU soil pit 3	63.881145°, -149.213840° (alternate 2)
Dominant soil type	Not available
Expected soil depth	Unknown
Depth to water table	Unknown

Expected depth of soil horizons	**Expected measurement depths***
Unknown	[a]0.10 m
	[a]0.35 m
	[a]1.00 m
	[a]3.00 m

* Currently, there are no data on the expected soil depth of soil horizons from NRCS. However, we fully expect to be measuring (at least) 4 different horizons, i.e., the top and bottom of the active layer, at 3 m and other TBD layers. The 3 m depth is below the biologically active layer, but provides a link between the active layer dynamics and the temperature regime of the deep permafrost, V. Romanofsky, pers. Comm.. Actual soil measurement depths will be determined based on measured soil horizon depths at the NEON FIU soil pit and may differ substantially from those shown here. At the NEON Alaska sites soil temperature and moisture sensors will be inserted up to 3 m deep in order to measure long-term permafrost dynamics. [a]Notes the current understanding of the measurement depths to be applied by the soil array.

6.4 Information for ecosystem productivity plots.

The tower at this site has been positioned to optimize the collection of the air/wind signals both temporally and spatially over the desired ecosystem (tussock tundra on thermokasting terrain). Winds blow from all directions throughout the whole year. Prevailing wind direction changes from season to season. Winds from 180° to 270° (clockwise from 180°) have relatively higher frequency through the year. Airshed from 90° to 180° (clockwise from 90°) have secondary high frequency throughout the whole year. 90% signals for flux measurements are from a distance of < 800 m from tower during summer while over 1000 m during the winter, and 80% within 450 m from tower during summer while 500 m during the winter. We suggest FSU Ecosystem Productivity plots to be placed within the major airshed boundaries of 180° to 270° (clockwise from 180°) from tower. EHS indicates that the lands in the secondary airshed belongs to different owner and may not be available for NEON use.

6.5 Issues and attentions

The tower location we selected during FIU site characterization is no longer able to us due to ownership shifts. We have to change tower location to current one. Flux measurements may see some influence from a scrub shrub island (~ 80 m away from tower) when wind blow from northeast to tower. There is another shrub island on the ~ 300 m southwest to tower location. Therefore, only 70% signals from the major airshed of southwest will be contributed by tussock tundra. There will be better fetch area on south and southeast for the measurements on tundra ecosystem.

We miscrosited the tower site ~150 meters closer to road than original candidate site to optimize the source area and provide measurements with confidence. The original site is too close to ridge where no permafrost presents, which doesn't fit in our design to measure tundra ecosystem on discontinued permafrost with thermokarst features.

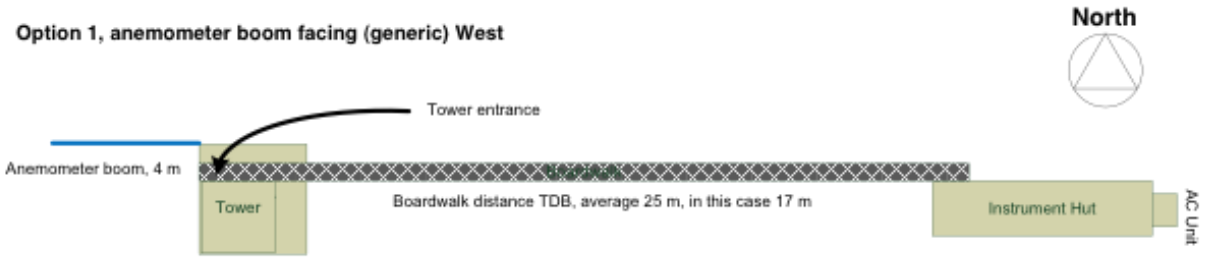
Because it is hard to predict the direction and growth rate of thermokarst, deeper (tower and instrument hut) foundations into permafrost will be required at this site.

Dr T. Schuur conducts flux measurements and many other experiments at nearby sites for years, and will be able to provide us excellent baseline information for weather and plants.

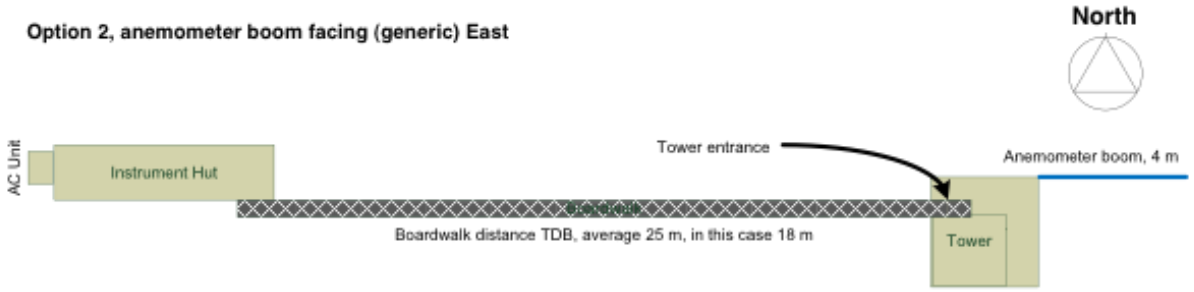
Line power is quite far away (~1.6 mile straight line, and ~ 2 miles along the dirt road).

Moose is commonly found around shrub islands. It was said that the rate people attacked by moose is much higher than bears and other animals at this region.

