B

D06 FIU SITE CHARACTERIZATION: SUMMARY

PREPARED BY	ORGANIZATION	DATE
E. Ayres	FIU	3/18/2011
H. Luo	FIU	3/18/2011
H. Loescher	FIU	3/18/2011

APPROVALS (Name)	ORGANIZATION	APPROVAL DATE
Hank Loescher	FIU	11/04/2011

RELEASED BY (Name)	ORGANIZATION	RELEASE DATE
Anne Balsley	CCB ADMINISTRATOR/DCS	11/07/2011

See Configuration Management System for approval history.

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	3/18/2011	ECO-00131	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 D06 Site Characterization: Supporting Data (AD[01]).

1.2 Scope

This document summarizes the FIU site characterization data for three D06 tower locations: Konza Prairie Biological Station - Core (Advanced), The University of Kansas Field Station (Relocatable 1) and Konza Prairie Biological Station - Relocatable (Agricultural Lowland, Relocatable 2). 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.011078	FIU D06 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 KONZA - CORE ADVANCE TOWER SITE

3.1 Desired ecosystem

Table 1. Ecosystem at the Konza - Core tower site.

Ecosystem Type	Management activity
Tallgrass prairie	Managed as a wildland (managed burns every 2 yrs)

The Konza Prairie Biological Station is a 3,487-hectare (8,616 acre, 13.5 sq mi) preserve of native tallgrass prairie in the Flint Hills of northeastern Kansas. The ecosystem at Konza Advanced site is unplowed tallgrass prairie. The landscape at site is rolling hills, with trees in the valley near streams. Site is not grazed, but managed by fire and burned every 2 years. The plot ~100 m north of the tower is burned every 20 years and, as a result of the lower fire frequency, it is dominated by shrubs and small trees.

Table 2. Ecosystem and site attributes for Konza Advanced tower site.

Ecosystem attributes	Measure and units
Mean canopy height	1.5 m
Surface roughness[a]	0.3 m
Zero place displacement height[a]	1.0 m
Structural elements	unplowed tallgrass prairie, uniform
Time zone	Central time zone
Magnetic declination	3° 51' E changing by 0° 7' W/year

Note, [a] From field observation.

3.2 Site Design and Tower Attributes

The site layout is summarized in the table below. **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 Konza 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			160° to 230° (major), and 310° to 80° (secondary)		Clockwise from first angle
Tower location	39.10077,	-96.56309	--	--	
Instrument hut	39.10069,	-96.56292			

Instrument hut orientation vector	--	--	200° - 20°		Longwise
Instrument hut distance z	--	--	--	17	meter
Anemometer/Temperature boom orientation	--	--	290°	--	
DFIR	39.10037,	-96.56242			
Height of the measurement levels					
Level 1				0.2	m.a.g.l.
Level 2				1.5	m.a.g.l.
Level 3				3.8	m.a.g.l.
Level 4				6.0	m.a.g.l.
Tower Height				6.0	m.a.g.l.

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

According to the wind roses, wind can blow from any direction throughout the year. But wind blows most frequently from the airshed between 160° and 230° (clockwise from 160°, major airshed), and between 310° and 80° (clockwise from 310°, secondary airshed). Eddy covariance, sonic wind and air temperature **boom arms** orientation toward the northwest will be best to capture signals from all wind directions. **Radiation boom arms** should always be facing south to avoid any shadowing effects from the tower structure.

DFIR location is at 39.10037, -96.56242, which is ~70 m southeast to tower. **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. 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). The boardwalk to access the tower is not on any side that has a boom.
Specific Boardwalks at this site:

- Boardwalk from access point to instrument hut
- Boardwalk from instrument hut to tower and access tower on the north face.
- Boardwalk to the soil array.
- No boardwalk from the soil array boardwalk to the individual soil plots.
- No boardwalk or path needed to DFIR site.

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

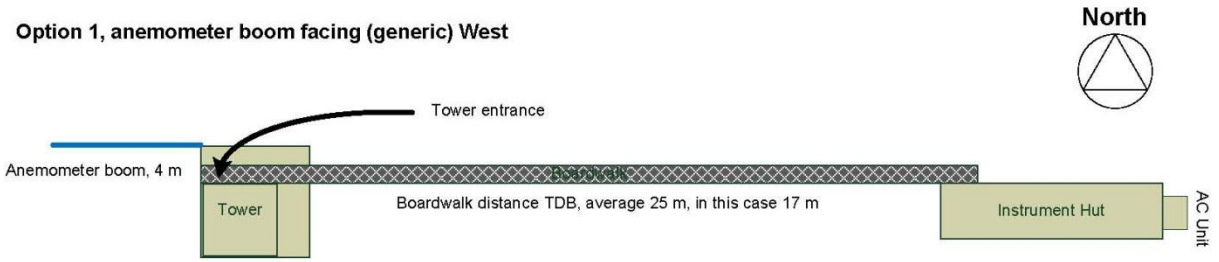


Figure 1. Generic diagram to demonstration the relationship between tower and instrument hut when boom facing west and instrument hut on the east towards the tower.

This is just 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 290 degrees, instrument hut location is on the southeast toward tower, the distance between instrument hut and tower is 17 m. The instrument hut vector will be SW-NE (200°-20°, longwise).

