



July 28, 2020

Town of Marblehead Planning Board
Abbot Hall
188 Washington Street
Marblehead, MA 01945

Via Hand Delivery

**Subject: Definitive Subdivision Plan for
 Clark Lane Improvements
 Assessor's Map 120 Lot 28A & 28 – 4 & 5 Clark Lane**

Dear Planning Board:

On behalf of the Applicant, MPM Companies LLC, we herewith submit this Definitive Subdivision Plan for proposed improvements on Clark Lane. The plan involves extending the improved portion Clark Lane approximately 96-feet. The extension will be privately owned and maintained, consistent with the adjacent portion of Clark Lane.

Enclosed please find the following:

1. Four (4) copies of full size plans (Cover, C-1 thru C-3);
2. Marblehead Form C - Application;
3. Drainage Summary;
4. Filing Fee (\$389.70).

A certified abutters list has been requested and will be submitted under separate cover.

In summary, the project proposes to:

- A. Extend the improved portion of Clark Lane by approximately 96-feet within the existing 25-ft private right-of-way. The paved portion of the extension will be 20-feet wide;
- B. Construct a single-family residence at 4 Clark Lane with associated driveway, utilities and landscaping. The proposed residence will have a fire-suppression system;
- C. Extend water and sewer utilities from the existing easement on 5 Clark Lane and 99 Village Street property to the proposed residence;
- D. Extend overhead electrical, telephone, and cable services from an existing utility pole in Clark Lane to the new single-family residence; and
- E. Construct a subsurface stormwater infiltration structure to infiltrate stormwater runoff from the proposed building roof and roadway.

Due to the small size of the project and existing site constraints, the attached plans and the proposed improvements do not fully conform to the design standards published in

July 28, 2020

the Town of Marblehead Rules and Regulations Governing Subdivision of Land.

The Applicant requests waivers from the following:

Article IV – Definitive Plan

Section 258-14.C

Required: Street plans and profiles shall be drawn at a scale of 1"=40'.

Provided: Plans were drawn at a scale of 1"=20'.

Section 258-14.C

Required: Street plans and profiles shall be on the N.G.V.D 1929 datum.

Provided: Plan datum is N.A.V.D. of 1988. The plans are consistent with current Marblehead GIS maps.

Article V – Design Standards

Section 258-17.B.3.d

Required: Street width: 40-ft R.O.W. & 24-ft pavement width.

Provided: 25-ft R.O.W. exists with 20-ft pavement width proposed. The existing pavement at the southeast end of the improved portion of Clark Lane is approximately 20-ft wide.

Section 258-17.B.5

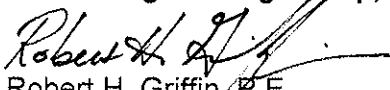
Required: Dead End Streets: 130' dia cul-de-sac (100' dia pavement).

Provided: A hammerhead type turn-around is proposed on the 5 Clark Lane parcel.

We look forward to meeting with the Board to describe this plan further and respond to questions or comments.

Very truly yours,

Griffin Engineering Group, LLC



Robert H. Griffin, P.E.

Enclosures as noted.

Cc: Town Clerk (Copy of Form C Application Only)
Marblehead Board of Health (1 copy & enclosures)
Marblehead Conservation Commission (1 copy & enclosures)
Marblehead Police Department (1 copy & enclosures)
Marblehead Fire Department (1 copy & enclosures)
Marblehead Highway Superintendent (1 copy & enclosures)
Marblehead Town Council (1 copy & enclosures)
M. McNiff, MPM Companies LLC (1 copy & enclosures)

FORM C

APPLICATION FOR APPROVAL OF DEFINITIVE PLAN

(Page 1 of 2)

To the Marblehead Planning Board:

The undersigned herewith submits the accompanying Definitive Plan of property located in the Town of Marblehead for approval as a subdivision under the requirements of the Subdivision Control Law and the Rules and Regulations governing the Subdivision of Land of the Planning Board of the Town of Marblehead.