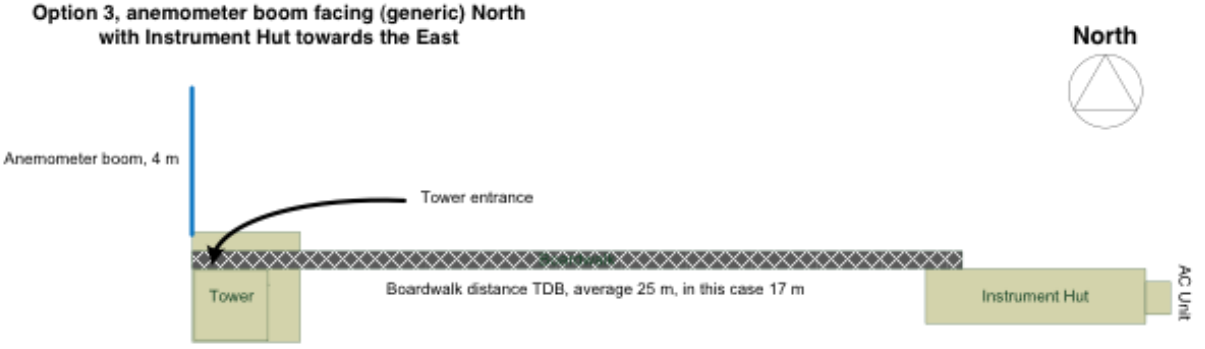
Option 1, anemometer boom facing (generic) West



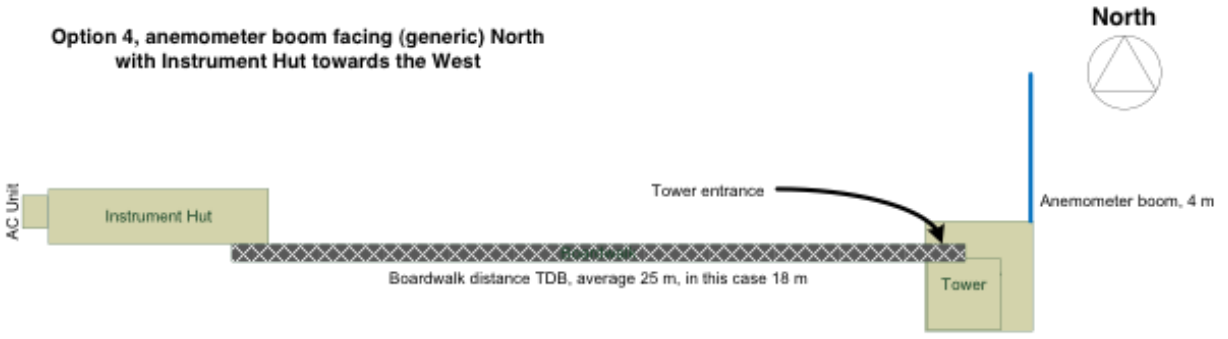
Option 2, anemometer boom facing (generic) East

