RALPH G. MASTROMONACO, P.E., P.C. Consulting Engineers 13 Dove Court, Croton-on-Hudson, New York 10520 Tel: (914) 271-4762 Fax: (914) 271-2820

To: Nick Vamvas, PE Labella (Chazen) Company <u>nvamvas@chazencompanies.com</u>

From: Ralph G. Mastromonaco, PE

Date: January 14, 2022

Re: Supplemental Information for Matrix / Hudson National Solar Project

We earlier submitted "Drainage Computations", dated November 8, 2021 and your review requested that we include minor impervious pavement and roofs at the Maintenance Area.

There were seven (7) watersheds studied. The impervious area we note was only significant in watershed #1.

Accordingly, rather than repeat the entire study I am submitting the revised computations for watershed #1. The results are still consistent with the earlier report in that we anticipate a minor reduction in peak flows. I enclose the printout for this revision and request that you accept the supplement in place of a redo of the full report.

The results for watershed #1 are as follows:

|       |          | Existing | Proposed |
|-------|----------|----------|----------|
| Event | Rainfall | Runoff   | Runoff   |
|       | (inches) | (cfs)    | (cfs)    |
| 2     | 3.42     | 3.10     | 2.83     |
| 10    | 5.13     | 8.93     | 8.45     |
| 100   | 9.23     | 26.84    | 25.96    |

As you may note that even with the inclusion of the impervious area there is a reduction in peak flows.

If you have any questions, please call or email back.



# Results of Including 9123 sf of Impervious Area

| Event | Rainfall | Existing<br>Runoff | Proposed<br>Runoff |
|-------|----------|--------------------|--------------------|
|       | (inches) | (cfs)              | (cfs)              |
| 2     | 3.42     | 3.10               | 2.83               |
| 10    | 5.13     | 8.93               | 8.45               |
| 100   | 9.23     | 26.84              | 25.96              |

SUPPLEMENTAL COMPUTATION TO THE NOVEMBER 8, 2021 REPORT "DRAINAGE COMPUATIONS" MODIFYING WATERSHED #1 MATRIX LLC AND HUDSON NATIONAL



WS1



PR WS1

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Subcat Reach



Routing Diagram for HN\_WSHEDS\_rev\_ws\_1\_Impervious Prepared by RGMPEPC, Printed 1/14/2022 HydroCAD® 10.10-4a s/n M16359 © 2020 HydroCAD Software Solutions LLC

#### Runoff = 3.10 cfs @ 12.49 hrs, Volume= 0.468 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 Rainfall=3.42"

|   | Area (a                     | ac)    | CN D    | escription   |           |                |  |
|---|-----------------------------|--------|---------|--------------|-----------|----------------|--|
|   | 2.0                         | 00 6   | 0.00 W  | oods, Fair,  | HSG B     |                |  |
|   | 4.5                         | 90 6   | 0.00 W  | oods, Fair,  | HSG B     |                |  |
|   | 1.5                         | 00 7   | 9.00 W  | oods, Fair,  | HSG D     |                |  |
| * | 0.2                         | 10 9   | 8.00 D  | riveway - Ir | npervious |                |  |
|   | 8.3                         | 00 6   | 4.40 W  | eighted Av   | erage     |                |  |
|   | 8.090 97.47% Pervious Area  |        |         | vious Area   |           |                |  |
|   | 0.210 2.53% Impervious Area |        |         |              |           |                |  |
|   |                             |        |         |              |           |                |  |
|   | Тс                          | Length | Slope   | Velocity     | Capacity  | Description    |  |
|   | (min)                       | (feet) | (ft/ft) | (ft/sec)     | (cfs)     |                |  |
|   | 5.72                        | 508    | 0.2500  | 1.48         |           | Lag/CN Method, |  |
|   | 14.37                       | 449    | 0.0325  | 0.52         |           | Lag/CN Method, |  |
|   | 9.18                        | 601    | 0.1270  | 1.09         |           | Lag/CN Method, |  |
|   | 29.27                       | 1,558  | Total   |              |           |                |  |