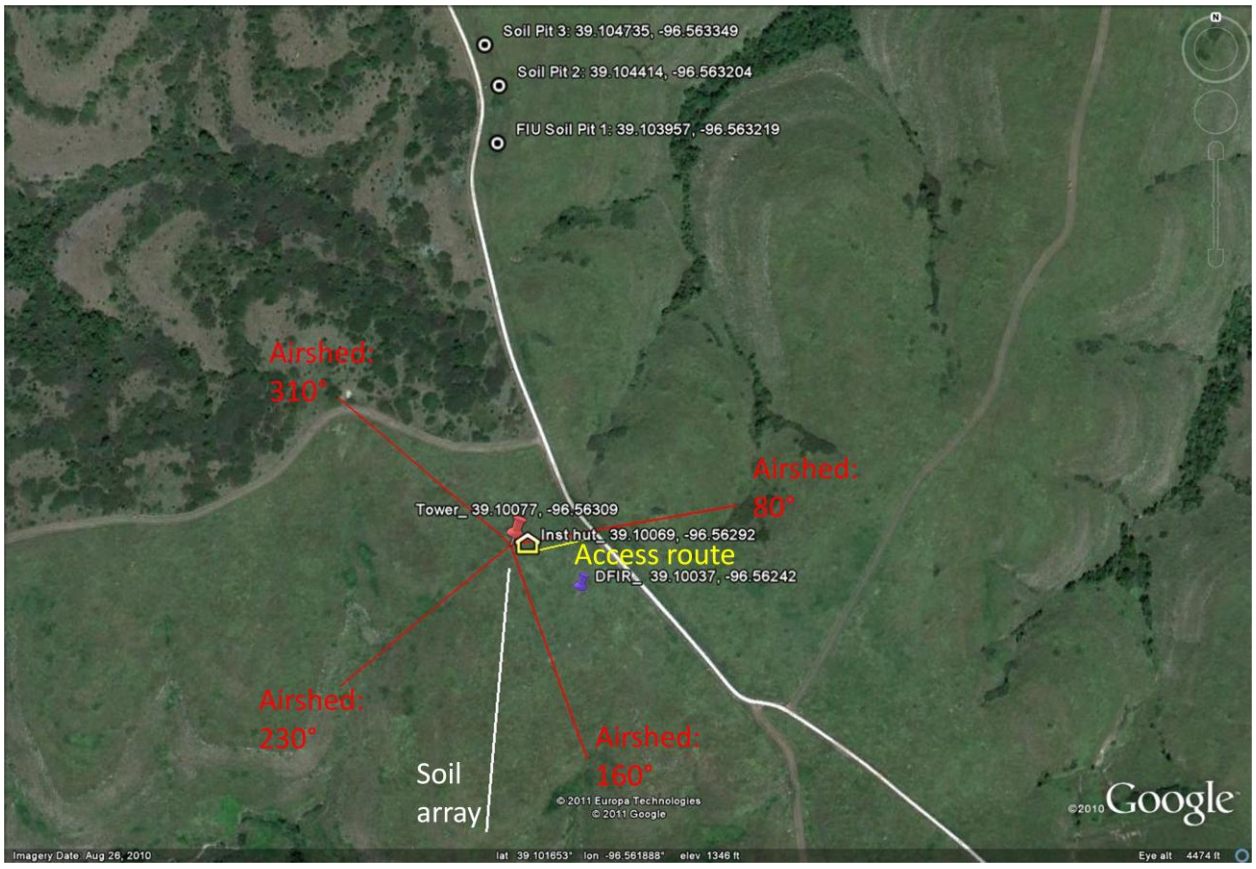


Figure 2. Site layout for Konza Advanced tower site.
i) Tower location is presented (red pin), ii) red lines indicate the airshed boundaries. Vectors 160° to 230° (major airshed, clockwise from 160°) and 310° to 80° (clockwise from 310°, secondary) would have quality wind data without causing flow distortions, respectively, iii) Yellow line is the suggested access road to instrument hut, and iv) Purple pin is 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 may be microsited 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: Benfield-Florence complex, 5 to 30 percent slopes. The taxonomy of this soil is shown below:
Order: Mollisols
Suborder: Ustolls
Great group: Argiustolls
Subgroup: Udertic Argiustolls- Udic Argiustolls
Family: Fine, mixed, superactive, mesic Udertic Argiustolls- Clayey-skeletal, smectitic, mesic Udic Argiustolls
Series: Benfield-Florence complex, 5 to 30 percent slopes

Table 4. Summary of soil array and soil pit information at Konza - 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	52 m
Distance from tower to closest soil plot: y	20 m
Latitude and longitude of 1st soil plot OR direction from tower	39.100590°, -96.563110°
Direction of soil array	185°
Latitude and longitude of FIU soil pit 1	39.103957, -96.563219 (primary location)
Latitude and longitude of FIU soil pit 2	39.104414, -96.563204 (alternate 1)
Latitude and longitude of FIU soil pit 3	39.104735, -96.563349 (alternate 2)
Dominant soil type	Benfield-Florence complex, 5 to 30 percent slopes
Expected soil depth	0.56-0.99 m
Depth to water table	>2 m
Expected depth of soil horizons	**Expected measurement depths***
0-0.15 m (Silty clay loam)	0.08 m†
0.15-0.30 m (Silty clay loam)	0.30 m†
0.30-0.66 m (Silty clay)	0.48 m†
0.66-0.89 (Silty clay loam)	0.78 m
	0.89 m
0.89-0.99 m (Bedrock)	

*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.
†Expected depth of soil CO_2 sensors (actual depth will be based on findings from the FIU soil pit)

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 (tallgrass prairie). Wind can blow from any direction during the year, but has higher frequency from the airshed between 160^{o} and 230^{o} (clockwise from 160^{o}, major airshed), and between 310^{o} and 80^{o} (clockwise from 310^{o}, secondary airshed). 90% signals for flux measurements are within 600 m from tower, and 80% within 300 m. We suggest FSU Ecosystem Productivity plots are placed within the boundaries of 160^{o} to 230^{o} (clockwise from 160°, major) and 310^{o} to 80^{o} (clockwise from 310^{o}, secondary) from tower.

3.5 Issues and attentions

The land where the tower, instrument hut, soil array, and DFIR are located is burned every 2 years by managed fires. In addition, wildfires or managed burns in other areas may occasionally spread to this location (i.e. unmanaged fires). The site design, construction, and operation must be able to tolerate frequent fires. Chiggers and ticks are prevalent. Konza Prairie Biological Station is heavily used for ecological research. Coordination with land managers is required to ensure that the NEON site does not interfere with other research in the area and vice versa.

4 UNIVERSITY OF KANSAS FIELD STATION, RELOCATABLE TOWER 1

4.1 Desired ecosystem

Table 5. Ecosystem at the University of Kansas Field Station tower site.

Ecosystem Type	Management activity
Mixed hardwood forest	Managed as wildland

The Biological Station is characterized by rolling hills. The tower is located at a relatively high location, with small valleys to the west, south, and east. There are limestone outcrops throughout the area (e.g. ~100 south of the tower), which sometimes form small cliffs/steep slopes (~3 m high). This site was tallgrass prairie in 1850, but since then, forest has invaded and expanded due to fire suppression. The tower and soil array location was not plowed. However, several nearby areas were plowed and then abandoned and are now dominated by cedar (e.g. the area ~50 m north of the tower location). The ecosystem around tower and inside the major airshed is mixed hardwood forest with canopy height at ~19 m. Major species include oak and hickory, with some elm. The new NEON tower location is at the site of an old snag (dead tree) that is ~7 m tall, and is approximately equidistant between nearby live trees.

Table 6. Ecosystem and site attributes for the University of Kansas Field Station Relocatable site.

Ecosystem attributes	Measure and units
Mean canopy height at construction [a]	19.0 m
Surface roughness at construction [a]	3.0 m
Zero place displacement height at construction [a]	14.5 m
Structural elements	Mixed hardwood forest, young tree understory, dense vegetation on forest floor
Time zone	central time zone
Magnetic declination	2° 52' E changing by 0° 7' 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 University of Kansas Field Station Relocatable site

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

Attribute	lat	long	degree	meters	notes
Airshed area			80° to 230° & 280° to 350°		Clockwise from first angle
Tower location	39.04043,	-95.19215	--	--	
Instrument hut	39.04054,	-95.19205			
Instrument hut orientation vector	--	--	150° - 330°		
Instrument hut distance z	--	--	--	15	
Anemometer/Temperature boom orientation	--	--	230°	--	
Height of the measurement levels					
Level 1				0.3	m.a.g.l.
Level 2				1.0	m.a.g.l.
Level 3				8.0	m.a.g.l.
Level 4				19.0	m.a.g.l.
Level 5				24.0	m.a.g.l.
Level 6				32.5	m.a.g.l.
Tower Height				32.5	m.a.g.l.

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

According to wind roses, wind can blow from any direction between 80° to 230° (clockwise from 80°) and between 280° to 350° (clockwise from 280°). Eddy covariance, sonic wind and air temperature **boom arms** orientation toward the southwest will be best to capture signals from all major wind directions. **Radiation boom arms** should always be facing south to avoid any shadowing effects from the tower structure.

Secondary **precipitation collector** for bulk precipitation collection will be located the top of tower at this site. W**et deposition collector** will be collocated 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 Relocatable site

- Boardwalk from the access point to the instrument hut, pending landowner decision.
- Boardwalk from the instrument hut to the tower to intersect on north face of the tower
- Boardwalk to the soil array
- No boardwalk to individual soil plots

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

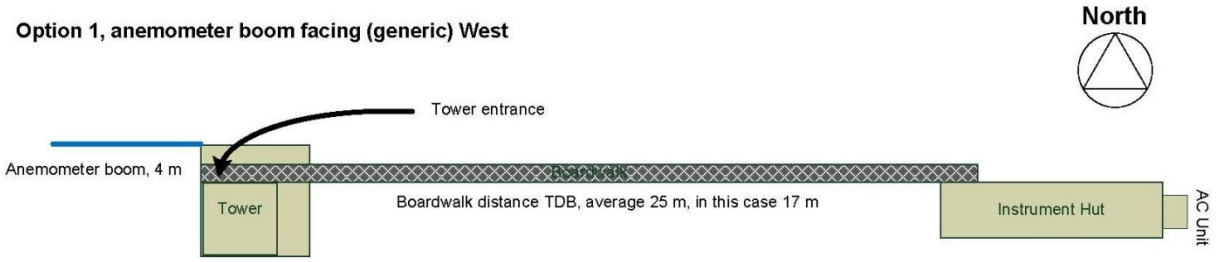


Figure 3. Generic diagram to demonstration the relationship between tower and instrument hut when boom facing west and instrument hut on the east towards the tower.

This is just 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 Relocatable site, the boom angle will be 230^{o}, instrument hut will be on the northeast towards the tower, the distance between instrument hut and tower is ~15 m. The instrument hut vector will be SE-NE (150^{o}-330^{o}, longwise).