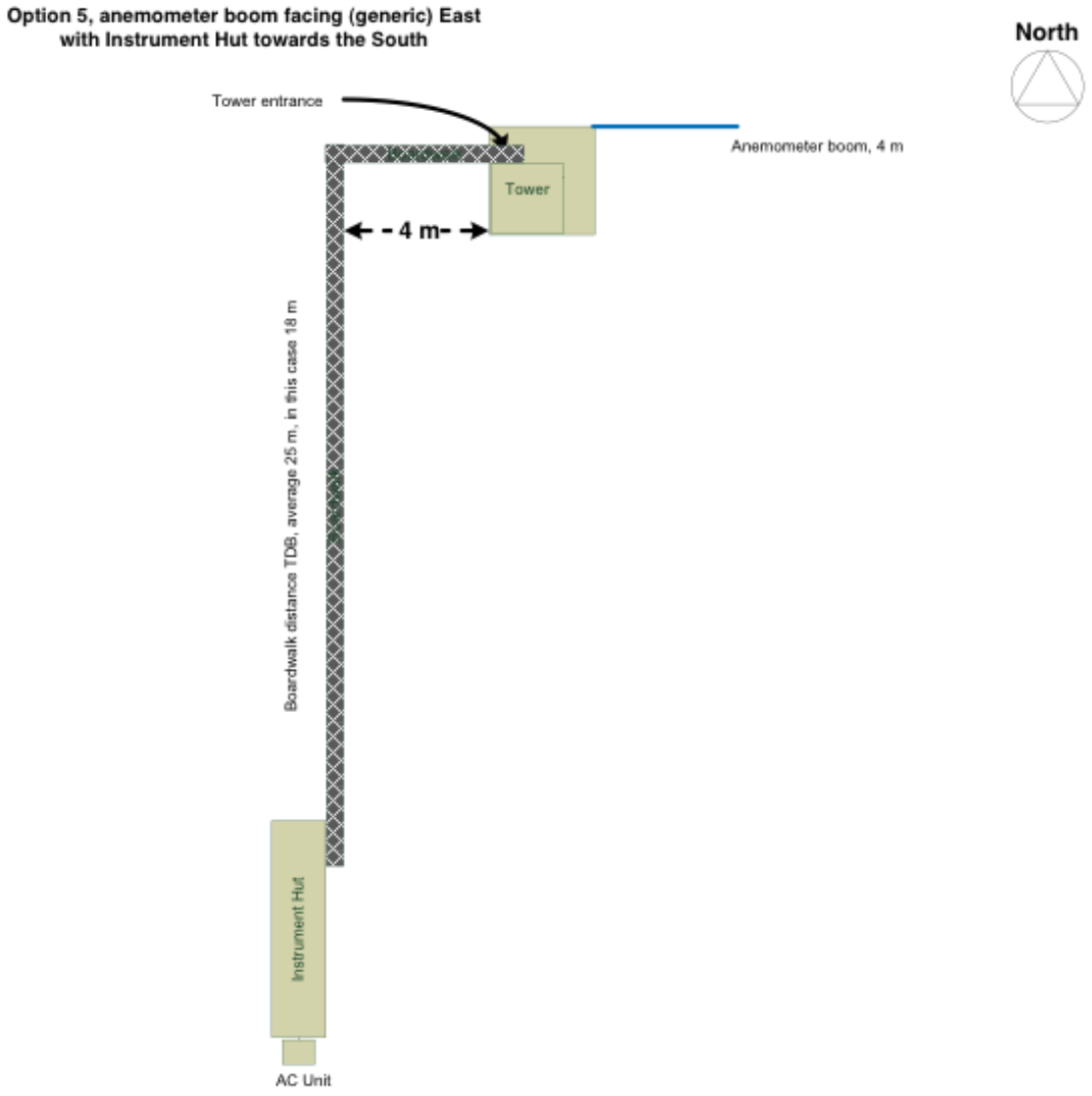


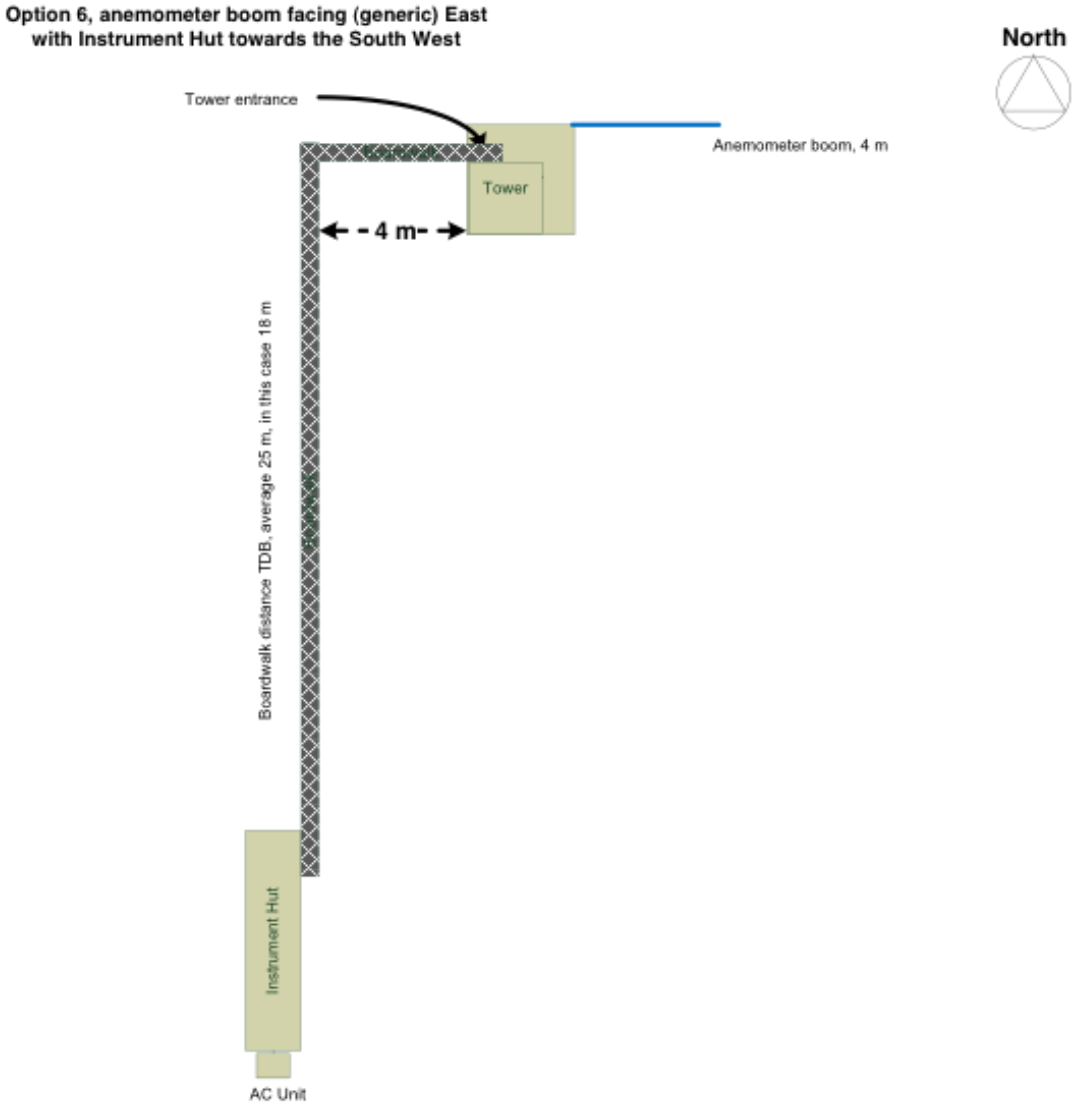
Option 3, anemometer boom facing (generic) North with Instrument Hut towards the East