## Subcatchment EX1: WS1



#### Summary for Subcatchment PR1: PR WS1

Runoff 2.83 cfs @ 12.51 hrs, Volume= 0.441 af, Depth> 0.64" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 Rainfall=3.42"

|   | Area (a | ac)    | CN D    | escription  |             |                |  |
|---|---------|--------|---------|-------------|-------------|----------------|--|
|   | 2.0     | 00 6   | 0.00 W  | oods, Fair, | HSG B       |                |  |
|   | 3.5     | 50 5   | 8.00 M  | eadow, noi  | n-grazed, H | ISG B          |  |
|   | 1.5     | 00 7   | 9.00 W  | oods, Fair, | HSG D       |                |  |
|   | 1.0     | 40 6   | 0.00 W  | oods, Fair, | HSG B       |                |  |
| * | 0.2     | 10 9   | 8.00 D  | riveway + I | mpervious   |                |  |
|   | 8.3     | 00 6   | 3.54 W  | eighted Av  | erage       |                |  |
|   | 8.0     | 90     | 97      | 7.47% Perv  | vious Area  |                |  |
|   | 0.2     | 10     | 2.      | 53% Imper   | vious Area  |                |  |
|   |         |        |         |             |             |                |  |
|   | Тс      | Length | Slope   | Velocity    | Capacity    | Description    |  |
|   | (min)   | (feet) | (ft/ft) | (ft/sec)    | (cfs)       |                |  |
|   | 5.85    | 508    | 0.2500  | 1.45        |             | Lag/CN Method, |  |
|   | 14.69   | 449    | 0.0325  | 0.51        |             | Lag/CN Method, |  |

| 9.38  | 601   | 0.1270 | 1.07 |
|-------|-------|--------|------|
| 29.92 | 1,558 | Total  |      |

l otal 1,558

# Subcatchment PR1: PR WS1

Lag/CN Method,



## Summary for Subcatchment EX1: WS1

Runoff = 8.93 cfs @ 12.44 hrs, Volume= 1.164 af, Depth> 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 Rainfall=5.13"

|   | Area (a                      | ac)    | CN De   | escription  |            |                |  |
|---|------------------------------|--------|---------|-------------|------------|----------------|--|
|   | 2.0                          | 00 60  | 0.00 W  | oods, Fair, | HSG B      |                |  |
|   | 4.5                          | 90 60  | 0.00 W  | oods, Fair, | HSG B      |                |  |
|   | 1.5                          | 00 79  | 9.00 W  | oods, Fair, | HSG D      |                |  |
| * | 0.2                          | 10 98  | 3.00 Dr | iveway - Ir | npervious  |                |  |
|   | 8.300 64.40 Weighted Average |        |         |             |            |                |  |
|   | 8.090 97.47% Pervious Area   |        |         |             | rious Area |                |  |
|   | 0.210 2.53% Impervious Area  |        |         |             |            |                |  |
|   |                              |        |         |             |            |                |  |
|   | Тс                           | Length | Slope   | Velocity    | Capacity   | Description    |  |
| _ | (min)                        | (feet) | (ft/ft) | (ft/sec)    | (cfs)      |                |  |
|   | 5.72                         | 508    | 0.2500  | 1.48        |            | Lag/CN Method, |  |
|   | 14.37                        | 449    | 0.0325  | 0.52        |            | Lag/CN Method, |  |
|   | 9.18                         | 601    | 0.1270  | 1.09        |            | Lag/CN Method, |  |
|   | 29.27                        | 1,558  | Total   |             |            |                |  |

#### Subcatchment EX1: WS1



#### Summary for Subcatchment PR1: PR WS1

Runoff = 8.45 cfs @ 12.46 hrs, Volume= 1.120 af, Depth> 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 Rainfall=5.13"

