FUNCTIONAL SERVICING
and
STORMWATER MANAGEMENT REPORT

of

THE PROPOSED HOME FARM

RESIDENTIAL SUBDIVISION

for

MacPherson Builders (Blue Mountains) Ltd.

Comprised of

Part of Lot 20, Concession 2,

Lots 2,3,4,5,6 & 7, R.P. 555 &

Part of Lot 159, R.P. 529.

Town of the Blue Mountains

County of Grey

Prepared by:

Higgins Engineering Ltd.
416 Moore Avenue, Suite 306,
TORONTO, Ontario.
M4G 1C9

(Phone) (416) 443-8001
Our Ref: 02-1410
Dated: 26 February 2015

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INTRODUCTION

Higgins Engineering Limited was retained by MacPherson Builders (Blue Mountains) Ltd. to prepare a Stormwater Management and Functional Servicing Report as part of the approval process for a proposed Draft Plan of Subdivision. The project is known locally as 'The Home Farm'.

The lands are located along the east side of Grey County Road 19 opposite the Craigleith Ski Club ski hills, see Figure 1. The Draft Plan is comprised of residential units, roads, lands to be dedicated to the Town of Blue Mountains for Open Space, the Plater Martin archaeological site and lands to be retained by the Owner. The legal description of the property is Part Lot 20, Concession 2, Lots 2,3,4,5,6 & 7, Registered Plan 555 and Lot 159 Registered Plan 529, Town of the Blue Mountains.

This report outlines the road, water, sanitary, storm and the stormwater management proposed for servicing the subdivision. The project is being processed toward Draft Plan approval by the Town of the Blue Mountains and the Grey County.

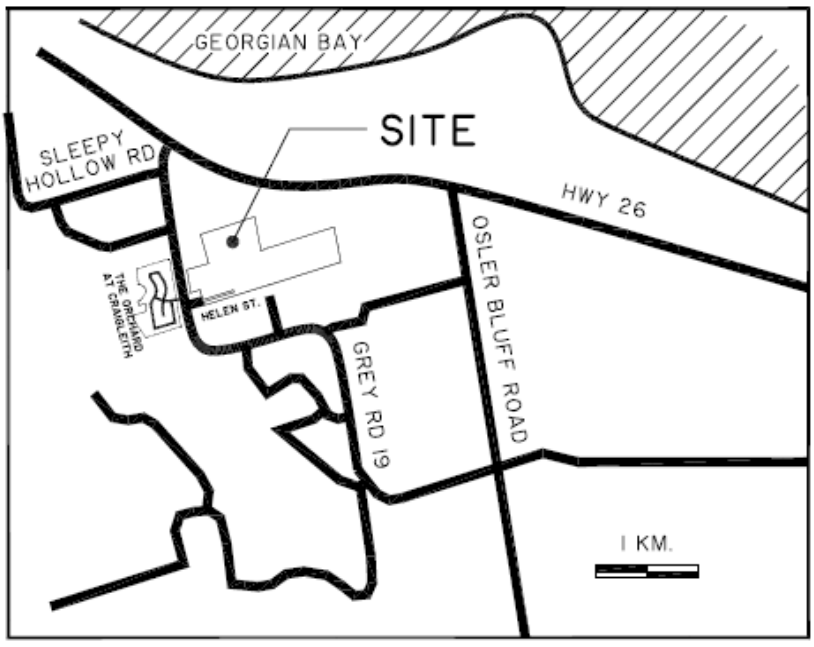


Figure 1, Location

BACKGROUND

The lands are designated Escarpment Recreational in the Official Plan with indications of floodplain and sloped areas. The lands are designated Recreational Residential in the Official Plan (RR-50) and are currently zoned Deferred Development (DD) and Hazard (H). The existing 7 lots on Helen Street are zoned Residential (RS).

The lands were included in the "Craigleith Camperdown Subwatershed Study" by Gore and Storrie dated November 1993. The main watercourse traversing the site is not, however, contained within the flood plain area shown in the Official Plan.

The lands are also subject to a Master Servicing Plan adopted by the Town of the Blue Mountains Council on June 19, 2000. As part of the Master Servicing Plan for Service Area 1 (Craigleith), the area sanitary servicing was addressed. Subsequent to this Plan a sanitary sewer was extended along Grey Road 19, to the Home Farm site. This work was done in conjunction with the servicing of "The Orchard" Condominium project.

The lands immediately to the west (The Orchard) at the foot of Craigleith Ski Hills were developed subject to a Functional Servicing Report and Stormwater Management (SWM) Study by Higgins Engineering Ltd (January 2005). The lands downstream (Eden Oak) are being developed subject to a Functional Servicing and SWM Report by C.F.Crozier and Associates Inc. (2012).

Terraprobe Inc. has prepared a Geotechnical Investigation dated July, 2011 and a Natural Hazard Setback and a Slope Stability Requirements Report in May 2014, for the proposed development. Additionally; C. F. Crozier and Associates Inc. prepared a Traffic Impact Study in December 2013, SLR Consulting (Canada) Ltd. an Environmental Impact Study (EIS), dated February 2015 and W.F. Baird & Associates Costal Engineers Ltd. examined the channel realignment details, December 2014.

SITE DESCRIPTION

The site comprises 55.695 ha. located east of Grey County Road 19 between Helen Street and the extension of Craigleith Avenue. The west side of the property extends 610m along Grey County Road 19, with 276m of this being direct frontage on Grey Road 19. The property extends easterly from Grey County Road 19 approximately 1360m toward Highway 26. Figure 2 shows the existing property and its topography.

The lands to the west and south of the subject property are developed as residential. Toward the north east is the proposed "Eden Oak" residential development. The only structure currently on the subject property is a 26m X 15m concrete block building at the south-west corner of the property, on Helen Street.

The site is divided into upper and lower plateaus by the Nipissing Ridge, which cuts diagonally across the site in a northwest to southeast direction.

The upper plateau is located west of the Nipissing Ridge adjacent Grey County Road 19 and contains the lands to be developed, as well as the Plater-Martin archaeological site. This well documented archaeological site is surrounded by ravines on all sides except for a narrow (62m wide) isthmus attaching it to the upper plateau. The archaeological site is generally level, and is located at an elevation just lower than the upper plateau.

The lower plateau, which is not part of this application, is located to the east of the Nipissing Ridge and adjacent the proposed "Eden Oak" development.

The lands have a vertical elevation change of 45m over the site, dropping from west to east. The upper plateau slopes down at approximately 3% to the Nipissing Ridge.

The ridge drops approximately 21m to the lower plateau. The lower plateau slopes approximately 2.4% down to the northeast.

The upper plateau, much of which is a former farm field, is fallow and overgrown with scrub trees. The lower plateau is open and fallow. The Nipissing Ridge, bisecting the property, is well treed and steeply sloped. It is deeply incised with small ravines as a result of erosion. These ravines are terminated at a fairly sharply defined toe of slope.

The native soils are primarily sandy silt glacial till with some clay and trace of gravel. Frequent cobbles and boulders were encountered. The Soils Series (from the Soils of Grey County) over most of the site is identified as 'Kemble'. On the upper plateau the soils became very dense at 2m to 3m depths. Due to these very dense soils, the test pits were all terminated in the overburden glacial tills. The lower plateau has a shallow overburden underlain by shale-limestone bedrock. The ridge is sandy silt.

The site is generally bisected by a creek which originates on the ski hills west of Grey Road 19. This creek drains the area identified as watershed 701 in the Craigleith Camperdown Subwatershed Study.

The creek from watershed 701 flows through the Mountain Springs Hotel property (formerly Todd Brooker Lodge), easterly under Grey Road 19 via a 1.2m X 1.8m culvert and through residential properties between Helen Street and Craigmore Crescent. It enters the subject property via a culvert under Helen Street at the south west corner of the site.

From this south west corner of the site, the drainage now follows a man made channel at right angles to the property lines for about 300m and then spreads out over much of the former farm fields, during relatively high spring flows, before discharging into two of the northerly ravines. During regular flows the stream is conveyed in small defined channels. From these ravines in the Nipissing Ridge the

drainage discharges to a well defined creek at the base of the ridge and then exits the property, through the Eden Oak Subdivision and eventually to Nottawasaga Bay (Georgian Bay). As part of the Eden Oak development the watercourse through that development is being re-designed.

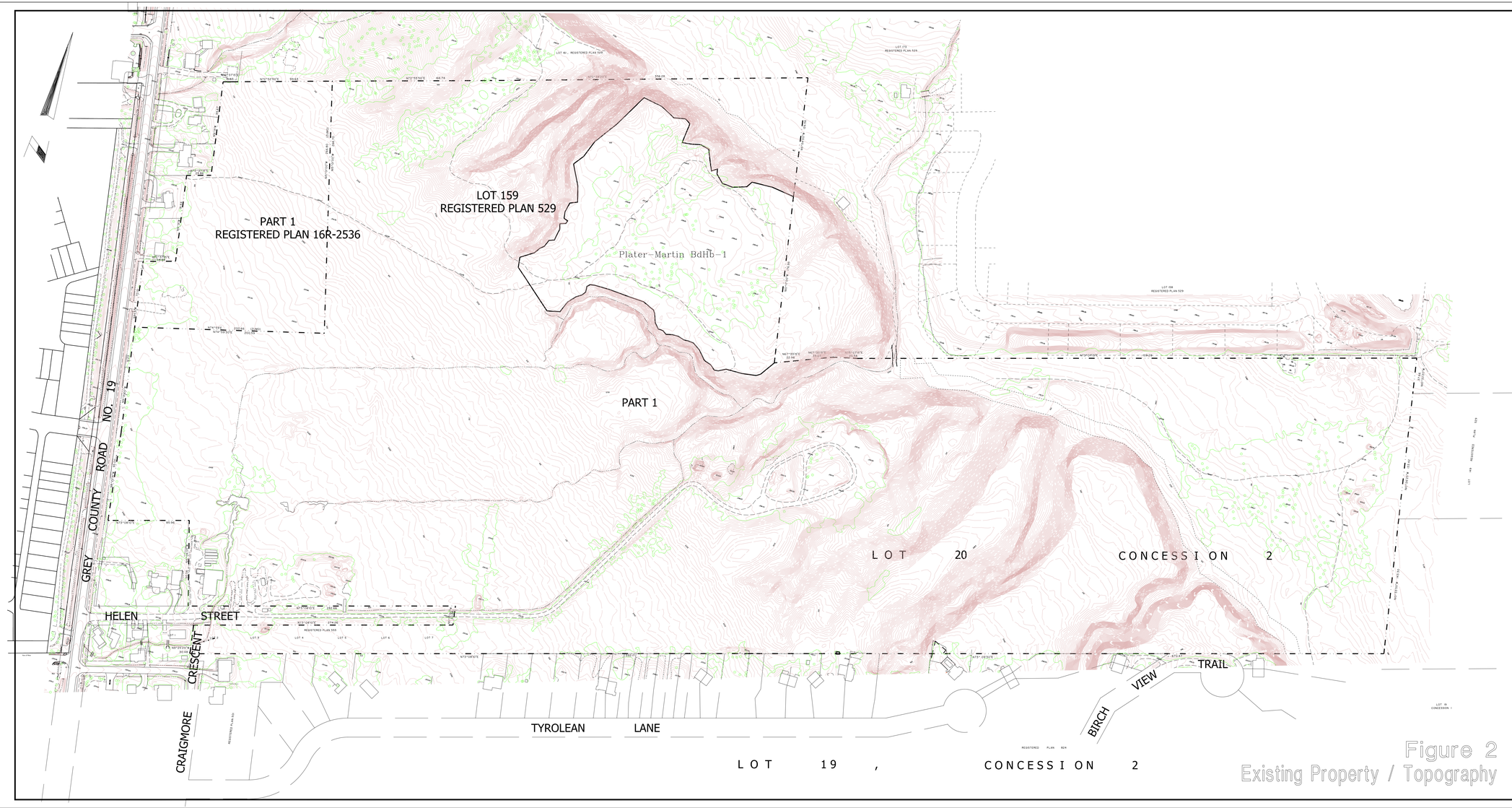
The site drains north east, generally following the grades of the upper plateau. The ravines, incised on the Nippising Ridge, directs this runoff down the ridge to the outlet described above.

Note: Because of the small relief on the upper plateau, the drainage across this area is not well defined and has varied over the years. From the south west corner of the site, the drainage 'historically' crossed the property diagonally, (according to the Historic Atlas Map for Township of Collingwood,1880). As the drainage crosses the property it currently spreads out over the former farm fields, especially during relatively high flow conditions in spring; It had formerly (in the 1990's) followed a farm ditch about 160m parallel to the south property limit to one of the deeply incised ravines leading down the ridge; but more recently, this route has moved 140m north along the edge of another field, before discharging to a different ravine. (The current contour and mapping show both of these former routes).

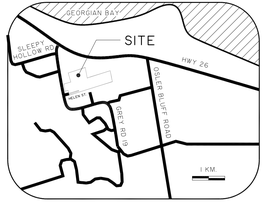
PROPOSED DEVELOPMENT

The proposed development will be located on the upper plateau. Included in the proposal is conveyance of the Plater Martin historical site to the Town of the Blue Mountains and provision of a public access road (Ekarenniondi Street) for same. Flows from Watershed 701 is to be routed though the site via a 60m wide greenway block.

