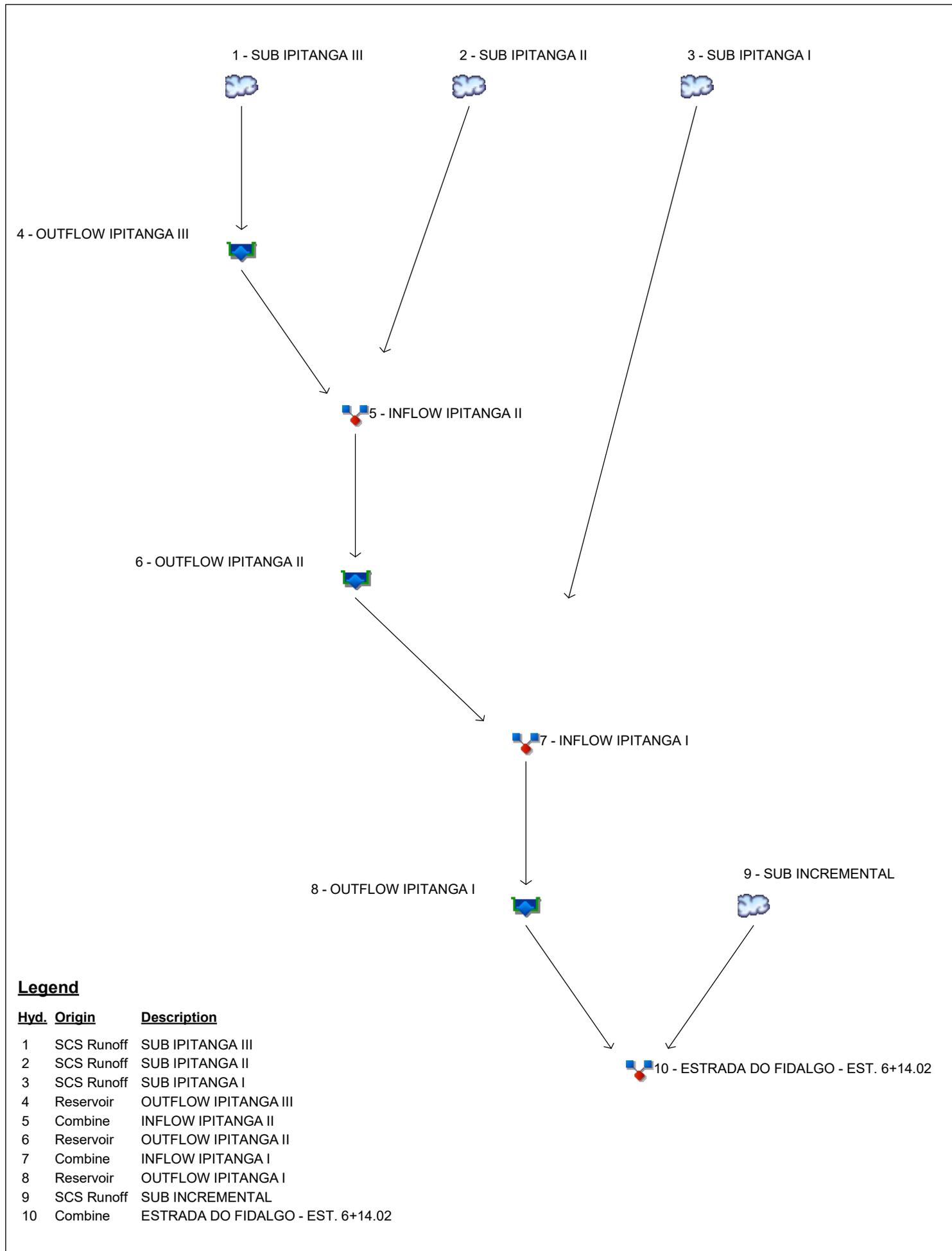


Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Legend

Hyd.	Origin	Description
1	SCS Runoff	SUB IPITANGA III
2	SCS Runoff	SUB IPITANGA II
3	SCS Runoff	SUB IPITANGA I
4	Reservoir	OUTFLOW IPITANGA III
5	Combine	INFLOW IPITANGA II
6	Reservoir	OUTFLOW IPITANGA II
7	Combine	INFLOW IPITANGA I
8	Reservoir	OUTFLOW IPITANGA I
9	SCS Runoff	SUB INCREMENTAL
10	Combine	ESTRADA DO FIDALGO - EST. 6+14.02

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cms)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	-----	-----	-----	22.44	-----	-----	-----	SUB IPITANGA III
2	SCS Runoff	-----	-----	-----	-----	-----	56.99	-----	-----	-----	SUB IPITANGA II
3	SCS Runoff	-----	-----	-----	-----	-----	51.85	-----	-----	-----	SUB IPITANGA I
4	Reservoir	1	-----	-----	-----	-----	2.154	-----	-----	-----	OUTFLOW IPITANGA III
5	Combine	2, 4	-----	-----	-----	-----	57.98	-----	-----	-----	INFLOW IPITANGA II
6	Reservoir	5	-----	-----	-----	-----	7.538	-----	-----	-----	OUTFLOW IPITANGA II
7	Combine	3, 6	-----	-----	-----	-----	54.63	-----	-----	-----	INFLOW IPITANGA I
8	Reservoir	7	-----	-----	-----	-----	24.07	-----	-----	-----	OUTFLOW IPITANGA I
9	SCS Runoff	-----	-----	-----	-----	-----	2.167	-----	-----	-----	SUB INCREMENTAL
10	Combine	8, 9	-----	-----	-----	-----	24.54	-----	-----	-----	ESTRADA DO FIDALGO - EST. 6+1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description	
1	SCS Runoff	22.44	1	956	549,403.6	-----	-----	-----	SUB IPITANGA III	
2	SCS Runoff	56.99	1	1014	1,535,671.8	-----	-----	-----	SUB IPITANGA II	
3	SCS Runoff	51.85	1	1035	1,455,288.0	-----	-----	-----	SUB IPITANGA I	
4	Reservoir	2.154	1	1509	197,999.3	1	62.16	17,269,074	OUTFLOW IPITANGA III	
5	Combine	57.98	1	1016	1,733,669.1	2, 4	-----	-----	INFLOW IPITANGA II	
6	Reservoir	7.538	1	1581	692,693.9	5	59.95	48,684,264	OUTFLOW IPITANGA II	
7	Combine	54.63	1	1041	2,147,984.8	3, 6	-----	-----	INFLOW IPITANGA I	
8	Reservoir	24.07	1	1359	1,702,835.0	7	28.14	32,454,382	OUTFLOW IPITANGA I	
9	SCS Runoff	2.167	1	936	58,335.6	-----	-----	-----	SUB INCREMENTAL	
10	Combine	24.54	1	1393	1,761,171.0	8, 9	-----	-----	ESTRADA DO FIDALGO - EST. 6+1	
0365-MC-10-HC-001_R-00.gpw					Return Period: 10 Year			Wednesday, 08 / 31 / 2016		

Hydrograph Report

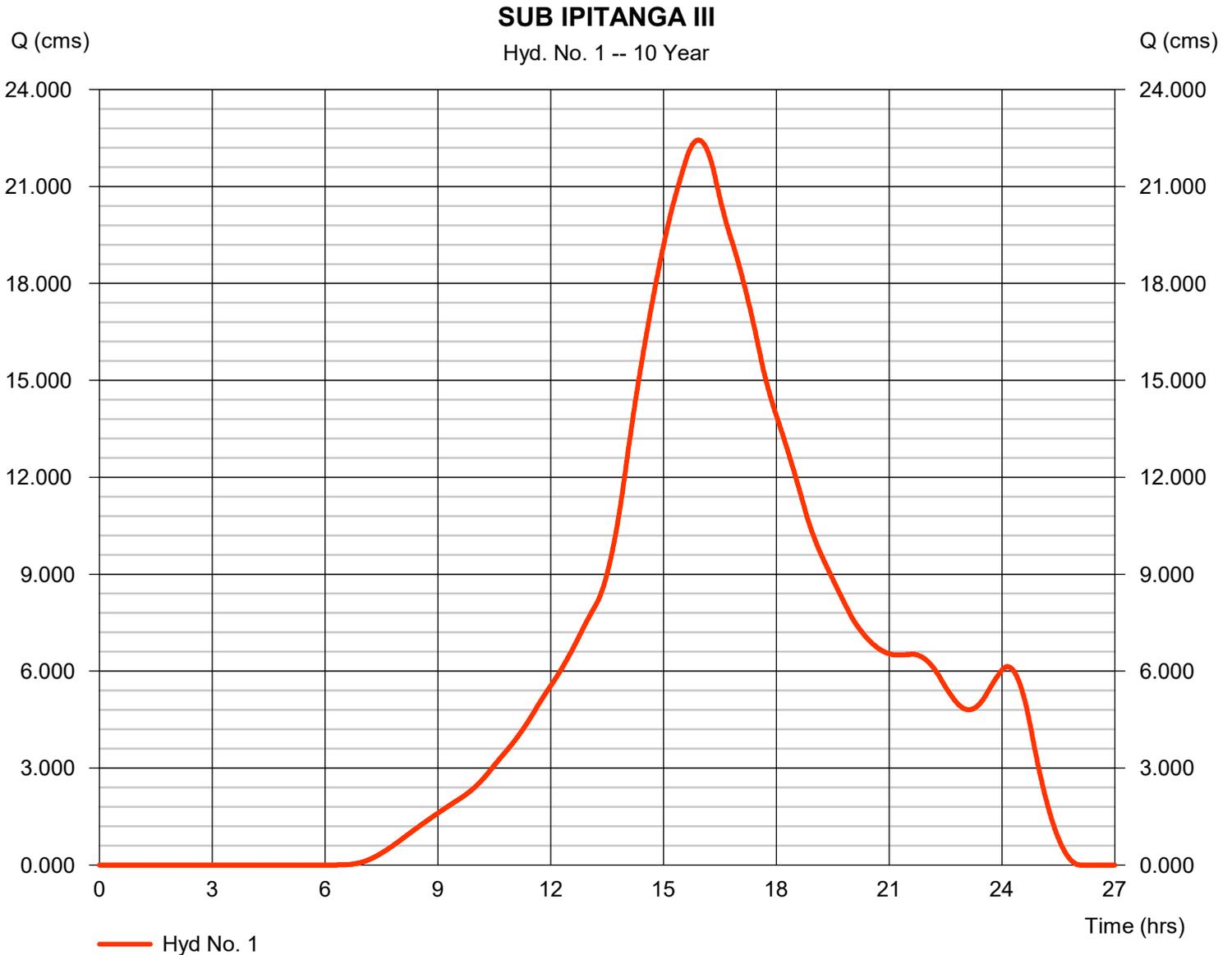
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

Hyd. No. 1

SUB IPITANGA III

Hydrograph type	= SCS Runoff	Peak discharge	= 22.44 cms
Storm frequency	= 10 yrs	Time to peak	= 15.93 hrs
Time interval	= 1 min	Hyd. volume	= 549,403.6 cum
Drainage area	= 762.600 hectare	Curve number	= 66
Basin Slope	= 0.8 %	Hydraulic length	= 4330 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 78.48 min
Total precip.	= 166.00 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

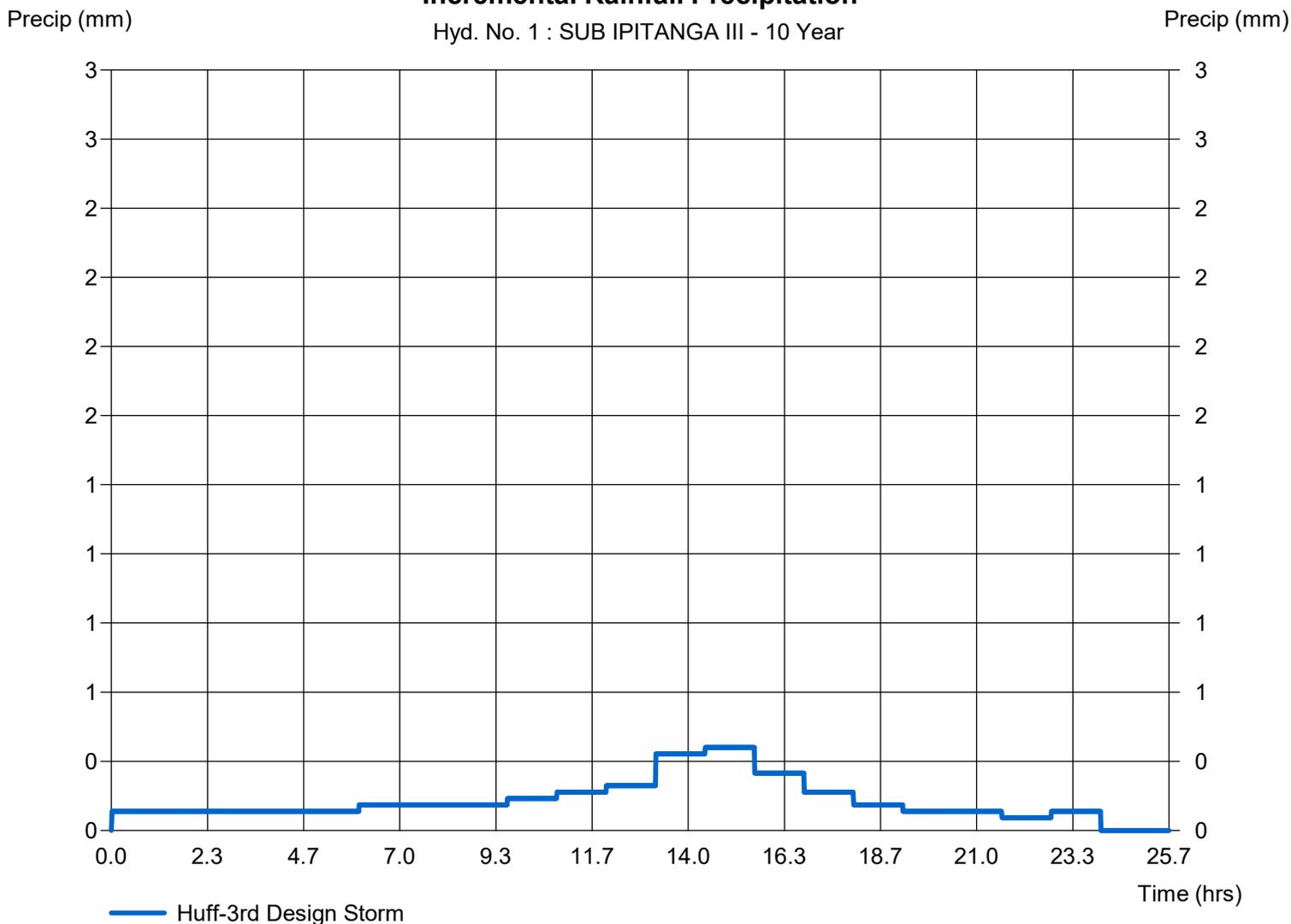
Hyd. No. 1

SUB IPITANGA III

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 166.0 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs		

Incremental Rainfall Precipitation

Hyd. No. 1 : SUB IPITANGA III - 10 Year



Hydrograph Report

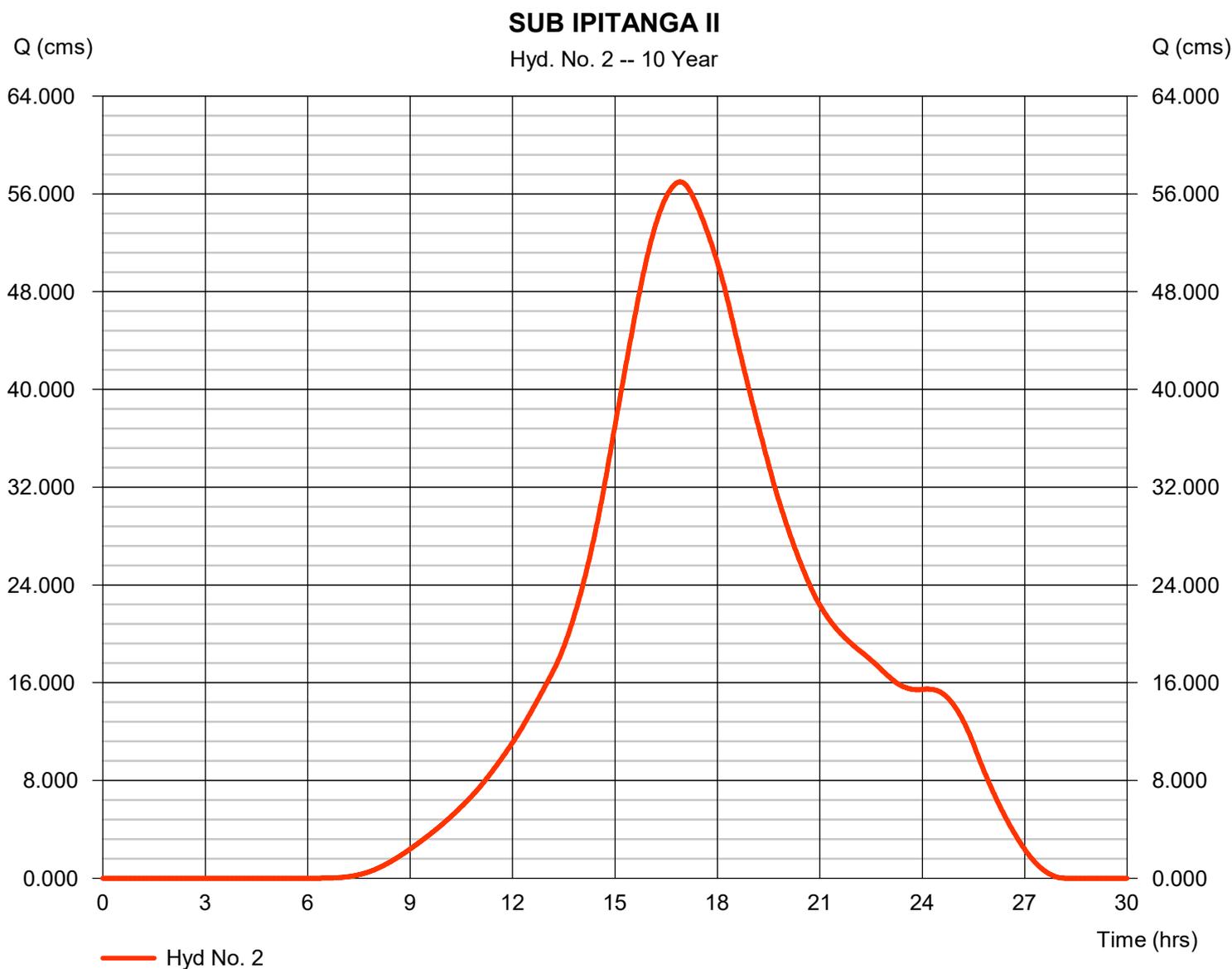
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