| 5.85    | 50   | 0.2   | 500   | 1.45   |   | Lag/CN Method,   |  |
|---------|--|---|---|--|---|--|--|
| (min)   | (fee   | et) (†  | ft/ft)  | (ft/sec)   | (cfs)   |  |  |
| Тс      | Leng   | th Sl   | ope   | Velocity   | Capacity  | Description  |  |
|         |  |   |   |  |   |  |  |
| 0.2     | 10   |   | 2.5   | 3% Imper   | vious Area  |  |  |
| 8.0     | 90   |   | 97  |  | ious Area   |  |  |
| 0.0     | 00   | 05.54   | 07  | 470/ Dom   |   |  |  |
| 83      | 00   | 63 54   | \\/   | highted Av   |   |  |  |
| 0.2     | 10   | 98.00   | Dri   | veway + Ir   | npervious   |  |  |
| 1.0     | 40   | 60.00   | Wo  | ods, Fair,   | HSG B   |  |  |
| 1.5     | 00   | 79.00   | Wo  | ods, Fair,   | HSG D   |  |  |
| 3.5     | 50   | 58.00   | Me  | adow, nor  | n-grazed, H   | SG B   |  |
| 2.0     | 00   | 60.00   | Wo  | ods, Fair,   | HSG B   |  |  |
| Area (a | ac)  | CN  | De  | scription  |   |  |  |
|         | Area (a<br>2.0<br>3.5<br>1.5<br>1.0<br>0.2<br>8.3<br>8.0<br>0.2<br>Tc<br>(min)<br>5.85 | Area (ac)<br>2.000<br>3.550<br>1.500<br>1.040<br>0.210<br>8.300<br>8.090<br>0.210<br>Tc Leng<br>(min) (fee<br>5.85 50 | Area (ac) CN   2.000 60.00   3.550 58.00   1.500 79.00   1.040 60.00   0.210 98.00   8.300 63.54   8.090 0.210   Tc Length SI   (min) (feet) (feet) | Area (ac) CN De   2.000 60.00 Wc   3.550 58.00 Me   1.500 79.00 Wc   1.040 60.00 Wc   0.210 98.00 Dri   8.300 63.54 We   8.090 97. 0.210   2.50 Tc Length Slope   (min) (feet) (ff/ft)   5.85 508 0.2500 | Area (ac) CN Description   2.000 60.00 Woods, Fair,   3.550 58.00 Meadow, nor   1.500 79.00 Woods, Fair,   1.040 60.00 Woods, Fair,   0.210 98.00 Driveway + Ir   8.300 63.54 Weighted Ave   8.090 97.47% Pervio   0.210 2.53% Impervio   Tc Length Slope Velocity   (min) (feet) (ft/ft) (ft/sec)   5.85 508 0.2500 1.45 | Area (ac) CN Description   2.000 60.00 Woods, Fair, HSG B   3.550 58.00 Meadow, non-grazed, H   1.500 79.00 Woods, Fair, HSG D   1.040 60.00 Woods, Fair, HSG B   0.210 98.00 Driveway + Impervious   8.300 63.54 Weighted Average   8.090 97.47% Pervious Area   0.210 2.53% Impervious Area   Tc Length Slope Velocity Capacity   (min) (feet) (ft/ft) (ft/sec) (cfs)   5.85 508 0.2500 1.45 | Area (ac) CN Description   2.000 60.00 Woods, Fair, HSG B   3.550 58.00 Meadow, non-grazed, HSG B   1.500 79.00 Woods, Fair, HSG D   1.040 60.00 Woods, Fair, HSG B   0.210 98.00 Driveway + Impervious   8.300 63.54 Weighted Average   8.090 97.47% Pervious Area   0.210 2.53% Impervious Area   Tc Length Slope Velocity Capacity Description   (min) (feet) (ft/ft) (ft/sec) (cfs) Lag/CN Method, |

| 00.00 | 4 550 | Tatal  |      |
|-------|-------|--------|------|
| 9.38  | 601   | 0.1270 | 1.07 |