1. Name of Owner: Barbara C. Pierce & Kenneth J. Clark

Address: 133 Linden Street, Exeter, NH, 03833

2. Name of Subdivider/Applicant (if different): MPM Companies, LLC

3. Name of Engineer and Surveyor: Griffin Engineering Group, LLC; Leblanc Survey Associates

Address: 495 Cabot Street, 2nd Floor, Beverly, MA; 161 Holten St, Danvers, MA

4. Deed of property recorded in Essex County Registry Book 3711, Page 406, or registered in Land Court as Document No. _____ and noted on Title of Certificate No. _____, registered in Book _____, Page _____.

5. Said parcel of land is described as follows:

A. Location and description of property _____

4 & 5 Clark Lane are located at the end of the Clark Lane private way
(see deed for legal description).

B. The proposed ways run from [No proposed way]
to project will improve an unconstructed portion of a private way (Clark Lane)
all as more particularly described and bounded on the plot filed herewith and made part of this application and agreement. The following are mortgages and other liens or encumbrances on the whole or any part of the above described property. (list mortgages, etc., here): _____

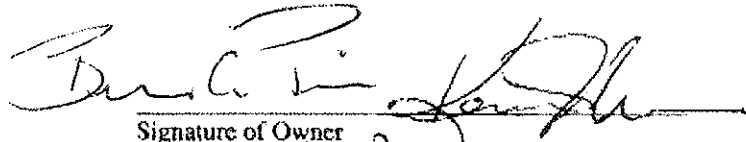
6. The undersigned hereby applies for approval of said plot by the Board. The undersigned hereby covenants and agrees with the Town of Marblehead upon approval of the plot.

A. To install the utilities and complete the ways as finally approved by the Board within _____ months from the date thereof;

B. To install utilities and complete the construction of ways, in accordance with the Marblehead Subdivision Rules and Regulations and approved Definitive Plans/documents incorporated herein and made part of this agreement.

C. This Agreement shall be binding upon the heirs, executors, administrators, and assigns - successors and assigns - of the undersigned.

D. To file with the Board of Selectmen of the Town of Marblehead, two (2) copies of final as-built plan of the utilities and the ways upon completion, along with proper instruments for the conveyance of all easements to the Town of Marblehead.



Signature of Owner

133 Linden St.
Exeter, NH 03833-4109

Address of Owner

3711

& Plan

I, Ruth E. Mann

406

of Marblehead, Essex County, Massachusetts,
being ~~unmarried~~, for consideration paid, grant to Loring E. Clark and Gladys E. Clark,
husband and wife, as tenants by the entirety, both

of said Marblehead, with quitclaim covenants

the land in said Marblehead, as shown on a plan entitled, "Marblehead, Mass., Land off Village St." dated Oct. 1949 R.O. Burlington, Land Surveyor, to be filed ~~herewith~~ herewith and bounded:

Beginning at a point at the Northeastly corner of land of Clark about one hundred twelve and thirty-three one-hundredths (112.33) feet Northeastly from Village Street and being on the Northwestly line of land now or formerly of Robinson; thence Northwestly about one hundred fifteen (115) feet to land now or formerly of Mann; thence Northeastly about sixty-two and five-tenths (62.5) feet; thence Southeastly one hundred three (103) feet to land now or formerly of Robinson; thence Southwestly about sixty-four (64) feet measured on said Northwestly line of Robinson to the point of beginning. Said parcel containing about 6815 Sq. Ft.

In addition another parcel, which begins at a point on the Northwestly line of land of Robinson about two hundred one and thirty-three one-hundredths (201.33) feet from the Northeastly line of Village Street; thence Northwestly about ninety-seven and five-tenths (97.5) feet to land now or formerly of Mann; thence Northeastly about sixty-two and five-tenths (62.5) feet to land now or formerly of Nicholson; thence Southeastly about eighty-three and seven-tenths (83.7) feet to land now or formerly of Robinson; thence Southwestly about sixty-four (64) feet to the point of beginning. Said parcel containing about 5641 Sq. Ft.

Together with a right of way in and over a twenty-five (25) foot strip of land of the grantor, extending from land now or formerly of Robinson Northwestly about one hundred (100) feet, and situate between the above described parcels.