Hyd. No. 2

SUB IPITANGA II

Hydrograph type	= SCS Runoff	Peak discharge	= 56.99 cms
Storm frequency	= 10 yrs	Time to peak	= 16.90 hrs
Time interval	= 1 min	Hyd. volume	= 1,535,671.8 cum
Drainage area	= 2123.100 hectare	Curve number	= 66
Basin Slope	= 0.6 %	Hydraulic length	= 8968 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 158.46 min
Total precip.	= 166.00 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

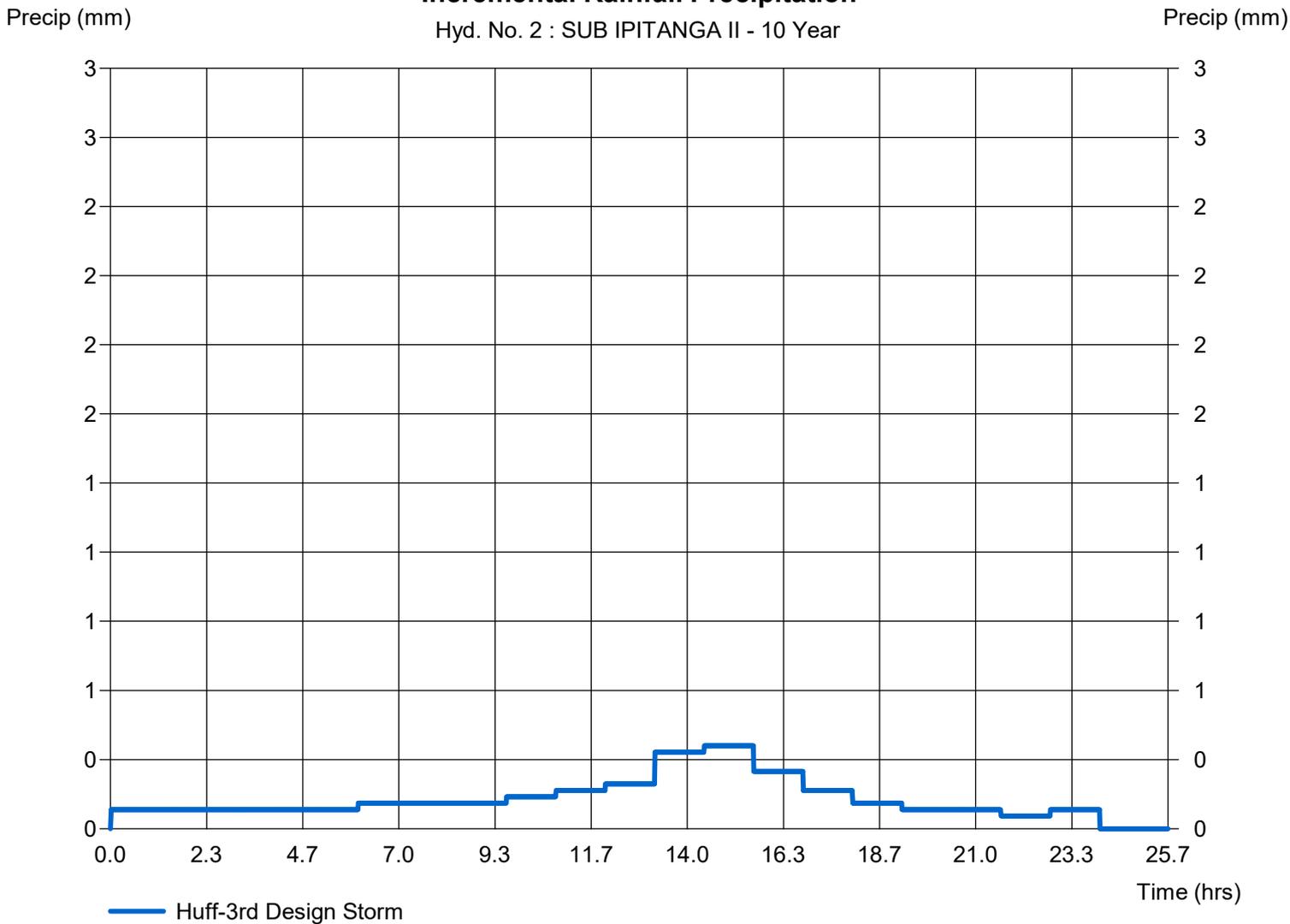
Hyd. No. 2

SUB IPITANGA II

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 166.0 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs		

Incremental Rainfall Precipitation

Hyd. No. 2 : SUB IPITANGA II - 10 Year



Hydrograph Report

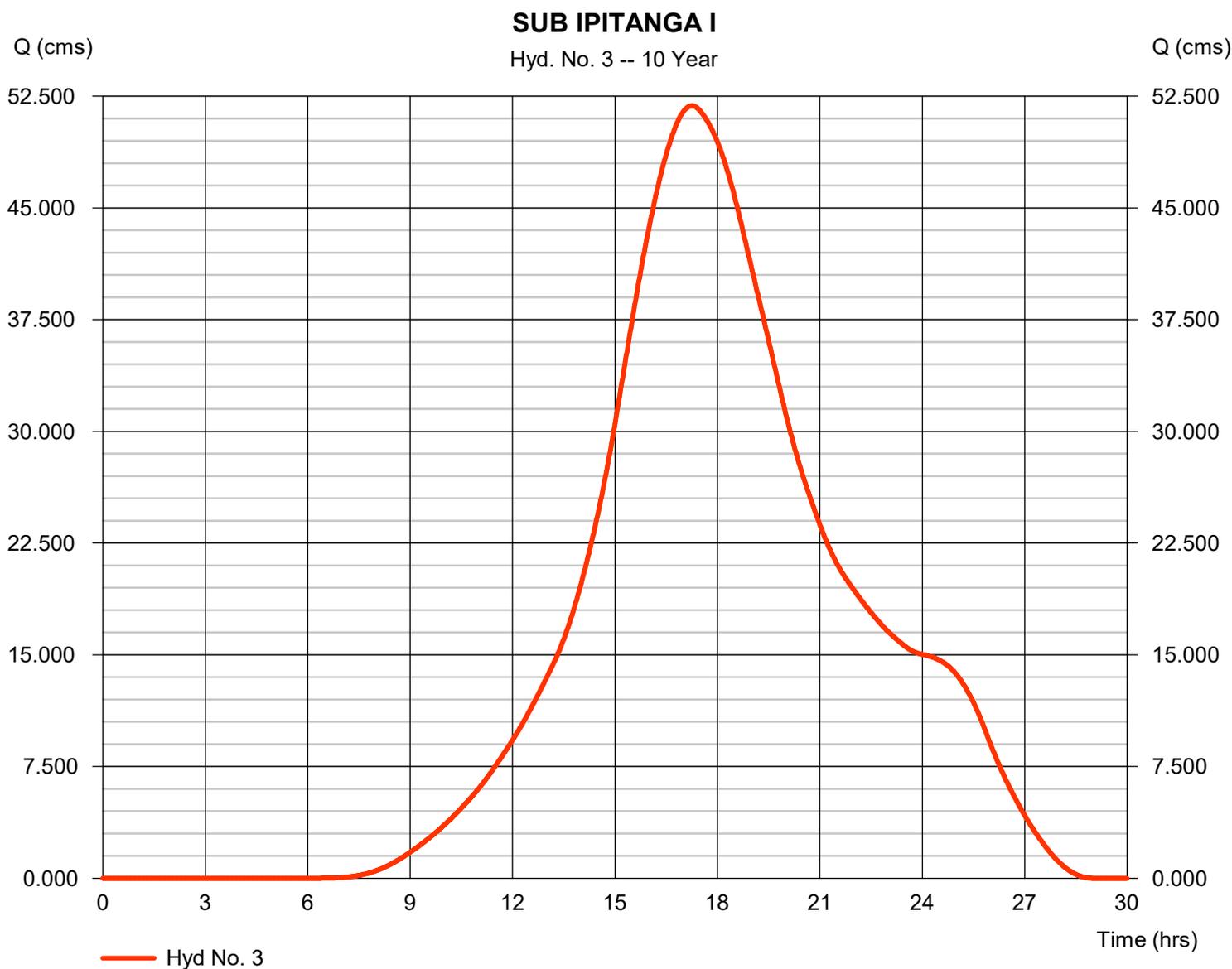
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

Hyd. No. 3

SUB IPITANGA I

Hydrograph type	= SCS Runoff	Peak discharge	= 51.85 cms
Storm frequency	= 10 yrs	Time to peak	= 17.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,455,288.0 cum
Drainage area	= 2012.400 hectare	Curve number	= 66
Basin Slope	= 0.6 %	Hydraulic length	= 11734 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 189.80 min
Total precip.	= 166.00 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

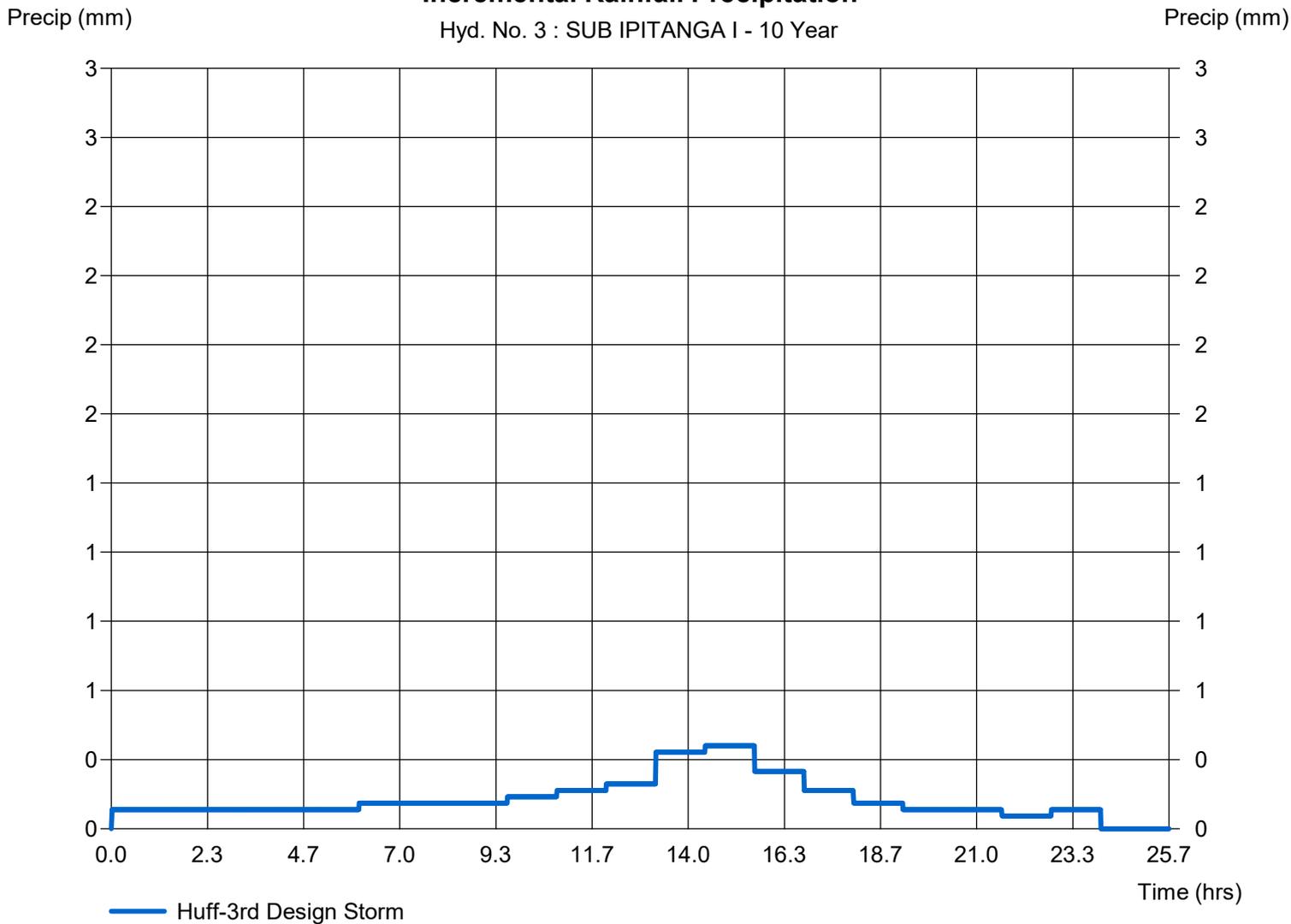
Hyd. No. 3

SUB IPITANGA I

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 166.0 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs		

Incremental Rainfall Precipitation

Hyd. No. 3 : SUB IPITANGA I - 10 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

Hyd. No. 4

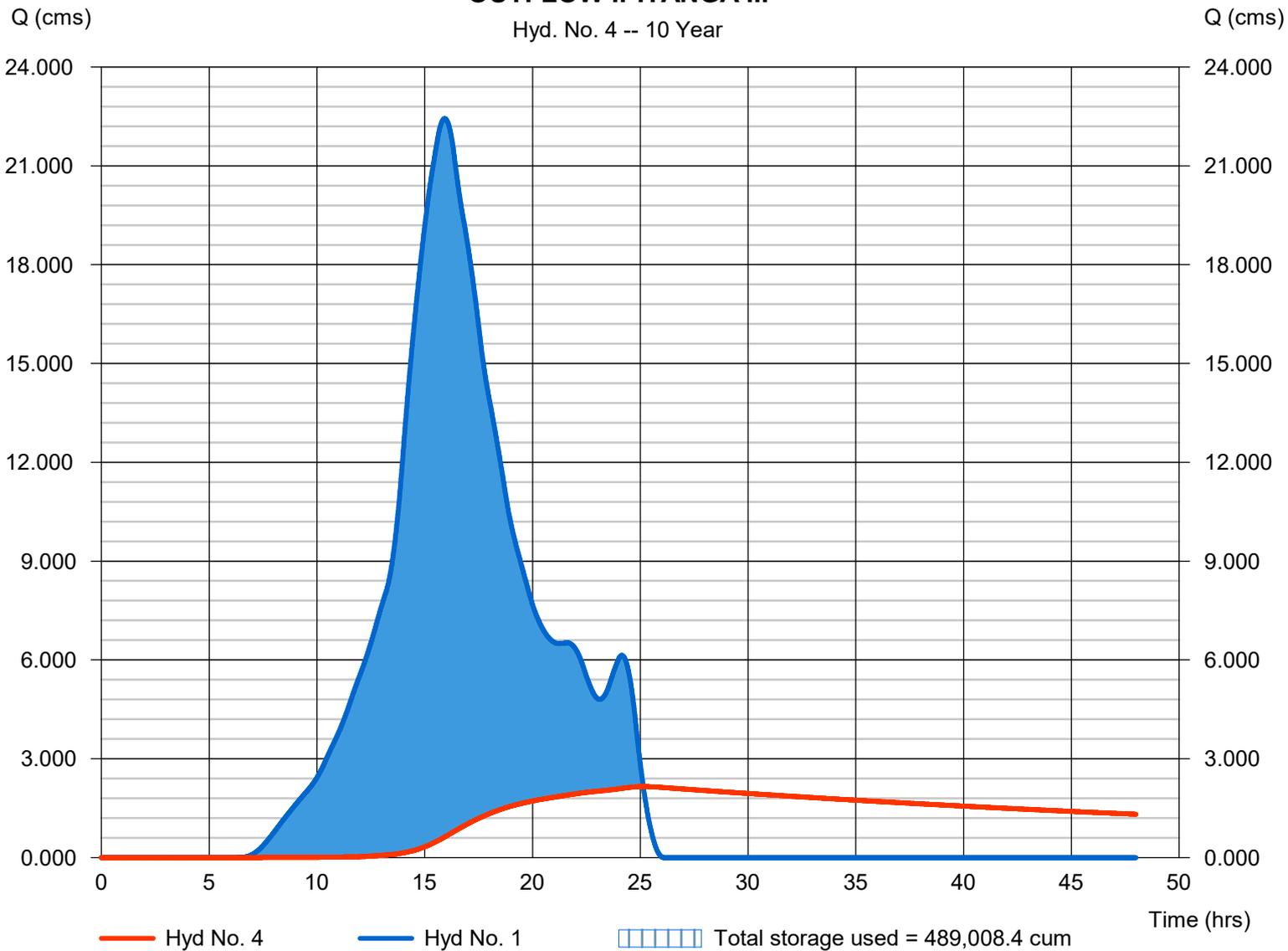
OUTFLOW IPITANGA III

Hydrograph type	= Reservoir	Peak discharge	= 2.154 cms
Storm frequency	= 10 yrs	Time to peak	= 25.15 hrs
Time interval	= 1 min	Hyd. volume	= 197,999.3 cum
Inflow hyd. No.	= 1 - SUB IPITANGA III	Max. Elevation	= 62.16 m
Reservoir name	= IPITANGA III	Max. Storage	= 489,008.4 cum

Storage Indication method used.