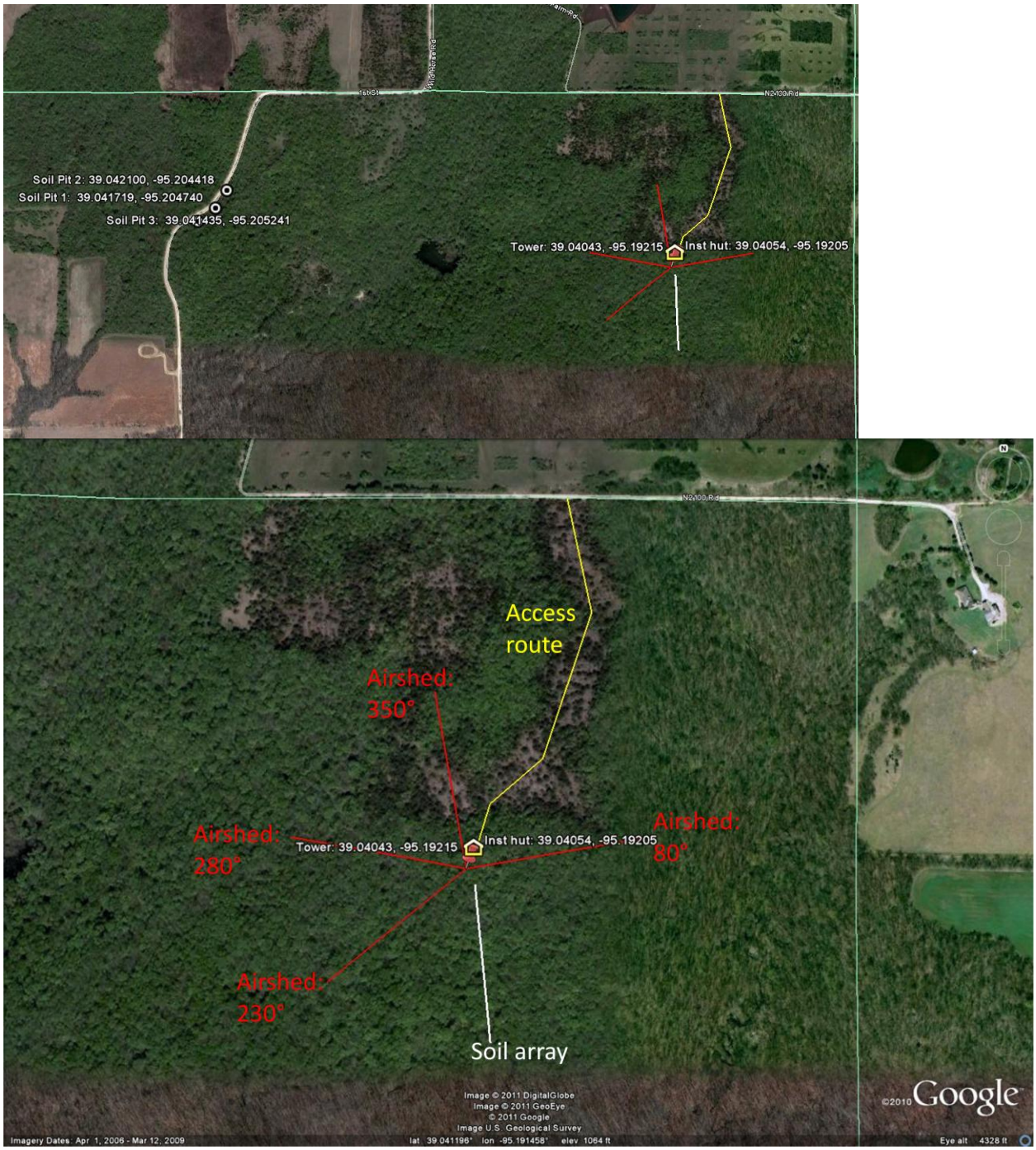


Figure 4. Site layout for University of Kansas Field Station Relocatable site.
i) Tower location is presented (red pin), ii) red lines indicate the airshed boundaries. Vectors 80° to 230° (clockwise from 80°) and 280° to 350° (clockwise from 280°) would have quality wind data without causing flow distortions, respectively. iii) Yellow line is the suggested access road to instrument hut. Soil pits are ~1 km from tower as this was the closest location to the tower with good road access for a bobcat-type excavator with the same soil type

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 may be microsited 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: Rosendale-Bendena silty clay loams, 3 to 40 percent slopes. The taxonomy of this soil is shown below:
Order: Inceptisols-Mollisols
Suborder: Udepts-Udolls
Great group: Eutrudepts-Hapludolls
Subgroup: Typic Eutrudepts- Lithic Hapludolls
Family: Fine, mixed, superactive, mesic Typic Eutrudepts- Clayey, smectitic, mesic Lithic Hapludolls
Series: Rosendale-Bendena silty clay loams, 3 to 40 percent slopes

Table 8. Summary of soil array and soil pit information at University of Kansas Biological Station. 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	20 m
Latitude and longitude of 1st soil plot OR direction from tower	39.040275, -95.192033
Direction of soil array	175°
Latitude and longitude of FIU soil pit 1	39.041719, -95.204740 (primary location)§
Latitude and longitude of FIU soil pit 2	39.042100, -95.204418 (alternate 1) §
Latitude and longitude of FIU soil pit 3	39.041435, -95.205241 (alternate 2) §
Dominant soil type	Rosendale-Bendena silty clay loams, 3 to 40 percent slopes
Expected soil depth	0.10-1.02 m
Depth to water table	>2 m
Expected depth of soil horizons	**Expected measurement depths***
0-0.20 m (Silty clay)	0.10 m†
0.20-0.33 m (Silty clay)	0.27 m†
0.33-0.51 m (Silty clay)	0.42 m†
0.51-0.76 m (Silty clay)	0.64 m
0.76-1.02 m (Silty clay)	0.89 m
1.02-1.40 m (Weathered bedrock)	1.21 m
1.40 m	1.40 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.
†Expected depth of soil CO_2 sensors (actual depth will be based on findings from the FIU soil pit).
§Soil pits are ~1 km from tower as this was the closest location to the tower with good road access for a bobcat-type excavator with the same soil type.

4.4 Information for ecosystem productivity plots

The tower at this relocatable site has been positioned to optimize the collection of the air/wind signals both temporally and spatially over the desired ecosystem (mixed hardwood forest). Prevailing wind blows the airshed from 80^{o} to 230^{o} (clockwise from 80^{o}) and 280^{o} to 350^{o} (clockwise from 280^{o}). We expect that 90% signals for flux measurements are within a distance of 1200 m from tower, and 80% within 700 m. We suggest FSU Ecosystem Productivity plots are placed within the boundaries of 80^{o} to 230^{o} (clockwise from 80^{o}) and 280^{o} to 350^{o} (clockwise from 280^{o}) from tower.

4.5 Issues and attentions

The tower is located at the site of a ~7 m snag (dead tree) that was approximately equidistant between nearby living trees. The snag will have to be removed ***carefully*** to make room for the tower, but no other trees should need to be removed. T he GPS coordinates for the tower location are 39.04043, -95.19215 (±14 feet or 4.3 m).

There was an umarked dirt path leading to an abondoned tower approximately 180 m east (39.04055, -95.19003) of the NEON tower. However, this path is not suggested for access to the NEON tower since it is not well maintained and would result in a longer access route to the NEON tower than is suggested in this report.

Ticks, 2 types of pit viper, and poison oak are found at this site.

Soil pits are ~1 km from tower as this was the closest location to the tower with good road access for a bobcat-type excavator with the same soil type.

5 KONZA - RELOCATABLE, RELOCATEABLE TOWER 2

5.1 Desired ecosystem

Table 9. Ecosystem at the Konza - Relocatable site.

Ecosystem Type	Management activity
Currently arable field, will begin to be restored to tallgrass prairie	Currently farmed (plowing and likely pesticides), future management unknown but may include managed burns, herbicide, reseeding with native plants.