449 0.0325

0.51

29.92 1,558 Total

14.69

# Subcatchment PR1: PR WS1

Lag/CN Method,

Lag/CN Method,



## Summary for Subcatchment EX1: WS1

Runoff = 26.84 cfs @ 12.41 hrs, Volume= 3.324 af, Depth> 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 Rainfall=9.23"

|   | Area (a                    | ac)    | CN     | Des  | scription  |            |                |  |
|---|----------------------------|--------|--------|------|------------|------------|----------------|--|
|   | 2.0                        | 00 6   | 0.00   | Wo   | ods, Fair, | HSG B      |                |  |
|   | 4.5                        | 90 6   | 0.00   | Wo   | ods, Fair, | HSG B      |                |  |
|   | 1.5                        | 00 7   | 9.00   | Wo   | ods, Fair, | HSG D      |                |  |
| * | 0.2                        | 10 9   | 00.8   | Driv | veway - In | npervious  |                |  |
|   | 8.3                        | 00 6   | 4.40   | We   | ighted Av  | erage      |                |  |
|   | 8.090 97.47% Pervious Area |        |        |      | 47% Perv   | ious Area  |                |  |
|   | 0.2                        | 10     |        | 2.5  | 3% Imper   | vious Area |                |  |
|   |                            |        |        |      |            |            |                |  |
|   | Тс                         | Length | l Slop | ре   | Velocity   | Capacity   | Description    |  |
| _ | (min)                      | (feet) | (ft/   | ft)  | (ft/sec)   | (cfs)      |                |  |
|   | 5.72                       | 508    | 0.250  | 00   | 1.48       |            | Lag/CN Method, |  |
|   | 14.37                      | 449    | 0.032  | 25   | 0.52       |            | Lag/CN Method, |  |
| _ | 9.18                       | 601    | 0.127  | 70   | 1.09       |            | Lag/CN Method, |  |
|   | 29.27                      | 1,558  | Total  | 1    |            |            |                |  |

# Subcatchment EX1: WS1



#### Summary for Subcatchment PR1: PR WS1

Runoff 25.96 cfs @ 12.42 hrs, Volume= 3.249 af, Depth> 4.70" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 Rainfall=9.23"

|   | 5.85    | 50    | 8 0.25 | 500  | 1.45        |             | Lag/CN Method, |  |
|---|---------|-------|--------|------|-------------|-------------|----------------|--|
| _ | (min)   | (fee  | t) (ft | /ft) | (ft/sec)    | (cfs)       | -              |  |
|   | Тс      | Lengt | th Slo | ре   | Velocity    | Capacity    | Description    |  |
|   |         |       |        |      |             |             |                |  |
|   | 0.2     | 10    |        | 2.5  | 3% Imper    | vious Area  |                |  |
|   | 8.0     | 90    |        | 97   | .47% Perv   | ious Area   |                |  |
|   | 8.3     | 00    | 63.54  | We   | eighted Ave | erage       |                |  |
| * | 0.2     | 10    | 98.00  | Dri  | veway + Ir  | npervious   |                |  |
|   | 1.0     | 40    | 60.00  | Wo   | ods, Fair,  | HSG B       |                |  |
|   | 1.5     | 00    | 79.00  | Wo   | ods, Fair,  | HSG D       |                |  |
|   | 3.5     | 50    | 58.00  | Me   | adow, nor   | n-grazed, H | SG B           |  |
|   | 2.0     | 00    | 60.00  | Wo   | ods, Fair,  | HSG B       |                |  |
|   | Area (a | ac)   | CN     | De   | scription   |             |                |  |

601 29.92 1,558 Total

449 0.0325

0.1270

0.51

1.07

14.69

9.38

# Subcatchment PR1: PR WS1

Lag/CN Method,

Lag/CN Method,



# **Events for Subcatchment EX1: WS1**

| Event | Rainfall | Runoff | Volume      | Depth    |
|-------|----------|--------|-------------|----------|
|       | (inches) | (cfs)  | (acre-feet) | (inches) |
| 2     | 3.42     | 3.10   | 0.468       | 0.68     |
| 10    | 5.13     | 8.93   | 1.164       | 1.68     |
| 100   | 9.23     | 26.84  | 3.324       | 4.81     |

## **Events for Subcatchment PR1: PR WS1**

| Event | Rainfall | Runoff | Volume      | Depth    |
|-------|----------|--------|-------------|----------|
|       | (inches) | (cfs)  | (acre-feet) | (inches) |
| 2     | 3.42     | 2.83   | 0.441       | 0.64     |
| 10    | 5.13     | 8.45   | 1.120       | 1.62     |
| 100   | 9.23     | 25.96  | 3.249       | 4.70     |