OUTFLOW IPITANGA III

Hyd. No. 4 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

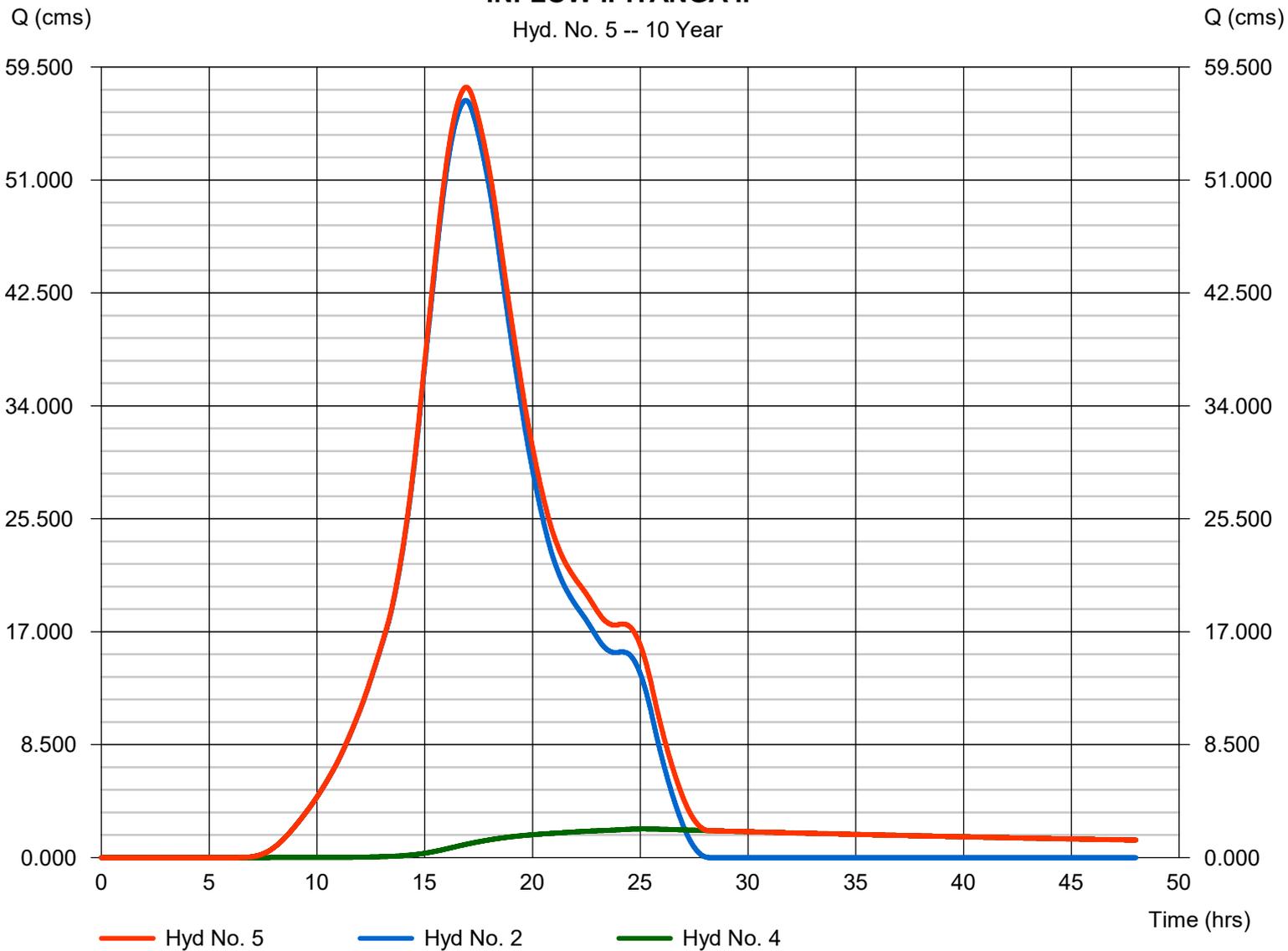
Hyd. No. 5

INFLOW IPITANGA II

Hydrograph type	= Combine	Peak discharge	= 57.98 cms
Storm frequency	= 10 yrs	Time to peak	= 16.93 hrs
Time interval	= 1 min	Hyd. volume	= 1,733,669.1 cum
Inflow hyds.	= 2, 4	Contrib. drain. area	= 2123.100 hectare

INFLOW IPITANGA II

Hyd. No. 5 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

Hyd. No. 6

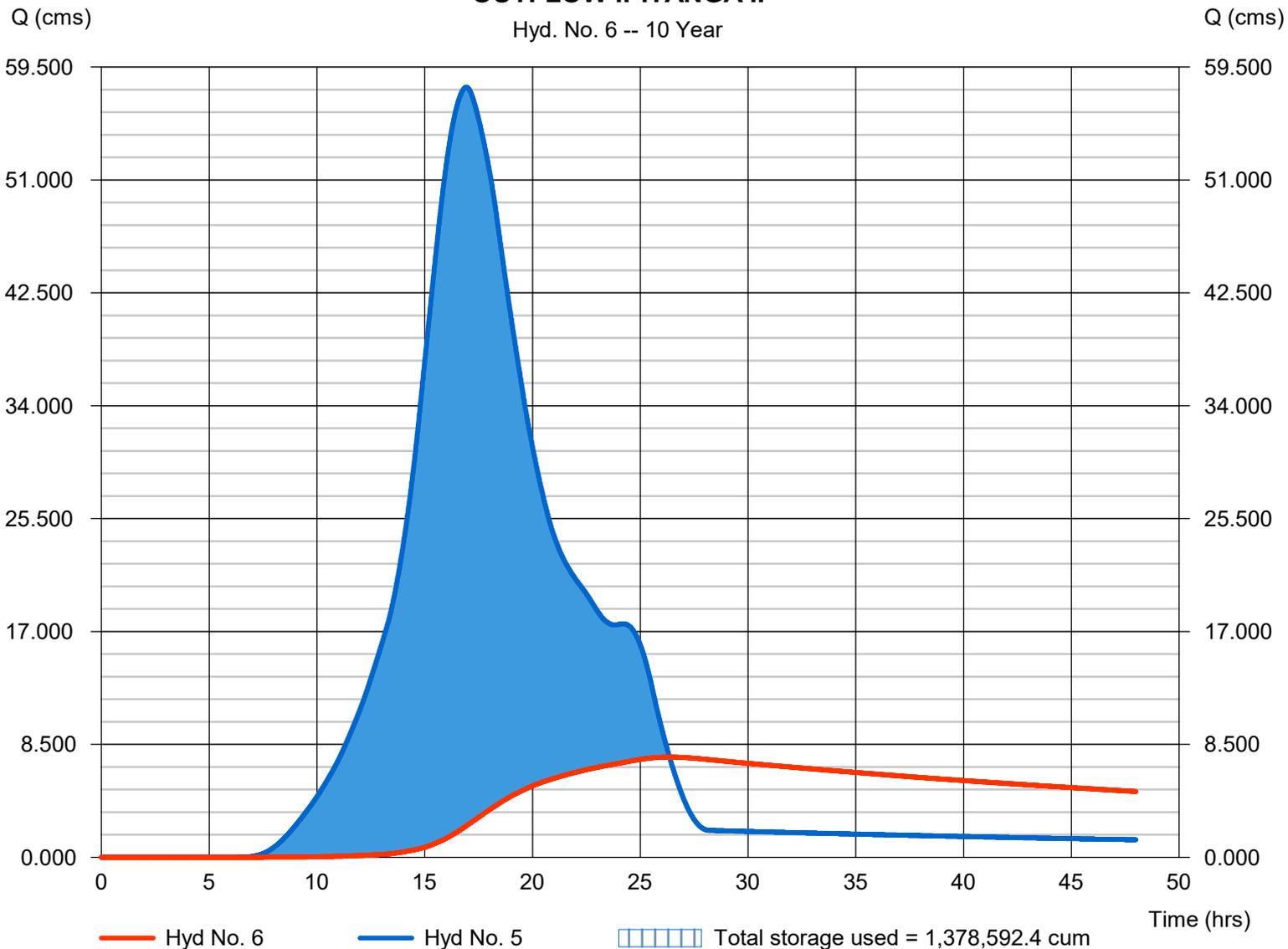
OUTFLOW IPITANGA II

Hydrograph type	= Reservoir	Peak discharge	= 7.538 cms
Storm frequency	= 10 yrs	Time to peak	= 26.35 hrs
Time interval	= 1 min	Hyd. volume	= 692,693.9 cum
Inflow hyd. No.	= 5 - INFLOW IPITANGA II	Max. Elevation	= 59.95 m
Reservoir name	= IPITANGA II	Max. Storage	= 1,378,592.4 cum

Storage Indication method used.

OUTFLOW IPITANGA II

Hyd. No. 6 -- 10 Year



Pond No. 2 - IPITANGA II

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (m)	Elevation (m)	Contour area (sqm)	Incr. Storage (cum)	Total storage (cum)
0.00	59.20	n/a	0.0	0.0
0.80	60.00	n/a	1,470,530.0	1,470,530.0
1.80	61.00	n/a	1,810,999.9	3,281,530.0

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (mm)	= 0.00	0.00	0.00	0.00
Span (mm)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (m)	= 0.000	0.000	0.000	0.000
Length (m)	= 0.000	0.000	0.000	0.000
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (m)	= 10.000	0.000	0.000	0.000
Crest El. (m)	= 59.200	0.000	0.000	0.000
Weir Coeff.	= 2.10	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(cm/hr)	= 0.000			
TW Elev. (m)	= 0.00			

(by Wet area)

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage m	Storage cum	Elevation m	Civ A cms	Civ B cms	Civ C cms	PrfRsr cms	Wr A cms	Wr B cms	Wr C cms	Wr D cms	Exfil cms	User cms	Total cms
0.00	0.0	59.20	---	---	---	---	0.00	---	---	---	---	---	0.000
0.08	147,053.0	59.28	---	---	---	---	0.26	---	---	---	---	---	0.262
0.16	294,106.0	59.36	---	---	---	---	0.74	---	---	---	---	---	0.742
0.24	441,159.0	59.44	---	---	---	---	1.36	---	---	---	---	---	1.363
0.32	588,212.0	59.52	---	---	---	---	2.10	---	---	---	---	---	2.099
0.40	735,265.0	59.60	---	---	---	---	2.93	---	---	---	---	---	2.933
0.48	882,318.1	59.68	---	---	---	---	3.86	---	---	---	---	---	3.856
0.56	1,029,371.0	59.76	---	---	---	---	4.86	---	---	---	---	---	4.859
0.64	1,176,424.0	59.84	---	---	---	---	5.94	---	---	---	---	---	5.936
0.72	1,323,477.0	59.92	---	---	---	---	7.08	---	---	---	---	---	7.083
0.80	1,470,530.0	60.00	---	---	---	---	8.30	---	---	---	---	---	8.296
0.90	1,651,630.0	60.10	---	---	---	---	9.90	---	---	---	---	---	9.899
1.00	1,832,730.0	60.20	---	---	---	---	11.59	---	---	---	---	---	11.59
1.10	2,013,830.1	60.30	---	---	---	---	13.38	---	---	---	---	---	13.38
1.20	2,194,930.0	60.40	---	---	---	---	15.24	---	---	---	---	---	15.24
1.30	2,376,030.0	60.50	---	---	---	---	17.18	---	---	---	---	---	17.18
1.40	2,557,130.0	60.60	---	---	---	---	19.21	---	---	---	---	---	19.21
1.50	2,738,230.0	60.70	---	---	---	---	21.30	---	---	---	---	---	21.30
1.60	2,919,330.0	60.80	---	---	---	---	23.46	---	---	---	---	---	23.46
1.70	3,100,430.0	60.90	---	---	---	---	25.70	---	---	---	---	---	25.70
1.80	3,281,530.0	61.00	---	---	---	---	28.00	---	---	---	---	---	28.00

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

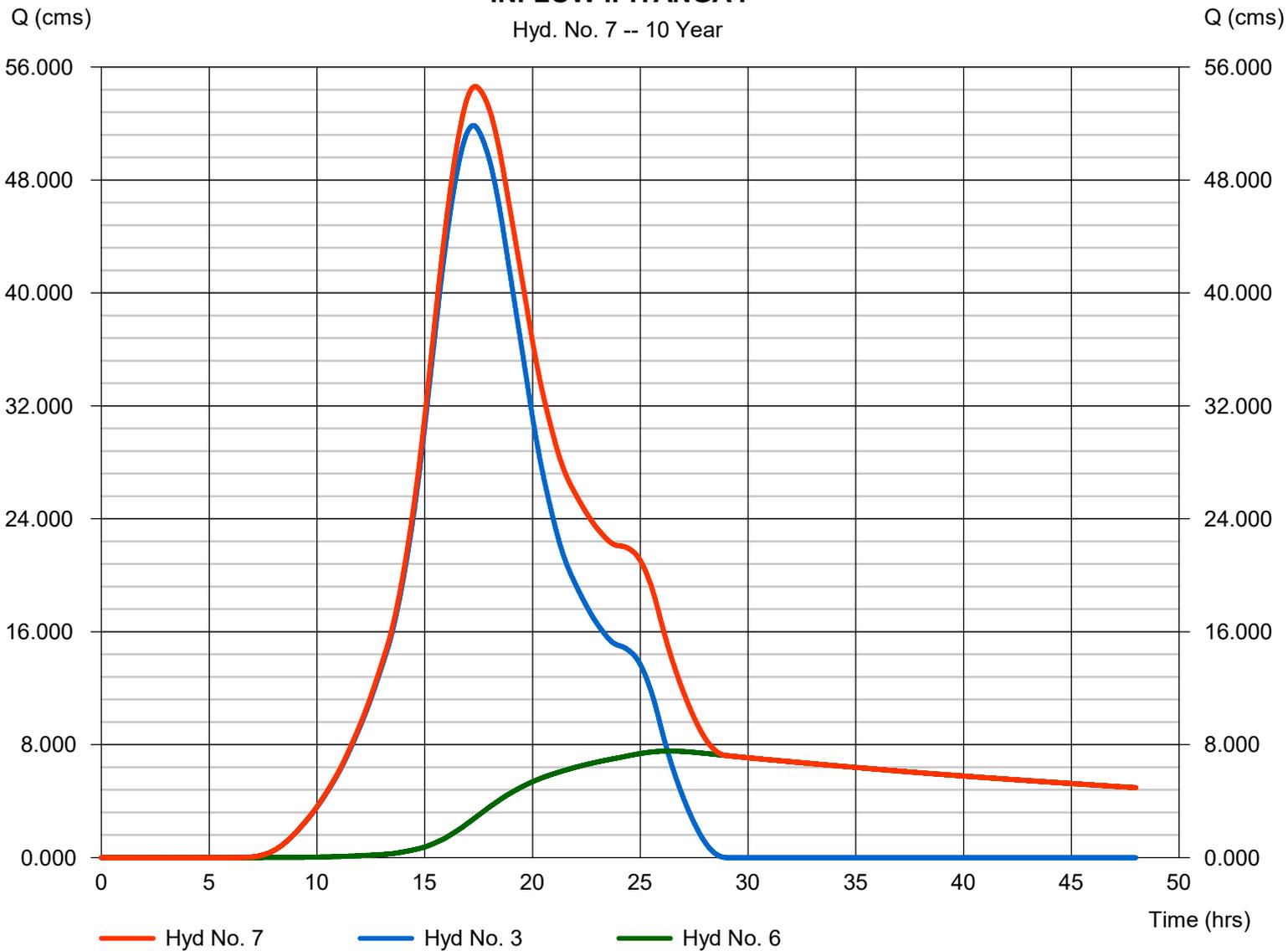
Hyd. No. 7

INFLOW IPITANGA I

Hydrograph type	= Combine	Peak discharge	= 54.63 cms
Storm frequency	= 10 yrs	Time to peak	= 17.35 hrs
Time interval	= 1 min	Hyd. volume	= 2,147,984.8 cum
Inflow hyds.	= 3, 6	Contrib. drain. area	= 2012.400 hectare

INFLOW IPITANGA I

Hyd. No. 7 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

Hyd. No. 8

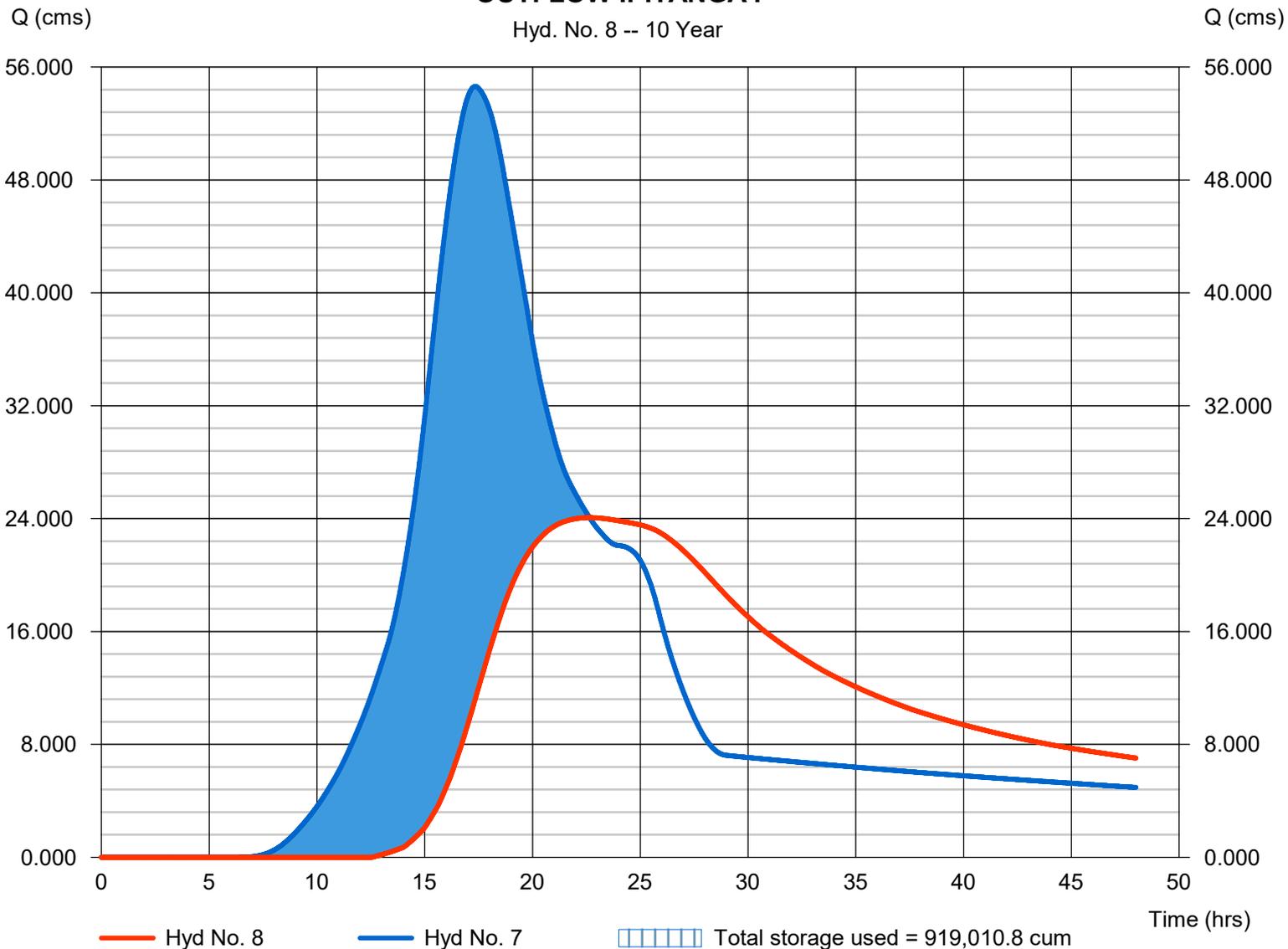
OUTFLOW IPITANGA I

Hydrograph type	= Reservoir	Peak discharge	= 24.07 cms
Storm frequency	= 10 yrs	Time to peak	= 22.65 hrs
Time interval	= 1 min	Hyd. volume	= 1,702,835.0 cum
Inflow hyd. No.	= 7 - INFLOW IPITANGA I	Max. Elevation	= 28.14 m
Reservoir name	= IPITANGA I	Max. Storage	= 919,010.8 cum

Storage Indication method used.