The site will be developed as a condominium, with the area north of Ekarenniondi Street and the greenway being Phase 1 and the area south, Phase 2. The proposal is shown in Figure 3. (Dwg 1410-209, Proposed Development)



LOTS 2, 3, 4, 5, 6 AND 7,
REGISTERED PLAN 555 AND
PART OF LOT 159
REGISTERED PLAN 529 AND
PART OF LOT 20
CONCESSION 2
PART 1, PLAN 16R-2536
PART OF HELEN STREET ROW
TOWN OF THE BLUE MOUNTAINS
COUNTY OF GREY



KEY PLAN

No.	REVISIONS	DATE	APPROVED

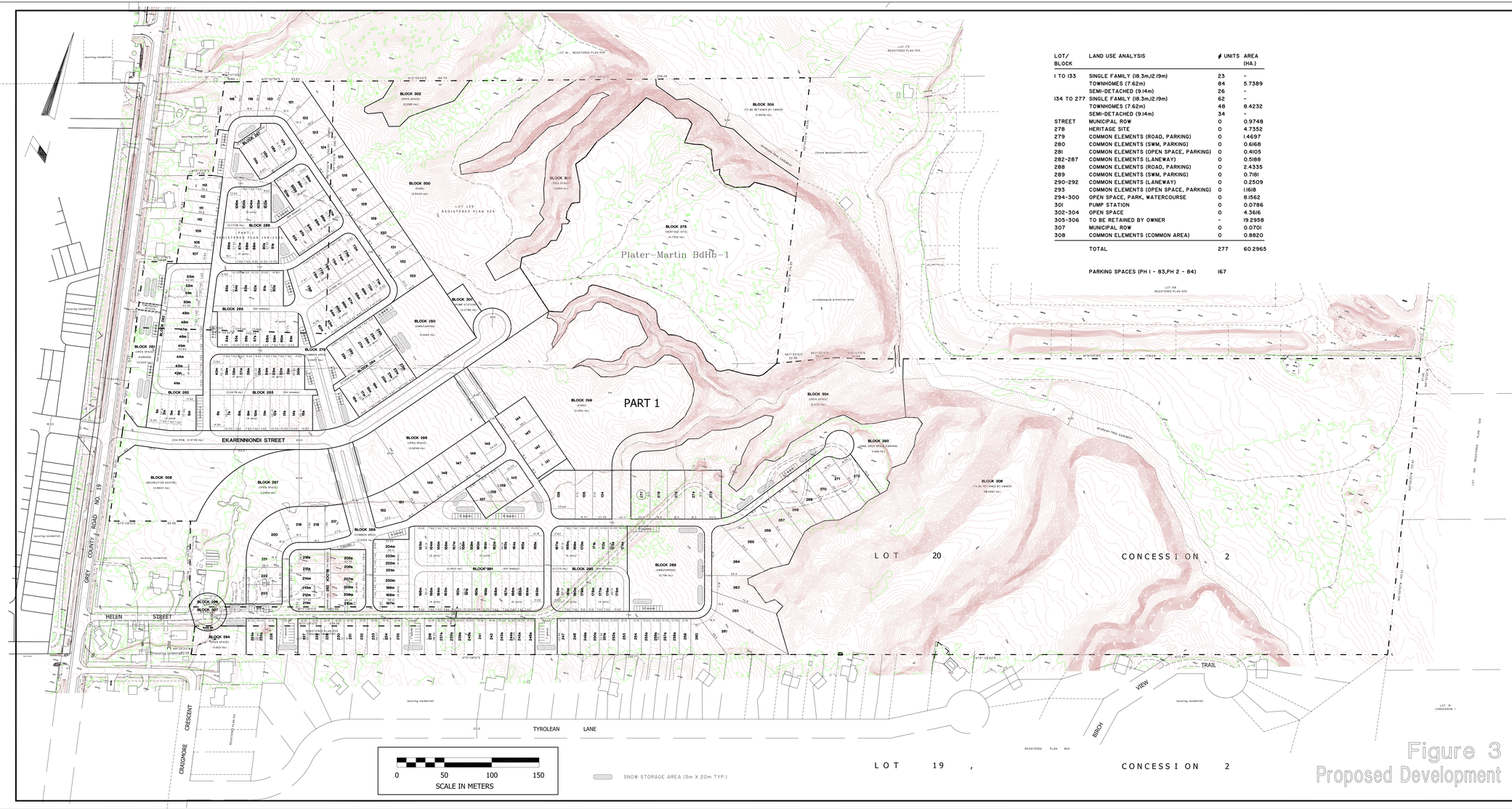
HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
46 MOORE AVENUE, SUITE 306, TORONTO, (416) 443-8000

TOWN OF THE BLUE MOUNTAINS
PLANNING DEPARTMENT

PLAN OF PROPOSED SUBDIVISION
PART LOT 20, CONCESSION 2,
TOWN OF THE BLUE MOUNTAINS
COUNTY OF GREY

DESIGN	L.S.H.	SCALE: HOR.	1:1000
DRAWN	L.S.H.	REVIEWED	DRAWING No.
DATE	12 NOV 2013	SHEET No.	1410-208-S

Figure 2
Existing Property / Topography



LOT/ BLOCK	LAND USE ANALYSIS	# UNITS	AREA (HA.)
1 TO 133	SINGLE FAMILY (18.3m,12.19m)	23	-
	TOWNHOMES (7.62m)	84	5.7389
	SEMI-DETACHED (9.14m)	26	-
134 TO 277	SINGLE FAMILY (18.3m,12.19m)	62	-
	TOWNHOMES (7.62m)	48	8.4232
	SEMI-DETACHED (9.14m)	34	-
STREET	MUNICIPAL ROW	0	0.9748
278	HERITAGE SITE	0	4.7352
279	COMMON ELEMENTS (ROAD, PARKING)	0	1.4697
280	COMMON ELEMENTS (SWM, PARKING)	0	0.6168
281	COMMON ELEMENTS (OPEN SPACE, PARKING)	0	0.4105
282-287	COMMON ELEMENTS (LANEWAY)	0	0.5188
288	COMMON ELEMENTS (ROAD, PARKING)	0	2.4335
289	COMMON ELEMENTS (SWM, PARKING)	0	0.7181
290-292	COMMON ELEMENTS (LANEWAY)	0	0.2509
293	COMMON ELEMENTS (OPEN SPACE, PARKING)	0	1.1618
294-300	OPEN SPACE, PARK, WATERCOURSE	0	8.1562
301	PUMP STATION	0	0.0786
302-304	OPEN SPACE	0	4.3616
305-306	TO BE RETAINED BY OWNER	-	19.2958
307	MUNICIPAL ROW	0	0.0701
308	COMMON ELEMENTS (COMMON AREA)	0	0.8820
	TOTAL	277	60.2965
	PARKING SPACES (PH 1 - 83,PH 2 - 84)	167	

DRAFT PLAN

OF PROPOSED SUBDIVISION
LOTS 2, 3, 4, 5, 6 AND 7,
REGISTERED PLAN 555 AND
PART OF LOT 159
REGISTERED PLAN 529 AND
PART OF LOT 20
CONCESSION 2
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PART OF HELEN STREET ROW
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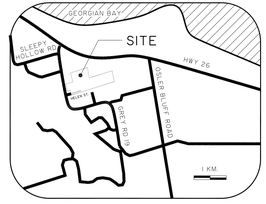


KEY PLAN

OWNER'S AUTHORIZATION

I hereby authorize Higgins Engineering Limited, Consulting Engineers and Planners, to prepare and submit this proposed plan of subdivision

MACPHERSON BUILDERS (BLUE MOUNTAINS) LIMITED DATE
RUSSELL HIGGINS (AUTHORIZED SIGNING OFFICER)

TOWN OF THE BLUE MOUNTAINS DATE
ELLEN ANDERSON (MAYOR)

TOWN OF THE BLUE MOUNTAINS DATE
CORRINA GILES (CLERK)

SURVEYOR'S CERTIFICATE

I hereby certify that the boundary of the lands to be subdivided as shown on this plan and their relationship to the adjacent lands are accurately and correctly shown

ZUBEK, EMO AND PATTEN LTD DATE

ADDITIONAL INFORMATION

Required under Section 51(17) of the Planning Act

(a) as shown
(b) as shown
(c) as shown on key plan
(d) residential / open space
(e) as shown
(f) as shown
(g) as shown
(h) municipal / private water
(i) till over bedrock
(j) as shown
(k) municipal / private sewers
(l) as shown

No.	REVISIONS	DATE	APPROVED

HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVENUE, SUITE 306, TORONTO, (416) 443-8001

TOWN OF THE BLUE MOUNTAINS
PLANNING DEPARTMENT

PLAN OF PROPOSED SUBDIVISION
PART LOT 20, CONCESSION 2,
TOWN OF THE BLUE MOUNTAINS
COUNTY OF GREY

DESIGN	L.S.H.	SCALE HOR.	1:1000
DRAWN	L.S.H.	REVIEWED	
DATE	23 APR 2014	SHEET No.	DRAWING No. 1410-209-S

Figure 3
Proposed Development

ROADWAYS

The roadways internal to the proposed development are as shown on Figure 3. These consist of a central municipal road, Ekarenniondi Street, internal condominium roadways, and laneways for service access to the rear of the units.

The municipal road, Ekarenniondi Street, is proposed as a 20m Municipal right-of-way with an 8.5m wide curbed pavement. Ekarenniondi Street connects to Grey Road 19 centrally within the site and provides a municipal road access to the connecting condominium roadways, access to the sanitary pump station property and to the Plater-Martin site. It aligns with the main entrance, Birches Boulevard, of "The Orchard" condominium on the west side of Grey Road 19.

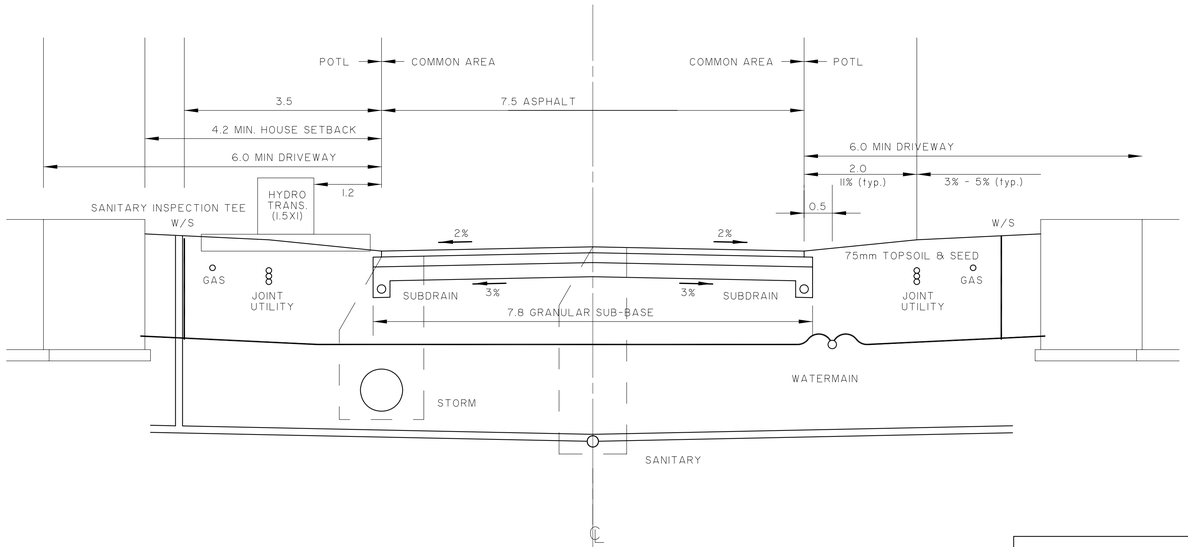
The internal roads to the Condominium Development(s) are proposed with 7.5m non-curbed pavements, providing vehicular access to all of the units. A central 27m right-of-way with twin 7.5m wide curbed roadway and 3m center median provide a connection between the north and south areas of the plan.

The laneways are proposed as having a 6m wide non-curbed pavement with an "V" shaped cross section. (I.E. storm drainage to the middle of the pavement.) . These will provide service access to the rear of most units.

All of the roadways, municipal and condominium, will be drained by a storm sewer system. Drainage from the laneways will be directed to the storm sewers in the roadways.

The Traffic Impact Study by C. F. Crozier and Associates Inc. prepared for the property, concluded that the traffic generated by the proposal would not materially affect the operations of the public roadway system.

The proposed road cross sections are as shown in Figure 4a & 4b.