Being a portion of the land conveyed to me by deed of Luke B. Colbert, Administrator of the Estate of John F. Power, late of Marblehead, Essex County, Massachusetts, acting under a license of the Probate Court within and for said County of Essex, dated November 12, 1923, and recorded in Essex South District Registry of Deeds, Book 2579 Page 516.



Witness my hand and seal this thirteenth day of December 1949.

Ruth E. Mann

The Commonwealth of Massachusetts

Essex ss.

December 13, 1949

Then personally appeared the above named Ruth E. Mann

and acknowledged the foregoing instrument to be her free act and deed, before me,

Richard H. Rockett
Notary Public - ~~Essex County, Massachusetts~~

My commission expires Nov. 7, 1953.

Essex ss. Received Dec. 20, 1949. 21 m. past 10 A.M. Recorded and Examined.

20

Approved *Wm. J. M. Little*
Director.

SALEM CO-OPERATIVE BANK holder of a mortgage
from Doris Bent Sawyer
to the SALEM CO-OPERATIVE BANK
dated May 4, 1948,
recorded with the ESSEX REGISTRY OF DEEDS, SOUTH DISTRICT
Book 3600, Page 184, acknowledges satisfaction of the same.

In witness whereof the said SALEM CO-OPERATIVE BANK
has caused its corporate seal to be hereto affixed and these presents to be signed, in its name and behalf
by H. Willard Horne its Asst. Treas. this 16th day of
December A. D. 19 49.

SALEM CO-OPERATIVE BANK

by

H. Willard Horne
Assistant



The Commonwealth of Massachusetts

ESSEX, SS.

December 16, 1949.

Then personally appeared the above named H. Willard Horne and acknowledged
the foregoing instrument to be the free act and deed of the SALEM CO-OPERATIVE BANK.

before me,

Daniel C. Fitz
Daniel C. Fitz.

Daniel C. Fitz
Notary Public.

My commission expires March 26, 1954.

Essex ss. Received Dec. 20, 1949. 27 m. past 10 A.M. Recorded and Examined.

Drainage Summary

Clark Lane Improvements & Construction of a Single-Family Residence

MPM Companies, LLC 4 & 5 Clark Lane, Marblehead, MA

This report is prepared in support of the proposed roadway improvements and single-family residence construction at 4 & 5 Clark Lane (Assessors Map 120 Lots 28A and 28) in Marblehead, MA. The project consists of improving approximately 100 linear-feet of Clark Lane (an existing, private way) and constructing one single-family residence at 4 Clark Lane, with frontage on the newly improved way.

This drainage analysis was prepared in accordance with the Town of Marblehead Subdivision regulations, Section 258-17C(3).

PRE-DEVELOPMENT CONDITIONS

The two properties are currently undeveloped and consist primarily woodland vegetation. The properties are situated at the end of Clark Lane on opposite sides of the 25-ft wide private way. They are bounded to the East by the Village Middle School and elsewhere by developed residential properties. The properties are located at the top of a hill; site topography is moderately sloped in all directions. Exposed ledge is visible on both parcels and within the 25-ft private way.

Soils within the site are mapped by the Soil Conservation Service (Essex Co. Massachusetts Southern Part Soil Survey, 1984) as belonging to the Paxton – Urban land complex soil map unit. These soils consist of well-drained, shallow Paxton soils and are classified in the “C” hydrologic soil group (HSG); the urban land soils are in HSG “D”. Due to the presence of exposed ledge at the site and the HSG designations above, the “D” hydrologic soil group was assigned for this analysis.

POST-DEVELOPMENT CONDITIONS

The project involves extending the improved portion of Clark Lane and constructing a single-family residence at 4 Clark Lane. The proposed development scheme is shown on the project plans and is described as follows:

- 1) Clark Lane Extension. The Applicant proposes to extend the improved portion of Clark Lane by approximately 96-feet. The proposed pavement width is 20-ft. A hammerhead turn-around is proposed at the end of the roadway. A turning easement located on the 5 Clark Lane parcel is required to accommodate the hammerhead. The roadway surface was assigned a runoff curve number of 98 for calculation purposes.
- 2) Construction of Residence. The Applicant is proposing to construct an approximately 1,400 sq. ft. single-family residence on the 4 Clark Lane parcel. The proposed dwelling will be constructed on a conventional cast-in place concrete foundation. Stormwater runoff from the roofs will be captured and conveyed to the

proposed stormwater infiltration structure via gutters, downspouts, and 6-inch diameter PVC roof leaders. The roof was assigned a runoff curve number of 98 for calculation purposes.

