NDSU | UPPER GREAT PLAINS TRANSPORTATION INSTITUTE
ADVANCED TRAFFIC ANALYSIS CENTER

TECHNICAL MEMORANDUM

TO: Bradley Nelsen, NDDOT
FROM: Kshitij Sharma, UGPTI/ATAC
Subject: **Spot Speed Studies – 19th Ave N Fargo**
Date: September 1, 2021

This memorandum documents the Spot Speed Studies conducted on 19th Ave N in Cass County, ND.

BACKGROUND

NDDOT had requested ATAC to conduct spot speed studies at three locations along 19th Ave N east of I-29. The three locations are:

1. Site 1
   19th Ave N Fargo
   RP 929.96
   Posted Speed Limit 40mph
2. Site 2
   19th Ave N Fargo
   RP 930.470
   Posted Speed Limit 50mph
3. Site 3
   19th Ave N Fargo
   RP 930.690
   Posted Speed Limit 50mph

Three studies with minimum statistically significant sample size of 148 vehicles were completed per location. Both eastbound and westbound directions of travel were observed.

METHODOLOGY

For the purpose of these spot speed studies, Operating Speed Method, generally known as the 85th percentile speed method, was used. In addition to the 85th percentile speed, the following parameters were calculated:

- Mean Speed
  Average speed of vehicles observed.
- Mode Speed
  Most frequently observed speed.

- Median Speed
  50th percentile speed.
- Pace
  Window of 10 mph range encompassing highest number of observed vehicles.
- Vehicles in pace
  Percent of observed vehicles driving at speeds within pace.
- Over Posted
  Total percent of vehicles speeding.
- 5 mph Over Posted
  Total percent of vehicles speeding 5 mph over the speed limit.
- 10 mph Over Posted
  Total percent of vehicles speeding 10 mph over the speed limit.
- Standard deviation
  Measure of spread or dispersion of observed speeds.

Also, based on the observed data, the following charts were created:

- Frequency Distribution Chart
  Normal frequency distribution chart plotted against speeds. This chart includes Pace.
- Cumulative Frequency Distribution Chart
  Cumulative frequency distribution chart plotted against speeds. This chart shows 85th percentile speeds.

DATA COLLECTION

The dates and times of observation are listed in table 1. Note that due to rapidly decreasing/increasing instantaneous speeds or otherwise non-free- flow conditions, some vehicles were intentionally left out from the observations including:

- Emergency vehicles in pursuit or responding to emergency situations
- Vehicles deliberately driving slower (indicated by actively flashing beacons)
- Turning vehicles including vehicles in two way turn lane(s)
- Vehicles entering the roadway from a complete stop close to the study location (e.g. I-29 off ramp terminal)

Table 1. Observation dates and times for spot speed study sites.

Location	Date	Direction	Time From	Time To
Site 1	August 12, 2021	Eastbound	1:00 pm	2:30 pm
		Westbound	1:00 pm	2:30 pm
Site 2	August 12, 2021	Eastbound	10:30 am	12:00 pm
		Westbound	10:30 am	12:00 pm
Site 3	August 2, 2021	Eastbound	9:30 am	11:30 am
		Westbound	9:30 am	11:30 am

RESULTS

As aforementioned, various parameters were calculated from speed observations. A summary of the results is presented in table 2.

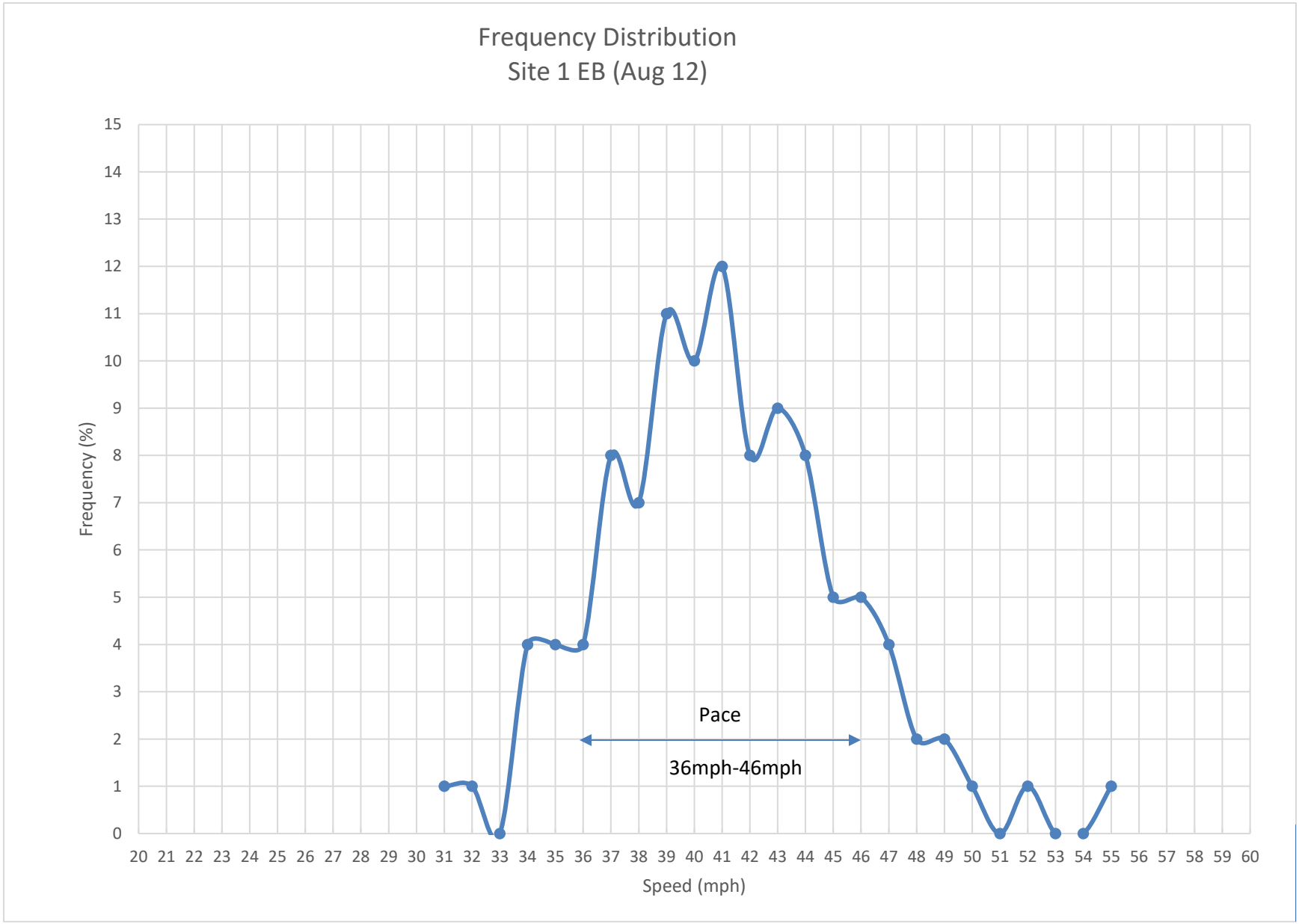
At all of the locations studied (except site 1), the 85th percentile speed, mean, median, and modal speed value is close to the posted speed limit. At Site 1, the 85th percentile speed was found to be on the higher side in both directions. At the same site we see that a high percentage of vehicles are speeding beyond the posted limit. The number of speeding vehicles drops sharply at 5 mph over the posted speed. Hardly any vehicles were observed speeding 10 mph over the posted speed at all three of the sites.