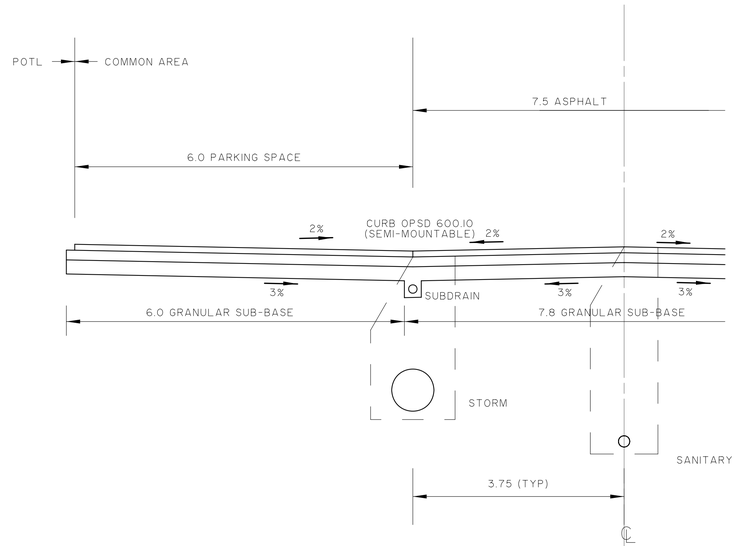


TYPICAL ROADWAY CROSS SECTION 7.5m

SCALE 1:50

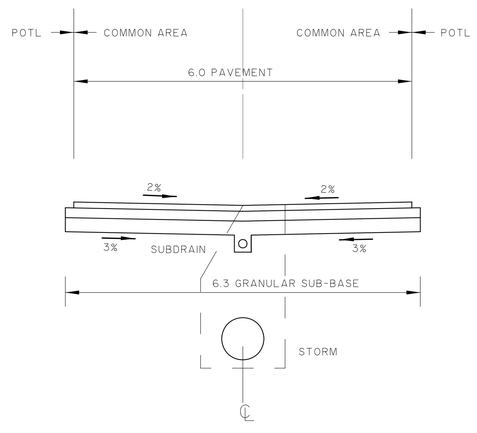
CONNECTIONS
SAN - 125mm
WATER - 19mm TYPE "K" COPPER

MINIMUM DEPTH OF ALL UTILITIES TO BE 0.9m



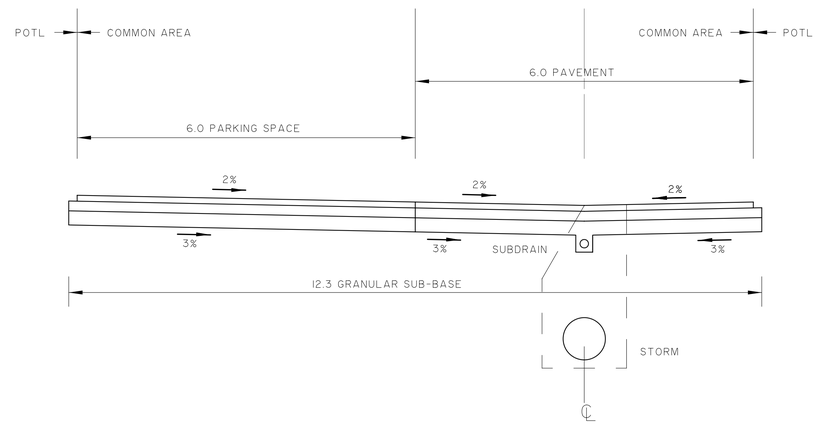
TYPICAL ROADWAY CROSS SECTION 7.5m
(WITH PARKING)

SCALE 1:50



TYPICAL LANEWAY CROSS SECTION 6m

SCALE 1:50



TYPICAL LANEWAY CROSS SECTION 6m
(WITH PARKING)

SCALE 1:50

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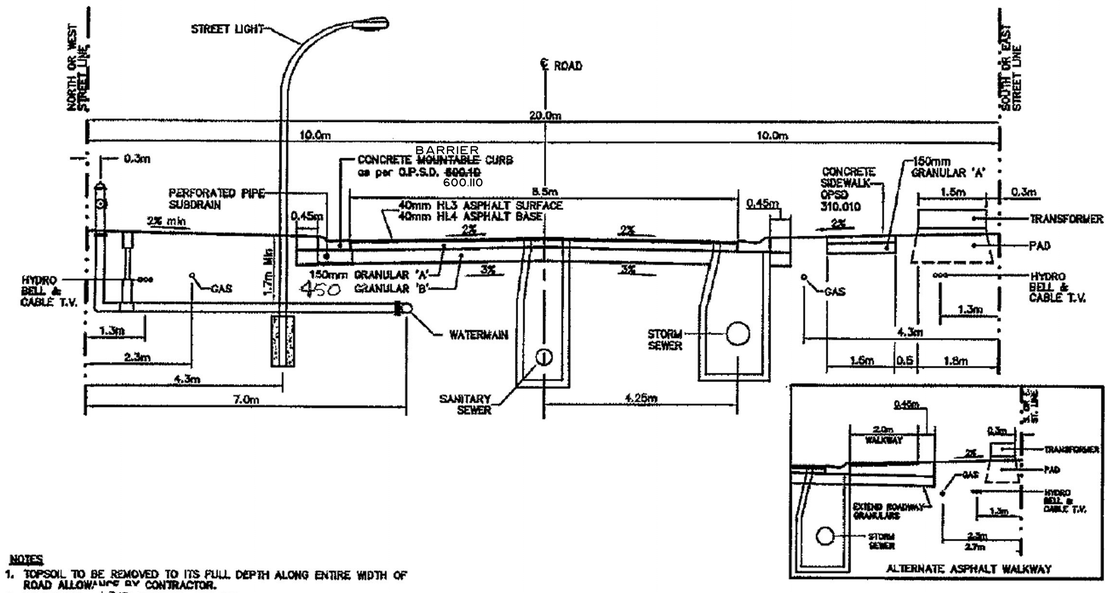
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVENUE, SUITE 306, TORONTO, (416) 443-8001

Figure 4a
Road Cross-Sections



NOTES

1. TOPSOIL TO BE REMOVED TO ITS FULL DEPTH ALONG ENTIRE WIDTH OF ROAD ALLOWANCE BY CONTRACTOR.
2. BOULEVARD - 100 ~~TOPSOIL~~ AND SOD.
3. DEPTH FOR ALL OTHERS 0.9m MIN.
4. ASPHALT WALKWAY – 40mm HL3 ASPHALT SURFACE
   – 40mm HL4 ASPHALT BASE
   – 150mm GRANULAR 'A'
   - 450 GRANULAR 'B'

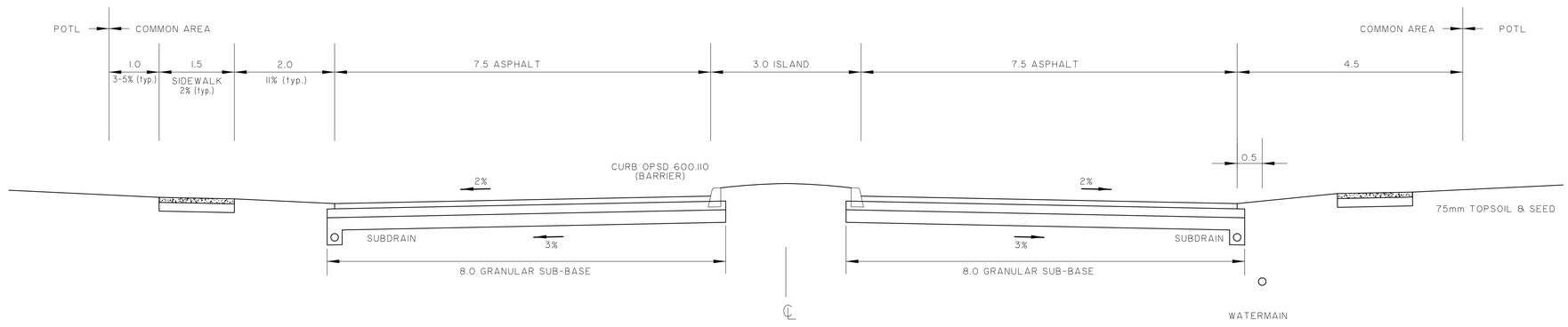
REVISED TO INCLUDE BARRIER CURB

Town of The Blue Mountains

STANDARD CROSS-SECTION
8.5m ROAD – 20m R.O.W.

DWN: A & A	DATE: MAY 2004	SCALE: NONE	DWG. 16-STD-U1

SCALE: NTS



TYPICAL ROADWAY CROSS SECTION 27m

SCALE 1:50

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CONSULTING ENGINEERS AND PLANNERS
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Figure 4b
Road Cross-Sections

WATER DISTRIBUTION

The development will be serviced with Municipal water. A large diameter watermain (350mm) exists on the east side of Grey County Road 19 along the frontage of the property.

The proposed water system would consist of local watermains along Ekarenniondi Street and the condominium roads.

The condominium water systems would connect to the existing Grey Road 19 watermain, providing servicing to both phases of the project. The central connection off of Grey County Road 19 would be along Ekarenniondi Street. Phase 1, north of Ekarenniondi Street, will be looped though the north limit of block 287 to Grey County Road 19. With Phase 2, south of Ekarenniondi Street, being looped to Grey County Road 19 via Helen Street.

The proposed water system is shown in Figure 5 (1410-WATER 1)

SANITARY SEWERAGE

The Master Servicing Plan for Service Area 1 (Craigleith), indicates that "All development shall be supplied with municipal water supply and sewage disposal services". The Town of the Blue Mountains prepared a Class EA and constructed a sanitary sewer along County Road 19 to service the subject property and several adjacent developments.

The southernmost manhole for the existing 250mm sanitary sewer constructed on Grey County Road 19 is located in the travelled portion of the road approximately 247m south of the centerline of Craigleith Road; this coincides with the northern limit of the Home Farm Property frontage on Grey Road 19.

It is proposed that the entire development be serviced with sanitary sewers which drain to a Sanitary Pump Station on Ekarenniondi Street adjacent the Plater-Martin Heritage site. The effluent would then be pumped west along Ekarenniondi Street to Grey County Road 19 and then north to the existing sanitary sewer manhole on Grey Road 19, either via or adjacent to the municipal right of way.

The entire Phase 1 of the proposed development and most of Phase 2 will be serviced as described above, by gravity to the pump station. Approximately 22 of the lowest units, in Phase 2, are too low to drain to the pump station by gravity; these will be serviced by a low pressure pipe system, connecting to the internal gravity system.

The Town of the Blue Mountains Standards are used for the sanitary sewer design. As per these standards the sewer location will be located in the center of the roadway.

Figure 6 (1410-SAN 1) shows the preliminary sanitary sewer, forcemain and low pressure system layout for the project.

UTILITIES

The Home Farm development will be serviced with Natural Gas, telephone, cable(TV) and electrical services. These services are currently available along Grey County Road 19, from the local area service providers.

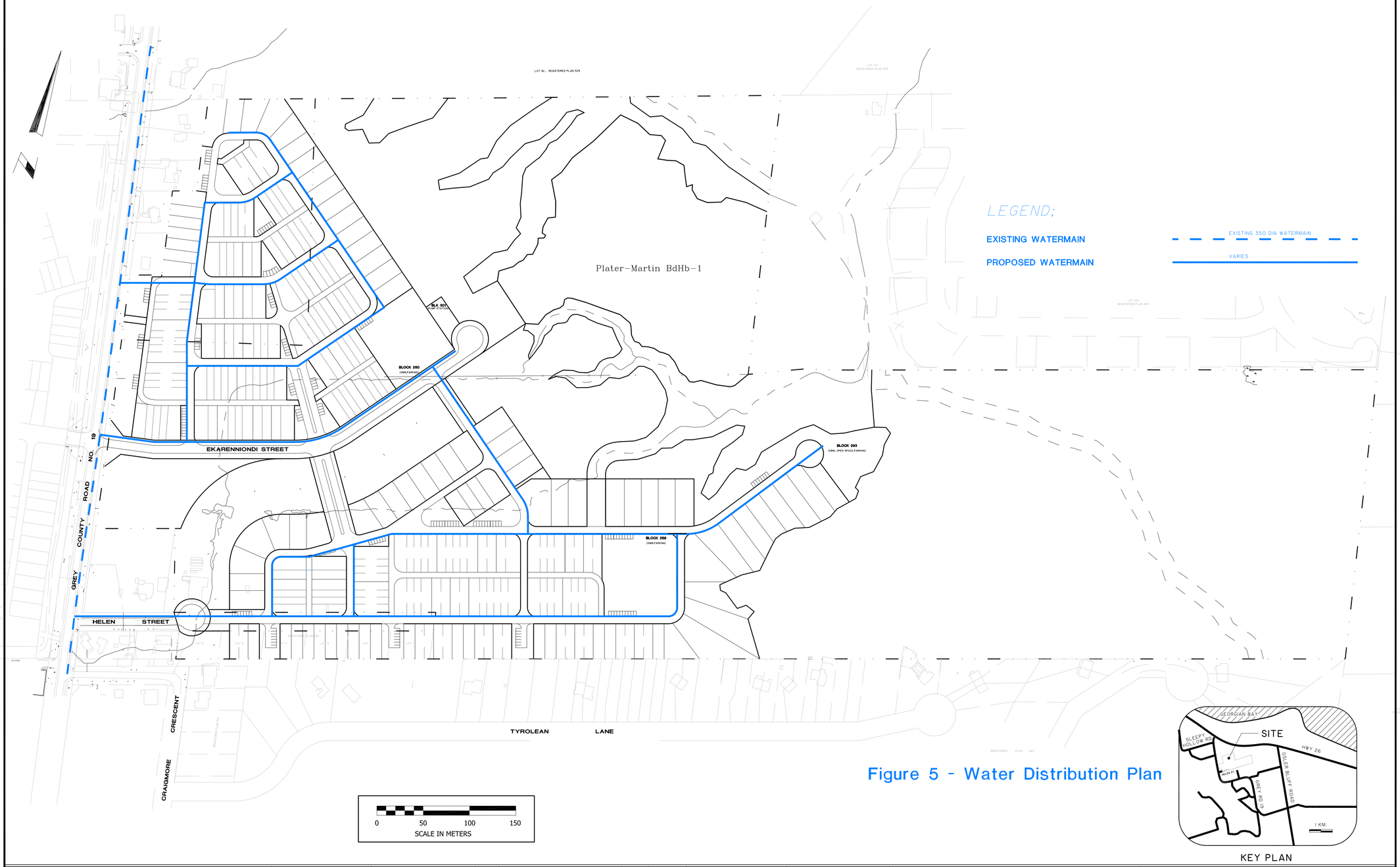


Figure 5 - Water Distribution Plan

KEY PLAN

LEGEND;