- 3) Stormwater Infiltration. To accommodate the increase in impervious surfaces associated with the proposed road improvements and residence construction, a subsurface infiltration field consisting of twelve (12) SC-740 plastic chambers set in a bed of crushed stone and wrapped in geotextile fabric is proposed. Stormwater runoff from the majority of the roadway and driveway will be directed into two catchbasins within the roadway. For infiltration system design, the Rawls Rate of 1.02 in/hr for Sandy Loam was used based on the Paxton soil profile.

Hydrologic modeling was conducted using the HydroCAD computer model. This model uses an approximation of Soil Conservation Service TR-20 methods to calculate runoff rates and volumes based on descriptions of land use, ground characteristics, and size.

The time of concentration (Tc) for each subcatchment was calculated in HydroCAD using a combination of sheet flow and shallow concentrated flow. Sheet flow uses roughness coefficients (Manning's *n*) and watercourse slope to calculate travel time of stormwater runoff for each subcatchment. The site was modeled using a maximum of 100-feet of sheet flow. The shallow concentrated flow method was used to determine the velocity factor along the flow path of the runoff and thereby derive a travel time. The time of concentration of each subcatchment is the combination of these travel times. A minimum time of concentration of 6 minutes was used for all subcatchments, for both existing and proposed conditions. Type-III rainfall patterns were used as an input parameter to generate runoff. Hydrographs representing the total discharge from the site are attached for the 1, 10, and 100-year, 24-hour design storm events. The calculated existing and proposed peak stormwater runoff rates and total runoff volumes are summarized for each design storm in Tables 1 and 2.

Table 1: Comparison of Pre-Development and Post Development Peak Runoff Rates

<u>Subcatchment</u>	Storm Frequency		
	1-Year	10-Year	100-Year
Pre-Development	0.25	0.74	1.28
Post-Development	0.22	0.65	1.11

Note: Runoff rates are shown in cubic feet per second (cfs).

Table 2: Comparison of Pre-Development and Post Development Total Runoff Volumes

<u>Subcatchment</u>	Storm Frequency		
	1-Year	10-Year	100-Year
Pre-Development	1,096	3,110	5,404
Post-Development	842	2,333	4,441

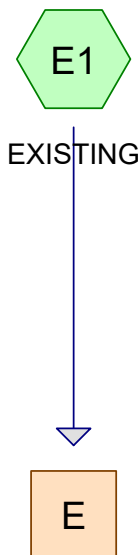
Note: Runoff volumes are shown in cubic feet (cf).

Tables 1 and 2 show a reduction in both peak stormwater runoff rates and total runoff volume for the 1, 10, and 100-year design storm events when comparing pre-development to post-development conditions. The calculations demonstrate that post-development storm discharges from the site will be less than the pre-development discharges for all storm events.

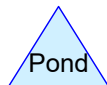
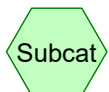
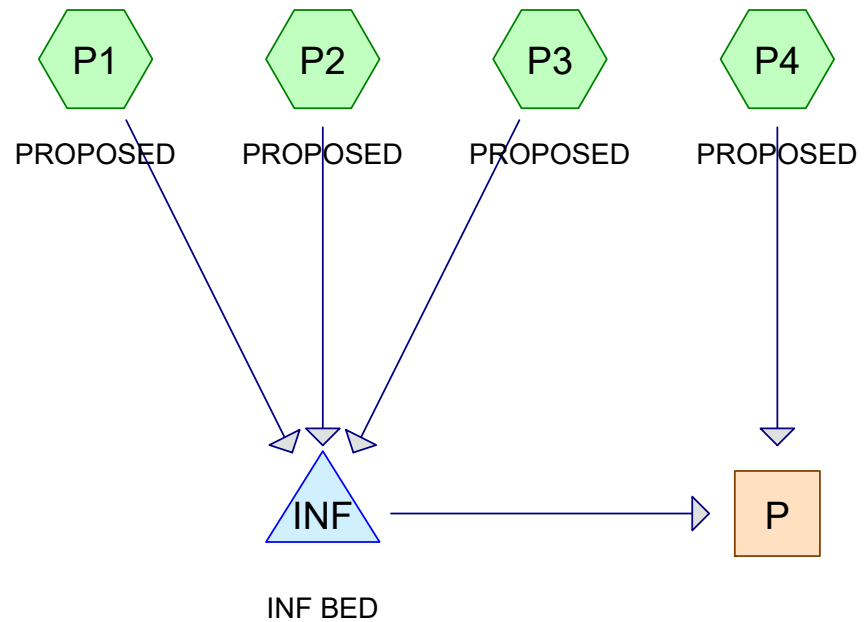
SUMMARY