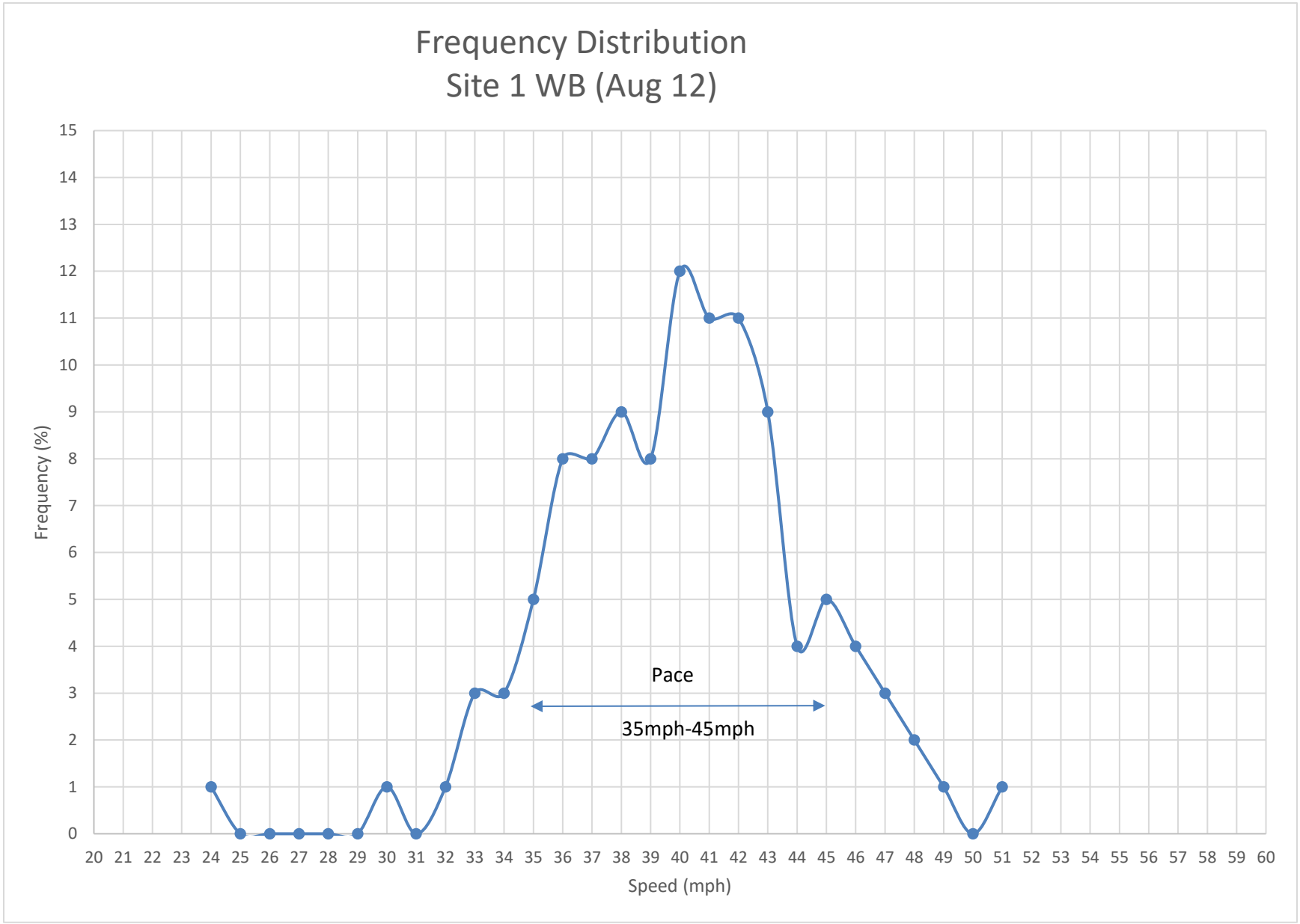
Table 2. Summary of spot speed study results.