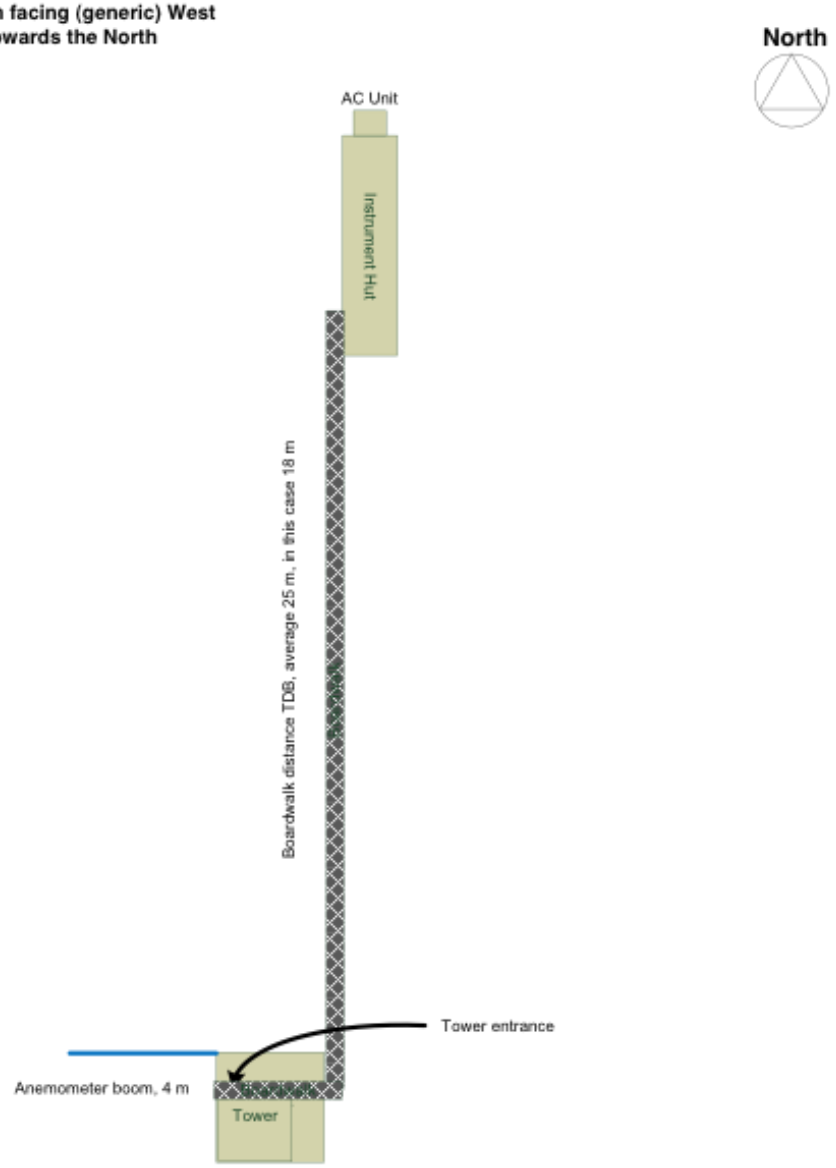
Option 4, anemometer boom facing (generic) North with Instrument Hut towards the West




Option 5, anemometer boom facing (generic) East
with Instrument Hut towards the South
North
Tower entrance
Anemometer boom, 4 m
Tower
4 m
Boardwalk distance TDB, average 25 m, in this case 18 m
Instrument Hut
AC Unit


Option 6, anemometer boom facing (generic) East
with Instrument Hut towards the South West
North
Tower entrance
Anemometer boom, 4 m
Tower
4 m
Boardwalk distance TDB, average 25 m, in this case 18 m
Instrument Hut
AC Unit

Option 7, anemometer boom facing (generic) West with Instrument Hut towards the North