No	REVISIONS	DATE	APPROVED

REGISTERED PROFESSIONAL ENGINEER
L.S.HIGGINS
PROVINCE OF ONTARIO

HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVE., SUITE 306, TORONTO, (416) 443-8001

TOWN OF THE BLUE MOUNTAINS
ENGINEERING DEPARTMENT
COUNTY OF GREY

THE HOME FARM
WATER DISTRIBUTION PLAN
PART OF LOT 20, CONCESSION 3
TOWN OF THE BLUE MOUNTAINS, COUNTY OF GREY

DESIGN	L.S.H.	SCALE HOR. 1:2000	VERT. 1:50
DRAWN	L.S.H.	REVIEWED	DRAWING No.
DATE	MAY 2014	SHEET No.	1410 -WATER

LEGEND;

EXISTING SANITARY SEWER

PROPOSED SANITARY SEWER

PROPOSED FORCEMAIN

PROPOSED PUMP STATION

PROPOSED LOW PRESSURE SANITARY

Plater-Martin BdHb-1

EKARENNIONDI STREET

BLOCK 290
(SWM,PARKING)

BLOCK 291
(SWM,PARKING)

BLOCK 292
(SWM,PARKING)

BLOCK 293
(SWM, OPEN SPACE,PARKING)

COUNTY ROAD NO. 19
GREY

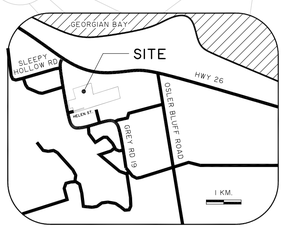
HELEN STREET

CRAIGMORE CRESCENT

TYROLEAN LANE

0 50 100 150
SCALE IN METERS

Figure 6 - Sanitary Servicing Plan



KEY PLAN

LEGEND;

No	REVISIONS	DATE	APPROVED

REGISTERED PROFESSIONAL ENGINEER
L.S.HIGGINS
PROVINCE OF ONTARIO

HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVE., SUITE 306, TORONTO, (416) 443-8001

TOWN OF THE BLUE MOUNTAINS
ENGINEERING DEPARTMENT
COUNTY OF GREY

THE HOME FARM

SANITARY SERVICING PLAN

PART OF LOT 20, CONCESSION 3
TOWN OF THE BLUE MOUNTAINS, COUNTY OF GREY

DESIGN	L.S.H.	SCALE HOR. 1:2000	VERT. 1:50
DRAWN	L.S.H.	REVIEWED	DRAWING No.
DATE	MAY 2014	SHEET No.	1410 -SAN 1

STORM DRAINAGE – MINOR SYSTEM

The proposed development will be serviced by conventional storm sewers to the standards of the Town of the Blue Mountains. These will be drained to the SWM facilities for quality control and attenuation prior to release into the watercourse.

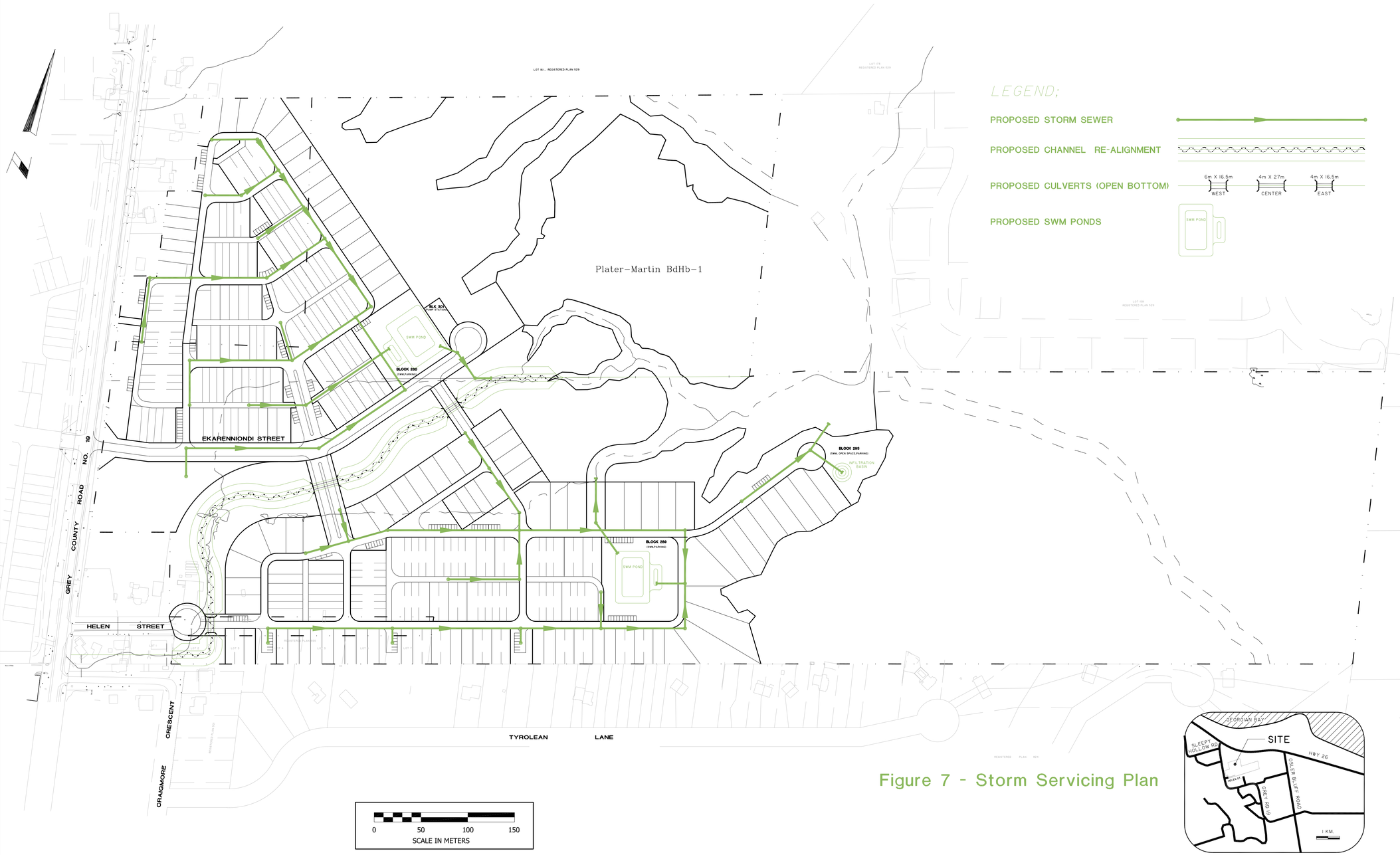
The area to be developed is comprised of two main, north / south areas, bisected by a central creek which drains the area west of Grey Road 19 (the Watershed 701, Craigleith Camperdown Subwatershed Study). Each of these areas will have pipe systems draining to a SWM facility.

The northerly area pipe system drains to a proposed SWM facility located on Block 280 and will outlet to the re-aligned central creek. The southerly pipe system drains similarly to a SWM facility on Block 289 and discharged north (between lots 134 and 277) to the existing ravine in Block 304.

The topography of the southerly area is such that a small portion of that area cannot be drained to the SWM facility in Block 289. This area (0.83 ha.) includes the westerly road and cu-de-sac; we are proposing to drain this area west and discharge via a diversion structure (MH) to an infiltration basin on Block 293. Volumes in excess of the infiltration basin's capacity will be directed by this diversion structure to an outfall at the end of the cul-de-sac. This is discussed further in the Stormwater Management section.

The SWM facilities will outlet to the central watercourse which traverses the site and conveys flows though the property. The creek re-alignment in this central watercourse is discussed later in the report.

Figure 7 (1410-STM 1) shows a preliminary storm system design, SWM facility locations, infiltration basin location and central creek re-alignment.



LEGEND;

- PROPOSED STORM SEWER
- PROPOSED CHANNEL RE-ALIGNMENT
- PROPOSED CULVERTS (OPEN BOTTOM) — 6m X 16.5m WEST; 4m X 27m CENTER; 4m X 16.5m EAST
- PROPOSED SWM PONDS — SWM POND

Figure 7 - Storm Servicing Plan

KEY PLAN

LEGEND;

No	REVISIONS	DATE	APPROVED

REGISTERED PROFESSIONAL ENGINEER — L.S.HIGGINS — PROVINCE OF ONTARIO

Higgins — HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVE., SUITE 306, TORONTO, (416) 443-8001

TOWN OF THE BLUE MOUNTAINS
ENGINEERING DEPARTMENT
COUNTY OF GREY

THE HOME FARM
STORM SERVICING PLAN
PART OF LOT 20, CONCESSION 3
TOWN OF THE BLUE MOUNTAINS, COUNTY OF GREY

DESIGN	L.S.H.	SCALE HOR. 1:2000	VERT. 1:50
DRAWN	L.S.H.	REVIEWED	DRAWING No.
DATE	MAY 2014	SHEET No.	1410 - STM 1

STORM DRAINAGE - EXTERNAL DRAINAGE AREAS
(Subwatershed Boundaries)

The watershed areas which pertain to the proposed development are referred to as subwatersheds 6,7,8 & 9 on the Gore & Storrie report and the 600, 700, 800 & 900 (series) in the Crozier (2012) report, and were unnamed in the Higgins report. The subwatershed numbers in the Gore & Storrie report 6, 7, etc. generally conform to the 600, 700, etc. (series) boundaries in the Crozier (2012) report; for the sake of clarity we have used the Crozier (2012) subwatershed identifications.

Subwatershed 602, 6063 & 6064 have little or no bearing upon the current proposal. The small rear lot areas draining to the upper portion of area 6063 (rear lots of the Home Farm proposal and the existing homes on Tyrolean Road) is accommodated in the Crozier (2012) report and included in the pond sizing for Eden Oak. Even without the Eden Oak construction it is unlikely that the rear lot drainage (1.39 Ha.) contributing to this area would have any effect on runoff, as it contains almost no impervious areas. This area would only be relevant to the development of the lower plateau of the Home Farm, which is not proposed here.

Subwatershed 901 (Subwatersheds 8 & 9 in the Gore & Storrie Report) drains through the Orchard Development, across Grey Road 19 and through subwatershed 902. This subwatershed area upstream of Grey Road 19 (101.8 Ha.) was subject of a stormwater management Brief by Higgins Engineering (Jan 2005) in conjunction with the construction of The Orchard subdivision.

With the construction of The Orchard subdivision there were some changes to the delineation of the subwatershed areas. A portion of subwatershed 701 adjacent the Orchard development was included in the area handled by the Orchard's storm/SWM drainage. This resulted in a reduction in the size of subwatershed 701 by 8.9131 ha. and corresponding increase in Subwatershed 901.

For the current Home Farm development, we are proposing to include a slightly smaller area (8.4764 ha.) back from subwatershed 902/801 to Subwatershed 7021 south of Grey Road 19.

The net result of the previous area delineation for the Orchard Project and the proposed revision, is a small reduction (0.4 ha.) in the overall size of subwatershed 701/7021. This brings the 701/7021 (and 901/902/801) subwatershed areas back inline with the drainage area used in the Crozier (2012) report.

This allows the runoff generated by the proposed development to be handled within the 7021 drainage area, and the flows controlled by the developments proposed SWM facilities. As well as the external drainage from Subwatershed 701 to drain through the site.

Figure 8 Shows the catchment areas/Revised Drainage areas (Based on Figure #8 in the Crozier (2012) Report).

STORM DRAINAGE - EXTERNAL DRAINAGE AREAS
(Conveyance)

Subwatershed 701/7021 comprise approximately 137.8 ha. west of Grey Road 19 and 43 ha. east of Grey Road 19. This area flows through the “Home Farm” down the Nipissing Ridge and through the “Eden Oak” subdivision.

The westerly portion, subwatershed 701, flows under Grey Road 19 via a SPCSP arch pipe (2.48m x 1.4m) with a capacity of 8cms. This continues through residential properties between Grey Road 19 and Helen Street, crossing Helen Street via a CSP arch pipe (1.03m x 0.74m) and steel pipe (0.8m) with a combined capacity of 2.60 cms.

The Gore & Storrie HEC-2 analysis showed that during the "Timmins" Regional Storm the Grey Road 19 roadway was overtopped by 0.15m. There would be generalized flooding of the downstream existing houses between that point and the Helen Street crossing; with the Helen Street crossing being overtopped as well.

This drainage enters the Home Farm property immediately south of the Helen Street crossing. This drainage then travels northward within the Home Farm property for approximately 120m and the creek proper disappears into the field.

At this point, the Gore and Storie analysis shows the creek turning east and spreading out over the field. Presently, however, the creek continues north for another approximately 140m before spreading out across the fields. This "spreading out" occurs outside the GSCA and Official Plan regulated areas. The water flows across the fields eastward before coalescing and discharging down the Nipissing Ridge via two ravines.

Note that the discharge point(s) are north of the watercourse shown on most of the available mapping. Both the Gore and Storrie HEC-2 mapping (1:10,000, 5m contour) and the Genivar HEC-2 mapping (1:2,000, 5ft contour) of the Regional Flood show a flood plain width of up to 300m. This analysis indicates flow depths of only a couple of inches over an area with topographic variations many times that flow depth (old fields with scrub). Because the land is slightly sloped, with a flat cross-section, any HEC-2 analysis (even with current topography) will not accurately show what is happening on the ground.