OUTFLOW IPITANGA I

Hyd. No. 8 -- 10 Year



Pond No. 3 - IPITANGA I

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (m)	Elevation (m)	Contour area (sqm)	Incr. Storage (cum)	Total storage (cum)
0.00	27.00	n/a	0.0	0.0
1.00	28.00	n/a	797,428.0	797,428.0
2.00	29.00	n/a	842,555.0	1,639,983.0
3.00	30.00	n/a	918,412.1	2,558,395.0
4.00	31.00	n/a	971,574.9	3,529,970.0
5.00	32.00	n/a	1,023,170.9	4,553,141.0
6.00	33.00	n/a	1,081,832.3	5,634,973.0
7.00	34.00	n/a	1,139,234.1	6,774,207.0
8.00	35.00	n/a	1,436,781.5	8,210,988.5

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (mm)	= 0.00	0.00	0.00	0.00
Span (mm)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (m)	= 0.000	0.000	0.000	0.000
Length (m)	= 0.000	0.000	0.000	0.000
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (m)	= 15.700	6.300	0.000	0.000
Crest El. (m)	= 27.100	28.900	0.000	0.000
Weir Coeff.	= 2.60	2.60	3.33	3.33
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	No	No	No
Exfil.(cm/hr)	= 0.000			
TW Elev. (m)	= 0.00			

(by Wet area)

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage m	Storage cum	Elevation m	Civ A cms	Civ B cms	Civ C cms	PrfRsr cms	Wr A cms	Wr B cms	Wr C cms	Wr D cms	Exfil cms	User cms	Total cms
0.00	0.0	27.00	---	---	---	---	0.00	0.00	---	---	---	---	0.000
0.10	79,742.8	27.10	---	---	---	---	0.00	0.00	---	---	---	---	0.000
0.20	159,485.6	27.20	---	---	---	---	0.71	0.00	---	---	---	---	0.713
0.30	239,228.4	27.30	---	---	---	---	2.02	0.00	---	---	---	---	2.016
0.40	318,971.2	27.40	---	---	---	---	3.70	0.00	---	---	---	---	3.703
0.50	398,714.0	27.50	---	---	---	---	5.70	0.00	---	---	---	---	5.701
0.60	478,456.8	27.60	---	---	---	---	7.97	0.00	---	---	---	---	7.968
0.70	558,199.6	27.70	---	---	---	---	10.47	0.00	---	---	---	---	10.47
0.80	637,942.4	27.80	---	---	---	---	13.20	0.00	---	---	---	---	13.20
0.90	717,685.2	27.90	---	---	---	---	16.13	0.00	---	---	---	---	16.13
1.00	797,428.0	28.00	---	---	---	---	19.24	0.00	---	---	---	---	19.24
1.10	881,683.4	28.10	---	---	---	---	22.54	0.00	---	---	---	---	22.54
1.20	965,939.0	28.20	---	---	---	---	26.00	0.00	---	---	---	---	26.00
1.30	1,050,195.0	28.30	---	---	---	---	29.62	0.00	---	---	---	---	29.62
1.40	1,134,450.0	28.40	---	---	---	---	33.40	0.00	---	---	---	---	33.40
1.50	1,218,706.0	28.50	---	---	---	---	37.33	0.00	---	---	---	---	37.33
1.60	1,302,961.0	28.60	---	---	---	---	41.40	0.00	---	---	---	---	41.40
1.70	1,387,217.0	28.70	---	---	---	---	45.61	0.00	---	---	---	---	45.61
1.80	1,471,472.0	28.80	---	---	---	---	49.95	0.00	---	---	---	---	49.95
1.90	1,555,728.0	28.90	---	---	---	---	54.42	0.00	---	---	---	---	54.42
2.00	1,639,983.0	29.00	---	---	---	---	59.02	0.29	---	---	---	---	59.31
2.10	1,731,824.0	29.10	---	---	---	---	63.74	0.81	---	---	---	---	64.55
2.20	1,823,665.0	29.20	---	---	---	---	68.58	1.49	---	---	---	---	70.07
2.30	1,915,506.9	29.30	---	---	---	---	73.54	2.29	---	---	---	---	75.83
2.40	2,007,348.0	29.40	---	---	---	---	78.61	3.20	---	---	---	---	81.81
2.50	2,099,189.0	29.50	---	---	---	---	83.79	4.20	---	---	---	---	87.99
2.60	2,191,031.0	29.60	---	---	---	---	89.08	5.30	---	---	---	---	94.38
2.70	2,282,872.0	29.70	---	---	---	---	94.48	6.47	---	---	---	---	100.95
2.80	2,374,713.0	29.80	---	---	---	---	99.98	7.72	---	---	---	---	107.71
2.90	2,466,555.0	29.90	---	---	---	---	105.59	9.04	---	---	---	---	114.63
3.00	2,558,395.0	30.00	---	---	---	---	111.30	10.43	---	---	---	---	121.73
3.10	2,655,553.0	30.10	---	---	---	---	117.10	11.89	---	---	---	---	128.99
3.20	2,752,710.0	30.20	---	---	---	---	123.01	13.40	---	---	---	---	136.41
3.30	2,849,867.0	30.30	---	---	---	---	129.01	14.98	---	---	---	---	143.99
3.40	2,947,025.0	30.40	---	---	---	---	135.10	16.61	---	---	---	---	151.71
3.50	3,044,182.0	30.50	---	---	---	---	141.29	18.30	---	---	---	---	159.59
3.60	3,141,340.0	30.60	---	---	---	---	147.57	20.04	---	---	---	---	167.61
3.70	3,238,497.0	30.70	---	---	---	---	153.94	21.84	---	---	---	---	175.77

Continues on next page...

IPITANGA I

Stage / Storage / Discharge Table

Stage m	Storage cum	Elevation m	Clv A cms	Clv B cms	Clv C cms	PrfRsr cms	Wr A cms	Wr B cms	Wr C cms	Wr D cms	Exfil cms	User cms	Total cms
3.80	3,335,655.0	30.80	---	---	---	---	160.39	23.68	---	---	---	---	184.08
3.90	3,432,812.0	30.90	---	---	---	---	166.94	25.58	---	---	---	---	192.52
4.00	3,529,970.0	31.00	---	---	---	---	173.57	27.52	---	---	---	---	201.09
4.10	3,632,287.0	31.10	---	---	---	---	180.29	29.51	---	---	---	---	209.80
4.20	3,734,604.0	31.20	---	---	---	---	187.09	31.54	---	---	---	---	218.64
4.30	3,836,921.0	31.30	---	---	---	---	193.98	33.62	---	---	---	---	227.60
4.40	3,939,237.8	31.40	---	---	---	---	200.95	35.75	---	---	---	---	236.70
4.50	4,041,556.0	31.50	---	---	---	---	208.00	37.91	---	---	---	---	245.91
4.60	4,143,873.3	31.60	---	---	---	---	215.13	40.12	---	---	---	---	255.25
4.70	4,246,190.0	31.70	---	---	---	---	222.34	42.37	---	---	---	---	264.71
4.80	4,348,507.0	31.80	---	---	---	---	229.63	44.66	---	---	---	---	274.29
4.90	4,450,825.0	31.90	---	---	---	---	237.00	46.99	---	---	---	---	283.99
5.00	4,553,141.0	32.00	---	---	---	---	244.44	49.36	---	---	---	---	293.80
5.10	4,661,324.0	32.10	---	---	---	---	251.96	51.77	---	---	---	---	303.73
5.20	4,769,507.0	32.20	---	---	---	---	259.56	54.21	---	---	---	---	313.77
5.30	4,877,691.0	32.30	---	---	---	---	267.23	56.69	---	---	---	---	323.93
5.40	4,985,874.0	32.40	---	---	---	---	274.98	59.21	---	---	---	---	334.19
5.50	5,094,057.0	32.50	---	---	---	---	282.80	61.77	---	---	---	---	344.57
5.60	5,202,240.0	32.60	---	---	---	---	290.69	64.36	---	---	---	---	355.05
5.70	5,310,423.0	32.70	---	---	---	---	298.65	66.99	---	---	---	---	365.64
5.80	5,418,606.0	32.80	---	---	---	---	306.69	69.65	---	---	---	---	376.34
5.90	5,526,790.0	32.90	---	---	---	---	314.79	72.35	---	---	---	---	387.14
6.00	5,634,973.0	33.00	---	---	---	---	322.97	75.08	---	---	---	---	398.04
6.10	5,748,897.0	33.10	---	---	---	---	331.21	77.84	---	---	---	---	409.05
6.20	5,862,820.0	33.20	---	---	---	---	339.53	80.64	---	---	---	---	420.17
6.30	5,976,744.0	33.30	---	---	---	---	347.91	83.46	---	---	---	---	431.38
6.40	6,090,668.0	33.40	---	---	---	---	356.36	86.33	---	---	---	---	442.69
6.50	6,204,591.0	33.50	---	---	---	---	364.88	89.22	---	---	---	---	454.10
6.60	6,318,515.0	33.60	---	---	---	---	373.47	92.14	---	---	---	---	465.61
6.70	6,432,438.0	33.70	---	---	---	---	382.12	95.10	---	---	---	---	477.22
6.80	6,546,362.0	33.80	---	---	---	---	390.84	98.09	---	---	---	---	488.93
6.90	6,660,286.0	33.90	---	---	---	---	399.62	101.11	---	---	---	---	500.73
7.00	6,774,207.0	34.00	---	---	---	---	408.47	104.15	---	---	---	---	512.62
7.10	6,917,886.0	34.10	---	---	---	---	417.38	107.23	---	---	---	---	524.61
7.20	7,061,564.0	34.20	---	---	---	---	426.35	110.34	---	---	---	---	536.70
7.30	7,205,242.0	34.30	---	---	---	---	435.39	113.48	---	---	---	---	548.87
7.40	7,348,920.0	34.40	---	---	---	---	444.50	116.65	---	---	---	---	561.14
7.50	7,492,598.0	34.50	---	---	---	---	453.66	119.84	---	---	---	---	573.50
7.60	7,636,276.0	34.60	---	---	---	---	462.89	123.07	---	---	---	---	585.95
7.70	7,779,954.0	34.70	---	---	---	---	472.18	126.32	---	---	---	---	598.49
7.80	7,923,633.0	34.80	---	---	---	---	481.53	129.60	---	---	---	---	611.12
7.90	8,067,313.0	34.90	---	---	---	---	490.94	132.91	---	---	---	---	623.84
8.00	8,210,988.5	35.00	---	---	---	---	500.41	136.24	---	---	---	---	636.65

...End

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

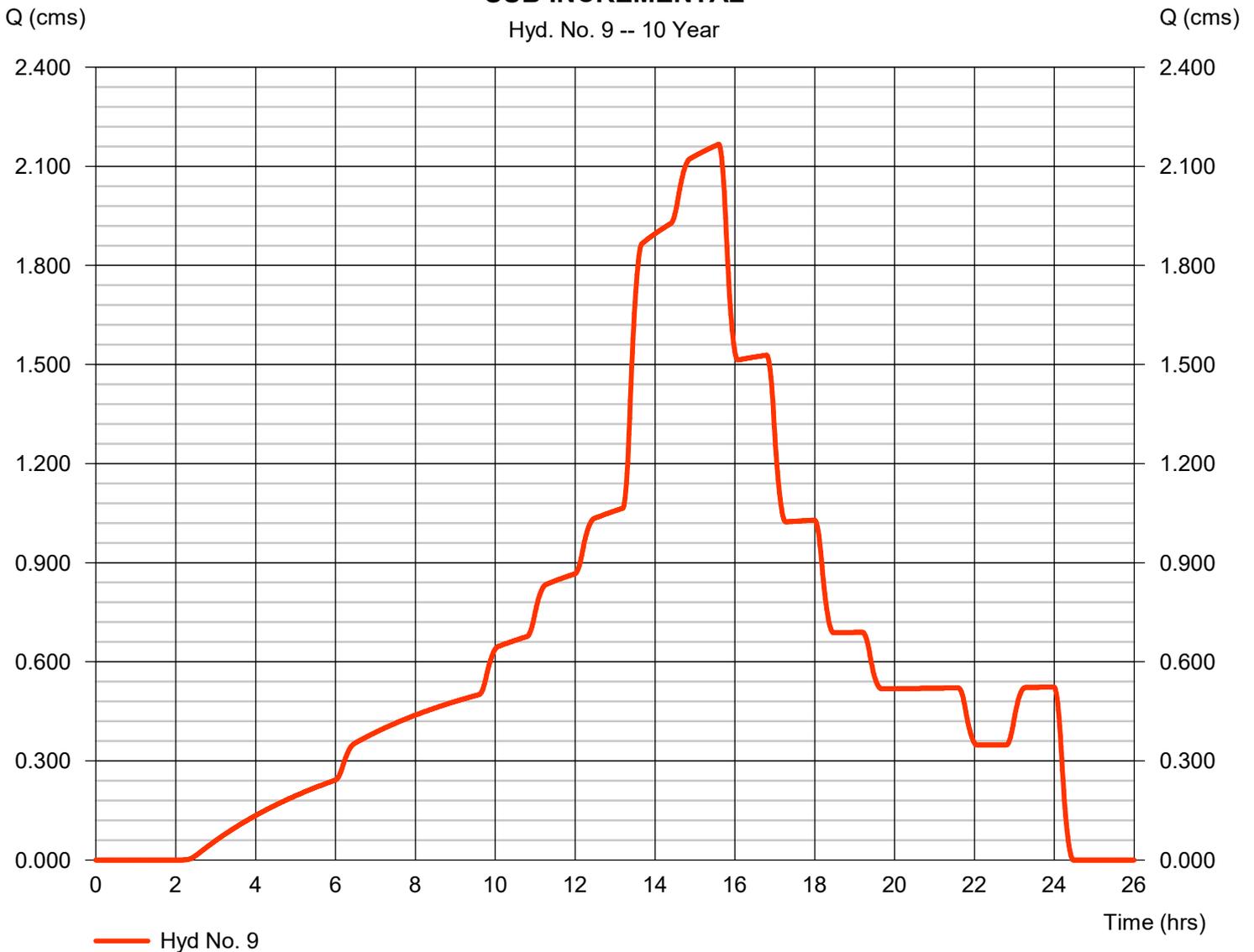
Hyd. No. 9

SUB INCREMENTAL

Hydrograph type	= SCS Runoff	Peak discharge	= 2.167 cms
Storm frequency	= 10 yrs	Time to peak	= 15.60 hrs
Time interval	= 1 min	Hyd. volume	= 58,335.6 cum
Drainage area	= 48.300 hectare	Curve number	= 85
Basin Slope	= 4.2 %	Hydraulic length	= 1421 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 17.74 min
Total precip.	= 166.00 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484

SUB INCREMENTAL

Hyd. No. 9 -- 10 Year



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

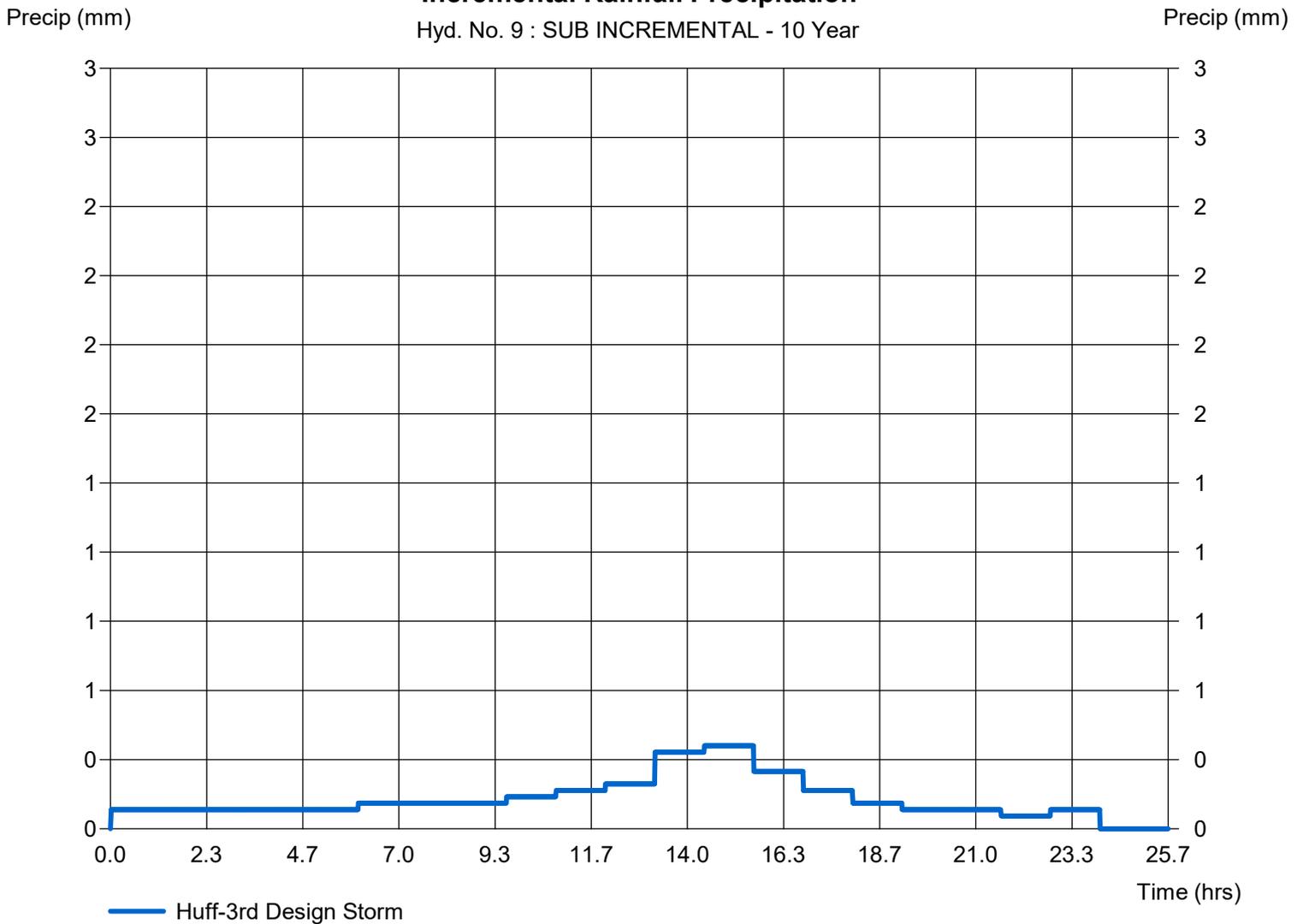
Hyd. No. 9

SUB INCREMENTAL

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 166.0 mm	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs		

Incremental Rainfall Precipitation

Hyd. No. 9 : SUB INCREMENTAL - 10 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