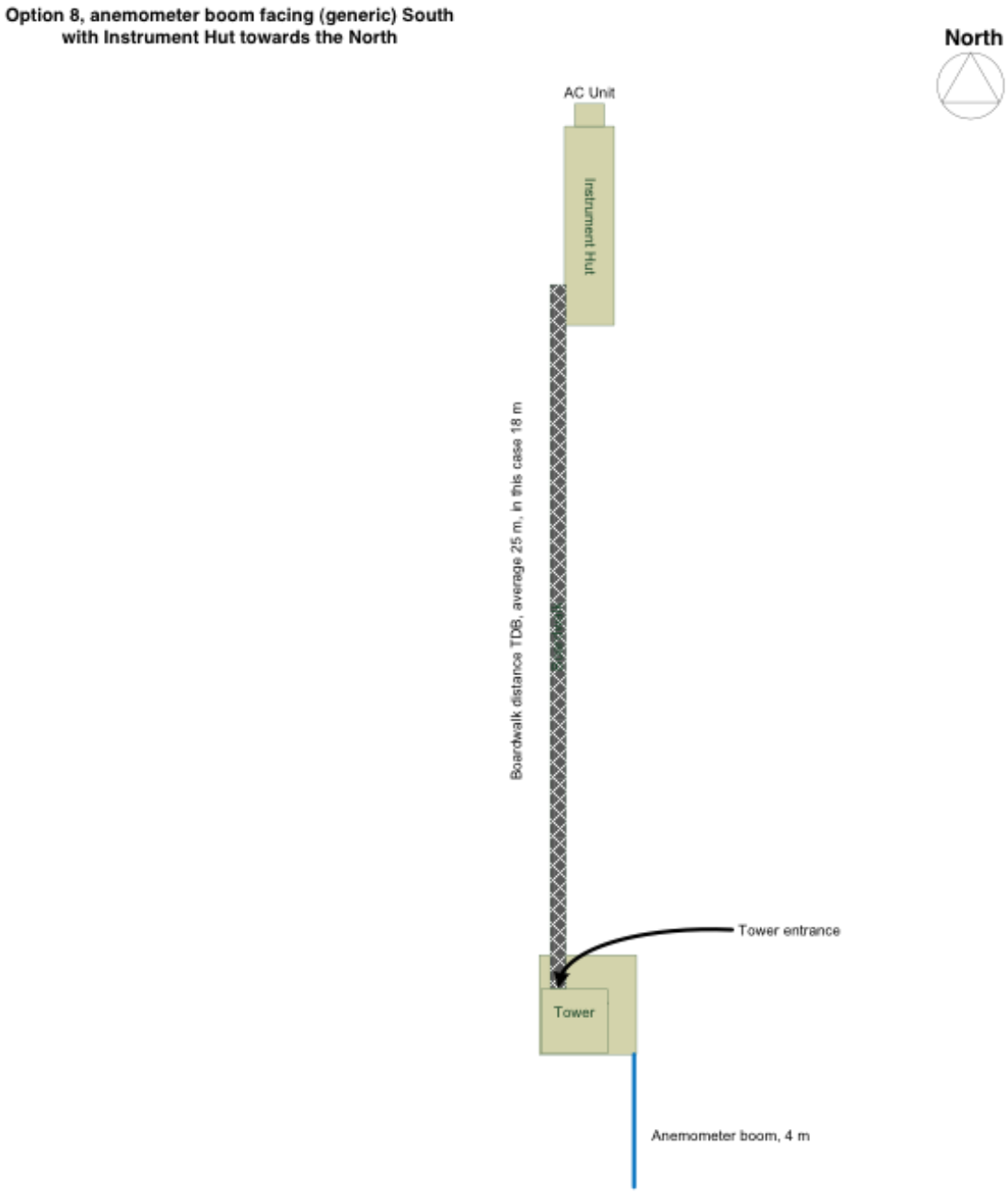
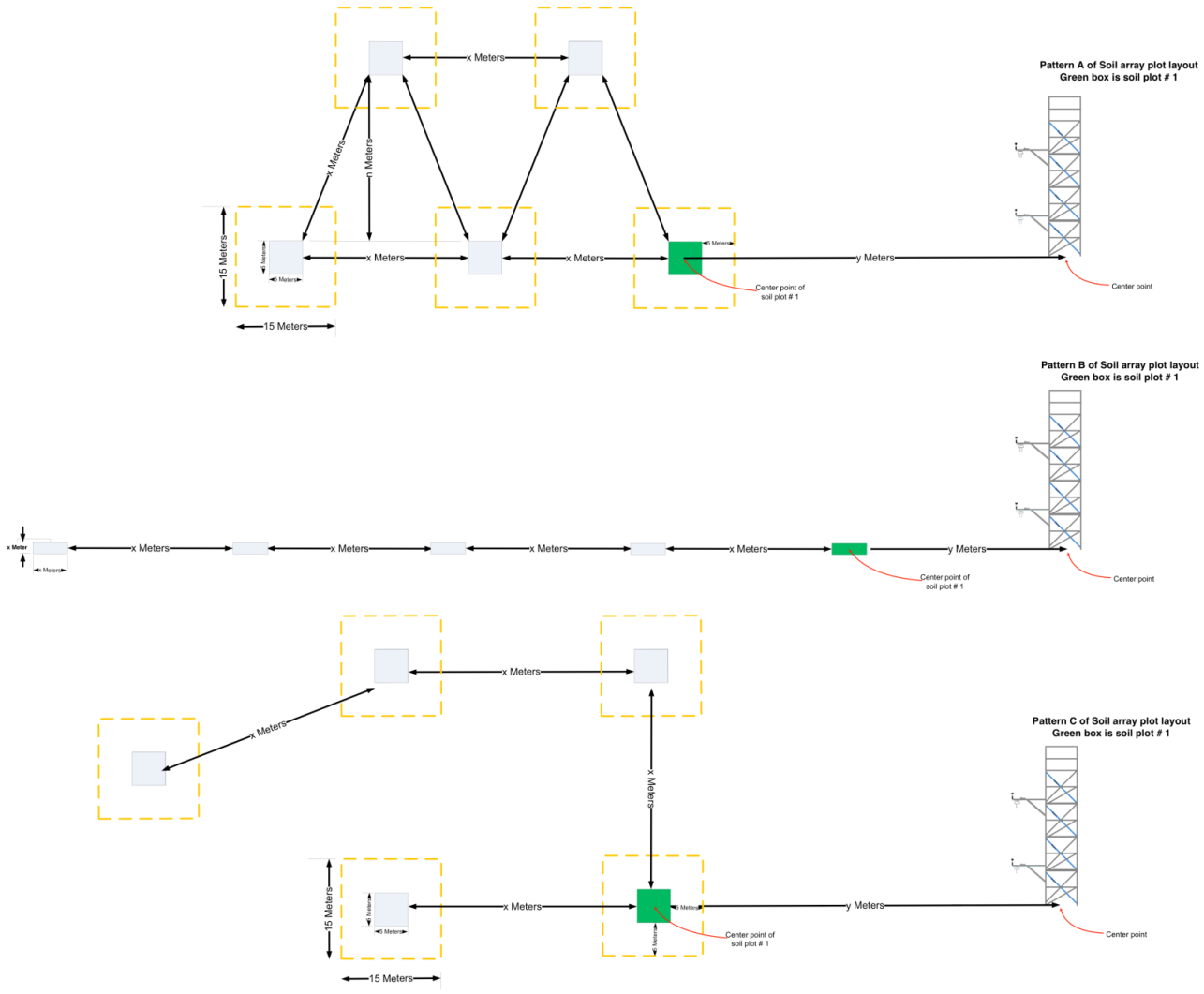


Figure 10. Generic patterns for the boardwalk configuration

These generic configurations are from the instrument hut to the tower based on 5 generic scenarios. The five options are based on anemometer boom orientation and the leeward side of the tower where the instrument hut is located. The tower entrance is always on the North side of the tower. Exact tower and instrument hut location and orientation will be specified at each location and presented in the site characterization document.