The proposed project involved the construction of approximately 100 linear feet of road and one single-family residence. To mitigate for increased runoff from the new impervious associated with the proposed development, stormwater runoff will be conveyed to a subsurface infiltration field. As proposed, the peak runoff rate and volume of stormwater runoff will be satisfactorily controlled as required by the Town of Marblehead Subdivision Regulations.

EXISTING



PROPOSED



Routing Diagram for MPM Companies, LLC - Clark Lane Improvements(2020

Prepared by Griffin Engineering Group, LLC

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MPM Companies, LLC - Clark Lane Improvements(2020)

Prepared by Griffin Engineering Group, LLC

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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
7,165	80	>75% Grass cover, Good, HSG D (P4)
2,922	98	Paved parking (P1, P3)
316	98	Pavement (P4)
1,412	98	Roofs (P2)
120	98	Walkway (P4)
19,475	79	Woods, Fair, HSG D (E1, P4)
31,410	82	TOTAL AREA

Summary for Subcatchment E1: EXISTING

Runoff = 0.25 cfs @ 12.24 hrs, Volume= 1,096 cf, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.50"

Area (sf)	CN	Description
15,705	79	Woods, Fair, HSG D
15,705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	100	0.0460	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	20	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
16.1	120	Total			

Summary for Subcatchment P1: PROPOSED

Runoff = 0.12 cfs @ 12.08 hrs, Volume= 406 cf, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.50"

Area (sf)	CN	Description
* 2,145	98	Paved parking
2,145		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	78	0.0400	1.70		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.10"
5.2					Direct Entry, 6' (min.)
6.0	78	Total			

Summary for Subcatchment P2: PROPOSED

Runoff = 0.08 cfs @ 12.08 hrs, Volume= 267 cf, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.50"

Area (sf)	CN	Description
* 1,412	98	Roofs
1,412		100.00% Impervious Area

MPM Companies, LLC - Clark Lane Improvements(202Type III 24-hr 1-Year Rainfall=2.50"

Prepared by Griffin Engineering Group, LLC

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6' (min.)

Summary for Subcatchment P3: PROPOSED

Runoff = 0.04 cfs @ 12.08 hrs, Volume= 147 cf, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.50"

Area (sf)	CN	Description
* 777	98	Paved parking
777		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0400	1.45		Sheet Flow,
					Smooth surfaces n= 0.011 P2= 3.10"
5.6					Direct Entry, 6' (min.)
6.0	35	Total			

Summary for Subcatchment P4: PROPOSED

Runoff = 0.22 cfs @ 12.16 hrs, Volume= 842 cf, Depth= 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.50"

Area (sf)	CN	Description
* 120	98	Walkway
3,770	79	Woods, Fair, HSG D
7,165	80	>75% Grass cover, Good, HSG D
* 316	98	Pavement
11,371	80	Weighted Average
10,935		96.17% Pervious Area
436		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	70	0.0600	0.11		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Reach E:

Inflow Area = 15,705 sf, 0.00% Impervious, Inflow Depth = 0.84" for 1-Year event
 Inflow = 0.25 cfs @ 12.24 hrs, Volume= 1,096 cf
 Outflow = 0.25 cfs @ 12.24 hrs, Volume= 1,096 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach P:

Inflow Area = 15,705 sf, 30.37% Impervious, Inflow Depth = 0.64" for 1-Year event
 Inflow = 0.22 cfs @ 12.16 hrs, Volume= 842 cf
 Outflow = 0.22 cfs @ 12.16 hrs, Volume= 842 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond INF: INF BED

Inflow Area = 4,334 sf, 100.00% Impervious, Inflow Depth = 2.27" for 1-Year event
 Inflow = 0.24 cfs @ 12.08 hrs, Volume= 820 cf
 Outflow = 0.01 cfs @ 10.47 hrs, Volume= 820 cf, Atten= 95%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 10.47 hrs, Volume= 820 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 77.21' @ 14.13 hrs Surf.Area= 512 sf Storage= 380 cf

Plug-Flow detention time= 267.4 min calculated for 820 cf (100% of inflow)
 Center-of-Mass det. time= 267.4 min (1,029.3 - 761.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	76.00'	496 cf	20.50'W x 24.98'L x 3.50'H Field A 1,792 cf Overall - 551 cf Embedded = 1,241 cf x 40.0% Voids
#2A	76.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	79.50'	0 cf	0.50'D x 1.00'H Vertical Cone/Cylinder -Impervious
		1,048 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	76.00'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#2	Primary	80.00'	6.0" Horiz. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 10.47 hrs HW=76.05' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=76.00' (Free Discharge)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Subcatchment E1: EXISTING

Runoff = 0.74 cfs @ 12.22 hrs, Volume= 3,110 cf, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
15,705	79	Woods, Fair, HSG D
15,705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	100	0.0460	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	20	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
16.1	120	Total			

Summary for Subcatchment P1: PROPOSED

Runoff = 0.22 cfs @ 12.08 hrs, Volume= 762 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
* 2,145	98	Paved parking
2,145		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	78	0.0400	1.70		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.10"
5.2					Direct Entry, 6' (min.)
6.0	78	Total			

Summary for Subcatchment P2: PROPOSED

Runoff = 0.14 cfs @ 12.08 hrs, Volume= 502 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
* 1,412	98	Roofs
1,412		100.00% Impervious Area

MPM Companies, LLC - Clark Lane Improvements(20Type III 24-hr 10-Year Rainfall=4.50"

Prepared by Griffin Engineering Group, LLC

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6' (min.)

Summary for Subcatchment P3: PROPOSED

Runoff = 0.08 cfs @ 12.08 hrs, Volume= 276 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
* 777	98	Paved parking
777		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0400	1.45		Sheet Flow,
					Smooth surfaces n= 0.011 P2= 3.10"
5.6					Direct Entry, 6' (min.)
6.0	35	Total			

Summary for Subcatchment P4: PROPOSED

Runoff = 0.65 cfs @ 12.15 hrs, Volume= 2,333 cf, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
* 120	98	Walkway
3,770	79	Woods, Fair, HSG D
7,165	80	>75% Grass cover, Good, HSG D
* 316	98	Pavement
11,371	80	Weighted Average
10,935		96.17% Pervious Area
436		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	70	0.0600	0.11		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Reach E:

Inflow Area = 15,705 sf, 0.00% Impervious, Inflow Depth = 2.38" for 10-Year event
 Inflow = 0.74 cfs @ 12.22 hrs, Volume= 3,110 cf
 Outflow = 0.74 cfs @ 12.22 hrs, Volume= 3,110 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach P:

Inflow Area = 15,705 sf, 30.37% Impervious, Inflow Depth = 1.78" for 10-Year event
 Inflow = 0.65 cfs @ 12.15 hrs, Volume= 2,333 cf
 Outflow = 0.65 cfs @ 12.15 hrs, Volume= 2,333 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond INF: INF BED

Inflow Area = 4,334 sf, 100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
 Inflow = 0.44 cfs @ 12.08 hrs, Volume= 1,540 cf
 Outflow = 0.01 cfs @ 8.57 hrs, Volume= 1,324 cf, Atten= 97%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 8.57 hrs, Volume= 1,324 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 78.78' @ 16.02 hrs Surf.Area= 512 sf Storage= 898 cf