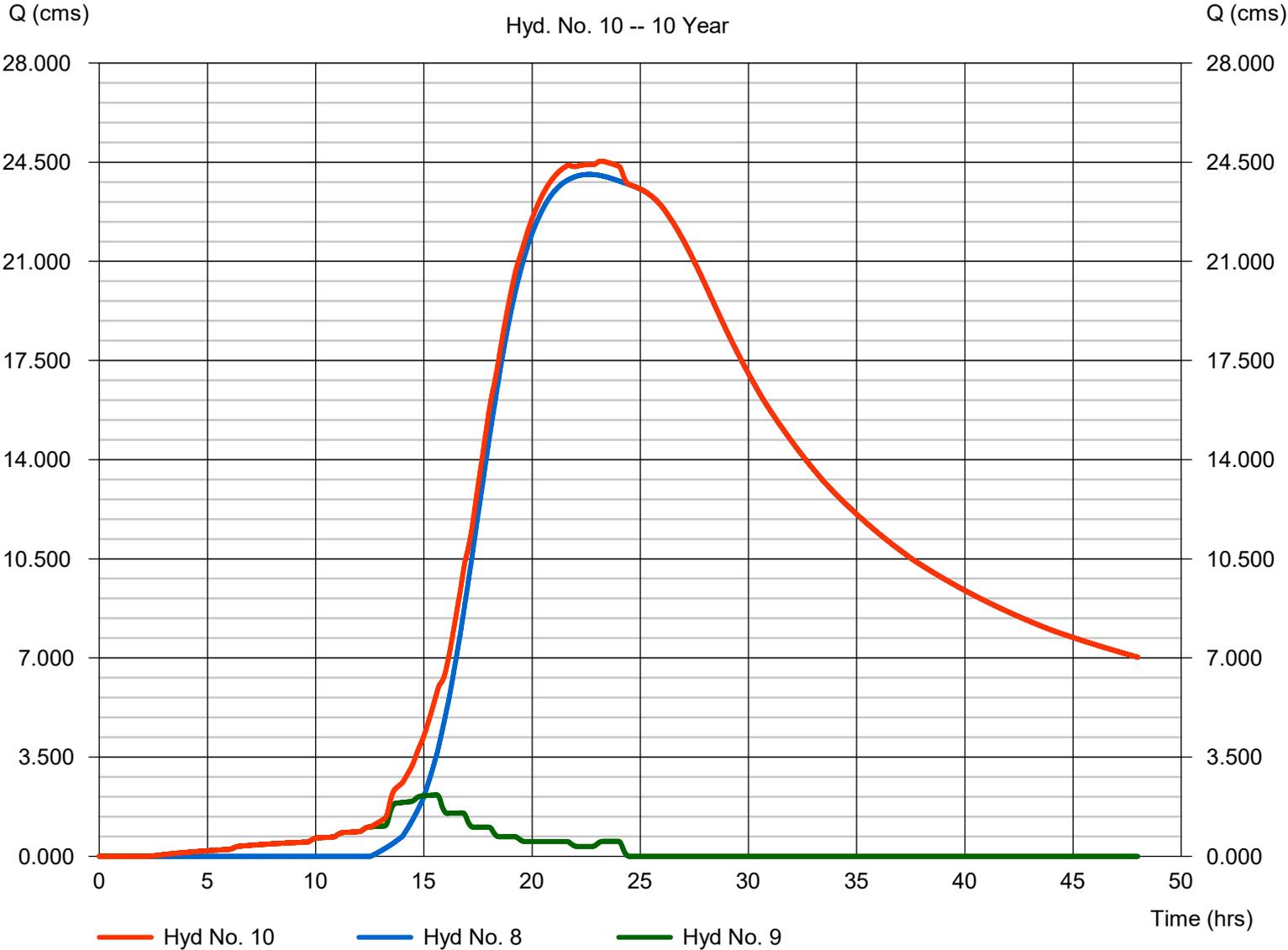
Hyd. No. 10

ESTRADA DO FIDALGO - EST. 6+14.02

Hydrograph type	= Combine	Peak discharge	= 24.54 cms
Storm frequency	= 10 yrs	Time to peak	= 23.22 hrs
Time interval	= 1 min	Hyd. volume	= 1,761,171.0 cum
Inflow hyds.	= 8, 9	Contrib. drain. area	= 48.300 hectare

ESTRADA DO FIDALGO - EST. 6+14.02

Hyd. No. 10 -- 10 Year



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Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

1 - AV. SR DO BONFIM / R. VALE DO OURO - EST. 36+14.32



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff AV. SR DO BONFIM / R. VALE DO OURO - EST. 36+14.32

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cms)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	-----	-----	-----	17.15	-----	-----	-----	AV. SR DO BONFIM / R. VALE DO
Proj. file: 0365-MC-10-HC-002_R-00.gpw									Wednesday, 08 / 31 / 2016		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	SCS Runoff	17.15	1	57	77,633.0	-----	-----	-----	AV. SR DO BONFIM / R. VALE DO
0365-MC-10-HC-002_R-00.gpw					Return Period: 10 Year			Wednesday, 08 / 31 / 2016	

Hydrograph Report

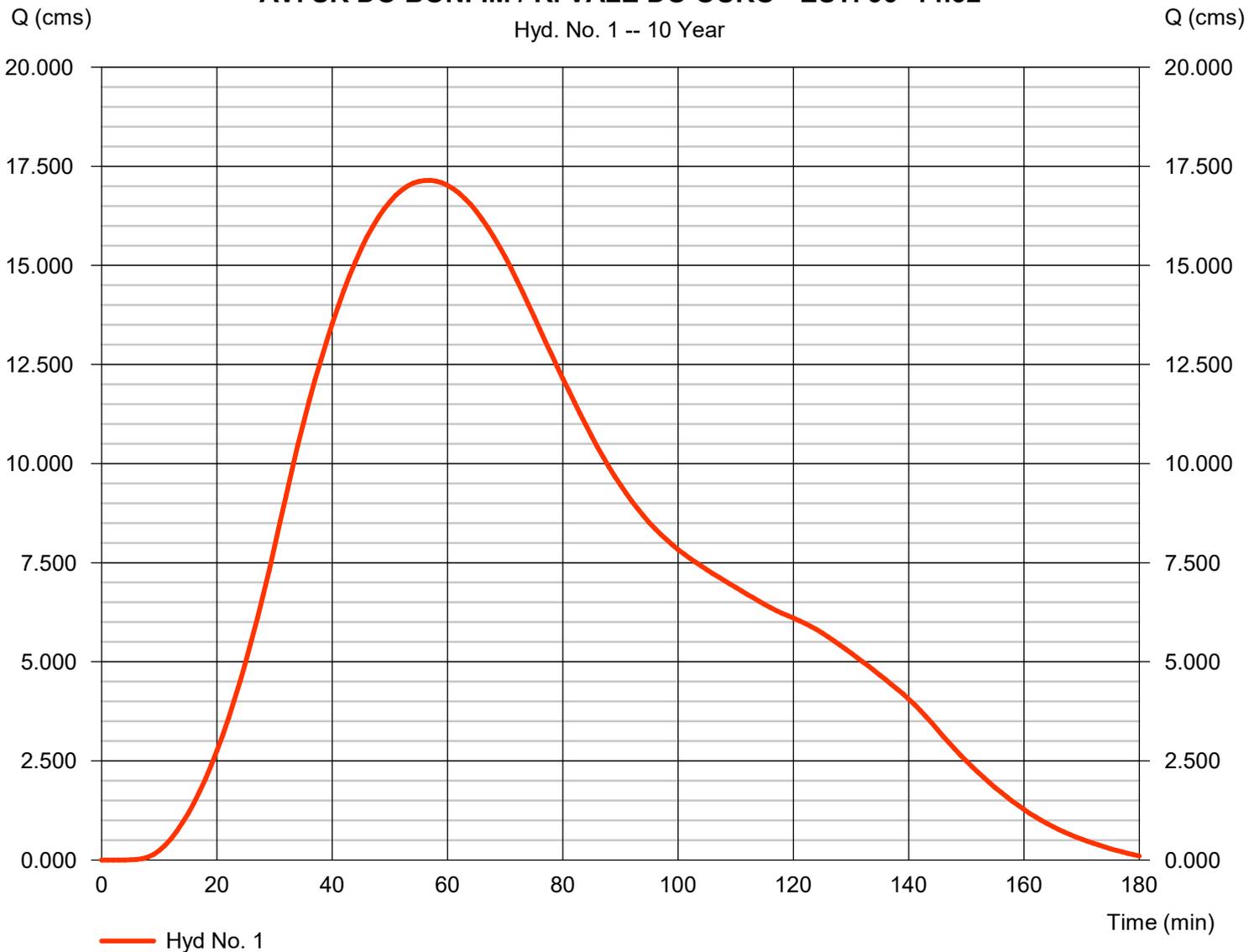
Hyd. No. 1

AV. SR DO BONFIM / R. VALE DO OURO - EST. 36+14.32

Hydrograph type	= SCS Runoff	Peak discharge	= 17.15 cms
Storm frequency	= 10 yrs	Time to peak	= 57 min
Time interval	= 1 min	Hyd. volume	= 77,633.0 cum
Drainage area	= 188.400 hectare	Curve number	= 85
Basin Slope	= 2.1 %	Hydraulic length	= 3010 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 40.88 min
Total precip.	= 77.00 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

AV. SR DO BONFIM / R. VALE DO OURO - EST. 36+14.32

Hyd. No. 1 -- 10 Year



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

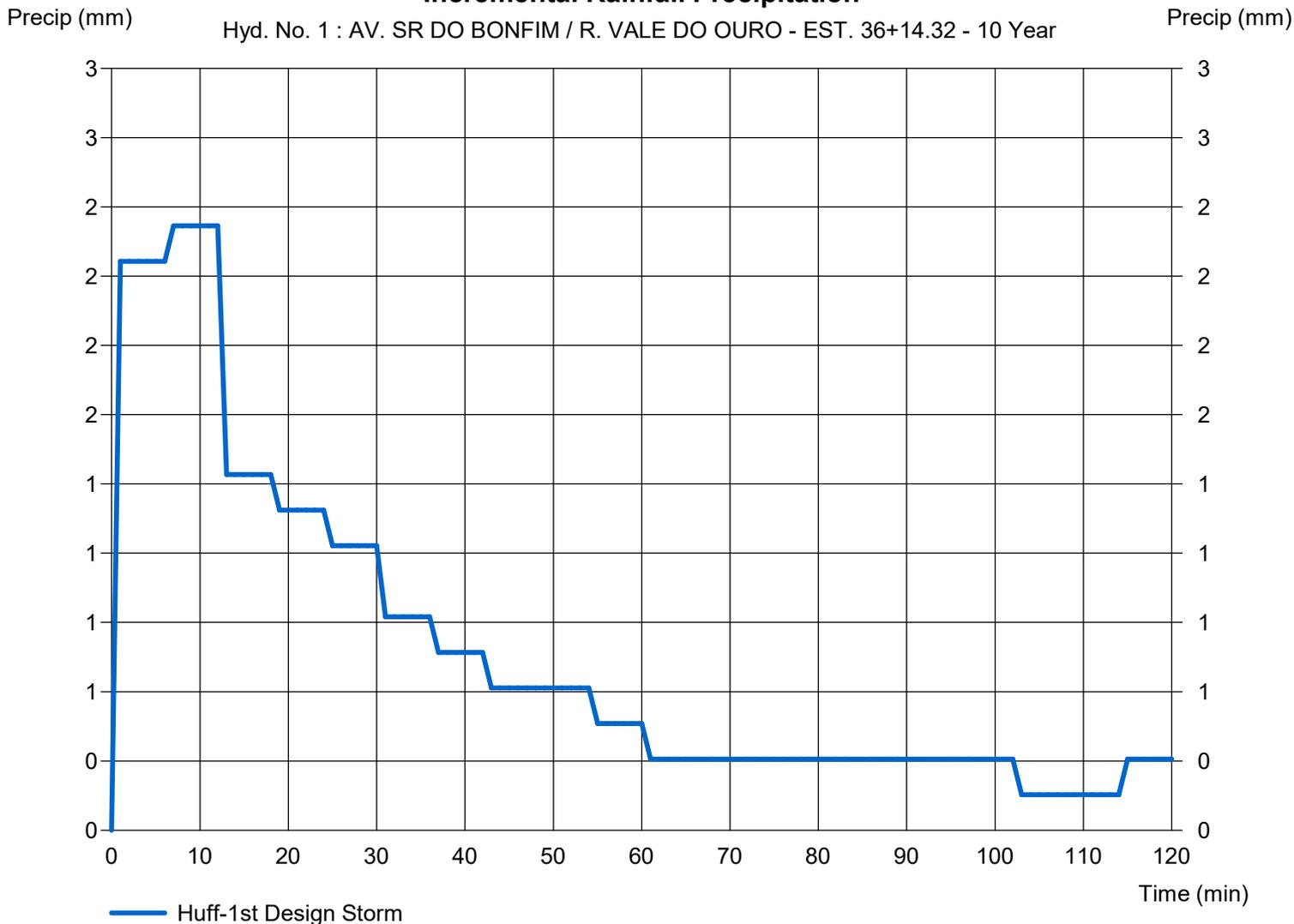
Wednesday, 08 / 31 / 2016

Hyd. No. 1

AV. SR DO BONFIM / R. VALE DO OURO - EST. 36+14.32

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 77.0 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs		

Incremental Rainfall Precipitation



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Culvert Report

ESTRADA DO FIDALGO - EST. 06+14.02

Invert Elev Dn (m)	=	10.1700
Pipe Length (m)	=	16.0000
Slope (%)	=	0.4375
Invert Elev Up (m)	=	10.2400
Rise (mm)	=	2000.0
Shape	=	Box
Span (mm)	=	4000.0
No. Barrels	=	2
n-Value	=	0.015
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

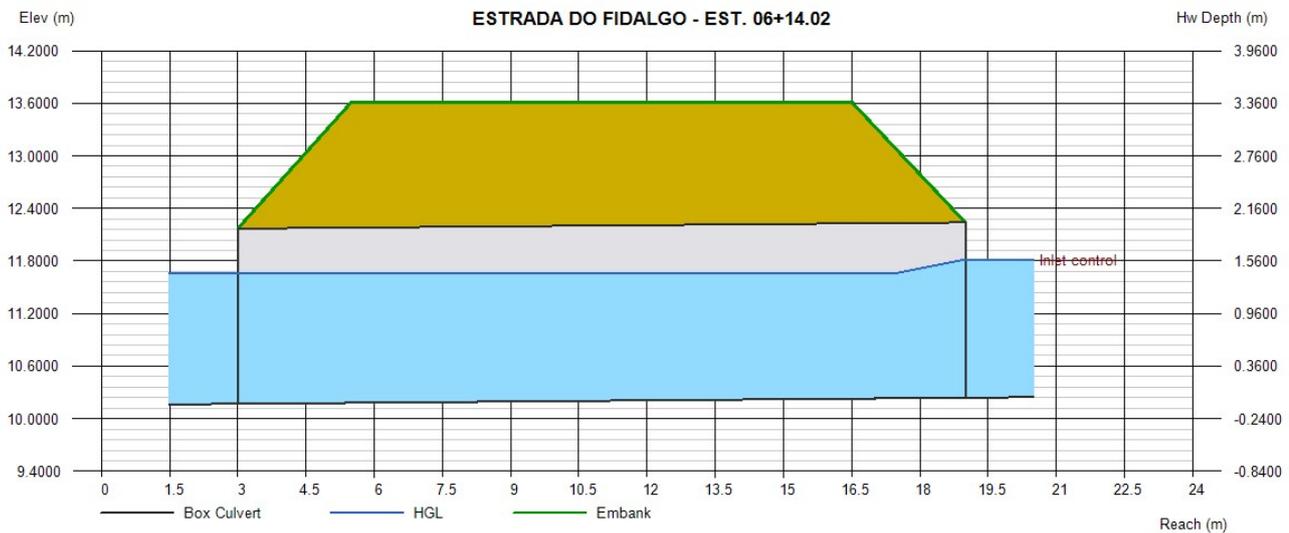
Top Elevation (m)	=	13.6140
Top Width (m)	=	11.0000
Crest Width (m)	=	100.0000

Calculations

Qmin (cms)	=	24.5400
Qmax (cms)	=	24.5400
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	24.5400
Qpipe (cms)	=	24.5400
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	2.0551
Veloc Up (m/s)	=	2.1557
HGL Dn (m)	=	11.6627
HGL Up (m)	=	11.6630
Hw Elev (m)	=	11.8175
Hw/D (m)	=	0.7887
Flow Regime	=	Inlet Control



Culvert Report

AV. SR DO BONFIM / R. VALE DO OURO - EST. 36+14.32

Invert Elev Dn (m)	= 11.0300
Pipe Length (m)	= 14.0000
Slope (%)	= 0.4286
Invert Elev Up (m)	= 11.0900
Rise (mm)	= 1500.0
Shape	= Box
Span (mm)	= 4000.0
No. Barrels	= 3
n-Value	= 0.015
Culvert Type	= Flared Wingwalls
Culvert Entrance	= 30D to 75D wingwall flares
Coeff. K,M,c,Y,k	= 0.026, 1, 0.0347, 0.81, 0.4

Calculations

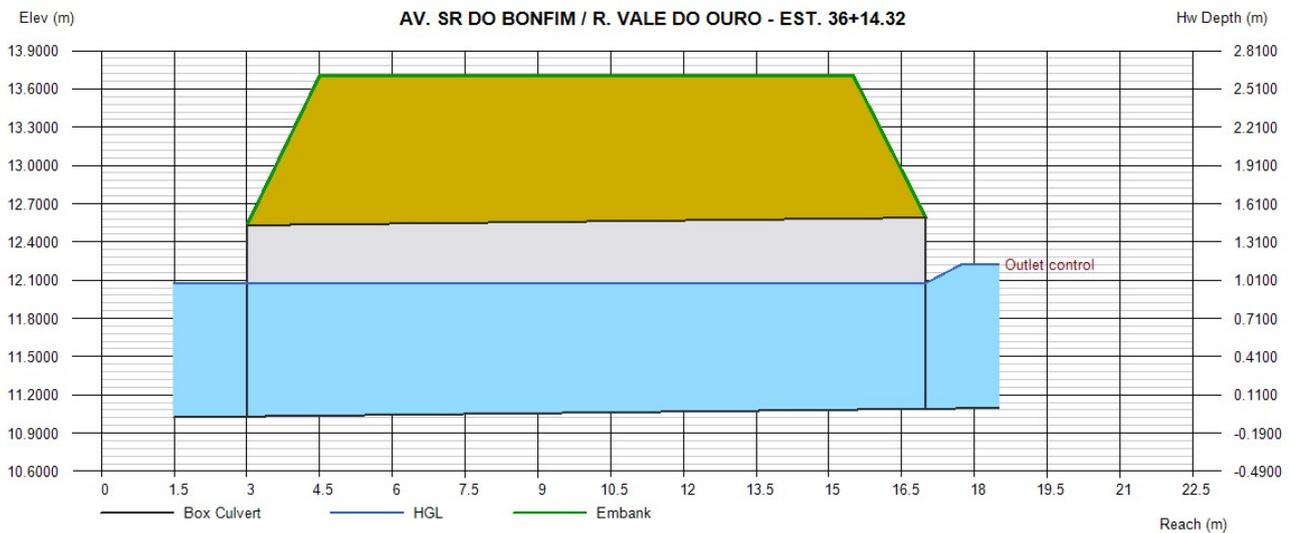
Qmin (cms)	= 17.1500
Qmax (cms)	= 17.1500
Tailwater Elev (m)	= (dc+D)/2