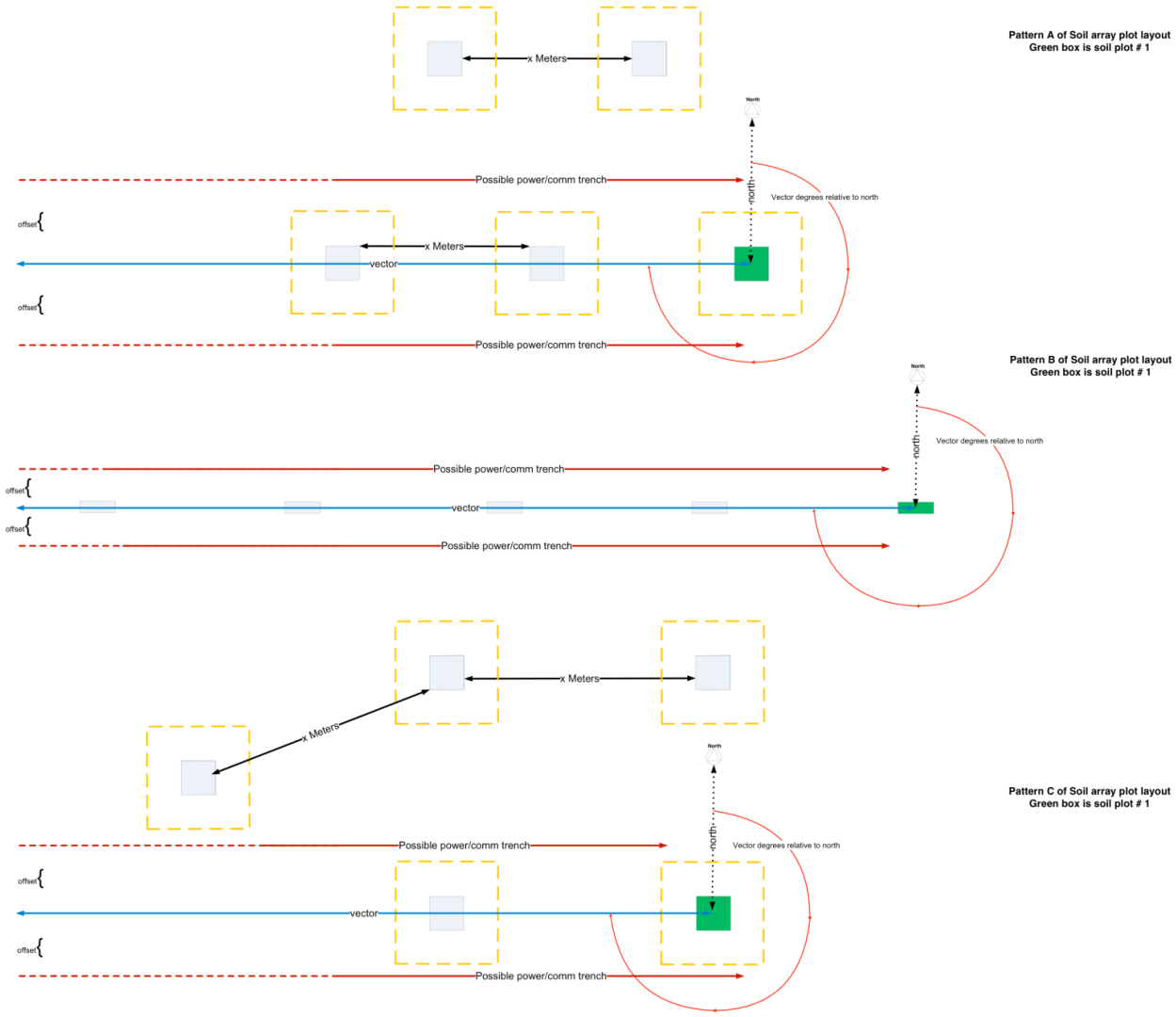


Figure 11. Conceptual diagram of Soil Array Patterns

Outlines the orientation for the soil array and instrument hut from the center point of the tower. The x, y, z distances are i) the distance between soil plots, ii) distance between the tower centerpoint and the closest edge of soil plot, and iii) the distance between the tower centerpoint and the closest edge of the instrument hut, respectively. The yellow outline around each soil plot is the 5 m perimeter keep out zone.

7 APPENDIX A. FCC SUMMARY TABLES

Table 17. FCC Summary Table for FIU site components at D19 Caribou Poker Core Site

Site Component				**units**
Tower location	65.15401,	-147.50258		Lat, Long, in degrees
Tower location	65° 9' 14.4354"	-147° 30' 9.2874"		Lat, Long in deg min sec
Tower height[f]	18			meters
Tower guying	Yes, heavy ice load			yes/none, notes
Instrument Hut location	65.15412,	-147.50266		Lat, Long, in degrees
Instrument Hut location	65° 9' 14.832"	-147° 30' 9.5754"		Lat, Long in deg min sec
IH orientation[a]	90° - 270°			vector
boom orientation[b]	180°			degrees
distance from center of tower to IH center		13	option 8	distance (m), option #
how the Bwalk intersects the tower access	Boardwalk intersects the north-side of the tower.			description
how the Boardwalk intersects the tower access	Boardwalk from IH straight to the north side of tower			description
Air shed vector(s)[c]	245° to 295° (major)			Vector, clock wise from first angle
Boardwalk from AP to IH	yes, from dirt road to IH	(see Figure 2)		yes/none, notes
Boardwalk to soil array	yes			yes/none, notes
Boardwalk needed to DFIR	yes	From dirt road to DFIR		yes/none, notes
Power and Communication line	10 m from edge of soil plot to the centerline of power/comms line	whichever side is easiest, line is above ground		offset, notes
DFIR location	65.15601	-147.48950		Lat, Long in degrees, notes
DFIR location	65° 9' 21.6354"	-147° 29' 22.1994"		Lat, Long in deg min sec
DFIR power supply	30 amp AC power required			description
Soil plot 1st location	65.15402°,	-147.50293°		Lat, Long in degrees (center point)
Soil plot 1st location	65° 9' 14.472"	-147° 30' 10.5474"		Lat, Long in deg min sec
Soil plot distance between plots (x)	25 m	16 m	13 m	x, y, z (meters)
Soil array pattern and vector[d]	B	250°		A, B, or C, vector
Soil plot dimensions	5 m x 5 m			L x W (meters)