Plug-Flow detention time= 554.6 min calculated for 1,324 cf (86% of inflow)
 Center-of-Mass det. time= 492.3 min (1,242.1 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	76.00'	496 cf	20.50'W x 24.98'L x 3.50'H Field A 1,792 cf Overall - 551 cf Embedded = 1,241 cf x 40.0% Voids
#2A	76.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	79.50'	0 cf	0.50'D x 1.00'H Vertical Cone/Cylinder -Impervious
		1,048 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	76.00'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#2	Primary	80.00'	6.0" Horiz. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 8.57 hrs HW=76.05' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=76.00' (Free Discharge)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Subcatchment E1: EXISTING

Runoff = 1.28 cfs @ 12.22 hrs, Volume= 5,404 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
15,705	79	Woods, Fair, HSG D
15,705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	100	0.0460	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	20	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
16.1	120	Total			

Summary for Subcatchment P1: PROPOSED

Runoff = 0.31 cfs @ 12.08 hrs, Volume= 1,119 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 2,145	98	Paved parking
2,145		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	78	0.0400	1.70		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.10"
5.2					Direct Entry, 6' (min.)
6.0	78	Total			

Summary for Subcatchment P2: PROPOSED

Runoff = 0.21 cfs @ 12.08 hrs, Volume= 737 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 1,412	98	Roofs
1,412		100.00% Impervious Area

MPM Companies, LLC - Clark Lane Improvements(2Type III 24-hr 100-Year Rainfall=6.50"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6' (min.)

Summary for Subcatchment P3: PROPOSED

Runoff = 0.11 cfs @ 12.08 hrs, Volume= 405 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 777	98	Paved parking
777		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0400	1.45		Sheet Flow,
					Smooth surfaces n= 0.011 P2= 3.10"
5.6					Direct Entry, 6' (min.)
6.0	35	Total			

Summary for Subcatchment P4: PROPOSED

Runoff = 1.11 cfs @ 12.14 hrs, Volume= 4,013 cf, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 120	98	Walkway
3,770	79	Woods, Fair, HSG D
7,165	80	>75% Grass cover, Good, HSG D
* 316	98	Pavement
11,371	80	Weighted Average
10,935		96.17% Pervious Area
436		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	70	0.0600	0.11		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Reach E:

Inflow Area = 15,705 sf, 0.00% Impervious, Inflow Depth = 4.13" for 100-Year event

Inflow = 1.28 cfs @ 12.22 hrs, Volume= 5,404 cf

Outflow = 1.28 cfs @ 12.22 hrs, Volume= 5,404 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach P:

Inflow Area = 15,705 sf, 30.37% Impervious, Inflow Depth = 3.39" for 100-Year event
 Inflow = 1.11 cfs @ 12.14 hrs, Volume= 4,441 cf
 Outflow = 1.11 cfs @ 12.14 hrs, Volume= 4,441 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond INF: INF BED

Inflow Area = 4,334 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.63 cfs @ 12.08 hrs, Volume= 2,261 cf
 Outflow = 0.39 cfs @ 12.34 hrs, Volume= 1,821 cf, Atten= 39%, Lag= 15.4 min
 Discarded = 0.01 cfs @ 7.13 hrs, Volume= 1,393 cf
 Primary = 0.37 cfs @ 12.34 hrs, Volume= 428 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 80.07' @ 12.34 hrs Surf.Area= 512 sf Storage= 1,048 cf

Plug-Flow detention time= 436.6 min calculated for 1,821 cf (81% of inflow)

Center-of-Mass det. time= 360.1 min (1,104.1 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	76.00'	496 cf	20.50'W x 24.98'L x 3.50'H Field A 1,792 cf Overall - 551 cf Embedded = 1,241 cf x 40.0% Voids
#2A	76.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	79.50'	0 cf	0.50'D x 1.00'H Vertical Cone/Cylinder -Impervious
		1,048 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	76.00'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#2	Primary	80.00'	6.0" Horiz. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 7.13 hrs HW=76.05' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.36 cfs @ 12.34 hrs HW=80.07' (Free Discharge)

↑**2=Orifice/Grate** (Weir Controls 0.36 cfs @ 0.85 fps)