The general site description about Konza Prairie Biological Station can be found in the site description for Konza - Core Advanced site above. The land around tower and inside the major airshed is currently managed as two plowed arable field. The crop in one field was wheat while the other field was fallow during FIU site characterization. However, prior to NEON site construction these fields will be begin to be restored to native tallgrass prairie, which will allow the NEON site to assess the initial phase of prairie restoration. The site is flat with the most of the surrounding land used for agriculture. Fire frequency is the restored prairie is unknown, but managed and/or unmanaged fires are likely to occur during the lifespan of the NEON site.

Table 10. Ecosystem and site attributes for the Konza Relocatable site.

Ecosystem attributes	Measure and units
Mean canopy height [a]	1.5 m
Surface roughness [a]	0.3 m
Zero place displacement height [a]	1.0 m
Structural elements	Uniform, current vegetation is crop, but will be restored native tallgrass prairie by the time NEON site is constructed
Time zone	Central time zone
Magnetic declination	3° 51' E changing by 0° 7' W/year

Note, [a] From field survey and empirical estimates

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 Konza Relocatable site

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

Attribute	lat	long	degree	meters	notes
Airshed area			160° to 230° (major), and 310° to 80° (secondary)		Clockwise from first angle
Tower location	39.11044,	-96.61295	--	--	
Instrument hut	39.11035,	-96.61277			
Instrument hut orientation vector	--	--	200° - 20°		longwise
Instrument hut distance z	--	--	--	18	
Anemometer/Temperature boom orientation	--	--	290°	--	
Height of the measurement levels					
Level 1				0.2	m.a.g.l.
Level 2				1.5	m.a.g.l.
Level 3				3.8	m.a.g.l.
Level 4				6.0	m.a.g.l.
Tower Height				6.0	m.a.g.l.

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

According to the wind roses, wind can blow from any direction throughout the year. But wind blows most frequently from the airshed between 160° and 230° (clockwise from 160°, major airshed), and between 310° and 80° (clockwise from 310°, secondary airshed). Eddy covariance, sonic wind and air temperature **boom arms** orientation toward the northwest will be best to capture signals from all wind directions. **Radiation boom arms** should always be facing south to avoid any shadowing effects from the tower structure.

Secondary **precipitation collector** for bulk precipitation collection will be located the top of tower at this site. No **wet 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. 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 to instrument hut
- Boardwalk from instrument hut to tower and access tower on the north face.
- Boardwalk to the soil array.
- No boardwalk from the soil array boardwalk to the individual soil plots.

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

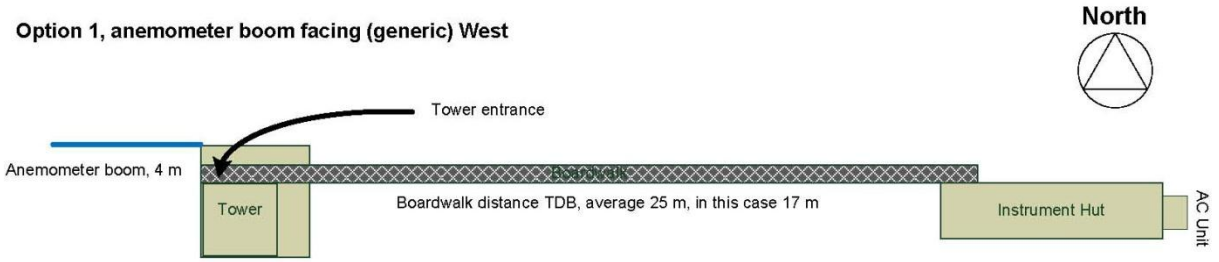


Figure 5. Generic diagram to demonstration the relationship between tower and instrument hut when boom facing west and instrument hut on the east towards the tower.

This is just 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 290 degrees, instrument hut location is on the southeast toward tower, the distance between instrument hut and tower is ~18 m. The instrument hut vector will be SW-NE (200^{o}-20^{o}, longwise).

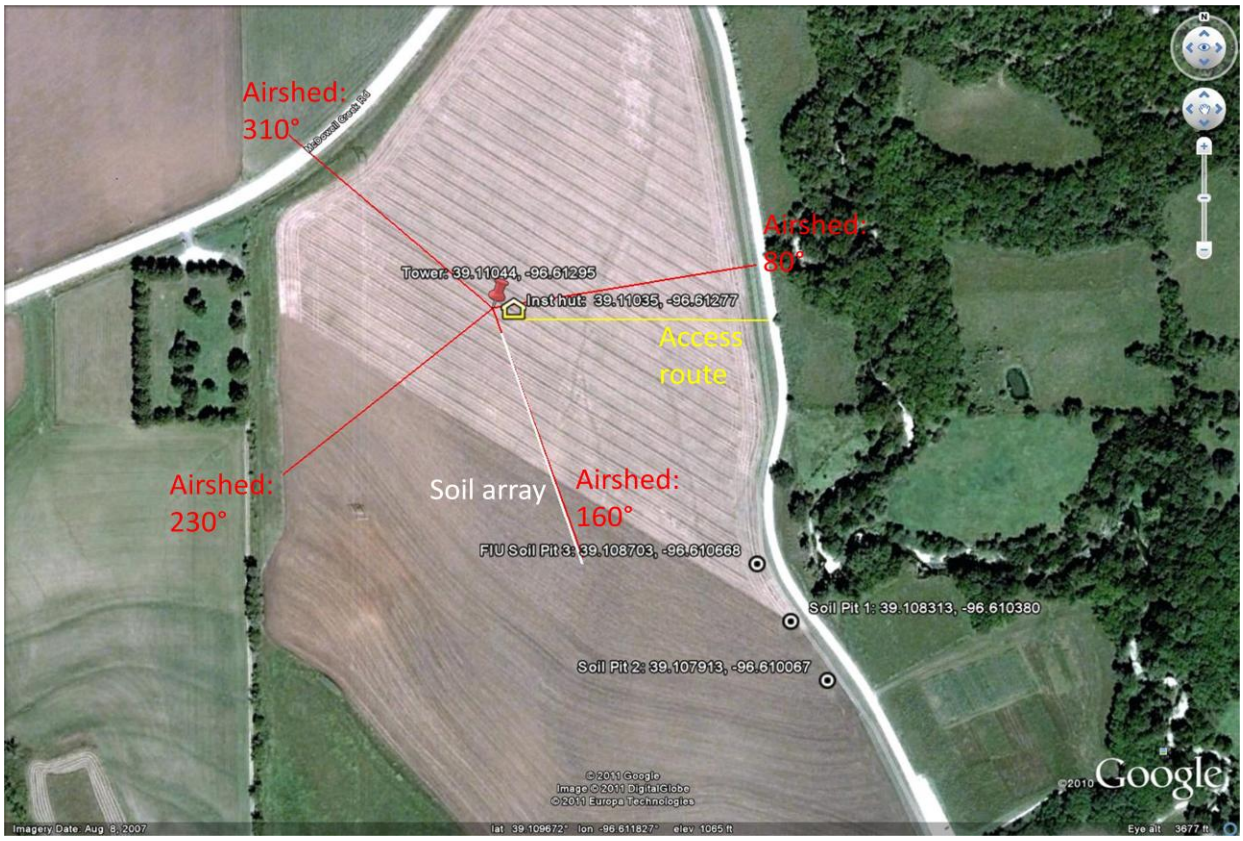


Figure 6. Site layout for Konza Relocatable site.
i) Tower location is presented (red pin), ii) red lines indicate the airshed boundaries. Vectors 160° to 230° (major airshed, clockwise from 160°) and 310° to 80° (clockwise from 310°, secondary) would have quality wind data without causing flow distortions, 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 may be microsited 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: Chase silty clay loam, rarely flooded. The taxonomy of this soil is shown below:
Order: Mollisols
Suborder: Udolls
Great group: Argiudolls
Subgroup: Aquertic Argiudolls
Family: Fine, smectitic, mesic Aquertic Argiudolls
Series: Chase silty clay loam, rarely flooded

Table 12. Summary of soil array and soil pit information at Konza - 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	40 m
Distance from tower to closest soil plot: y	20 m
Latitude and longitude of 1st soil plot OR direction from tower	39.110269°, -96.612876°
Direction of soil array	161°
Latitude and longitude of FIU soil pit 1	39.108313, -96.610380 (primary location)
Latitude and longitude of FIU soil pit 2	39.107913, -96.610067 (alternate 1)
Latitude and longitude of FIU soil pit 3	39.108703, -96.610668 (alternate 2)
Dominant soil type	Chase silty clay loam, rarely flooded
Expected soil depth	>2 m
Depth to water table	0.61-1.22 m
Expected depth of soil horizons	**Expected measurement depths***
0-0.18 m (Silty clay loam)	0.09 m†
0.18-0.33 m (Silty clay loam)	0.26 m†
0.33-1.02 m (Silty clay)	0.68 m†
1.02-1.27 m (Silty clay)	1.15 m
1.27-1.52 (Silty clay)	1.40 m
2.00 m	2.00 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.