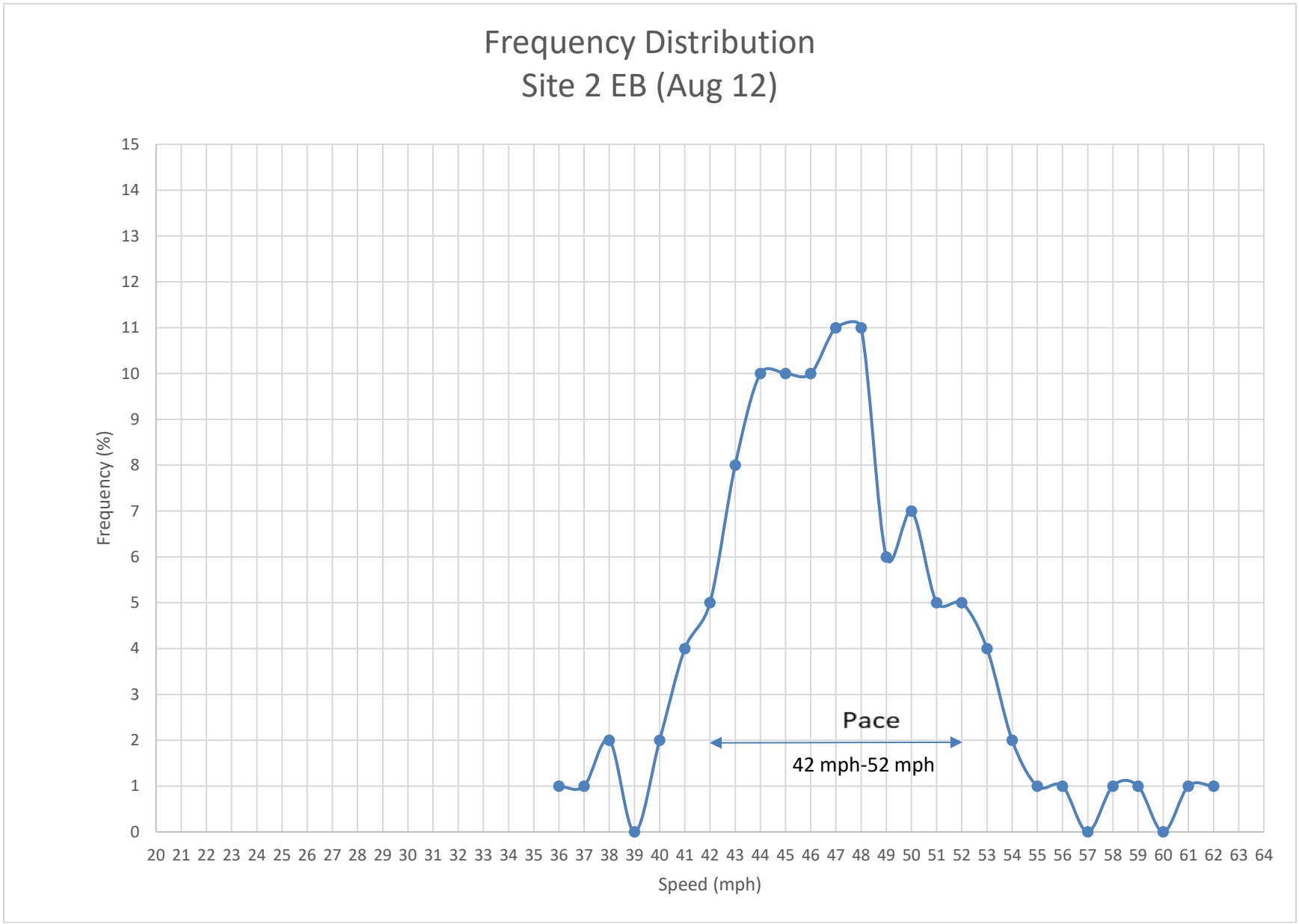
Parameter	Site 1		Site 2		Site 3	
	EB	WB	EB	WB	EB	WB
	12-Aug	12-Aug	12-Aug	12-Aug	2-Aug	2-Aug
85th Percentile (mph)	45	43	51	48	49	50
Mean (mph)	41	40	47	44	46	45
Standard Deviation (mph)	4.0	3.8	3.7	3.9	3.7	4.1
Mode (mph)	41	40	47	43	44	45
Median (mph)	40	40	46	43	46	45
Pace (mph)	36-46	35-45	42-52	39-49	41-51	41-51
In pace (%)	79	80	78	78	80	73
Over posted (%)	54	46	18	3	12	14
5 mph over posted (%)	13	8	3	0	0	0
10 mph over posted (%)	1	0	1	0	0	0

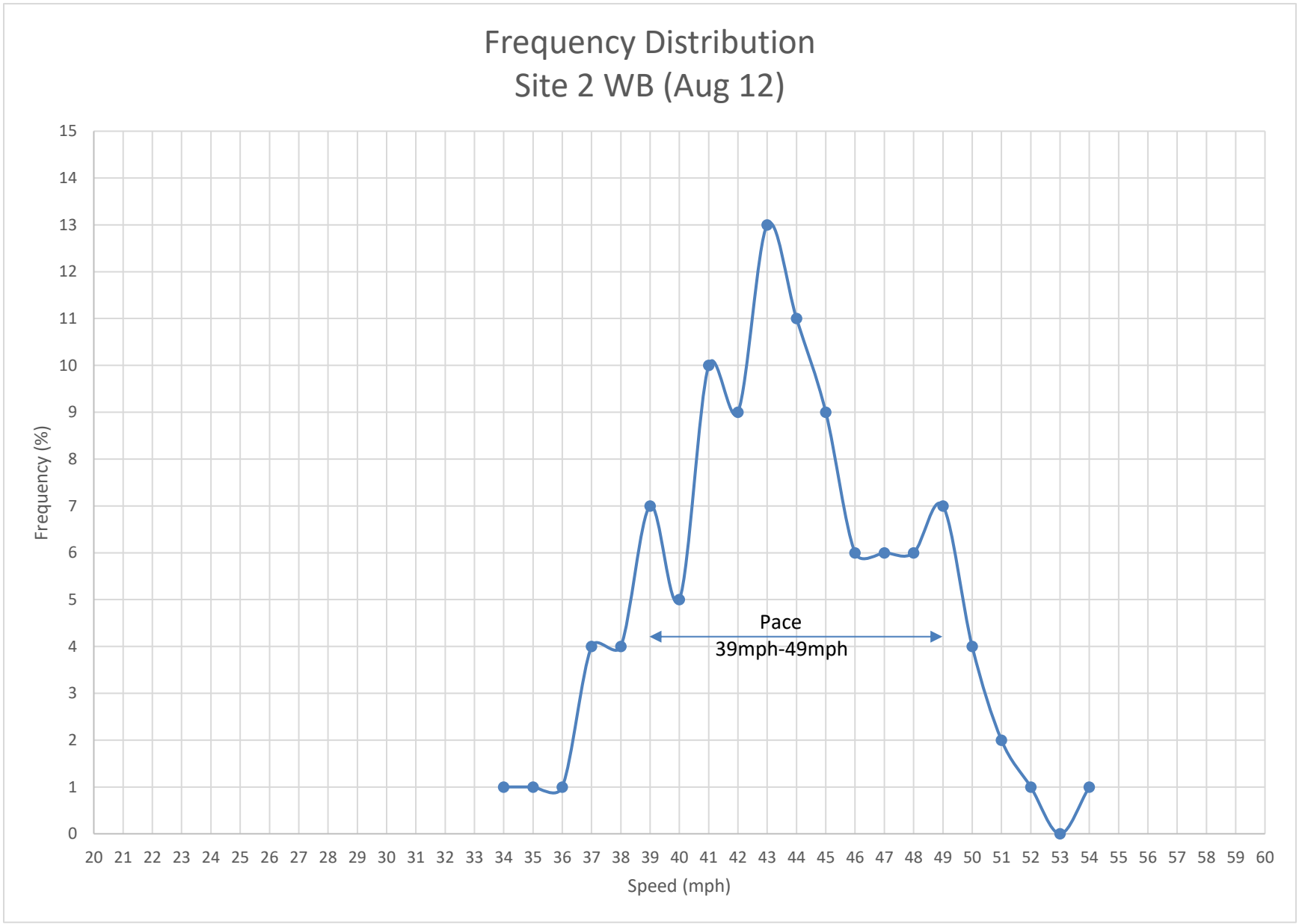
Note that the 50 mph section encompassing sites 2 and 3 is bounded by sections with 40mph posted speed limit on both ends. As a result, it is possible that drivers (especially through traffic) are not speeding up to the higher speed limit. It is also noteworthy that site 2 is located at a downhill going east and uphill going west. The effect of the geometry at this location is apparent in vehicle speeds throughout as the statistics in the opposing directions are found to be further apart than the other two sites which are located on level terrain.