Accordingly, we are proposing to provide this watercourse (draining subwatershed 701) with a more defined pathway through the development, one that will decrease the flooding for the existing houses upstream of Helen Street. This re-aligned watercourse will be designed for conveyance of the Regional Storm, at a depth and velocity which mitigates the impact on the existing residents and does not exacerbate the flooding. This is shown on the plan (Blocks 297 and 298 in Figure 3)

as a 60m wide floodway across the Home Farm property. In conjunction with this improvement, our proposal would also replace the Helen Street culverts with ones that convey the Regional Storm, without overtopping.

The proposed development either side of this 60m wide floodway will direct storm flows to ponds which will provide quality and quantity controls for up to the 100 year storm event.

The Gore & Storrie and Crozier (2012) studies adequately identity characteristics of the local subwatersheds and the flows to be conveyed through the site. Our design addresses the associated improvements required to convey these flows through the Home Farm property.

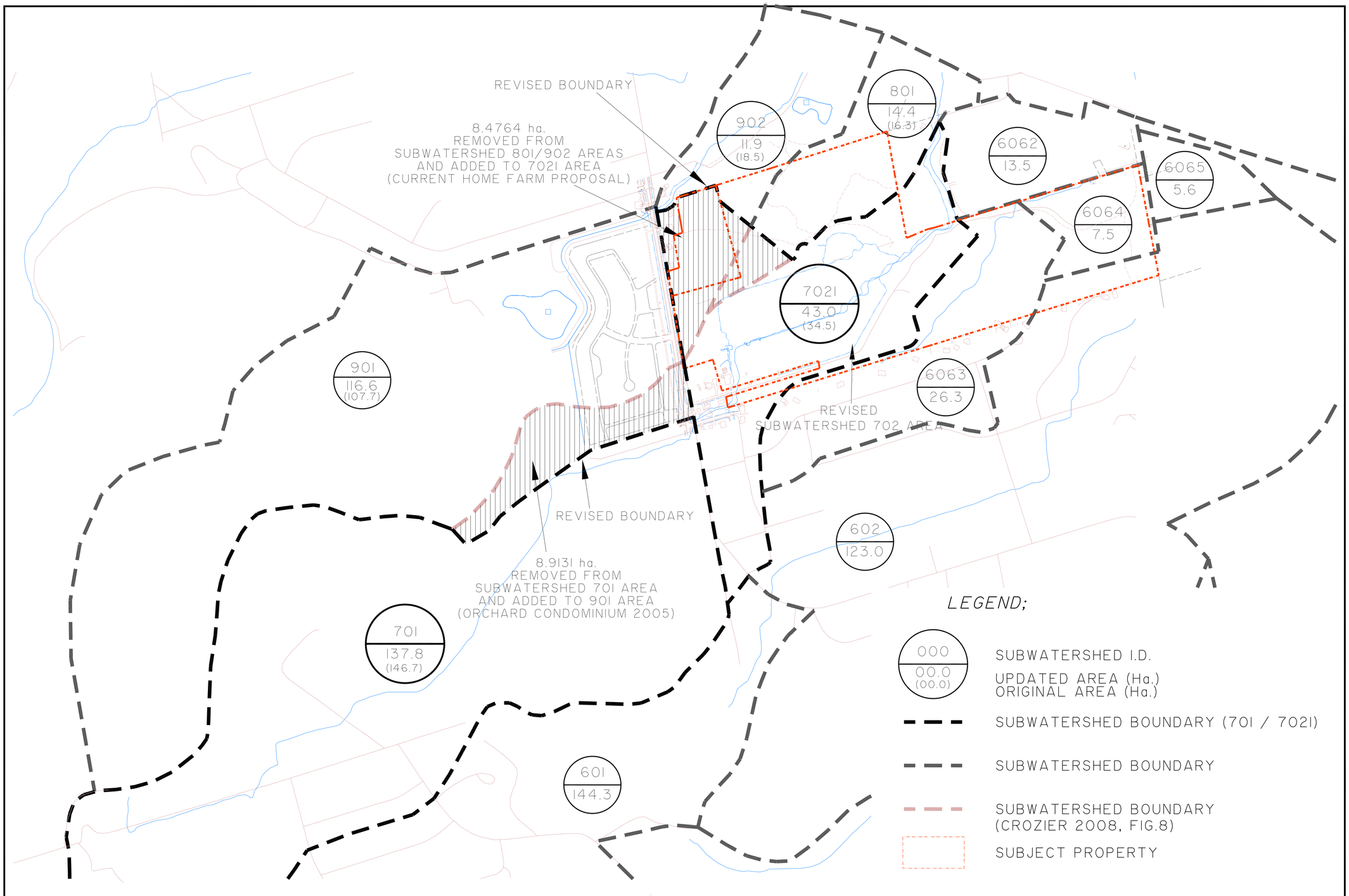
Table 1 summarizes the culvert capacities (Gore & Storie) at the lower limit of Watershed 701 (at Grey Road 19 and Helen Street) and the Crozier (2012) design flow (Timmins) for the watercourse improvements at the bottom of Watershed 702 (at entrance to Eden Oak)

In general the Helen Street culverts and watercourse through the Home Farm proposal will be sized to accommodate the Regional flows of 9.7 cms. Although somewhat conservative for use upstream, this matches the Crozier (2012) design flow used entering the Eden Oak development. .

Table 1 - Existing Culvert / Channel Flow Summary

Subwatershed 7 Location	Description	Capacity cms
Upstream Grey Road 19	SPCSP arch pipe (2.48m x 1.4m)	8
Helen Street	CSP arch pipe (1.03m x 0.74m) CSP (0.8m)	2.6
Downstream Eden Oak watercourse		9.7

(Gore & Storie and Crozier (2012))



No	REVISIONS	DATE	APPROVED

HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVE., SUITE 306, TORONTO, (416) 443-8001

TOWN OF THE BLUE MOUNTAINS
ENGINEERING DEPARTMENT
COUNTY OF GREY

HOME FARM
FIGURE 8
UPDATED SUBWATERSHED AREAS

DESIGN	L.S.H.	SCALE HOR. 1:7500	VERT. N/A
DRAWN	L.S.H.	REVIEWED	DRAWING No. 1410-FIG. 8
DATE	JUN 2014	SHEET No.	

Provided is a separate calculation of these discharge rates for Watersheds 701 and 7021 as a comparison/confirmation of the work provided by Gore & Storie and Crozier (2012). The flows were generated for these areas using Visual Otthymo and similar assumptions as the Gore & Storie Camperdown Report (Future Conditions) The flows are summarized in Table 2 and the calculations included in Appendix C.

Table 2
FLOW SUMMARY
EXTERNAL DRAINAGE AREAS - WATERSHED 701 / 702
(Visual Otthymo v2.1)

	Watershed/Hyd Area (ha.)*	701 146.7	7021 34.5	701 + 7021
	TOTAL RAINFALL (mm)	PEAK FLOW (cms)	PEAK FLOW (cms)	PEAK FLOW (cms)
Timmins	193.00	7.97	2.64	9.59
24 Hour SCS				
100yr	96.41	4.12	2.49	4.94
25yr	80.24	3.03	1.82	3.60
5yr	60.57	1.83	1.09	2.15
2yr	47.50	1.14	0.68	1.32

* Crozier (2012)

The primary purpose of this calculation (Table 2) was to provide flows for the more frequent events to be used in the design of the low flow portion of the channel through the Home Farm site.

The channel cross-section with a central low flow, main and flood stage areas, was developed in conjunction with the Baird recommendations for the channel configuration (Appendix A). The cross-section modeled consists of a 1m depth x 24m flood section, with a 8m wide by 300mm depth main section and then a low flow section that is 1m wide at the base and 700mm in depth. The total channel width of 24m is accommodated within the 60m watercourse area.

This channel configuration was simplified for the HEC-RAS modeling. Where the Baird recommendations of a meandering low flow channel and naturalization features will be incorporated in the final design, the modeled channel has a more regular section in a straighter profile.

The proposed channel includes crossings at Helen Street, the center road crossing and east road crossings. The crossings proposed are box culvert designs with natural channel bottoms and a 2m height. The width of the culverts for the two crossing within the property will be 4m. A 6m width is proposed for Helen Street to further mitigate upstream impacts. The lengths vary from 16.5m for Hellen Street and the east crossing and 27m for the center roadway.

The channel was modeled using HEC-RAS channel flow to determine the overall flow capacities met with the overall objectives of:

- Low flow channel capacity for the 2yr event (1.3cms).
- Conveyance of the Timmins regional storm (9.7 cms).
- Culvert sizing for the Timmins regional storm.
- Redesigned Helen Street culvert designed for the Timmins regional storm and to reduce upstream flooding (due to the Helen Street culvert).

The HEC-RAS summary data and sections are shown in Appendix B, the modelled channel cross-section and profile in Figure 9 and the Baird Conceptual Plan and Typical Section in Appendix A. These will form the basis for the detailed engineering drawings.

The works are also the subject of a detailed study and fisheries permit application by SLR Consulting (Canada) Ltd.

The SLR Consulting (Canada) Ltd. Report identified the Terrestrial and Aquatic conditions on site and summarized these conditions and recommendations for the re-aligned creek addressing the Terestrial and Aquatic features.

Terrestrial

A large percentage of terrestrial habitat being removed is wetland thicket that will require, to the greatest degree possible, on-site restoration. The new channel will be designed to provide a floodplain and pool areas with shallow water depths to create thicket wetland habitat. Although amphibian surveys resulted in low numbers, several incidental amphibian observations were made. Seasonal pools and floodplain inundation for amphibian breeding should be incorporated into channel design to maintain or re-create existing amphibian habitat.

Aquatic

Aquatic habitat, flow conditions and opportunities for fish will be enhanced as a result of the channel realignment. The new channel has been designed according to natural channel design principles by qualified fluvial geomorphologists and includes appropriate meander radius, substrate size, and longitudinal gradient. By incorporating, pool-riffle sequences, and a mixture of riffle, run and pool habitat with a range of substrate types and sizes, these features will provide habitat for spawning, rearing, young and adult growth to support resident fish species. Plantings to high water mark are preferred in order to create shade for water temperature modification and increased leaf litter to stream as food source for fish and invertebrates.

The new watercourse will comprise a gravel bed of clean river stone with diameter ranging from 20 to 200 mm. The finer substrate (20 mm) will be placed

in pools, and the courser material will be placed in riffle sections to emulate the natural along-stream variation in grain size observed in alluvial channels.

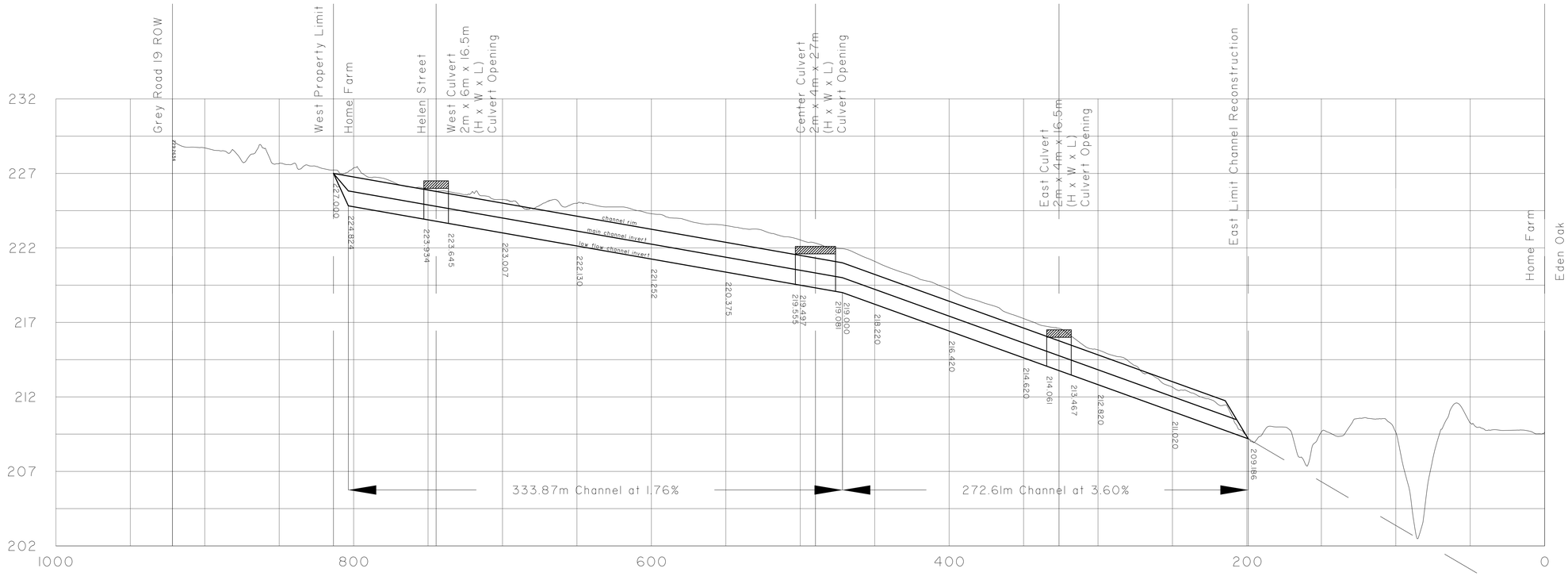
The new channel will also include floodplain and pool areas with seasonal shallow water depths to create thicket wetland habitat. The seasonal riparian pools and floodplain inundation will support amphibian breeding and adult growth.

Based on the above information, Baird and Associates prepared a report (Appendix A) recommending the features to be incorporated in the re-aligned creek. These recommendations have been incorporated in the proposed creek re-alignment shown in Figure 9 (Channel Section & Profile) and in Figure 7. The channel design will be further refined, based on the above reports, with the preparation of the detailed engineering drawings.