†Expected depth of soil CO_2 sensors (actual depth will be based on findings from the FIU soil pit)

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 (agricultural ecosystem). Wind can blow from any direction during the year, but has higher frequency from the airshed between 160° and 230° (clockwise from 160°, major airshed), and between 310° and 80° (clockwise from 310°, secondary airshed). 90% signals for flux measurements are within 600 m from tower, and 80% within 300 m. We suggest FSU Ecosystem Productivity plots are placed within the boundaries of 160° to 230° (clockwise from 160°, major) and 310° to 80° (clockwise from 310°, secondary) from tower.

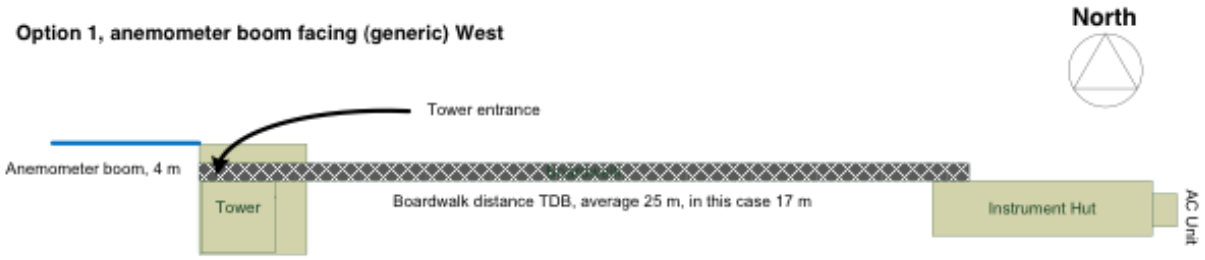
5.5 Issues and attentions

Fire frequency is unknown at the site as the restoration to tallgrass prairie has not yet begun. However, the site design, construction, and operation should be done with the expectation that fire (managed and/or unmanaged) may be frequent, e.g. annually.

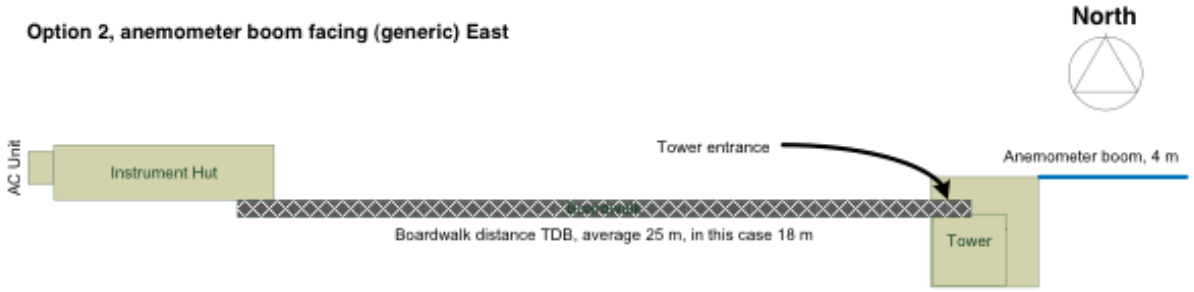
Chiggers and ticks will likely be prevalent in the restored prairie.

Konza Prairie Biological Station is heavily used for ecological research. Coordination with land managers is required to ensure that the NEON site does not interfere with other research in the area and vice versa.

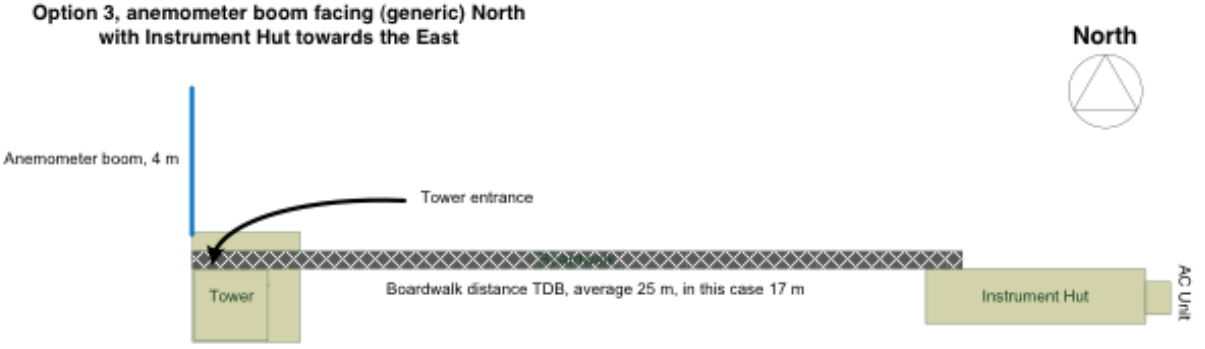
Option 1, anemometer boom facing (generic) West



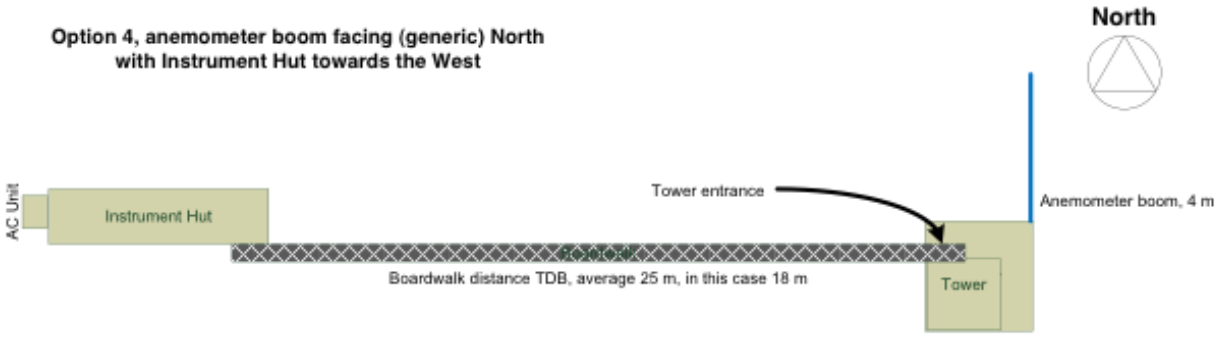
Option 2, anemometer boom facing (generic) East