Soil profile pit primary	65.155557°,	-147.489651°	<1 m	Lat, Long, and expected depth
Soil profile pit primary	65° 9' 20.0052"	-147° 29' 22.7436"		Lat, Long in deg min sec
Soil profile pit alternative 1	65.155110°,	-147.489810°	<1 m	Lat, Long, and expected depth
Soil profile pit alternative 1	65° 9' 18.3954"	-147° 29' 23.316"		Lat, Long in deg min sec
Soil profile pit alternative 2	65.155907°,	-147.490067°	<1 m	Lat, Long, and expected depth
Soil profile pit alternative 2	65° 9' 21.2646"	-147° 29' 24.2412"		Lat, Long in deg min sec
Fencing needs	no	None, but may need individual guards for outcropped instrument tubing on the ground to protect against rodents	no	IH, Soil Arrays, Guy anchors
Presence of large grazing animals	Yes, moose presents around this site. Grizzly bears are around and generally curious about all shinning materials, like metal. But doubtful that we would need fencing.			description
Site management*	unmanaged			description
Any additional site specific information	Open black spruce forest on permafrost terrain, tussock tundra on the floor, uneven floor, very thick moss layer			description
Magnetic declination	20° 59' E changing by 0° 22' W/year			At time of site visit

Table 18. FCC Summary Table for FIU site components at D19 Delta Junction Relocatable site 1

Site Component				**units**
Tower location	63.88112,	-145.75136		Lat, Long in degrees
Tower location	63° 52' 52.032"	-145° 45' 4.896"		Lat, Long in deg min sec
Tower height[f]	19			meters
Tower guying	Yes, heavy ice load			yes/none, notes
Instrument Hut location	63.88120,	-145.75119		Lat, Long in degrees
Instrument Hut location	63° 52' 52.3194"	-145° 45' 4.284"		Lat, Long in deg min sec
IH orientation[a]	105°-285°			vector
boom orientation[b]	200°			degrees
distance from center of tower to IH center		13	Option 8	vector, distance (m), option #
how the Bwalk intersects the tower access	Boardwalk intersects the north-side of the tower from the North.			description
how the Bwalk intersects the tower access	IH on the northeast to tower.			description
Air shed vector(s)[c]	75° to 125° (major) and 190° to 290° (secondary)	Clockwise from first angle		vector, notes
Boardwalk from AP to IH	yes	(Figure 5)		yes/none, notes
Boardwalk to soil array	yes			yes/none, notes
Boardwalk needed to DFIR	NA			yes/none
DFIR location	No DFIR			Lat, Long
Power and Communication line	10 m from edge of plot to the centerline of power/comms line	whichever side is easiest[e], line above ground		offset, notes
DFIR power supply	NA			description
Soil plot 1st location	63.881148°,	-145.751020°		Lat, Long (center point)
Soil plot 1st location	63° 52' 52.1328"	-145° 45' 3.672"		Lat, Long in deg min sec
Soil plot distance between plots (x)	40 m	17 m	13 m	x, y, z (meters)
Soil array pattern and vector[d]	B	125°		A, B, or C, vector
Soil plot dimensions	5 m x 5 m			L x W (meters)
Soil profile pit primary	63.879713°,	-145.747663°	>2 m	Lat, Long, and expected depth
Soil profile pit primary	63° 52' 46.9668"	-145° 44' 51.5862"		Lat, Long in deg min sec
Soil profile pit alternative 1	63.879242°,	-145.747665°	>2 m	Lat, Long, and expected depth

Soil profile pit alternative 1	63° 52' 45.2706"	-145° 44' 51.594"		Lat, Long in deg min sec
Soil profile pit alternative 2	63.878762°,	-145.747669°	>2 m	Lat, Long, and expected depth
Soil profile pit alternative 2	63° 52' 43.5432"	-145° 44' 51.6084"		Lat, Long in deg min sec
Fencing needs	no	None, but may need individual guards for outcropped instrument tubing on the ground to protect against rodents	no	IH, Soil Arrays, Guy anchors
Presence of large grazing animals	Yes, moose presents around this site. But doubtful that we would need fencing.			description
Site management*	unmanaged			description
Any additional site specific information	Black spruce forest on well drained non-permafrost, flat terrain			description
Magnetic declination	21° 10' E changing by 0° 22' W/year			At time of site visit

Table 19. FCC Summary Table for FIU site components at D19 Caribou Poker Relocatable site 2

Site Component				**units**
Tower location	65.11298,	-147.42274		Lat, Long in degrees
Tower location	65° 6' 46.7274"	-147° 25' 21.864"		Lat, Long in deg min sec
Tower height[f]	20			meters
Tower guying	Yes, heavy ice load			yes/none, notes
Instrument Hut location	65.11288,	-147.42244		Lat, Long in degrees
Instrument Hut location	65° 6' 46.368"	-147° 25' 20.7834"		Lat, Long in deg min sec
IH orientation[a]	60°-240°			vector
boom orientation[b]	360°			degrees
distance from center of tower to IH center		17	Option 3	vector, distance (m), option #
how the Bwalk intersects the tower access	Boardwalk intersects the north-side of the tower from the east.			description
how the Bwalk intersects the tower access	IH on the southeast to tower, dogleg may be needed.			description
Air shed vector(s)[c]	245° to 295°	Clockwise from first angle, but likely dominant by NE-SW wind direction, and see some winds from west as well		vector, notes
Boardwalk from AP to IH	yes	(Figure 7)		yes/none, notes
Boardwalk to soil array	yes			yes/none, notes
Boardwalk needed to DFIR	NA			yes/none
DFIR location	No DFIR			Lat, Long
Power and Communication line	10 m from edge of soil plot to the centerline of power/comms line	whichever side is easiest[e], line above ground		offset, notes
DFIR power supply	NA			description
Soil plot 1st location	65.112980°,	-147.423166°		Lat, Long (center point)
Soil plot 1st location	65° 6' 46.7274"	-147° 25' 23.3976"		Lat, Long in deg min sec
Soil plot distance between plots (x)	25 m	20 m	17 m	x, y, z (meters)
Soil array pattern and vector[d]	B	270°		A, B, or C, vector
Soil plot dimensions	5 m x 5 m			L x W (meters)
Soil profile pit primary	65.117221,	-147.433286	<2 m	Lat, Long, and expected depth
Soil profile pit primary	65° 7' 1.9956"	-147° 25' 59.8296"		Lat, Long in deg min sec
Soil profile pit alternative 1	65.117270,	-147.431916	<2 m	Lat, Long, and expected depth