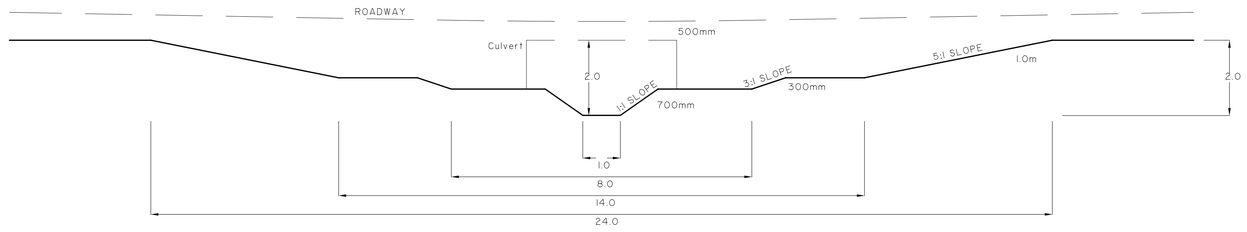
STORM DRAINAGE - EROSION AND SEDIMENT CONTROL

In addition to the controls provided by the SWM facility, measures proposed on site include:

- Roof leaders are to discharge to the surface in an effort to maximize the flow path length for runoff.
- A fence barrier will be provided to protect the treed areas during construction.
- All proposed construction, ditching and fill sections will be constructed using a maximum of 3:1 side slopes and will be topsoiled and vegetated as soon as possible.
- Ditch invert rock/geotextile check dams will also been located throughout the project to reduce sediment laden runoff from escaping downstream during construction.
- Sediment fencing is provided during construction.



Channel Profile
Proposed Home Farm channel re-alignment - Grey Road 19 to Plater-Martin BdHb-1
1:2000 H, 1:200 V



Proposed Channel Section
1:100 H, 1:100 V

Figure 9
Proposed Channel Re-Alignment

LEGEND;

0 50 100 150
SCALE IN METERS

No	REVISIONS	DATE	APPROVED

REGISTERED PROFESSIONAL ENGINEER
L.S. HIGGINS
PROVINCE OF ONTARIO

HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVE., SUITE 306, TORONTO, (416) 443-8001

TOWN OF THE BLUE MOUNTAINS
ENGINEERING DEPARTMENT
COUNTY OF GREY

THE HOME FARM
PROPOSED CHANNEL RE-ALIGNMENT
PART OF LOT 20, CONCESSION 3
TOWN OF THE BLUE MOUNTAINS, COUNTY OF GREY

DESIGN	L.S.H.	SCALE HOR. 1:2000	VERT. 1:50
DRAWN	L.S.H.	REVIEWED	DRAWING No. 1410 - STM 2
DATE	MAY 2014	SHEET No.	

STORM DRAINAGE - STORMWATER MANAGEMENT

The site Stormwater Management will address the contribution by the development of the Home Farm and the attenuation of the flows generated. This will also ensure the flows due to the proposed development will not affect the downstream Eden Oak development.

The site drainage has been dealt with as two separate sections, with this areas separated by the central 60m wide floodway which traverses the development. These areas, 11.49 ha. (north) and 10.05 ha. (south), will be examined for the pre and post development conditions to determine the controls required. The north area is identified as area 7021a and the south as areas 7021b and 7021c on Figure 10 (Pre/Post-Development Drainage Plan).

STORM DRAINAGE - STORMWATER MANAGEMENT
DESIGN & RATIONALE

For simplicity and direct comparison, the pre-development and post-development boundaries for the internal drainage areas, are coincident. These areas are described in the previous section and cover the entire area to be developed within the property.

This stormwater management plan has the following objectives:.

Quality and Erosion Control

- Detention of the 25mm volumes for a minimum of 48hr.
- Enhanced Level of Protection (80% TSS removal, MOE SWM Planning & Design Manual, 2003).

Quantity (Flood) Control

- Control post-development peak flows to pre-development levels for all storms up to and including the 100 year storm.

The stormwater management design criteria is based on standards of The Town of the Blue Mountains, the Grey Sauble Conservation Authority and the Ministry of the Environment.

The proposal is for two Stormwater Management ponds, one constructed for and located in the northerly 7021a area and one in the southerly 7021b area. These are proposed as end of pipe, wet pond facilities. They each include a permanent pool, extended detention (including 25mm volumes) as well as the detention and control of all storm events up to the 100yr event to pre-development levels.

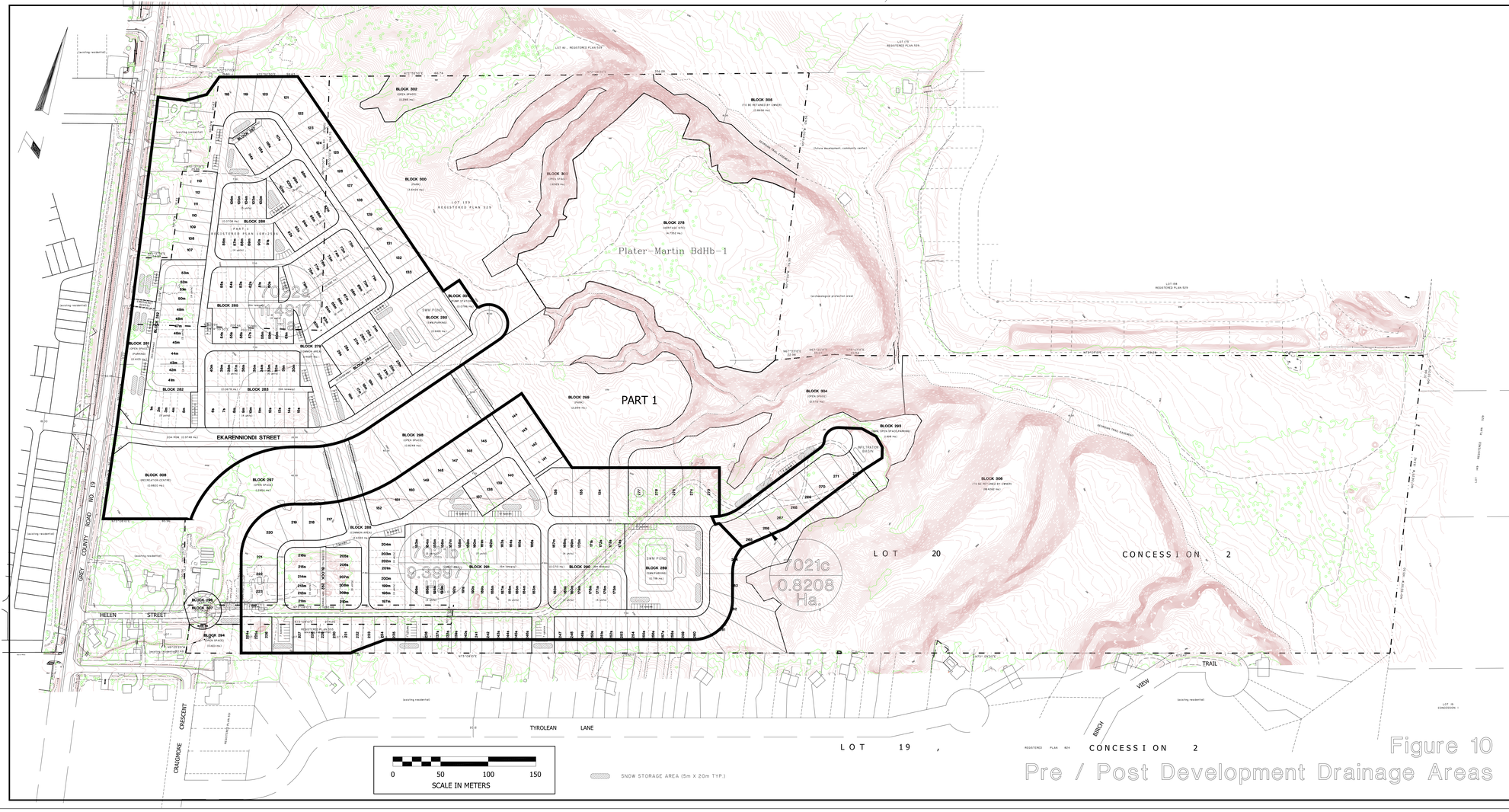
The majority of the southerly drainage is included in the 7021b area; the remaining southerly drainage from area 7021c will be directed to a infiltration basin in Block 293. This infiltration basin will outlet north to the existing watercourse.

STORM DRAINAGE - STORMWATER MANAGEMENT

Quality and Erosion Control

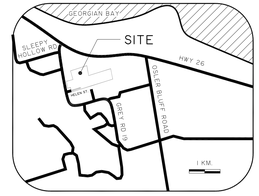
Using the MOE criteria (SWM Planning & Design Manual, Table 3.2 Water Quality Storage Requirements based on Receiving Waters) the Permanent Pool and Extended detention requirements for the two “wet” SWM ponds are summarized below.

Based on an overall site impervious level of 55%, for both the north (7021a) and south (7021b) drainage areas, the associated permanent pool volume requirements are 1,509 cu.m. and 1,724 cu.m., respectively. And for the extended detention portion, an additional 402 cu.m. would be required for the north pond and 460 cu.m. for the south pond.



DRAFT PLAN

OF PROPOSED SUBDIVISION
LOTS 2, 3, 4, 5, 6 AND 7,
REGISTERED PLAN 555 AND
PART OF LOT 159
REGISTERED PLAN 529 AND
PART OF LOT 20
CONCESSION 2
PART 1, PLAN 16R-2536
PART OF HELEN STREET ROW
TOWN OF THE BLUE MOUNTAINS
COUNTY OF GREY



KEY PLAN

OWNER'S AUTHORIZATION

I hereby authorize Higgins Engineering Limited, Consulting Engineers and Planners, to prepare and submit this proposed plan of subdivision

MACPHERSON BUILDERS (BLUE MOUNTAINS) LIMITED DATE
RUSSELL HIGGINS (AUTHORIZED SIGNING OFFICER)

TOWN OF THE BLUE MOUNTAINS DATE
ELLEN ANDERSON (MAYOR)

TOWN OF THE BLUE MOUNTAINS DATE
CORRINA GILES (CLERK)

SURVEYOR'S CERTIFICATE

I hereby certify that the boundary of the lands to be subdivided as shown on this plan and their relationship to the adjacent lands are accurately and correctly shown

ZUREK, TIMO AND PATTEN LTD. DATE

ADDITIONAL INFORMATION

Required under Section 51(17) of the Planning Act

(a) as shown
(b) as shown
(c) as shown on key plan
(d) residential / open space
(e) as shown
(f) as shown
(g) as shown
(h) municipal / private water
(i) till over bedrock
(j) as shown
(k) municipal / private sewers
(l) as shown

No.	REVISIONS	DATE	APPROVED

HIGGINS ENGINEERING LIMITED
CONSULTING ENGINEERS AND PLANNERS
416 MOORE AVENUE, SUITE 306, TORONTO, (416) 443-8001

TOWN OF THE BLUE MOUNTAINS
PLANNING DEPARTMENT

PLAN OF PROPOSED SUBDIVISION
PART LOT 20, CONCESSION 2,
TOWN OF THE BLUE MOUNTAINS
COUNTY OF GREY

DESIGN	L.S.H.	SCALE HOR.	1:1000
DRAWN	L.S.H.	REVIEWED	
DATE	23 APR 2014	SHEET No.	DRAWING No. 1410-209-S

Figure 10
Pre / Post Development Drainage Areas

The 25mm storm volumes required are 1,471 cu.m. and 1,680 cu.m, for the north and south pond respectively.

The 25mm volumes represent the larger volumes and are the determining criteria for the extended detention volumes. This extended detention portion will be drawn down over a 48 hour period and the permanent pool provided in the base of the pond.

For the Quality and Erosion Control aspects of the detention, a total storage volume of 2,980 cu.m. is required for the north pond and 3,404 cu.m. for the south pond; the northerly 7021a area and the southerly 7021b area, respectively.

For the smaller 7021c area the MOE criteria for an infiltration basin has different volume requirements from those of extended detention/permanent pool facilities. For the site impervious level (55%) a volume of 30 cu.m./ha. (95 cu.m.) would be required for the proposed infiltration basin (from Table 3.2 of the MOE SWM Planning & Design Manual).

In order to mitigate the impact of the runoff from this area (7021c) we are proposing to increase the size of the infiltration basin to 425 cu.m., representing the 100yr rainfall volume for the area. The small size of this drainage area and the available area in Block 293 make this feasible. The resulting infiltration basin would be approximately 25m x 20m in area and have a nominal depth of 1m. Although not specifically designed as flood (quantity) control, this would provide attenuation for the storms up to the 100yr. event.

The details of the inlet/outlet diversion manhole for the infiltration basin will be developed in the engineering phase of the project. This structure would consist of a manhole, with a diversion structure, intercepting the westerly storm sewer flow and directing it to the infiltration basin. As the runoff volumes exceed the infiltration

basin's capacity, the diversion structure would re-direct flows to the outlet sewer and to the outfall at the end of the cul-de-sac.

The Quality and Erosion Control storage requirement are summarized in Table 3.

Table 3

Summary - Quality and Erosion Control Storage requirements

Sub-Catchment				Enhanced Protection (80%)			
No.	Description	Area ha.		Extended	Permanent pool	Total	
7021a	North	11.49	Wet Pond	1,680	1,724	3,404	cu.m.
7021b	South	9.40	Wet Pond	1,375	1,410	2,785	cu.m.
7021c	South	0.82	Infiltration Basin	n/a	n/a	94	cu.m.