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



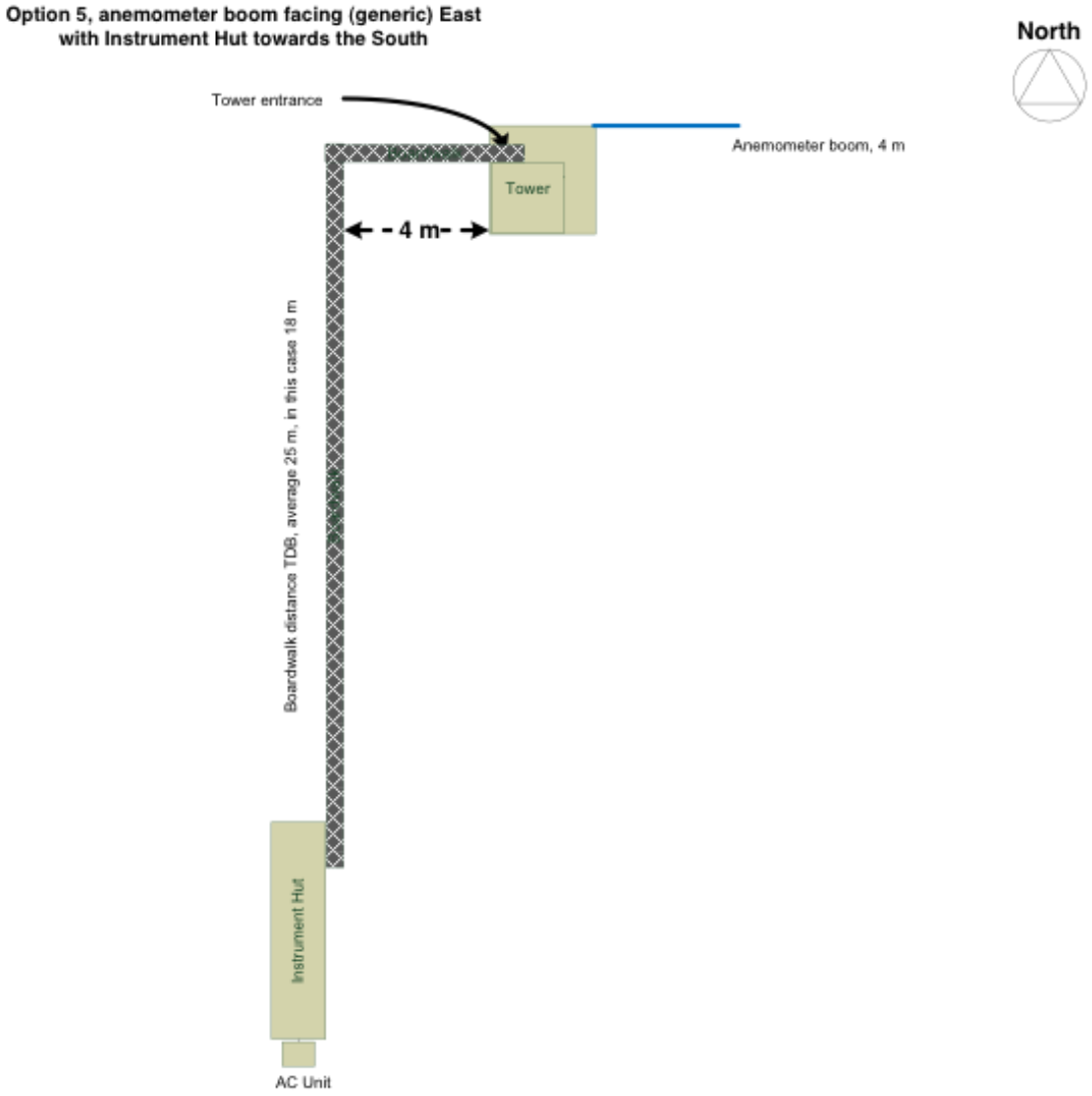
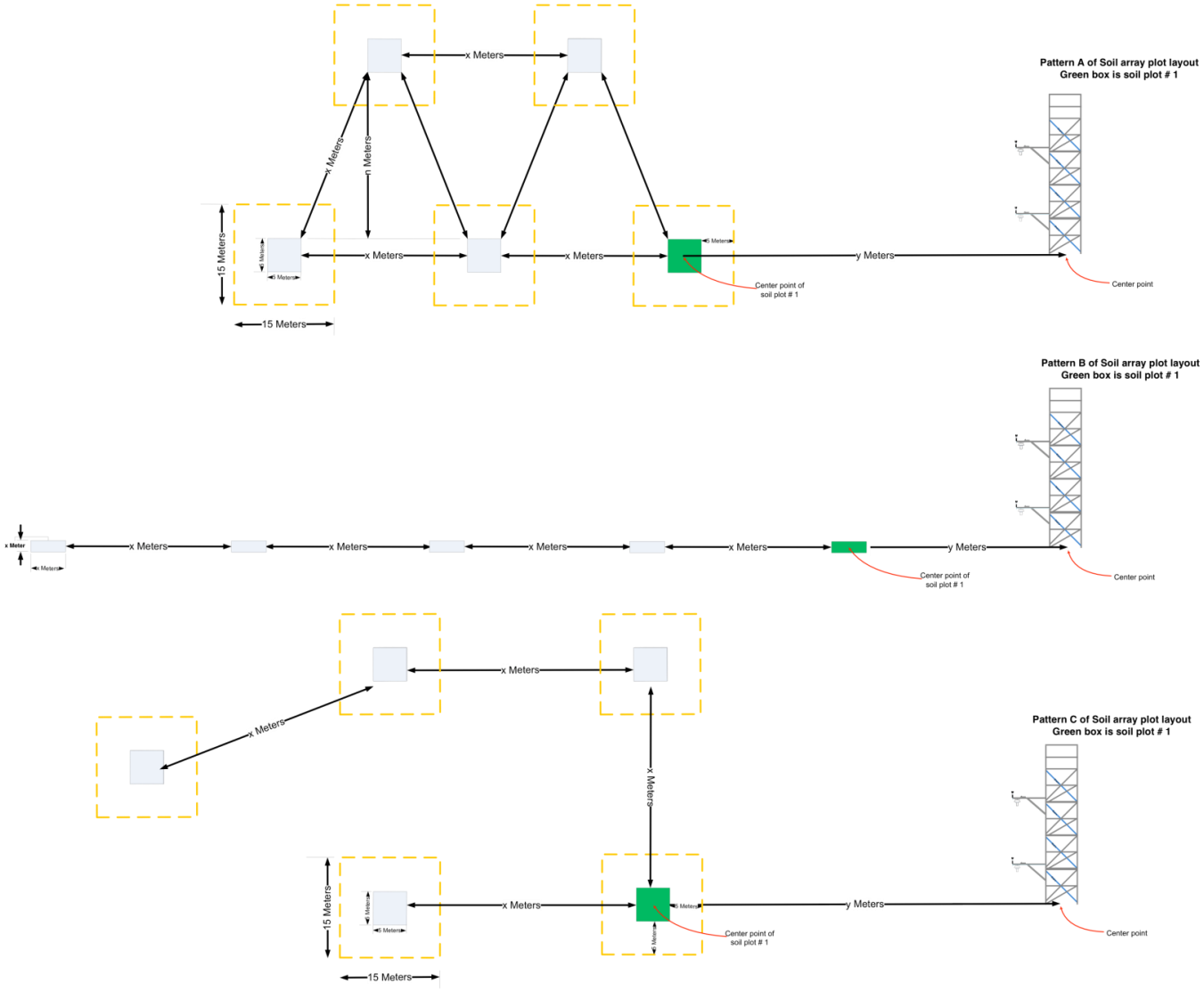

Option 5, anemometer boom facing (generic) East
with Instrument Hut towards the South
North
Tower entrance
Anemometer boom, 4 m
Tower
- 4 m-
Boardwalk distance TDB, average 25 m, in this case 18 m
Instrument Hut
AC Unit

Figure 7. 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.


Pattern A of Soil array plot layout
Green box is soil plot # 1
x Meters
x Meters
n Meters
15 Meters
15 Meters
x Meters
x Meters
y Meters
Center point of soil plot # 1
Center point
Pattern B of Soil array plot layout
Green box is soil plot # 1
x Meter
x Meters
x Meters
x Meters
x Meters
y Meters
Center point of soil plot # 1
Center point
Pattern C of Soil array plot layout
Green box is soil plot # 1
x Meters
x Meters
x Meters
15 Meters
15 Meters
x Meters
y Meters
Center point of soil plot # 1
Center point