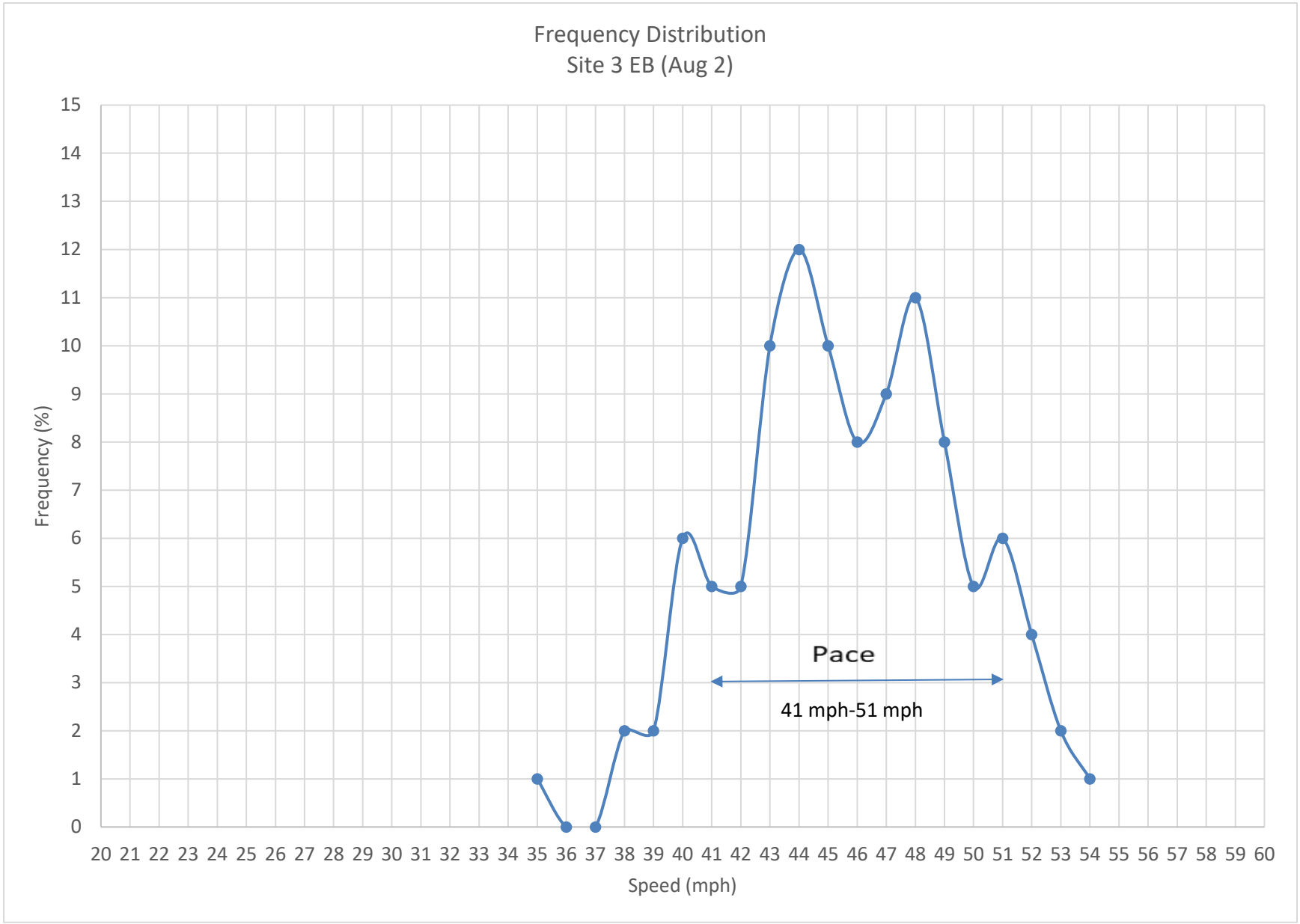
Refer to the Frequency Distribution and Cumulative Frequency Distribution Charts below for further details.