Highlighted

Qtotal (cms)	= 17.1500
Qpipe (cms)	= 17.1500
Qovertop (cms)	= 0.0000
Veloc Dn (m/s)	= 1.3660
Veloc Up (m/s)	= 1.4487
HGL Dn (m)	= 12.0762
HGL Up (m)	= 12.0765
Hw Elev (m)	= 12.2264
Hw/D (m)	= 0.7576
Flow Regime	= Outlet Control

Embankment

Top Elevation (m)	= 13.7040
Top Width (m)	= 11.0000
Crest Width (m)	= 100.0000



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

1 - RUA P. C. 02 - EST. 11+17.57



Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	RUA P. C. 02 - EST. 11+17.57

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cms)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	-----	-----	-----	1.405	-----	-----	-----	RUA P. C. 02 - EST. 11+17.57
Proj. file: 0365-MC-26-HC-001_R-00.gpw									Wednesday, 08 / 31 / 2016		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	SCS Runoff	1.405	1	16	4,778.0	-----	-----	-----	RUA P. C. 02 - EST. 11+17.57
0365-MC-26-HC-001_R-00.gpw					Return Period: 10 Year			Wednesday, 08 / 31 / 2016	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

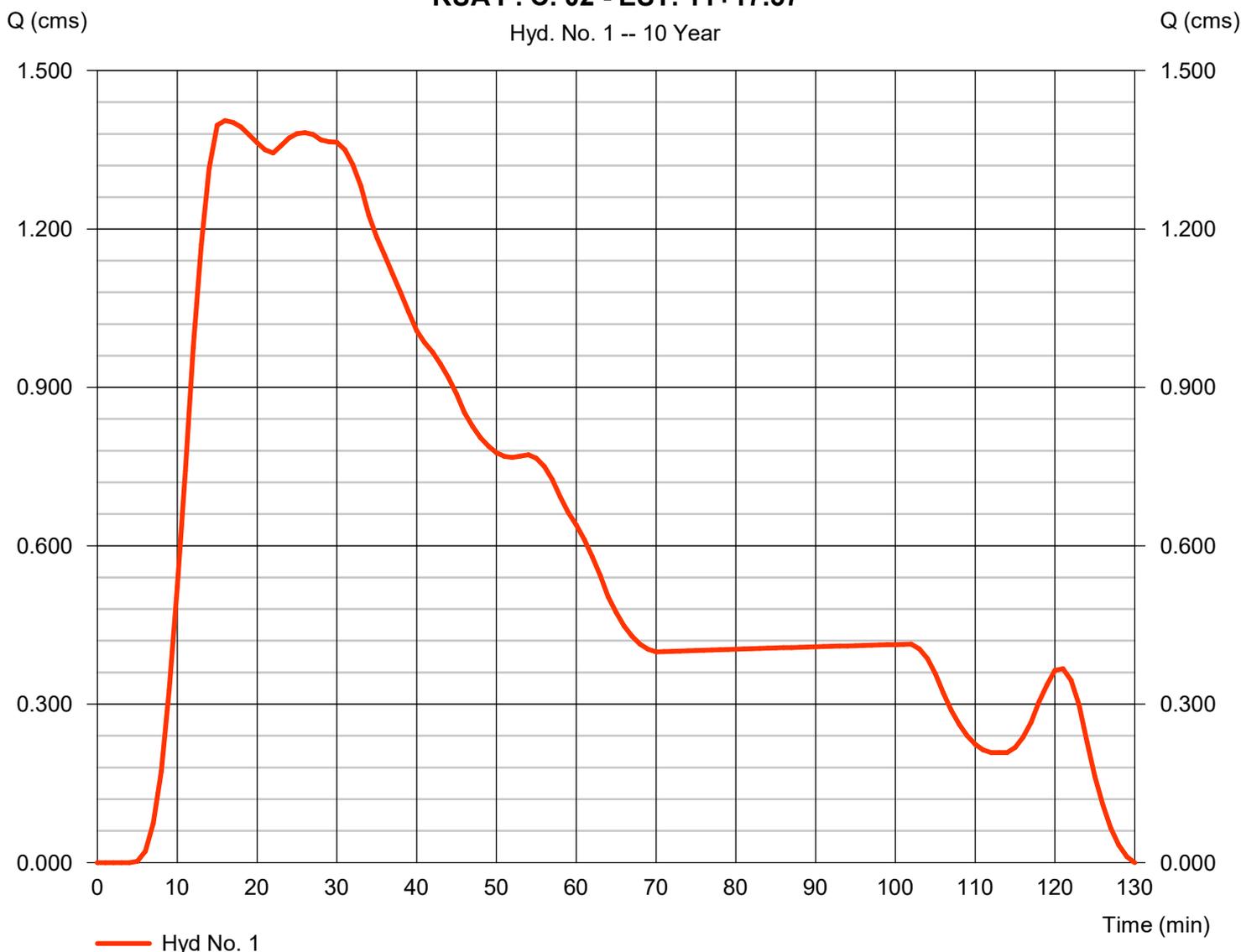
Hyd. No. 1

RUA P. C. 02 - EST. 11+17.57

Hydrograph type	= SCS Runoff	Peak discharge	= 1.405 cms
Storm frequency	= 10 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 4,778.0 cum
Drainage area	= 11.300 hectare	Curve number	= 85
Basin Slope	= 8.3 %	Hydraulic length	= 433 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 5.44 min
Total precip.	= 77.00 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

RUA P. C. 02 - EST. 11+17.57

Hyd. No. 1 -- 10 Year



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 08 / 31 / 2016

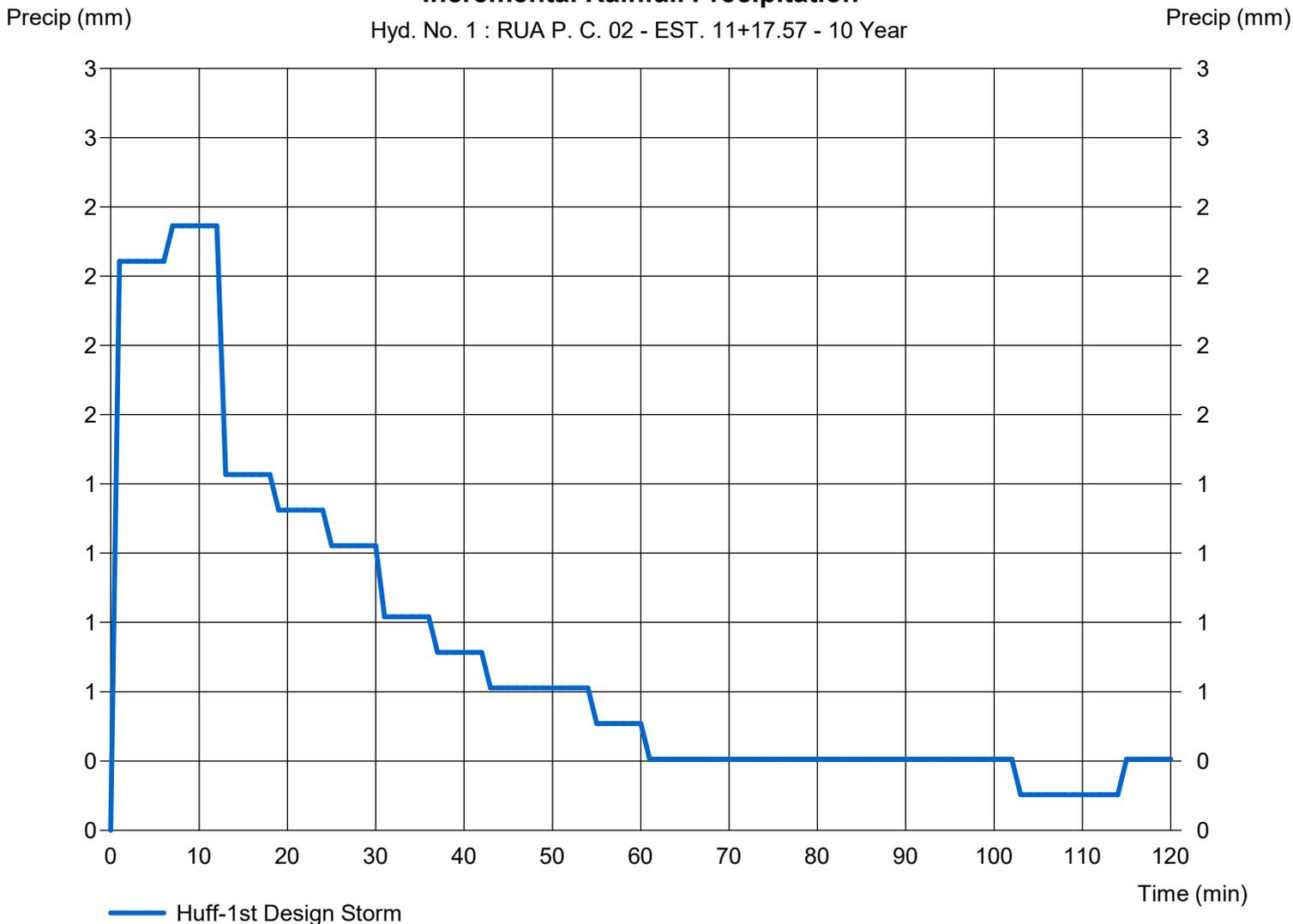
Hyd. No. 1

RUA P. C. 02 - EST. 11+17.57

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 77.0 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs		

Incremental Rainfall Precipitation

Hyd. No. 1 : RUA P. C. 02 - EST. 11+17.57 - 10 Year



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Culvert Report

RUA P. C. 02 - EST. 11+17.57

Invert Elev Dn (m)	=	46.3700
Pipe Length (m)	=	9.0000
Slope (%)	=	0.4445
Invert Elev Up (m)	=	46.4100
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Calculations

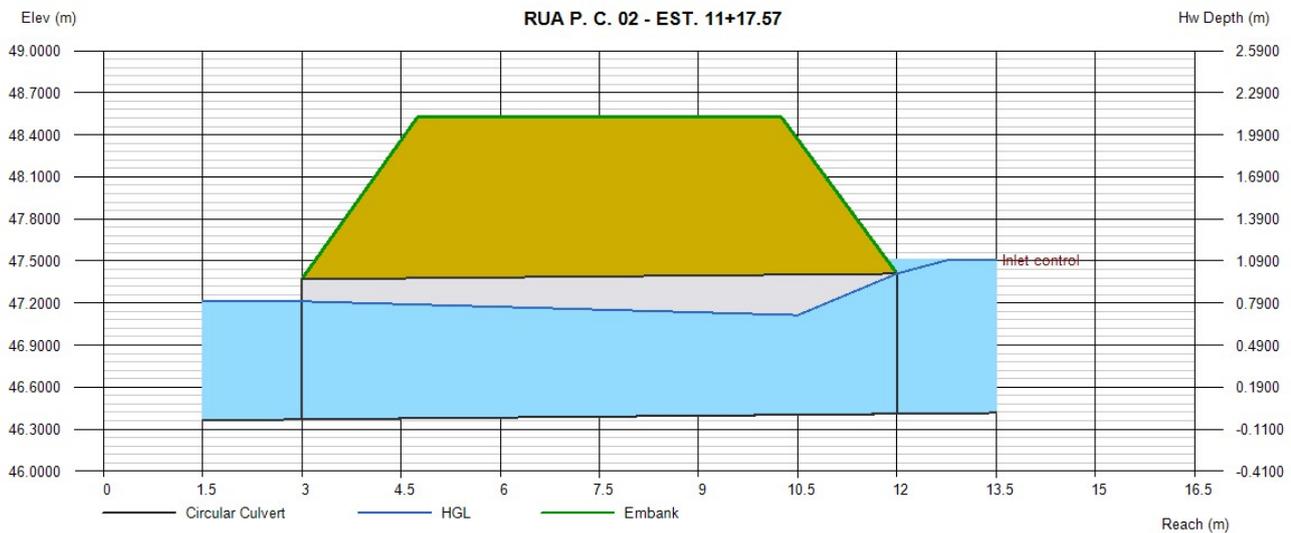
Qmin (cms)	=	1.4100
Qmax (cms)	=	1.4100
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	1.4100
Qpipe (cms)	=	1.4100
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.9977
Veloc Up (m/s)	=	2.4625
HGL Dn (m)	=	47.2121
HGL Up (m)	=	47.0941
Hw Elev (m)	=	47.5049
Hw/D (m)	=	1.0948
Flow Regime	=	Inlet Control

Embankment

Top Elevation (m)	=	48.5260
Top Width (m)	=	5.5000
Crest Width (m)	=	100.0000



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

1 - R. DOS CAJUEIROS / R. VALE DO OURO - EST. 0+15.98



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff R. DOS CAJUEIROS / R. VALE DO OURO - EST. 0+15.98

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cms)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	-----	-----	-----	5.336	-----	-----	-----	R. DOS CAJUEIROS / R. VALE DO
Proj. file: 0365-MC-34-HC-001_R-00.gpw									Wednesday, 08 / 31 / 2016		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	SCS Runoff	5.336	1	33	18,808.5	-----	-----	-----	R. DOS CAJUEIROS / R. VALE DO
0365-MC-34-HC-001_R-00.gpw					Return Period: 10 Year			Wednesday, 08 / 31 / 2016	

Hydrograph Report

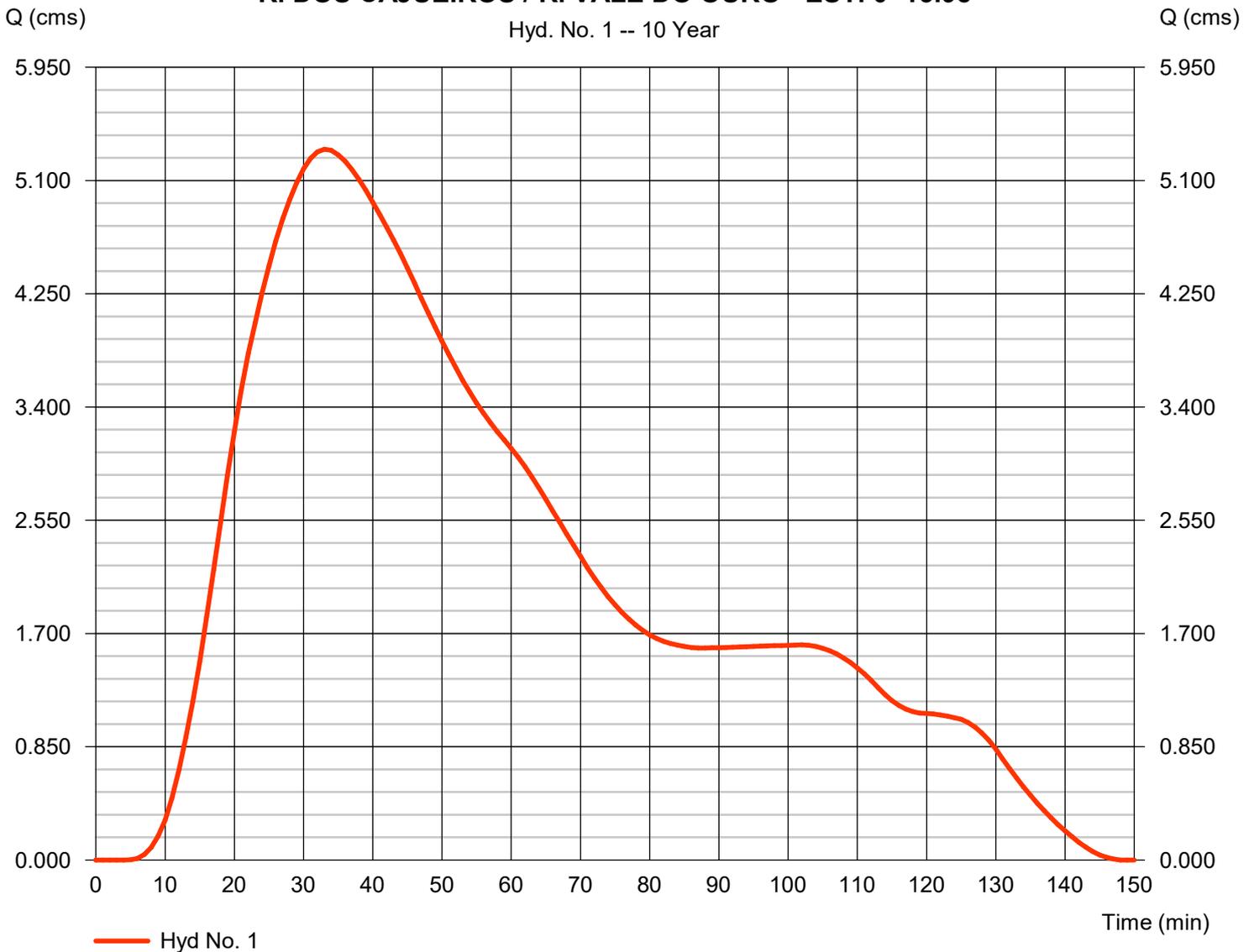
Hyd. No. 1

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 0+15.98

Hydrograph type	= SCS Runoff	Peak discharge	= 5.336 cms
Storm frequency	= 10 yrs	Time to peak	= 33 min
Time interval	= 1 min	Hyd. volume	= 18,808.5 cum
Drainage area	= 46.400 hectare	Curve number	= 85
Basin Slope	= 4.1 %	Hydraulic length	= 1338 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 17.00 min
Total precip.	= 77.00 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 0+15.98