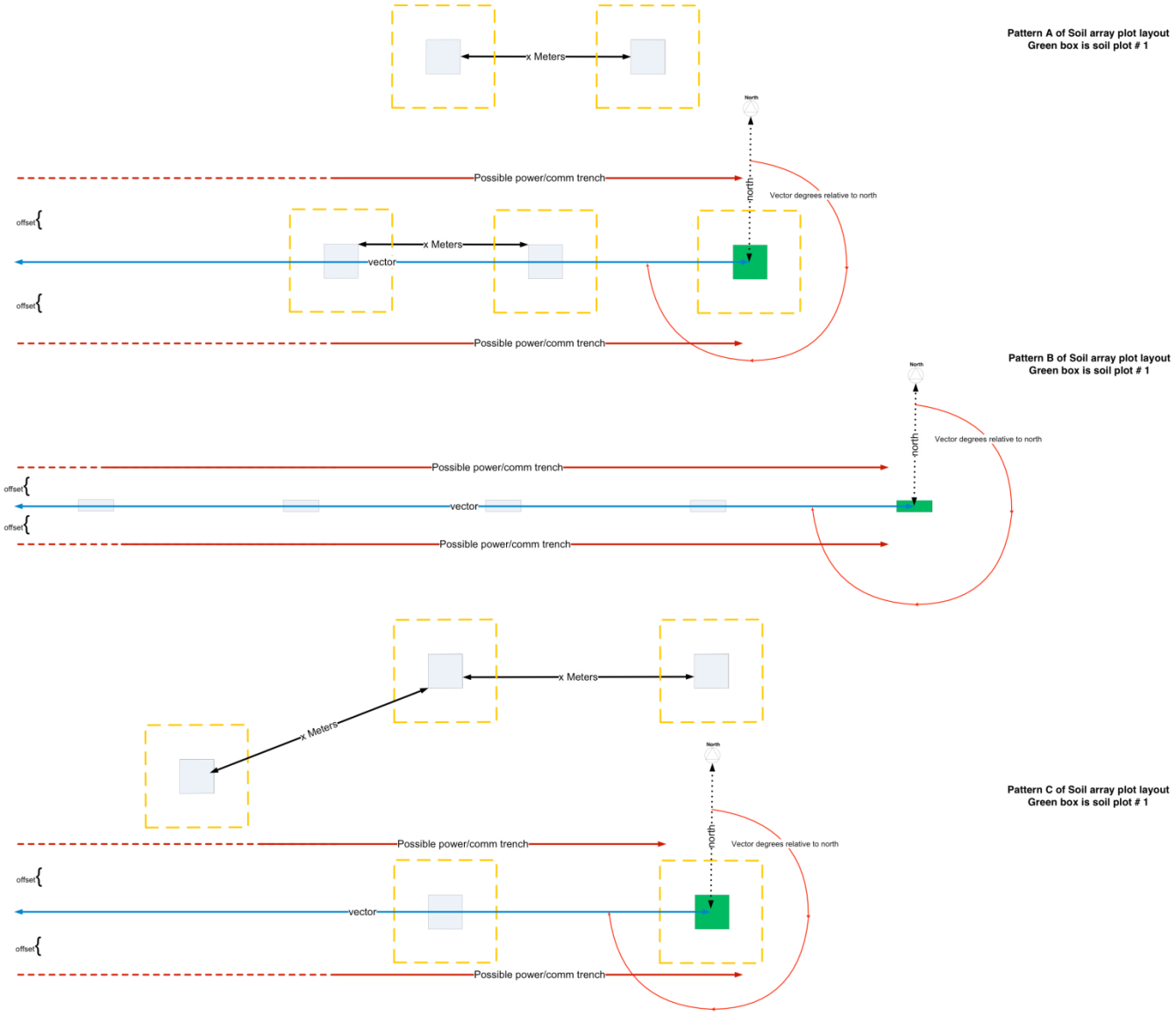


Figure 8. Conceptual diagram of Soil Array Patterns

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.

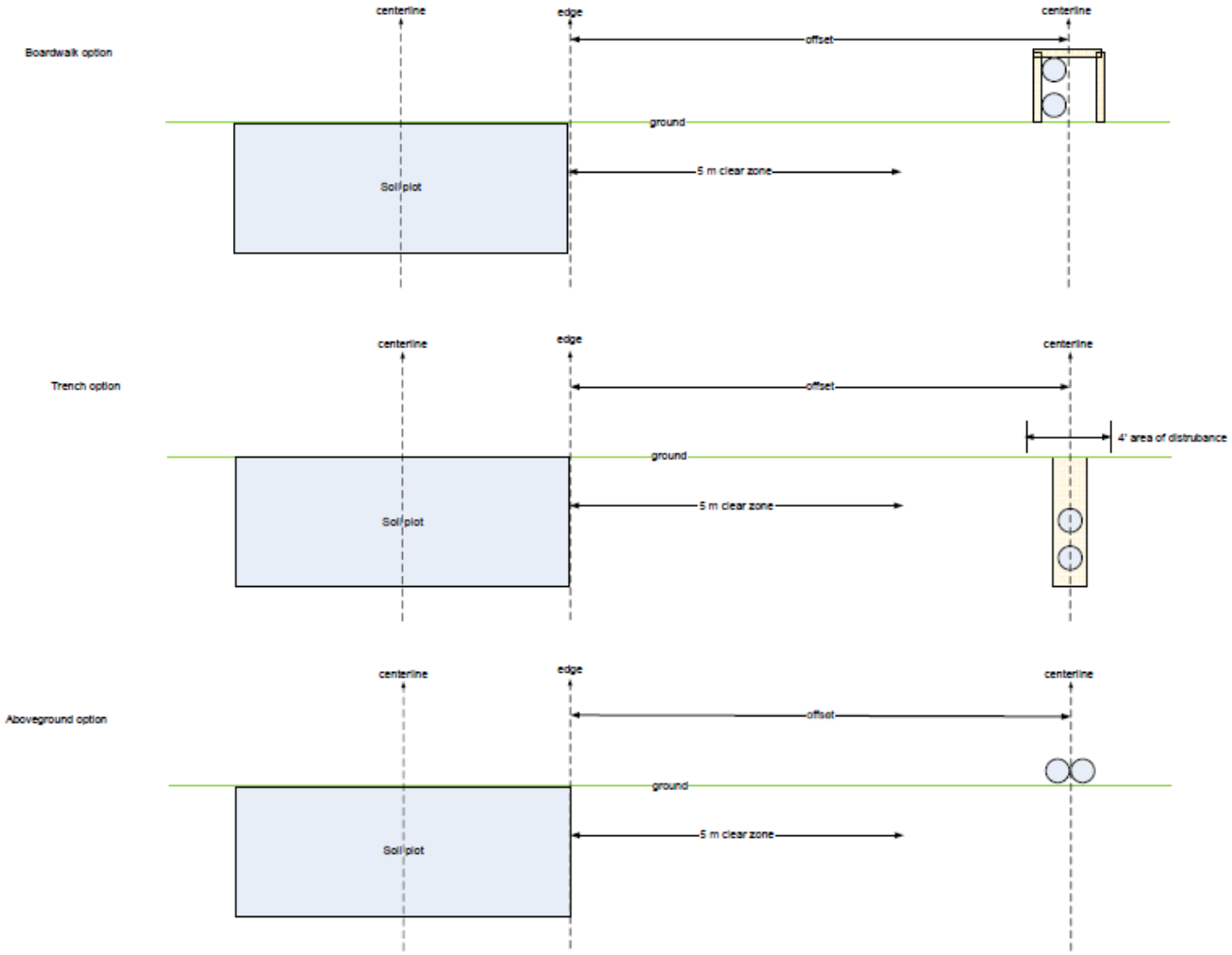


Figure 9. Conceptual diagram of power/communications line and boardwalk/path options in relation to FIU soil plots.

Boardwalk option: When a boardwalk is present the power and communication lines will typically follow the route of the boardwalk and be mounted aboveground (underneath the boardwalk). When no boardwalk is present (or the power/communication lines follow a different route than the boardwalk) the lines can be buried (Trench option) or run aboveground (Aboveground option). The aboveground option will be used instead of the trench option when trenching would be expected to cause significant disturbance to an ecosystem (e.g. cutting the roots of trees), pending landowner approval.