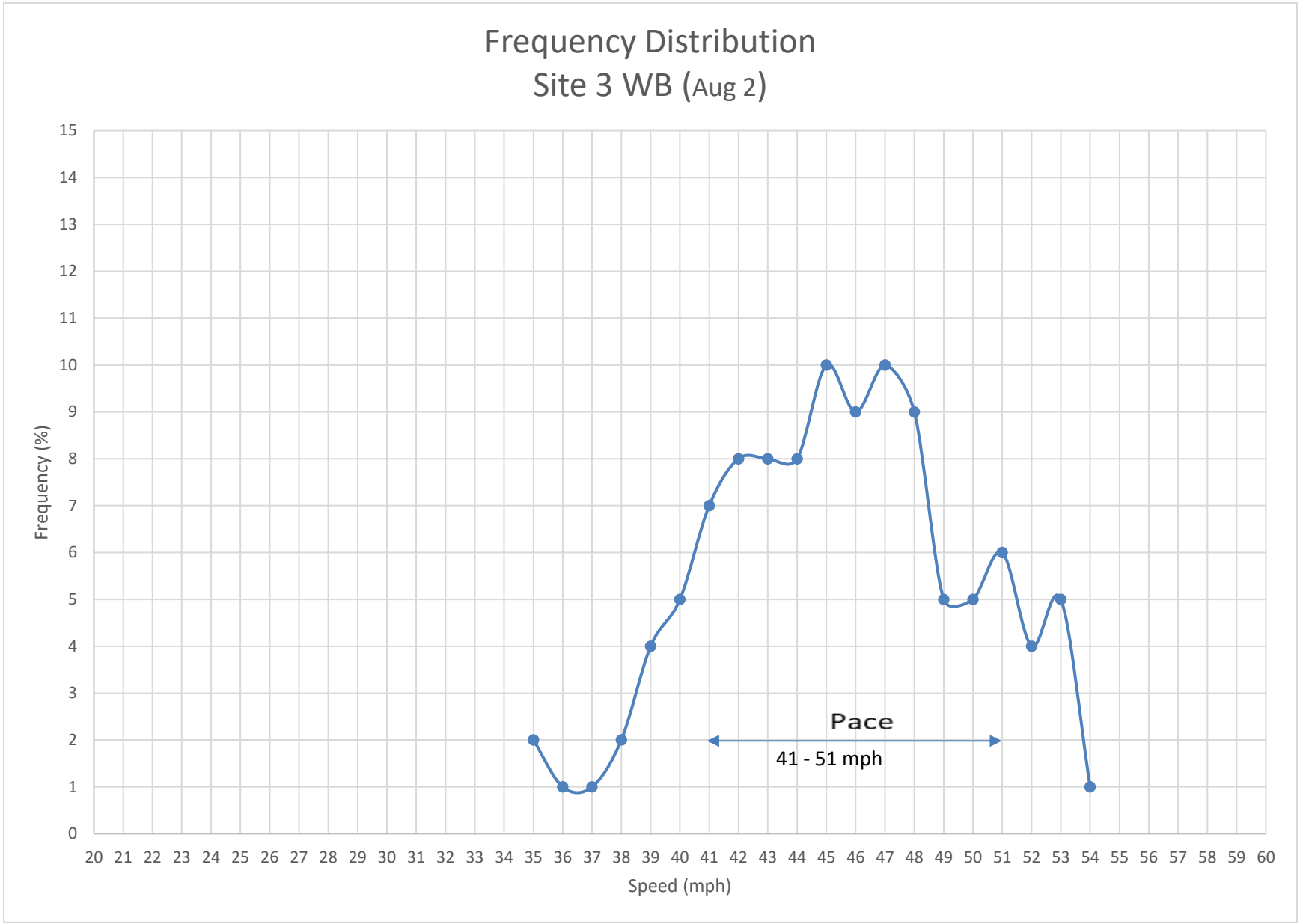

Frequency Distribution
Site 1 EB (Aug 12)
Frequency (%)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Speed (mph)
Pace
36mph-46mph

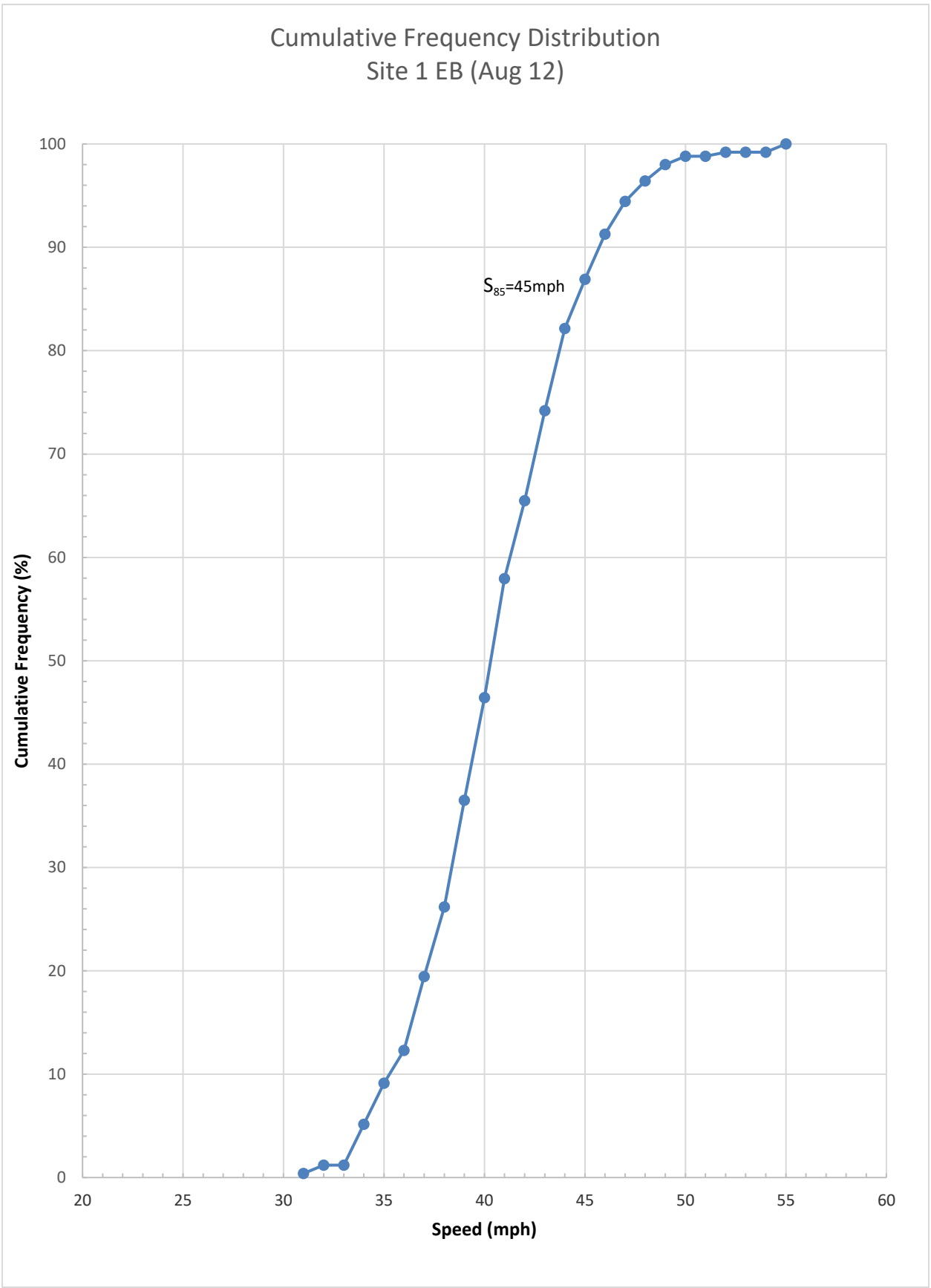

Frequency Distribution
Site 1 WB (Aug 12)
Frequency (%)
Speed (mph)
Pace
35mph-45mph