STORM DRAINAGE - STORMWATER MANAGEMENT

Quantity (Flood) Control

The storm water flows were modeled using the Visual Otthymo (ver.2) program. The storms used for modeling were the 2yr. to 100yr. “Chicago” storms as outlined in the The Blue Mountains 2009 Engineering Standards.

The 2 to 100 year storm flows, for both the pre and post development conditions, were generated for the two proposed SWM detention ponds; the northerly 7021a area and the southerly 7021b area. Similarly, the flows were also calculated for the infiltration basin (area 7021c); these are addressed separately, as there will no pre-post flow control, as such.

A summary of the Quantity Control (pre and post development) flow and storage requirements for the various storm levels is summarized in Table 5.

Table 4 - The Blue Mountains Chicago Storm Parameters

CHICAGO DESIGN STORM	2 yr	5 yr	25 yr	100 yr
Max. storm duration (min.)	180	180	210	210
Max. hydrograph length (min.)	360	360	360	360
Time step (min.)	5	5	5	5
Coefficient (a)	854.100	1234.576	1750.276	2171.754
Constant (b)	7.781	8.297	8.303	8.303
Exponent (c)	0.830	0.851	0.862	0.867
Fraction (r)	0.375	0.375	0.375	0.375
Duration t_d (min.)	180	180	210	210
Maximum Intensity (mm/hr)	101.673	134.692	165.718	202.862
Total Depth (mm)	33.228	42.929	59.007	71.271

Appendix D summarizes the parameters used to model the Pre-Developed and the Post-Developed areas and the Visual Otthymo modeling.

STORM DRAINAGE - STORMWATER MANAGEMENT MAINTENANCE

The SWM facilities shall be inspected periodically and after major storm events. The SWM pond and associated works shall be cleaned of accumulated sediment and repaired as determined by the Engineer. *Grass cutting shall be limited to not more than twice per year, to facilitate pollutant removal*. Inspections and maintenance shall be done in general accordance with the MOEE "Stormwater Management Practices Planning and Design Manual" (Section 5.0).

Inspections after Major Storm Events and Annual* inspections would typically include, but not limited to, inspecting the condition of the:

- Pond access and fencing
- Side slopes for erosion and weeds.
- Outlet for damage and blockage
- Water condition for contaminants
- And the pond sediment depth

** Annual inspection should be done in the late summer, early fall.*

Table 5 - Water Quantity Flow / Storage

Sub-Catchment					Storm Event			
No.	Description	Area ha.			2yr	5yr	25yr	100yr
PRE / POST - DEVELOPMENT FLOWS								
7021a	Pre-Development	11.49	flow	cms	0.120	0.220	0.480	0.700
7021a	Post-Development	11.49	inflow	cms	0.61	1.14	1.85	2.47
			outflow	cms	0.12	0.22	0.47	0.69
			storage	ha.m.	0.1183	0.1680	0.2380	0.2963
			required	cu.m.	1,183	1,680	2,380	2,963
7021b	Pre-Development	9.40	flow	cms	0.100	0.200	0.420	0.610
7021b	Post-Development	9.40	inflow	cms	0.41	0.88	1.49	2.01
			outflow	cms	0.09	0.20	0.40	0.61
			storage	ha.m.	0.0920	0.1290	0.1856	0.2308
			required	cu.m.	920	1,290	1,856	2,308
7021c	Pre-Development	0.83	flow	cms	0.020	0.040	0.080	0.110
			R.V.	mm	8.09	13.29	23.33	31.83
			R.V.	cu.m.	67	111	194	265
7021c	Post-Development	0.83	inflow	cms	0.02	0.04	0.08	0.11
			outflow	cms	0.07	0.10	0.17	0.22
			R.V.	mm	18.05	25.95	39.90	50.99
			R.V.	cu.m.	150	216	333	425
7021c	Pre to Post Development		R.V.increase	cu.m.	83	106	138	160
	INFILTRATION 100yr							

SUMMARY

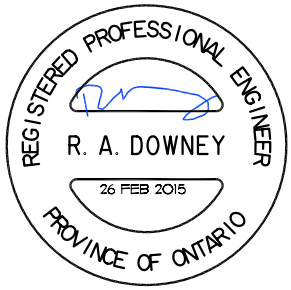
This report presents the proposed servicing required for development of the Home Farm project and includes:

- Provision of municipal water, for the proposed private watermain system, from the existing municipal watermain on Grey County Road 19.
- A sanitary system servicing the development; draining to an internal pumping station and discharged via a forcemain to the existing municipal sewer on Grey County Road 19.
- A storm drainage system directing internal major/minor flows to two storm detention ponds and one infiltration facility providing quality and quantity controls. Providing mitigation of discharge to the downstream properties and protection against erosion of the downstream creek and valley lands.
- Conveyance of the external drainage through the site; providing safe flow routes through the development and improved flood protection for the existing properties at Helen Street and Grey County Road 19. The channel design considers the not only flow requirements, but includes low flow features in deference to the aquatic environment.

The measures outlined summarize the overall servicing design for the proposed Home Farm development. The design provides for the protection of the local environment and provides for the servicing of the lands in a manner compatible with the Town of the Blue Mountains planning and development practices.

HIGGINS ENGINEERING LIMITED

PER:



R. A. Downey, P.Eng.

APPENDIX A

W.F. Baird & Associates Coastal Engineers Ltd.
December 5th, 2014

- Letter
- Typical Cross-Sections
- Conceptual 'Naturalized' Drainage Channel

December 5, 2014

Baird & Associates
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Gord Wichert
Aquatic Ecologist
SLR Consulting
Markham, Ontario, L3R 5Z6

Baird

oceans
engineering
lakes
design
rivers
science
watersheds
construction

Dear Dr. Wichert

This letter report presents proposed realignment of the drainage channel at Home Farm. This report is based on the following materials:

- Proposed Site Plan provided by Higgins Engineering
- Design storm flows provided by Higgins Engineering
- Dry weather discharge estimates and groundwater considerations provided by SLR Consulting
- Site photographs from you

Proposal: Realigned Meandering Low Flow Channel

The proposed meandering channel is designed to connect the existing stream at Helen Street with the existing ravine just downhill of the subdivision. The channel has been designed to convey dry weather flows in a low-flow channel and to accommodate larger flows via a larger floodplain channel that will also serve as a wetland shelf (hereafter referred to as "floodplain channel"). This setup will provide enhanced aquatic habitat in the low-flow channel and enhanced habitat for other wildlife in the floodplain channel.

Channel Details

The topography of the proposed channel can be divided into three sections separated by average slope. The upper section connecting to the existing channel at Helen Street (approximately 150 meters along the channel centerline) will have an approximate slope of 1.8 percent, the middle section through the site (approximately 150-375 meters along the channel centerline) will have an approximate slope of 3.4 percent, and the lower section connecting to the ravine will have a slope of approximately 6 percent. Slopes of the upper and middle sections are adequate to support a pool-riffle system into the low-flow channel, and the steeper lower section is best suited as a step-pool system for the low-flow channel.

Since the present flows are relatively low, a two-stage channel with natural channel design elements is proposed in order to introduce habitat diversity into the realigned section. The meandering low flow channel will allow conveyance of the relatively low base flow amounts, while keeping flow confined to a relatively deep channel in an attempt to limit vegetation encroachment during low flow periods. The larger floodplain channel should contain flow during periods of higher flow, and it has been designed to inundate approximately one to three times per year.

Baird

A typical proposed cross-section for designed channels is shown in Figure 1. The low-flow channel should be a small, meandering channel to encourage some flow diversity at the mean daily flow stage. The channel should have an approximate base width of 0.75 meters to one meter, an approximate depth of 0.65 meters, and side slopes of 1:1. This width:depth ratio is lower than the average for natural rivers, but the expected low-flow discharge should be confined for this situation to maintain a greater flow depth and to enhance aquatic habitat. The increased depth of the stream should also prevent the formation of springs along the floodplain channel by ensuring the water table remains below ground level throughout the year. This feature will allow for much easier construction and maintenance of the floodplain channel. Additionally, the dimensions suggested will allow the main channel to overflow into the floodplain channel periodically through the year, which will allow for improved habitat along the channel length.

Within the floodplain channel, the low flow channel should meander. A sequence of pool-riffle type features may be introduced into the low flow channel for the upper and middle reaches, and a step-pool system may be introduced into the low flow channel for the lower reaches. Mean meander amplitude of the low flow channel should be around 5 to 8 meters, and wavelength should be in the order of 10 to 15 meters. The most extensive dataset to date, Keller & Melhorn (1978), suggests a mean pool-pool spacing of 5.9 channel widths, so typical low flow pool-pool spacing should be around 10 to 15 meters and should reflect the meander wavelength.

With regards to cross-sectional form, pools should be narrower and deeper than riffles and should be sited on the outside of meander bends. Typical pools should be approximately 0.5 to 0.7 m deep, with a top width of 2 meters. Riffles should be approximately 0.15 to 0.25 meters deep, with a top width of 2 to 4 meters. These dimensions can vary around the mean grade shown on the detail in proposed site plan provided by Higgins Engineering. A gravel bed substrate should be instated once the design has been excavated. This bed should consist of clean river stone in the order of 20 to 200 mm. We suggest that the finer end of this range be installed in pools, while coarser material is maintained in the riffle sections to emulate the natural along-stream variation in grain size observed in alluvial channels.

In order to maintain conveyance of the flood flow, it is recommended that the floodplain channel remain relatively straight, as shown in Figure 2. Flood conveyance should be verified during detailed design by a qualified engineer.

Pools should match up with the outside of meander bends, and riffles should be installed in the intervening straight sections. Shading of pool areas by riparian planting should be engineered to attempt to maintain cooler water refuge during periods of little-no flow.

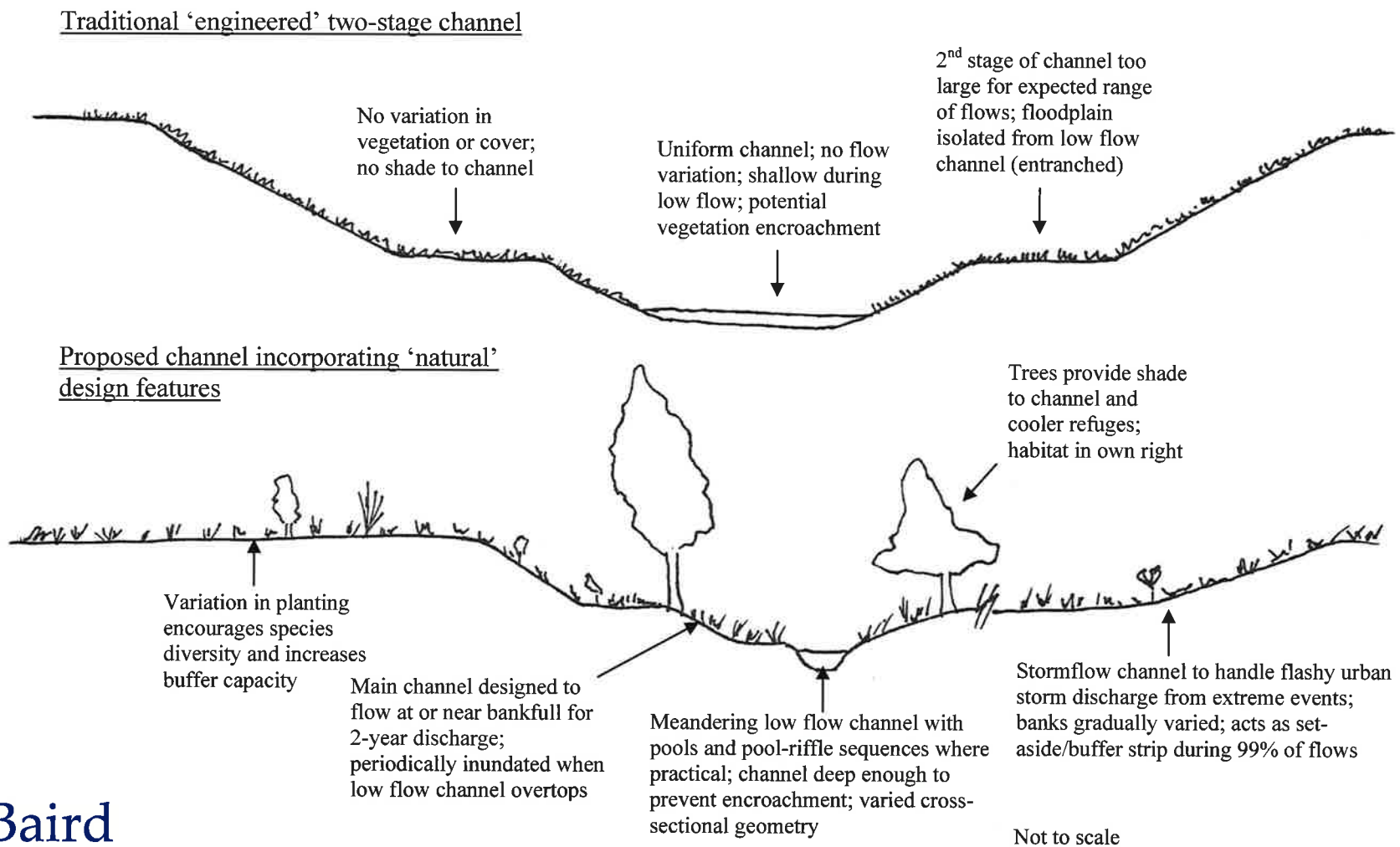
Baird

We hope you find the above pertinent to the detailed design stage of your project. Please do not hesitate to contact me if you require further assistance.