6 APPENDIX A. FCC SUMMARY TABLES

Table 13. FCC Summary Table for FIU site components at D06 Konza Advanced site

Site Component				**units**
Tower location	39.10077,	-96.56309		Lat, Long, in degrees
Tower location	39° 6' 2.7714"	-96° 33' 47.124"		Lat, Long in deg min sec
Tower height[f]	6			meters
Tower guying	none			yes/none, notes
Instrument Hut location	39.10069,	-96.56292		Lat, Long, in degrees
Instrument Hut location	39° 6' 2.484"	-96° 33' 46.512"		Lat, Long in deg min sec
IH orientation[a]	200° - 20°			vector
boom orientation[b]	290°			degrees
distance from center of tower to IH center (z)		17	option 1	distance (m), option #, (location chosen to meet National Park approval)
Air shed vector(s)[c]	160° to 230° (major)	310° to 80° (secondary)		Vector, clock wise from first angle
Boardwalk from AP to IH	yes			yes/none, notes
how the Bwalk intersects the tower access	BW access tower on the north face from IH on southeast			description
Boardwalk to soil array	yes			yes/none, notes
Boardwalk needed to DFIR	no			yes/none
Power and Communication trench	10 m from edge of soil plot to the centerline of the power/comms line	whichever side is easiest [e], trended below ground		offset, notes
DFIR location	39.10037,	-96.56242		Lat, Long in degrees, notes
DFIR location	39° 6' 1.3314"	-96° 33' 44.712"		Lat, Long in deg min sec
DFIR power supply	30 amp AC power from tower			description
Soil plot 1st location	39.100590°,	-96.563110°		Lat, Long in degrees (center point)
Soil plot 1st location	39° 6' 2.1234"	-96° 33' 47.1954"		Lat, Long in deg min sec
Soil plot distance between plots (x) and from tower (y)	52 m	20 m		x, y (meters)

Soil array pattern and vector[d]	B	185°		A, B, or C, vector
Soil plot dimensions	5 m x 5 m			L x W (meters)
Soil profile pit primary	39.103957,	-96.563219	0.56-0.99 m	Lat, Long, and expected depth
Soil profile pit primary	39° 6' 14.2452"	-96° 33' 47.5884"		Lat, Long in deg min sec
Soil profile pit alternative 1	39.104414,	-96.563204	0.56-0.99 m	Lat, Long, and expected depth
Soil profile pit alternative 1	39° 6' 15.8898"	-96° 33' 47.5338"		Lat, Long in deg min sec
Soil profile pit alternative 2	39.104735,	-96.563349	0.56-0.99 m	Lat, Long, and expected depth
Soil profile pit alternative 2	39° 6' 17.0454"	-96° 33' 48.0564"		Lat, Long in deg min sec
Fencing needs	none	none	none	IH, Soil Arrays, Guy anchors
Presence of large grazing animals	Likely, wild animals like dear, etc			description
Site management*	Fire management, burn every 2 years			description
Any additional site specific information	unplowed tallgrass prairie, uniform			description
Magnetic declination	3° 51' E changing by 0° 7' W/year			At time of site visit

Table 14. FCC Summary Table for FIU site components at D06 University of Kansas Field Station Relocatable 1

Site Component				**units**
Tower location	39.04043,	-95.19215		Lat, Long in degrees
Tower location	39° 2' 25.548"	-95° 11' 31.7394"		Lat, Long in deg min sec
Tower height[f]	32.5			meters
Tower guying	yes			yes/none, notes
Instrument Hut location	39.04054,	-95.19205		Lat, Long in degrees
Instrument Hut location	39° 2' 25.944"	-95° 11' 31.3794"		Lat, Long in deg min sec
IH orientation[a]	150° - 330°			vector
boom orientation[b]	230°			degrees
distance from center of tower to IH center (z)		15	Option 1	vector, distance (m), option #
Air shed vector(s)[c]	80° to 230° & 280° to 350°			vector, clockwise from first angle
Boardwalk from AP to IH	yes			yes/none, notes
how the Bwalk intersects the tower access	Boardwalk intersects the north-side of the tower from the IH on northeast			description
Boardwalk to soil array	Yes	No BW to individual soil plots		yes/none, notes
Boardwalk needed to DFIR	NA			yes/none
DFIR location	NA			Lat, Long
Power and Communication line	10 m from edge of soil plot to the centerline of the power/comms line	whichever side is easiest[e], trended below ground		offset, notes
DFIR power supply	na.			description
Soil plot 1st location	39.040275,	-95.192033		Lat, Long (center point)
Soil plot 1st location	39° 2' 24.99"	-95° 11' 31.3182"		Lat, Long in deg min sec
Soil plot distance between plots (x) and from tower (y)	40 m	20 m		x, y (meters)
Soil array pattern and vector[d]	B	175°		A, B, or C, vector
Soil plot dimensions	5 m x 5 m			L x W (meters)
Soil profile pit primary	39.041719,	-95.204740	0.10-1.02 m	Lat, Long, and expected depth
Soil profile pit primary	39° 2' 30.1884"	-95° 12' 17.064"		

Soil profile pit alternative 1	39.042100,	-95.204418	0.10-1.02 m	Lat, Long, and expected depth
Soil profile pit alternative 1	39° 2' 31.5594"	-95° 12' 15.9048"		Lat, Long in deg min sec
Soil profile pit alternative 2	39.041435,	-95.205241	0.10-1.02 m	Lat, Long, and expected depth
Soil profile pit alternative 2	39° 2' 29.1654"	-95° 12' 18.8676"		Lat, Long in deg min sec
Fencing needs	none	none	none	IH, Soil Arrays, Guy anchors
Presence of large grazing animals	Likely, wild animals like dear, etc			description
Site management*	Managed as wildland			description
Any additional site specific information	Mixed hardwood forest, young tree understory, dense vegetation on forest floor			description
Magnetic declination	2° 52' E changing by 0° 7' W/year			At time of site visit

Table 15. FCC Summary Table for FIU site components at D06 Konza Relocatable 2

Site Component				**units**
Tower location	39.11044,	-96.61295		Lat, Long in degrees
Tower location	39° 6' 37.5834"	-96° 36' 46.6194"		Lat, Long in deg min sec
Tower height[f]	6.0			meters
Tower guying	None			yes/none, notes
Instrument Hut location	39.11035,	-96.61277		Lat, Long in degrees
Instrument Hut location	39° 6' 37.2594"	-96° 36' 45.9714"		Lat, Long in deg min sec
IH orientation[a]	200° - 20°			vector
boom orientation[b]	290°			degrees
distance from center of tower to IH center (z)		18	Option 1	distance (m), option #
Air shed vector(s)[c]	160° to 230° (major),	310° to 80° (secondary)		vector, Clockwise from first angle
Boardwalk from AP to IH	yes	Restored tallgrass prarie		yes/none, notes
how the Bwalk intersects the tower access	Boardwalk from instrument hut to tower and access tower on the north face			description
Boardwalk to soil array	yes	No BW to individual soil plots		yes/none, notes
Boardwalk needed to DFIR	NA			yes/none
Power and Communication line	10 m from edge of soil plot to the centerline of the power/comms line	whichever side is easiest [e], trenched below ground.		offset, notes
DFIR location	NA			Lat, Long
DFIR power supply	NA			description
Soil plot 1st location	39.110269°,	-96.612876°		Lat, Long in degrees (center point)
Soil plot 1st location	39° 6' 36.9684"	-96° 36' 46.353"		Lat, Long in deg min sec
Soil plot distance between plots (x) and from tower (y)	40 m	20 m		X, Y (meters)
Soil array pattern and vector[d]	B	161°		A, B, or C, vector, notes
Soil plot dimensions	5 m x 5 m			L x W (meters)
Soil profile pit primary	39.108313,	-96.610380	> 2 m	Lat, Long, and expected depth

Soil profile pit primary	39° 6' 29.9268"	-96° 36' 37.368"		
Soil profile pit alternative 1	39.107913,	-96.610067	> 2 m	Lat, Long, and expected depth
Soil profile pit alternative 1	39° 6' 28.4868"	-96° 36' 36.2412"		Lat, Long in deg min sec
Soil profile pit alternative 2	39.108703,	-96.610668	> 2 m	Lat, Long, and expected depth
Soil profile pit alternative 2	39° 6' 31.3302"	-96° 36' 38.4048"		Lat, Long in deg min sec
Fencing needs	none	none	none	IH, Soil Arrays, Guy anchors
Presence of large grazing animals	No			description
Site management*	Currently agriculture field, but will restore to native tallgrass prairie prior to NEON tower construction.			description
Any additional site specific information	Prairie height can reach ~1.5 m in height by the end of growing season. Tower height design is based on this height.			description
Magnetic declination	3° 51' E changing by 0° 7' 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.
IH = instrument hut
AP = auxillary portal
*burn information that may affect boardwalk, IH, or tower infrastructure, or other management activities