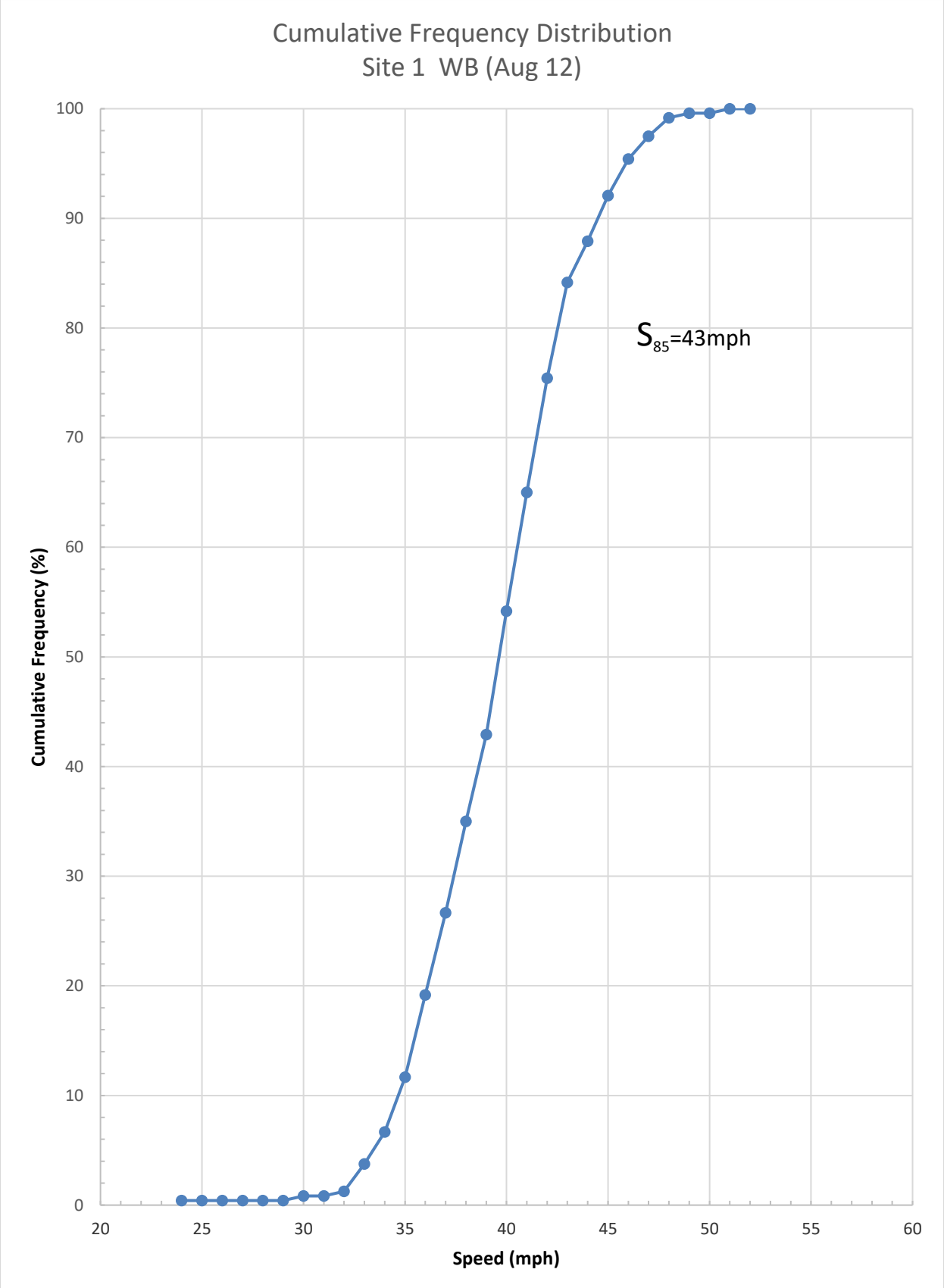

Frequency Distribution
Site 2 EB (Aug 12)
Frequency (%)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Speed (mph)
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
Pace
42 mph-52 mph

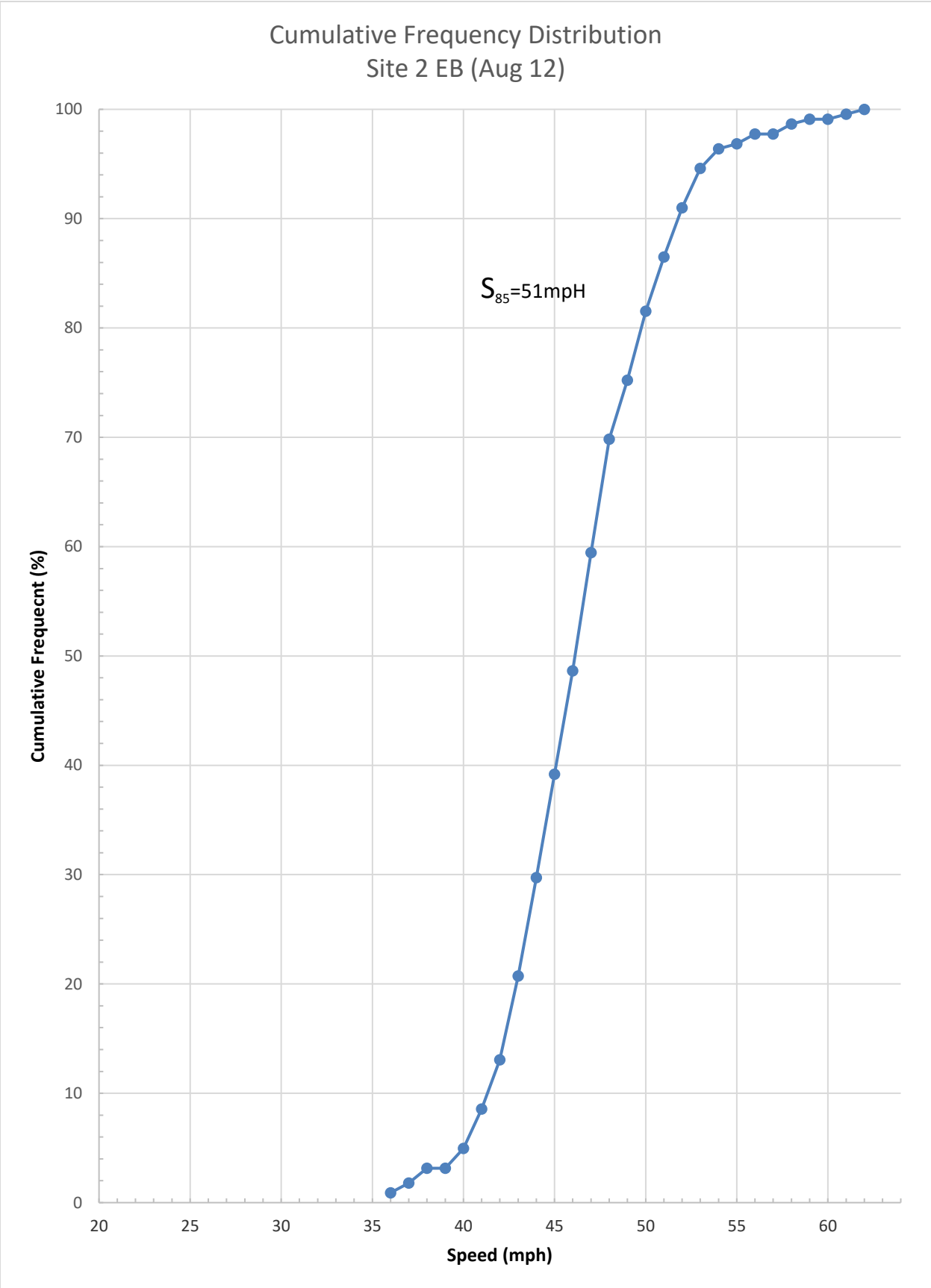

Frequency Distribution
Site 2 WB (Aug 12)
Frequency (%)
Speed (mph)
Pace
39mph-49mph