Hyd. No. 1 -- 10 Year



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

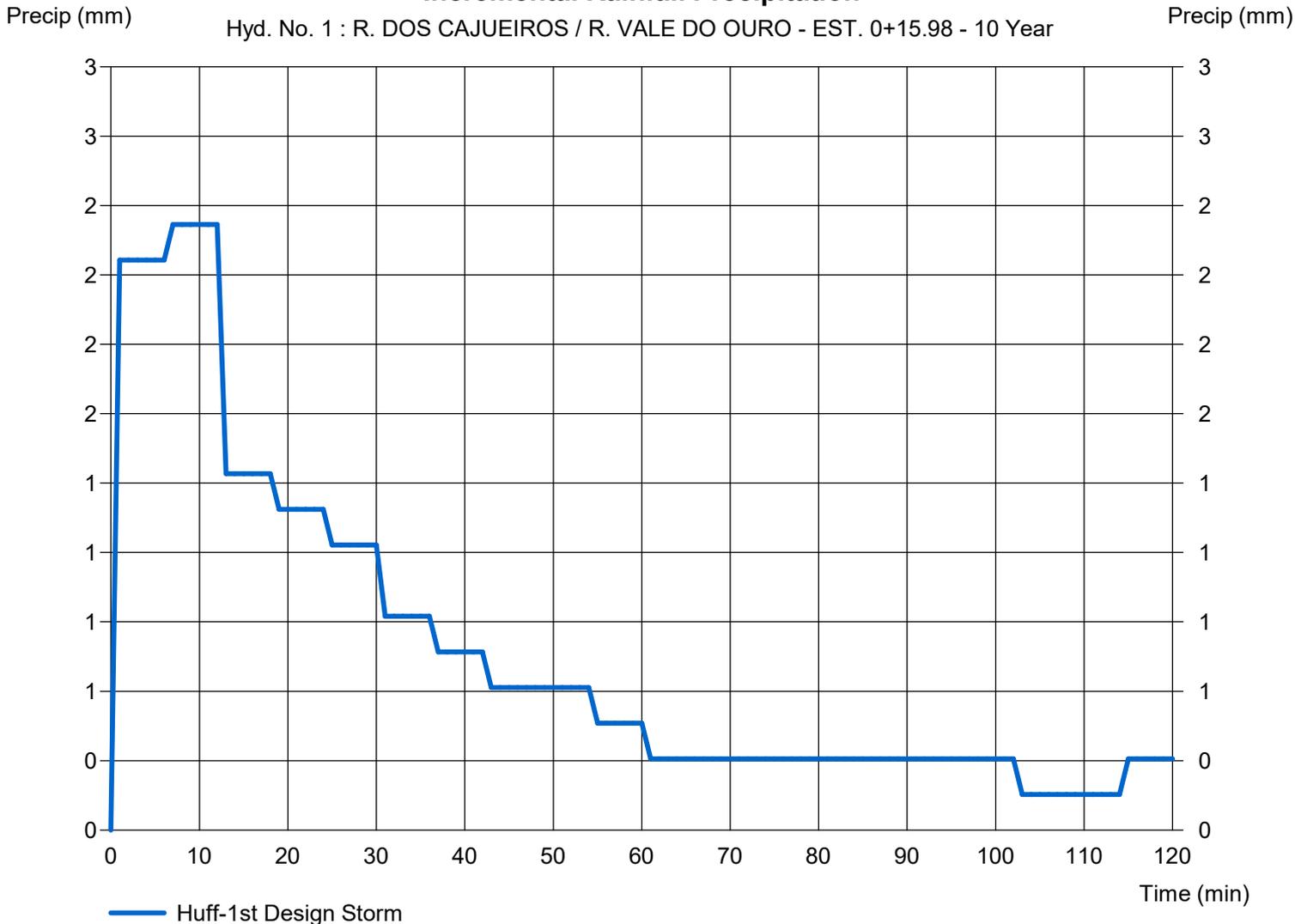
Wednesday, 08 / 31 / 2016

Hyd. No. 1

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 0+15.98

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 77.0 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs		

Incremental Rainfall Precipitation



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Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

1 - R. DOS CAJUEIROS / R. VALE DO OURO - EST. 35+14.33



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff R. DOS CAJUEIROS / R. VALE DO OURO - EST. 35+14.33

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cms)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	-----	-----	-----	0.977	-----	-----	-----	R. DOS CAJUEIROS / R. VALE DO
Proj. file: 0365-MC-34-HC-002_R-00.gpw									Wednesday, 08 / 31 / 2016		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	SCS Runoff	0.977	1	14	3,075.1	-----	-----	-----	R. DOS CAJUEIROS / R. VALE DO
0365-MC-34-HC-002_R-00.gpw					Return Period: 10 Year			Wednesday, 08 / 31 / 2016	

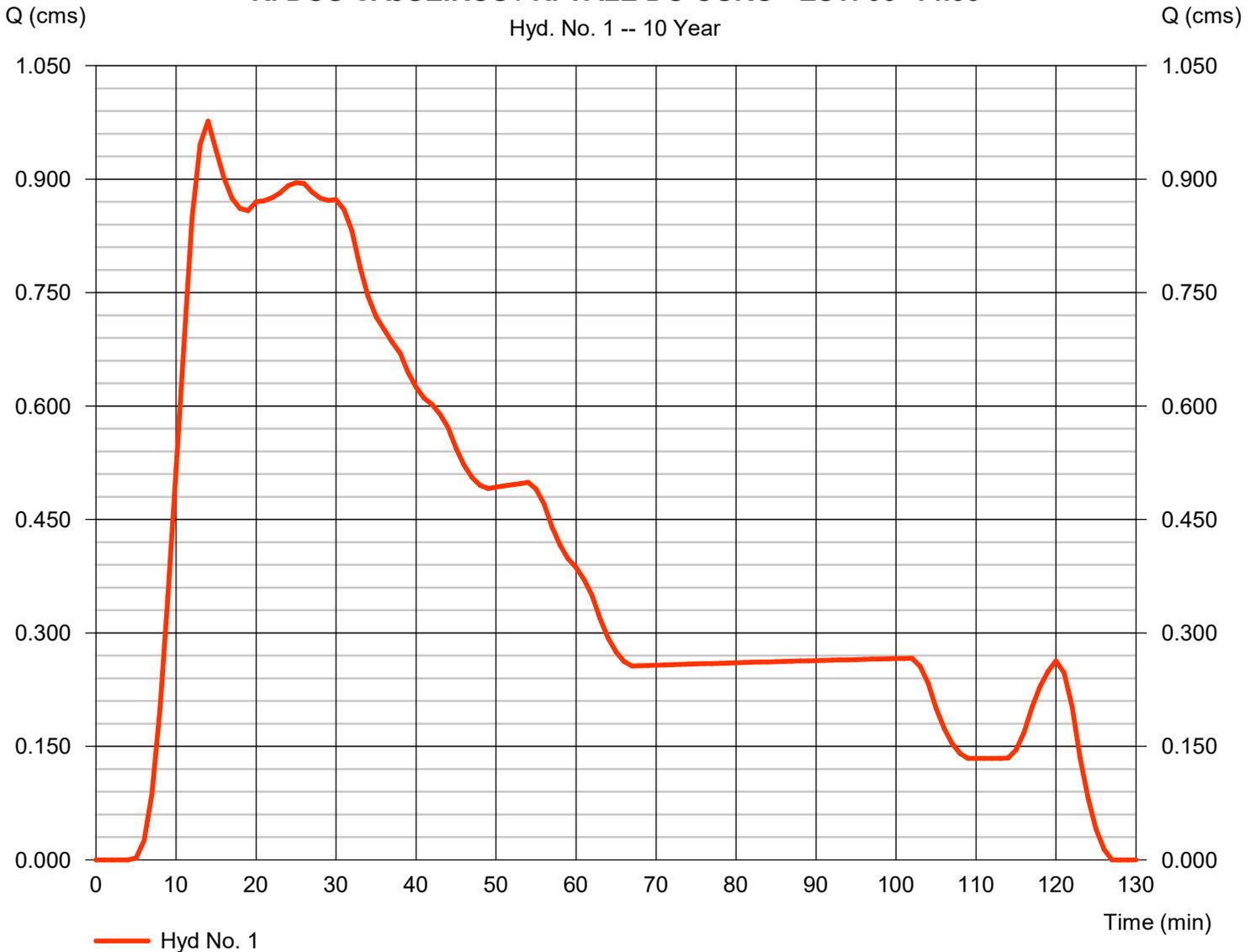
Hydrograph Report

Hyd. No. 1

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 35+14.33

Hydrograph type	= SCS Runoff	Peak discharge	= 0.977 cms
Storm frequency	= 10 yrs	Time to peak	= 14 min
Time interval	= 1 min	Hyd. volume	= 3,075.1 cum
Drainage area	= 7.500 hectare	Curve number	= 85
Basin Slope	= 13.5 %	Hydraulic length	= 334 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 3.70 min
Total precip.	= 77.00 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 35+14.33



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

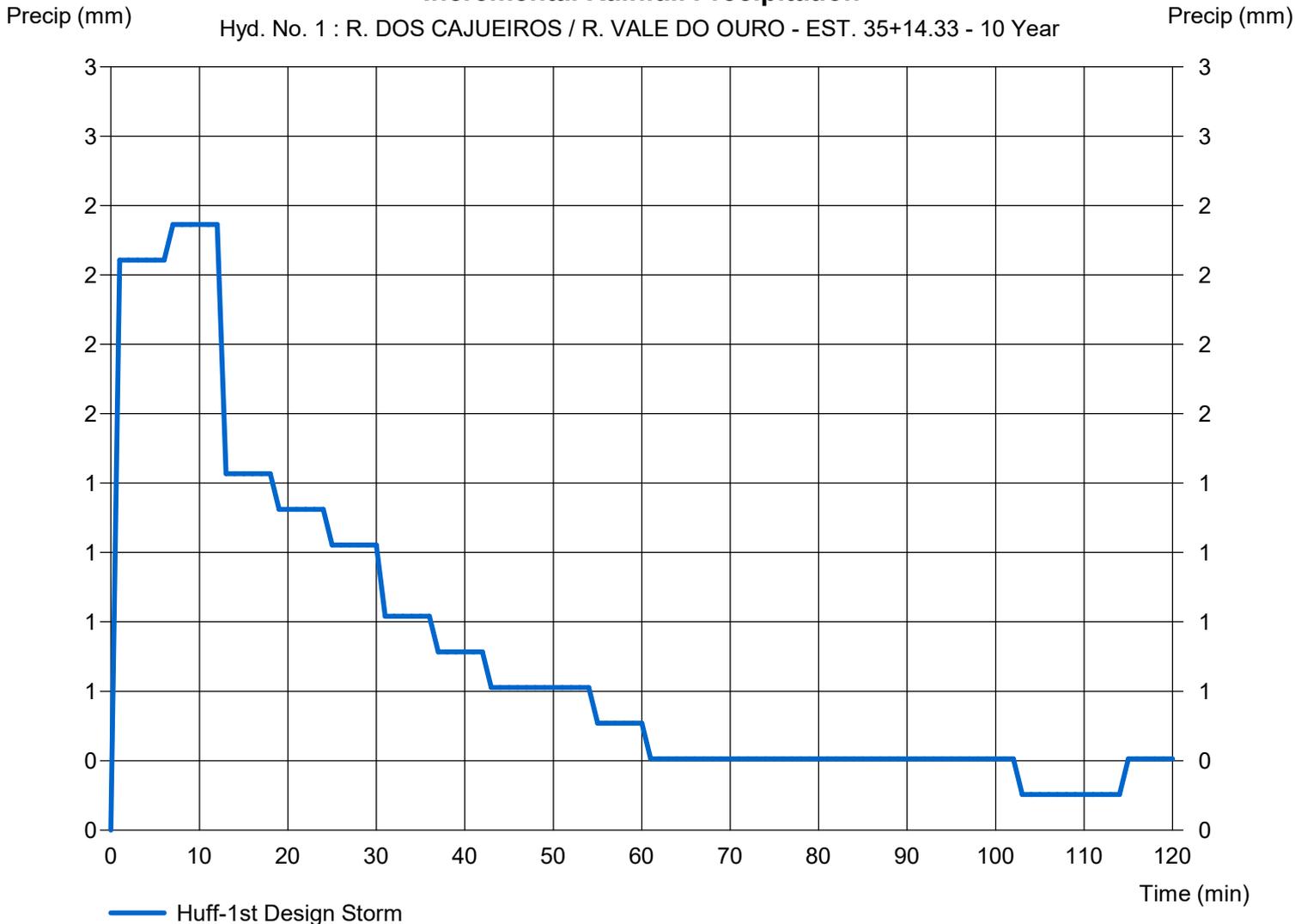
Wednesday, 08 / 31 / 2016

Hyd. No. 1

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 35+14.33

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 77.0 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs		

Incremental Rainfall Precipitation



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Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

1 - R. DOS CAJUEIROS / R. VALE DO OURO - EST. 40+08.13



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff R. DOS CAJUEIROS / R. VALE DO OURO - EST. 40+08.13

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cms)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	-----	-----	-----	9.900	-----	-----	-----	R. DOS CAJUEIROS / R. VALE DO
Proj. file: 0365-MC-34-HC-003_R-00.gpw									Wednesday, 08 / 31 / 2016		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	SCS Runoff	9.900	1	42	38,057.4	-----	-----	-----	R. DOS CAJUEIROS / R. VALE DO
0365-MC-34-HC-003_R-00.gpw					Return Period: 10 Year			Wednesday, 08 / 31 / 2016	

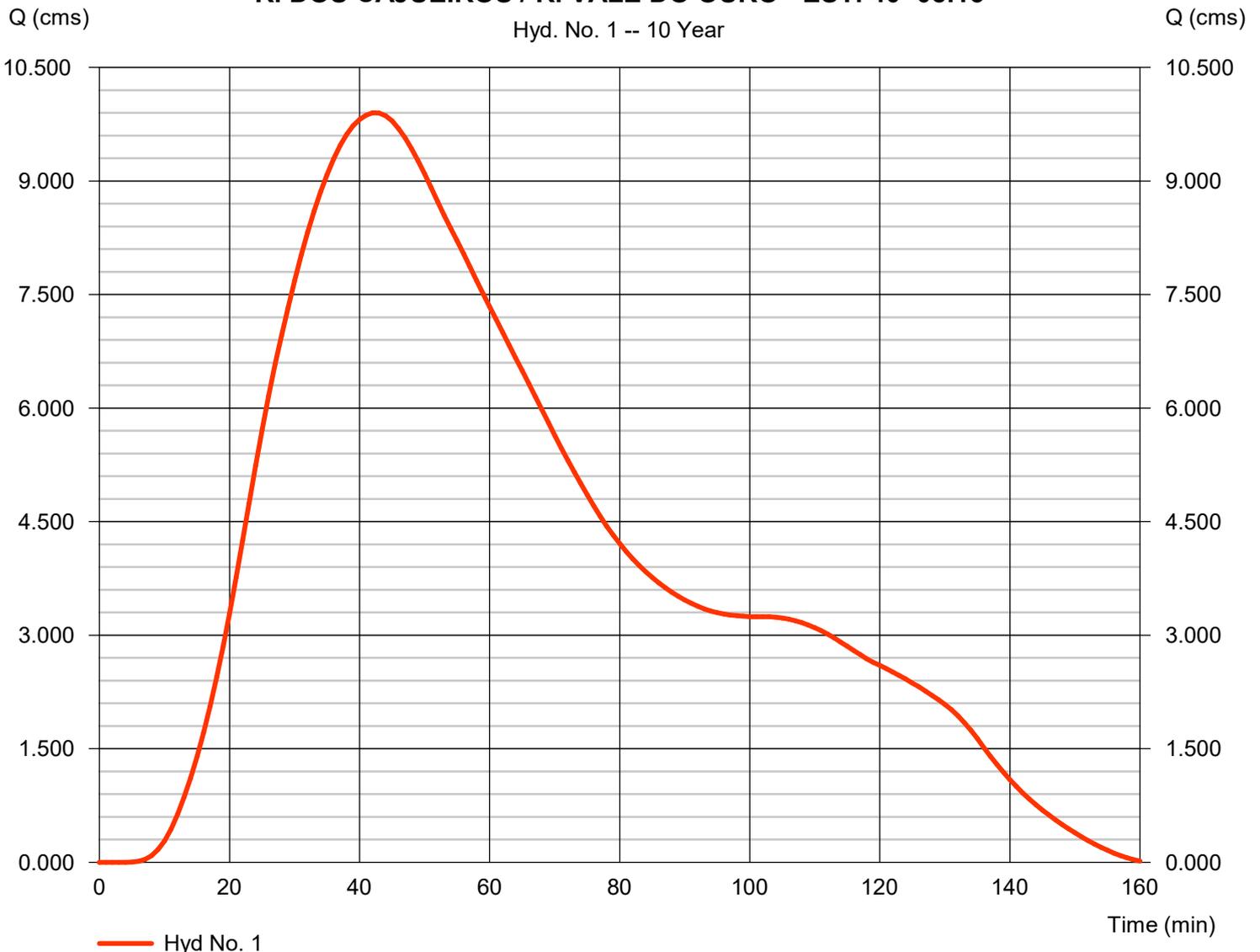
Hydrograph Report

Hyd. No. 1

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 40+08.13

Hydrograph type	= SCS Runoff	Peak discharge	= 9.900 cms
Storm frequency	= 10 yrs	Time to peak	= 42 min
Time interval	= 1 min	Hyd. volume	= 38,057.4 cum
Drainage area	= 92.100 hectare	Curve number	= 85
Basin Slope	= 2.9 %	Hydraulic length	= 2010 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 26.46 min
Total precip.	= 77.00 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 40+08.13