Soil profile pit alternative 1	65° 7' 2.172"	-147° 25' 54.8976"		Lat, Long in deg min sec
Soil profile pit alternative 2	65.117596°,	-147.430765°	<2 m	Lat, Long, and expected depth
Soil profile pit alternative 2	65° 7' 3.3456"	-147° 25' 50.754"		Lat, Long in deg min sec
Fencing needs	no	None, but may need individual guards for outcropped instrument tubing on the ground to protect against rodents	no	IH, Soil Arrays, Guy anchors
Presence of large grazing animals	Yes, moose presents around this site. But doubtful that we would need fencing.			description
Site management*	Unmanaged, but naturally burned in 2004			description
Any additional site specific information	Burned black spruce forest on permafrost, most burned stems remain standing, active recruitments include birch, willow, aspen, etc with height ~1.5 m. Site is on a ridge.			description
Magnetic declination	20° 59' E changing by 0° 22' W/year			At time of site visit

Table 20. FCC Summary Table for FIU site components at D19 Eight Mile Lake Relocatable site 3

Site Component				**units**
Tower location	63.87569,	-149.21334		Lat, Long in degrees
Tower location	63° 52' 32.4834"	-149° 12' 48.0234"		Lat, Long in deg min sec
Tower height[f]	8			meters
Tower guying	Yes, heavy ice load			yes/none, notes
Instrument Hut location	63.87584,	-149.21347		Lat, Long in degrees
Instrument Hut location	63° 52' 33.0234"	-149° 12' 48.492"		Lat, Long in deg min sec
IH orientation[a]	45°-225°			vector
boom orientation[b]	180°			degrees
distance from center of tower to IH center		18	Option 8	vector, distance (m), option #
how the Bwalk intersects the tower access	Boardwalk intersects the north-side of the tower from the North.			description
how the Bwalk intersects the tower access	IH on the northwest to tower.			description
Air shed vector(s)[c]	180° to 270°(major) and 90° to 180° (secondary)	Clockwise from first angle		vector, notes
Boardwalk from AP to IH	yes	(Figure 9)		yes/none, notes
Boardwalk to soil array	yes			yes/none, notes
Boardwalk needed to DFIR	NA			yes/none
DFIR location	No DFIR			Lat, Long
Power and Communication line	10 m from edge of soil plot to the centerline of power/comms line	whichever side is easiest[e], line is above ground		offset, notes
DFIR power supply	NA			description
Soil plot 1st location	63.875569°,	-149.213614°		Lat, Long (center point)
Soil plot 1st location	63° 52' 32.0478"	-149° 12' 49.0104"		Lat, Long in deg min sec
Soil plot distance between plots (x)	40 m	19 m	18 m	x, y, z (meters)
Soil array pattern and vector[d]	B	225°		A, B, or C, vector
Soil plot dimensions	5 m x 5 m			L x W (meters)
Soil profile pit primary	63.880318°,	-149.216824°	unknown	Lat, Long, and expected depth
Soil profile pit primary	63° 52' 49.1448"	-149° 13' 0.5664"		Lat, Long in deg min sec
Soil profile pit alternative 1	63.880765°,	-149.215347°	unknown	Lat, Long, and expected depth
Soil profile pit alternative 1	63° 52' 50.7534"	-149° 12' 55.2492"		Lat, Long in deg min sec

Soil profile pit alternative 2	63.881145°,	-149.213840°	unknown	Lat, Long, and expected depth
Soil profile pit alternative 2	63° 52' 52.1214"	-149° 12' 49.824"		Lat, Long in deg min sec
Fencing needs	no	None, but may need individual guards for outcropped instrument tubing on the ground to protect against rodents	no	IH, Soil Arrays, Guy anchors
Presence of large grazing animals	Yes, moose presents around this site. But doubtful that we would need fencing.			description
Site management*	unmanaged			description
Any additional site specific information	Tussock alpine tundra on thermokarsting and discontinued permafrost terrain, shrub islands present			description
Magnetic declination	19° 54' E changing by 0° 20' W/year			At time of site visit

Notes;
[a]parallel to the long side of the IH
[b]From tower point to this direction
[c]Clockwise from first angle, recommend reviewing FIU site characterization summary report
[d]From 1st plot toward other plots if pattern B, from 1st plot toward nearest neighbor (see diagram of the patterns)
[e]see Appendix A. Options for Soil Array, second figure.
[f]Tower Height is for FIU requirements; actual tower height will increase toward the next section height, indicates that the top measurement location is equal to level 4, and the tower top shall be taller based on the sections of tower.
IH = instrument hut
AP = auxillary portal
*burn information that may affect boardwalk, IH, or tower infrastructure, or other management activities