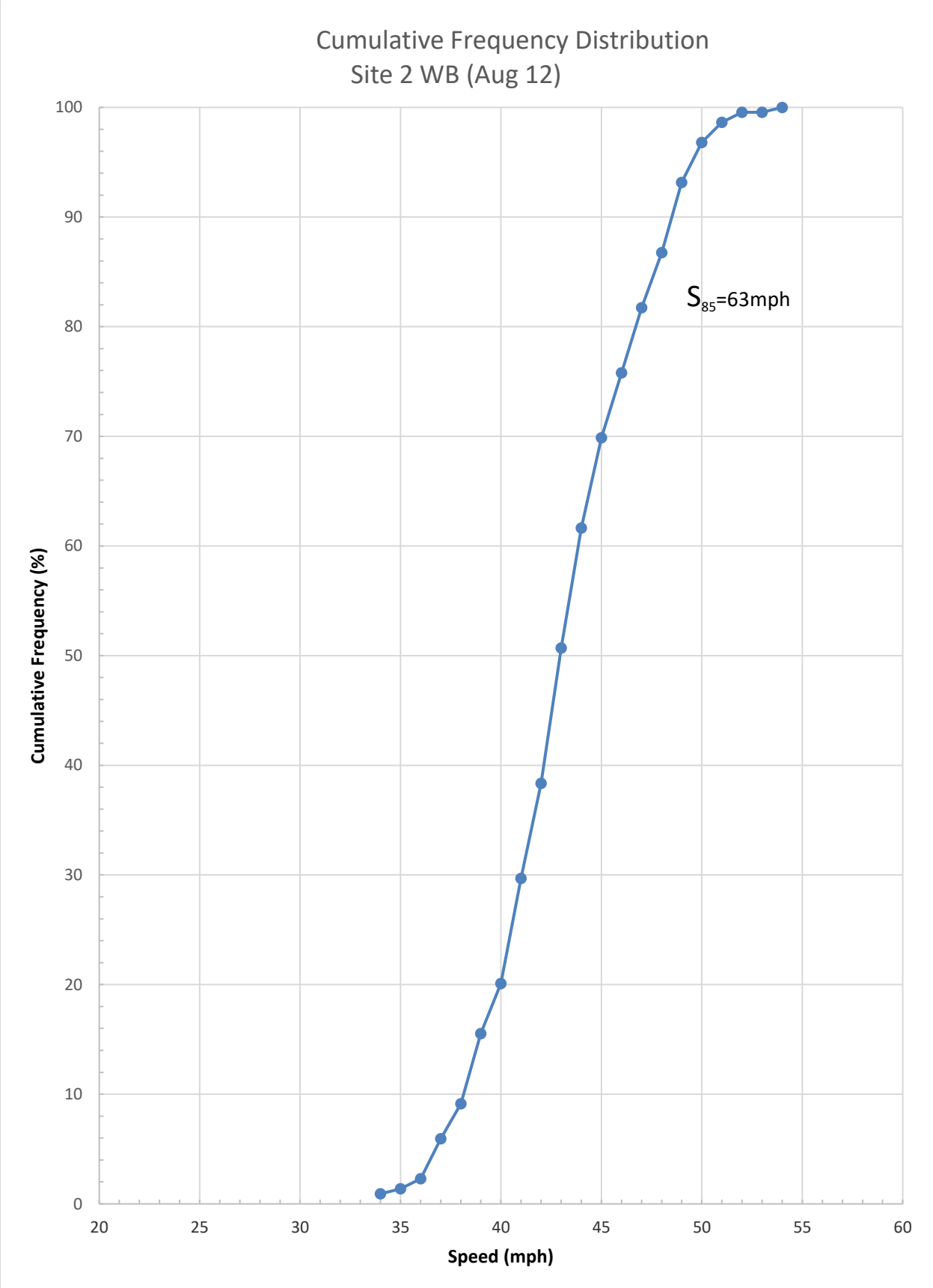

Frequency Distribution
Site 3 EB (Aug 2)
Frequency (%)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Speed (mph)
Pace
41 mph-51 mph