Precipitation Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

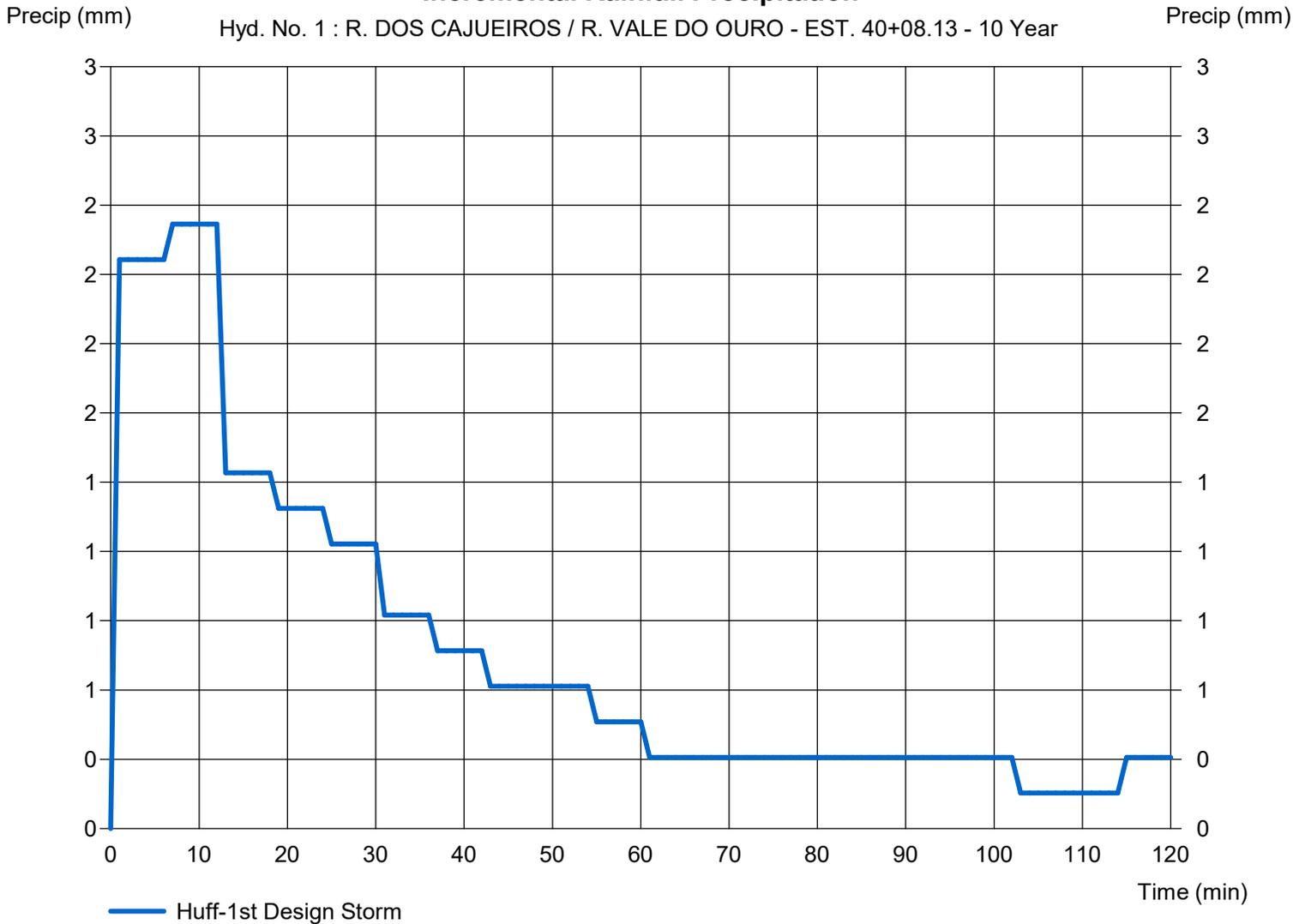
Wednesday, 08 / 31 / 2016

Hyd. No. 1

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 40+08.13

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 77.0 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs		

Incremental Rainfall Precipitation



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Culvert Report

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 00+15.98

Invert Elev Dn (m)	= 11.4300
Pipe Length (m)	= 11.0000
Slope (%)	= 0.7273
Invert Elev Up (m)	= 11.5100
Rise (mm)	= 1500.0
Shape	= Box
Span (mm)	= 2000.0
No. Barrels	= 1
n-Value	= 0.015
Culvert Type	= Flared Wingwalls
Culvert Entrance	= 30D to 75D wingwall flares
Coeff. K,M,c,Y,k	= 0.026, 1, 0.0347, 0.81, 0.4

Calculations

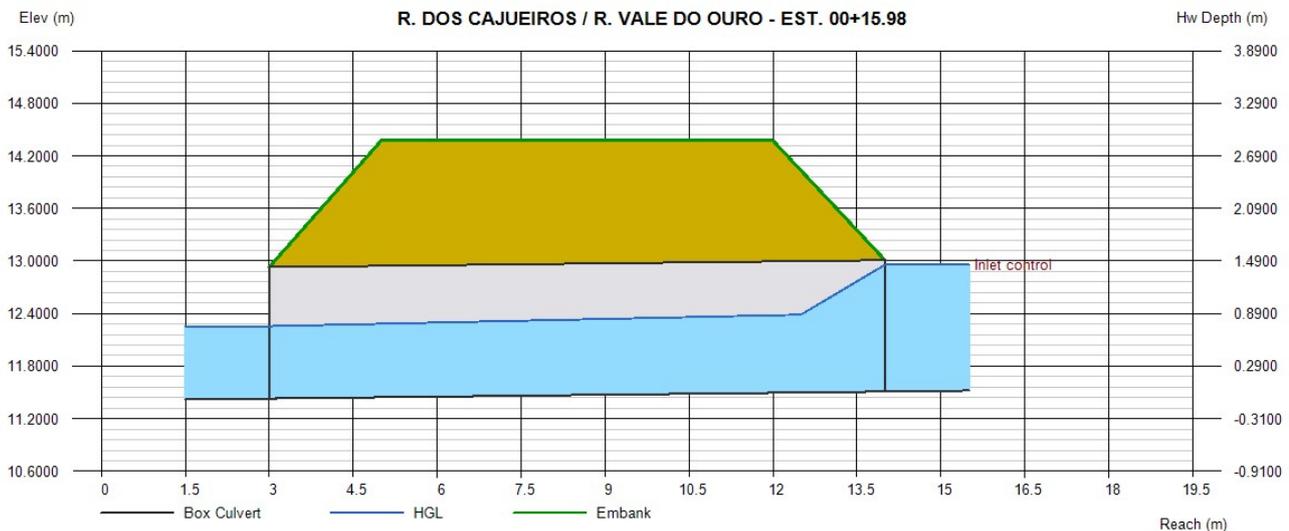
Qmin (cms)	= 5.3400
Qmax (cms)	= 5.3400
Tailwater Elev (m)	= 12.23

Highlighted

Qtotal (cms)	= 5.3400
Qpipe (cms)	= 5.3400
Qovertop (cms)	= 0.0000
Veloc Dn (m/s)	= 3.2324
Veloc Up (m/s)	= 2.9722
HGL Dn (m)	= 12.2560
HGL Up (m)	= 12.4083
Hw Elev (m)	= 12.9561
Hw/D (m)	= 0.9641
Flow Regime	= Inlet Control

Embankment

Top Elevation (m)	= 14.3740
Top Width (m)	= 7.0000
Crest Width (m)	= 100.0000



Culvert Report

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 35+14.33

Invert Elev Dn (m)	= 15.2300
Pipe Length (m)	= 11.0000
Slope (%)	= 1.9091
Invert Elev Up (m)	= 15.4400
Rise (mm)	= 1200.0
Shape	= Circular
Span (mm)	= 1200.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Calculations

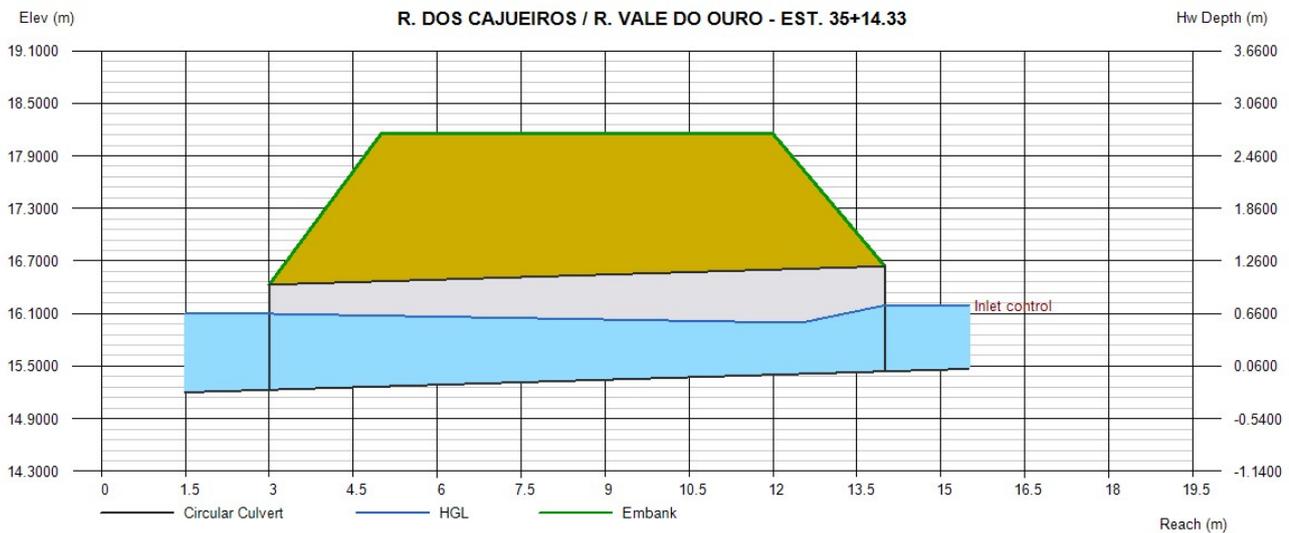
Qmin (cms)	= 0.9800
Qmax (cms)	= 0.9800
Tailwater Elev (m)	= (dc+D)/2

Highlighted

Qtotal (cms)	= 0.9800
Qpipe (cms)	= 0.9800
Qovertop (cms)	= 0.0000
Veloc Dn (m/s)	= 1.1190
Veloc Up (m/s)	= 1.9930
HGL Dn (m)	= 16.0977
HGL Up (m)	= 15.9784
Hw Elev (m)	= 16.1937
Hw/D (m)	= 0.6281
Flow Regime	= Inlet Control

Embankment

Top Elevation (m)	= 18.1520
Top Width (m)	= 7.0000
Crest Width (m)	= 100.0000



Culvert Report

R. DOS CAJUEIROS / R. VALE DO OURO - EST. 40+08.13

Invert Elev Dn (m)	= 14.1700
Pipe Length (m)	= 12.0000
Slope (%)	= 0.5833
Invert Elev Up (m)	= 14.2400
Rise (mm)	= 1500.0
Shape	= Box
Span (mm)	= 2000.0
No. Barrels	= 2
n-Value	= 0.015
Culvert Type	= Flared Wingwalls
Culvert Entrance	= 30D to 75D wingwall flares
Coeff. K,M,c,Y,k	= 0.026, 1, 0.0347, 0.81, 0.4

Calculations

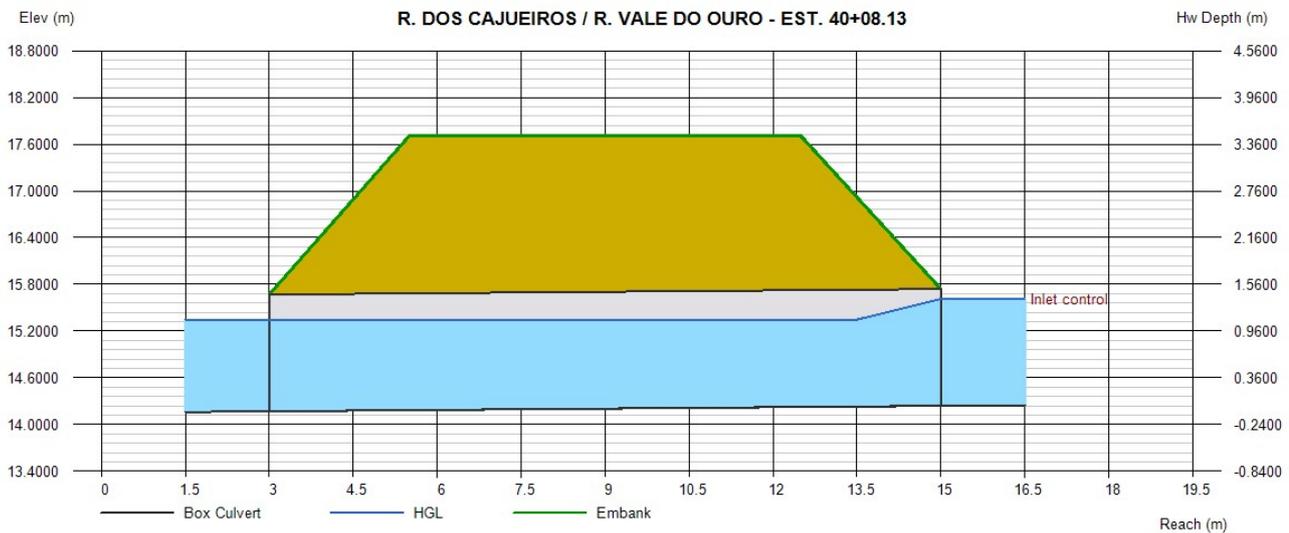
Qmin (cms)	= 9.9000
Qmax (cms)	= 9.9000
Tailwater Elev (m)	= (dc+D)/2

Highlighted

Qtotal (cms)	= 9.9000
Qpipe (cms)	= 9.9000
Qovertop (cms)	= 0.0000
Veloc Dn (m/s)	= 2.1027
Veloc Up (m/s)	= 2.2351
HGL Dn (m)	= 15.3470
HGL Up (m)	= 15.3473
Hw Elev (m)	= 15.6132
Hw/D (m)	= 0.9155
Flow Regime	= Inlet Control

Embankment

Top Elevation (m)	= 17.7040
Top Width (m)	= 7.0000
Crest Width (m)	= 100.0000



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

1 - R. GON?ALO A. PEREIRA - EST. 22+07.00



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff R. GON?ALO A. PEREIRA - EST. 22+07.00

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	SCS Runoff	0.636	1	13	1,845.1	-----	-----	-----	R. GON?ALO A. PEREIRA - EST. 2
0365-MC-35-HC-001_R-00.gpw					Return Period: 10 Year			Wednesday, 11 / 16 / 2016	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 11 / 16 / 2016

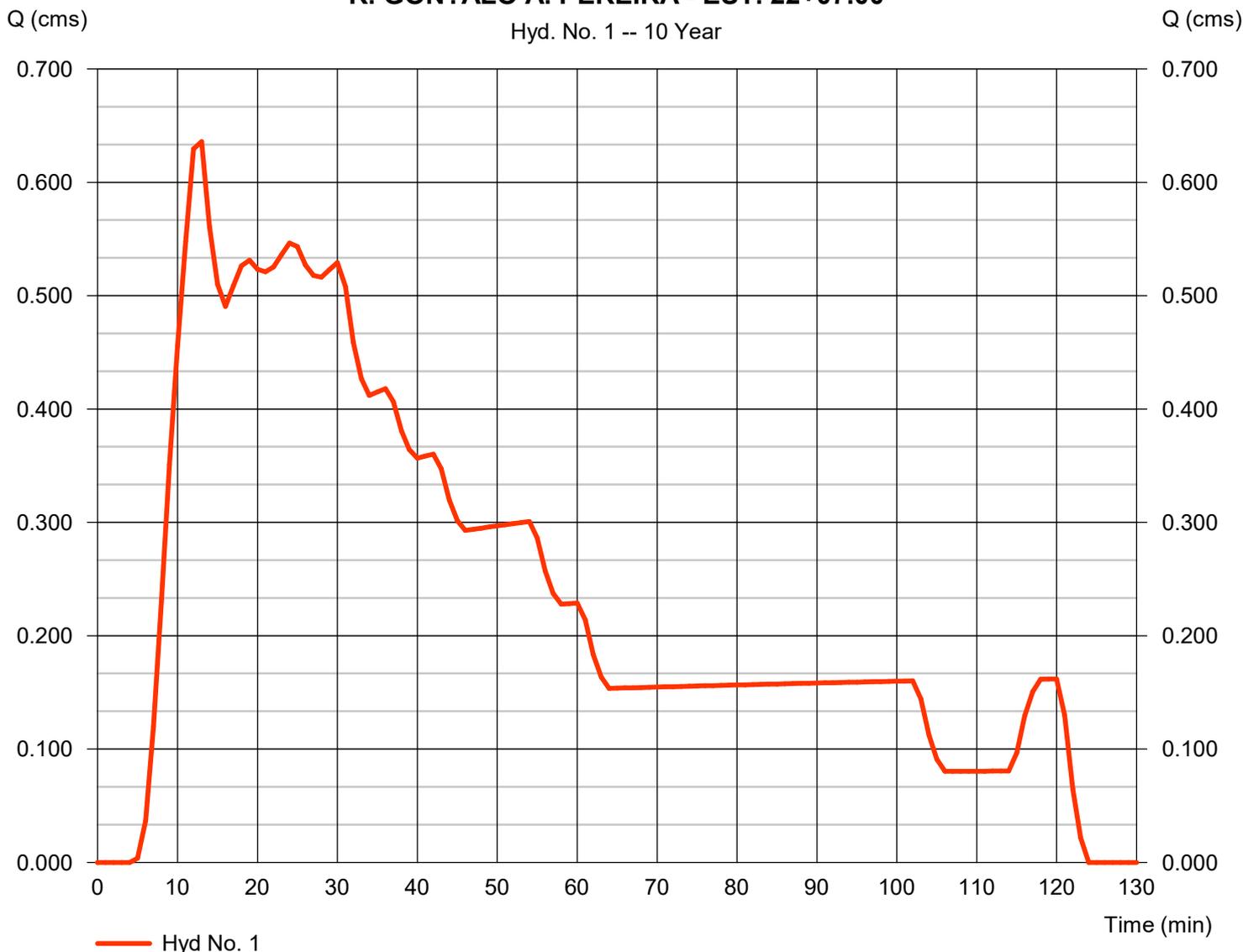
Hyd. No. 1

R. GON?ALO A. PEREIRA - EST. 22+07.00

Hydrograph type	= SCS Runoff	Peak discharge	= 0.636 cms
Storm frequency	= 10 yrs	Time to peak	= 13 min
Time interval	= 1 min	Hyd. volume	= 1,845.1 cum
Drainage area	= 4.800 hectare	Curve number	= 85
Basin Slope	= 16.6 %	Hydraulic length	= 229 m
Tc method	= KIRPICH	Time of conc. (Tc)	= 2.55 min
Total precip.	= 77.00 mm	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

R. GON?ALO A. PEREIRA - EST. 22+07.00

Hyd. No. 1 -- 10 Year



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Culvert Report

R GONCALO A. PEREIRA - EST. 22+07.00

Invert Elev Dn (m)	= 14.6800
Pipe Length (m)	= 13.0000
Slope (%)	= 0.4615
Invert Elev Up (m)	= 14.7400
Rise (mm)	= 1000.0
Shape	= Circular
Span (mm)	= 1000.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Calculations

Qmin (cms)	= 0.6400
Qmax (cms)	= 0.6400
Tailwater Elev (m)	= (dc+D)/2

Highlighted

Qtotal (cms)	= 0.6400
Qpipe (cms)	= 0.6400
Qovertop (cms)	= 0.0000
Veloc Dn (m/s)	= 1.0470
Veloc Up (m/s)	= 1.8501
HGL Dn (m)	= 15.4066
HGL Up (m)	= 15.1932
Hw Elev (m)	= 15.3868
Hw/D (m)	= 0.6468
Flow Regime	= Inlet Control

Embankment

Top Elevation (m)	= 18.2550
Top Width (m)	= 5.5000
Crest Width (m)	= 100.0000