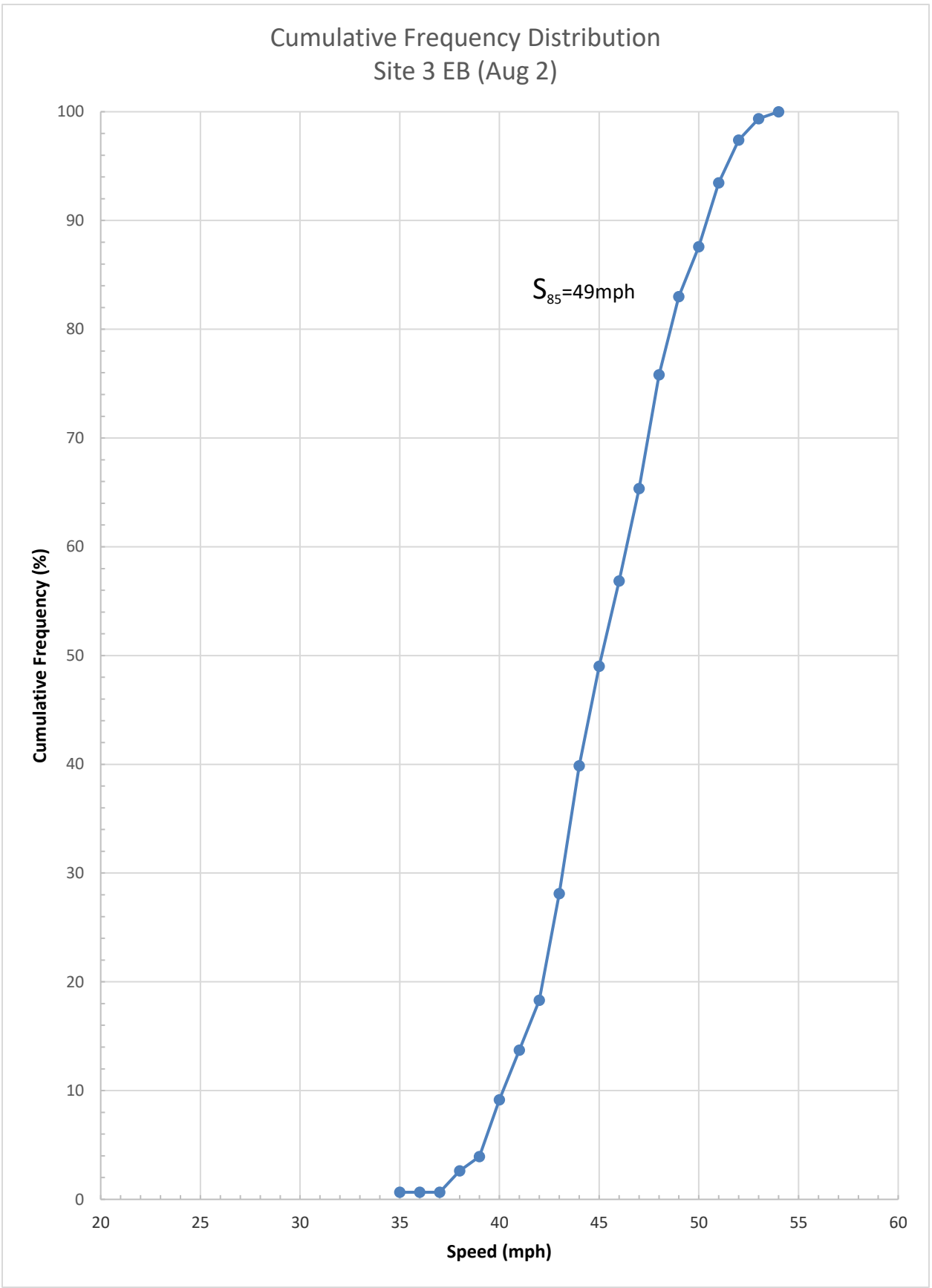

Frequency Distribution
Site 3 WB (Aug 2)
Frequency (%)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Speed (mph)
Pace
41 - 51 mph

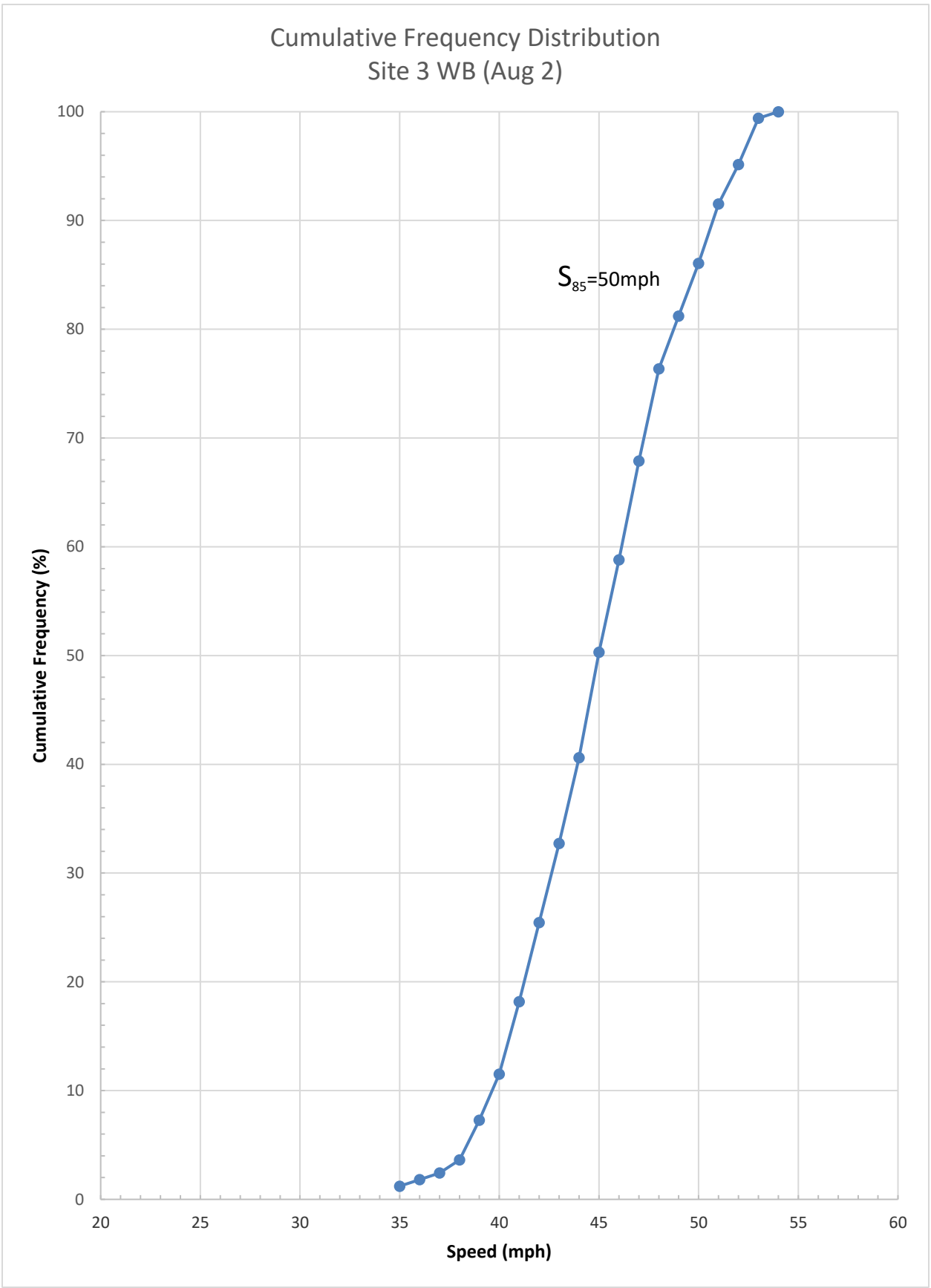

Cumulative Frequency Distribution
Site 1 EB (Aug 12)
S_{85}=45mph
Cumulative Frequency (%)
Speed (mph)
0
10
20
30
40
50
60
70
80
90
100
20
25
30
35
40
45
50
55
60


Cumulative Frequency Distribution
Site 1 WB (Aug 12)
S_{85}=43mph
Cumulative Frequency (%)
Speed (mph)
0
10
20
30
40
50
60
70
80
90
100
20
25
30
35
40
45
50
55
60


Cumulative Frequency Distribution
Site 2 EB (Aug 12)
S_{85}=51mpH
Cumulative Frequecnt (%)
Speed (mph)
0
10
20
30
40
50
60
70
80
90
100
20
25
30
35
40
45
50
55
60


Cumulative Frequency Distribution
Site 2 WB (Aug 12)
S_{85}=63mph
Cumulative Frequency (%)
Speed (mph)
0
10
20
30
40
50
60
70
80
90
100
20
25
30
35
40
45
50
55
60


Cumulative Frequency Distribution
Site 3 EB (Aug 2)
S_{85}=49mph
Cumulative Frequency (%)
Speed (mph)
0
10
20
30
40
50
60
70
80
90
100
20
25
30
35
40
45
50
55
60


Cumulative Frequency Distribution
Site 3 WB (Aug 2)
S_{85}=50mph
Cumulative Frequency (%)
Speed (mph)
0
10
20
30
40
50
60
70
80
90
100
20
25
30
35
40
45
50
55
60