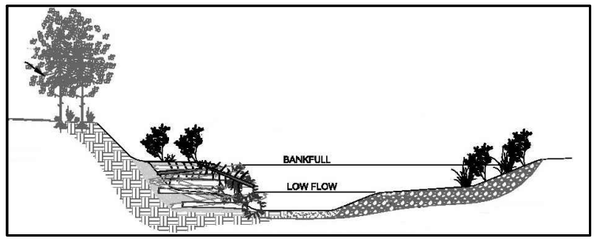
Yours truly,
W.F. Baird & Associates Coastal Engineers Ltd.

Alex Brunton, Ph.D.
Geomorphologist

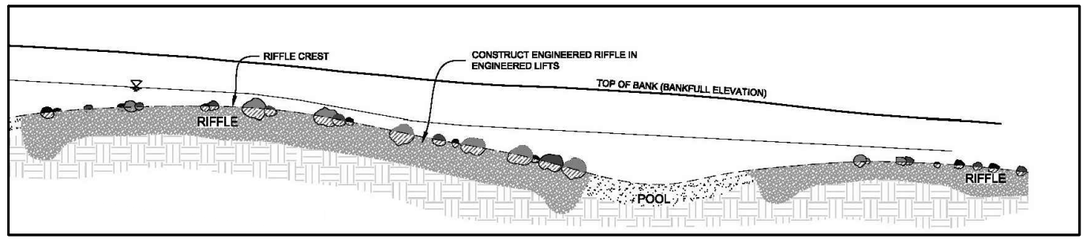
Figure 1: Typical channel cross-sections



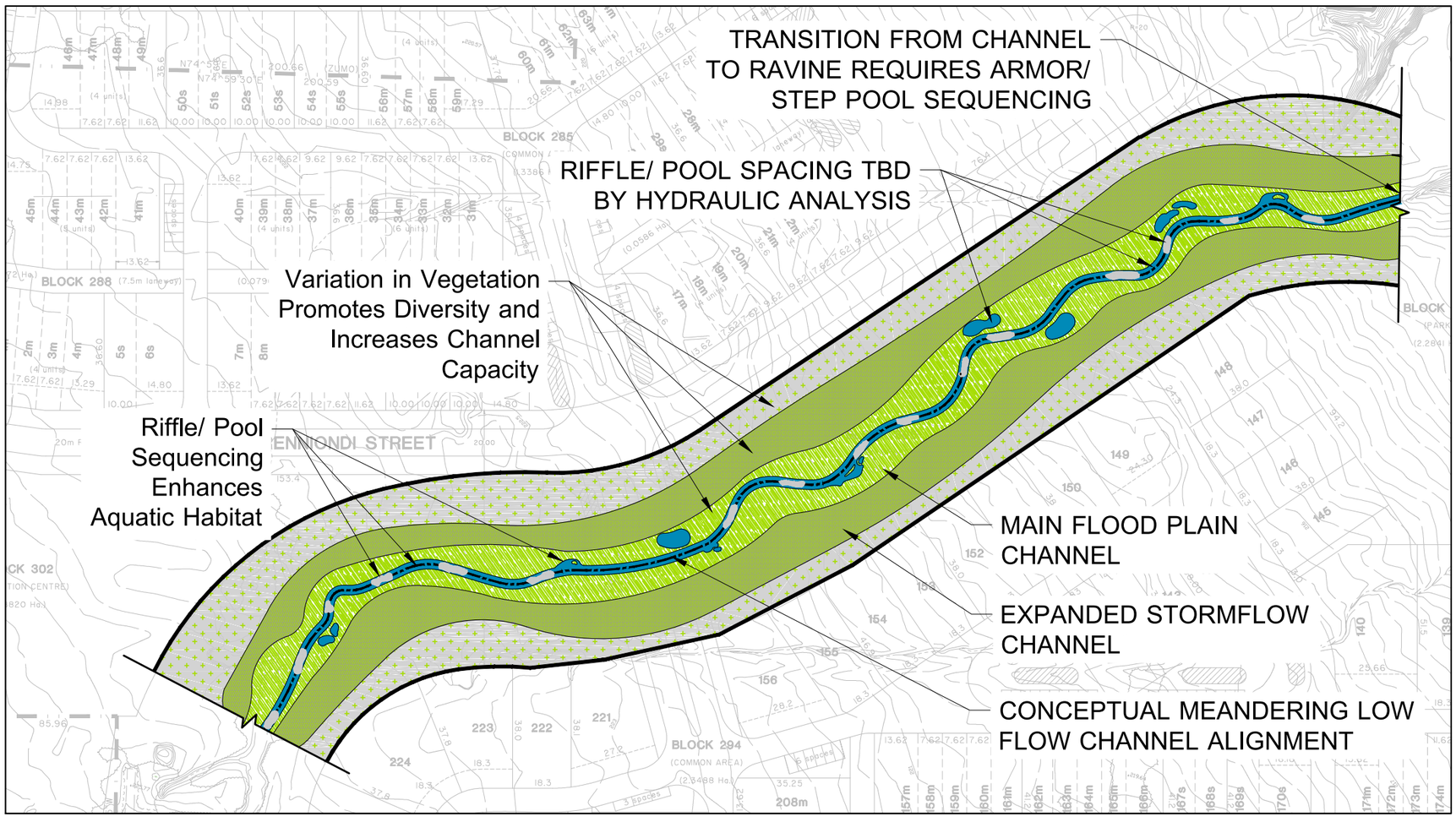
Baird



CONCEPTUAL SECTION



CONCEPTUAL PROFILE



CONCEPTUAL PLAN

RIFFLE POOL CONCEPT

N

0 20 40 Metres

HOME FARM

CONCEPTUAL 'NATURALIZED' DRAINAGE CHANNEL

BLUE MOUNTIANS, ONTARIO

Figure Number:	Project Number:
Description: CONCEPTUAL PLAN	Date: YY-MM-DD 14-09-12

Prepared By: Baird

T:\RORY\2014-07-29 HOME FARM\WORKING\CONCEPTUAL DESIGN - HOME FARM - REV2.DWG

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APPENDIX B

HEC-RAS

- Profile Output Table
- Channel Profile
- Channel Cross-Sections

HEC-RAS Plan: channel no culve River: Home Farm Channe Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	921.68	Regional	10.00	228.50	229.61	229.45	229.67	0.003826	1.37	11.39	24.01	0.47
1	921.68	2 Year	1.32	228.50	229.14	228.96	229.17	0.003606	0.78	1.91	8.52	0.40
1	921.68	100 Year	4.94	228.50	229.45	229.31	229.49	0.002839	1.03	7.59	23.08	0.39
1	910.68	Regional	10.00	228.50	229.48	229.45	229.60	0.009203	1.90	8.29	23.24	0.71
1	910.68	2 Year	1.32	228.50	229.05		229.10	0.009636	1.07	1.26	5.58	0.62
1	910.68	100 Year	4.94	228.50	229.31	229.31	229.43	0.009786	1.65	4.49	22.35	0.70
1	819.55	Regional	10.00	227.00	228.05	228.05	228.22	0.029064	2.73	5.70	15.39	0.86
1	819.55	2 Year	1.32	227.00	227.69	227.69	227.79	0.023791	1.85	1.12	5.31	0.73
1	819.55	100 Year	4.94	227.00	227.91	227.92	228.03	0.027181	2.39	3.61	14.61	0.82
1	803.55	Regional	10.00	224.82	225.65	226.01	227.20	0.140524	5.88	2.21	8.73	2.39
1	803.55	2 Year	1.32	224.82	225.02	225.30	226.58	0.599193	5.53	0.24	1.40	4.27
1	803.55	100 Year	4.94	224.82	225.39	225.77	226.96	0.205255	5.54	0.89	2.14	2.74
1	760.15	Regional	10.00	224.06	225.54	225.25	225.59	0.002757	1.34	11.73	18.80	0.38
1	760.15	2 Year	1.32	224.06	224.67	224.54	224.76	0.011632	1.36	0.97	2.21	0.65
1	760.15	100 Year	4.94	224.06	225.07	225.01	225.21	0.010719	1.93	3.89	14.02	0.69
1	756.14*	Regional	10.00	223.99	225.54	225.18	225.58	0.002068	1.20	13.05	19.49	0.33
1	756.14*	2 Year	1.32	223.99	224.64	224.47	224.72	0.009050	1.24	1.06	2.29	0.58
1	756.14*	100 Year	4.94	223.99	225.08	224.94	225.16	0.005698	1.50	5.13	14.88	0.51
1	744.58		Bridge									
1	732.33	Regional	10.00	223.57	224.63	224.76	225.04	0.029547	3.34	4.64	14.55	1.16
1	732.33	2 Year	1.32	223.57	224.11		224.24	0.017805	1.59	0.83	2.08	0.80
1	732.33	100 Year	4.94	223.57	224.49	224.52	224.69	0.016838	2.23	3.03	9.28	0.85
1	708.73*	Regional	10.00	223.16	224.34	224.34	224.53	0.013059	2.43	6.49	15.77	0.79
1	708.73*	2 Year	1.32	223.16	223.71		223.83	0.016966	1.56	0.85	2.09	0.78
1	708.73*	100 Year	4.94	223.16	224.07	224.10	224.28	0.017785	2.28	2.96	9.23	0.87
1	661.32*	Regional	10.00	222.33	223.43	223.51	223.73	0.021688	2.96	5.29	14.99	1.00
1	661.32*	2 Year	1.32	222.33	222.86		222.99	0.018362	1.61	0.82	2.07	0.81
1	661.32*	100 Year	4.94	222.33	223.24	223.27	223.45	0.017392	2.26	2.99	9.25	0.86
1	613.91*	Regional	10.00	221.50	222.65	222.68	222.87	0.014671	2.54	6.20	15.58	0.83
1	613.91*	2 Year	1.32	221.50	222.05		222.17	0.016440	1.54	0.86	2.10	0.77
1	613.91*	100 Year	4.94	221.50	222.40	222.44	222.62	0.017704	2.27	2.97	9.24	0.87
1	566.5*	Regional	10.00	220.66	221.78	221.85	222.06	0.019718	2.85	5.50	15.13	0.95
1	566.5*	2 Year	1.32	220.66	221.19	221.14	221.33	0.019137	1.63	0.81	2.06	0.83
1	566.5*	100 Year	4.94	220.66	221.57	221.61	221.78	0.017440	2.26	2.98	9.25	0.86
1	519.09*	Regional	10.00	219.83	221.40	221.02	221.44	0.001903	1.16	13.46	19.70	0.32
1	519.09*	2 Year	1.32	219.83	220.39		220.51	0.015581	1.51	0.87	2.12	0.75
1	519.09*	100 Year	4.94	219.83	220.88	220.78	220.99	0.007385	1.67	4.60	14.52	0.58
1	507.28	Regional	10.00	219.63	221.40	220.82	221.42	0.000940	0.89	17.47	21.64	0.23
1	507.28	2 Year	1.32	219.63	220.28	220.11	220.36	0.009056	1.24	1.06	2.29	0.58
1	507.28	100 Year	4.94	219.63	220.89	220.58	220.92	0.001984	1.00	7.81	16.58	0.31
1	489.79		Bridge									
1	471.68	Regional	10.00	219.00	219.96	220.18	220.59	0.050004	4.01	3.46	9.55	1.47
1	471.68	2 Year	1.32	219.00	219.47	219.47	219.66	0.028662	1.89	0.70	1.95	1.01
1	471.68	100 Year	4.94	219.00	219.91	219.94	220.12	0.017687	2.27	2.97	9.24	0.87
1	451.68	Regional	10.00	218.28	219.33	219.46	219.76	0.030749	3.39	4.56	14.49	1.18
1	451.68	2 Year	1.32	218.28	218.70	218.75	218.95	0.043928	2.21	0.60	1.84	1.24
1	451.68	100 Year	4.94	218.28	219.07	219.22	219.55	0.045437	3.22	1.92	8.53	1.35
1	428.821*	Regional	10.00	217.46	218.48	218.64	218.99	0.036454	3.63	4.23	14.27	1.28
1	428.821*	2 Year	1.32	217.46	217.93	217.93	218.11	0.029717	1.92	0.69	1.94	1.03
1	428.821*	100 Year	4.94	217.46	218.29	218.40	218.65	0.032347	2.84	2.27	8.77	1.15
1	385.963*	Regional	10.00	215.91	216.94	217.10	217.44	0.035706	3.60	4.27	14.29	1.26
1	385.963*	2 Year	1.32	215.91	216.34	216.39	216.58	0.043517	2.20	0.60	1.84	1.23
1	385.963*	100 Year	4.94	215.91	216.72	216.86	217.14	0.038091	3.02	2.10	8.65	1.24
1	343.105*	Regional	10.00	214.37	215.99	215.55	216.02	0.001583	1.08	14.41	20.18	0.29
1	343.105*	2 Year	1.32	214.37	214.88	214.85	215.03	0.021350	1.70	0.78	2.03	0.88

HEC-RAS Plan: channel no culve River: Home Farm Channe Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	343.105*	100 Year	4.94	214.37	215.47	215.32	215.54	0.005359	1.47	5.26	14.97	0.50
1	339.105	Regional	10.00	214.23	215.99	215.41	216.01	0.000935	0.89	17.50	21.65	0.23
1	339.105	2 Year	1.32	214.23	214.88	214.70	214.96	0.008544	1.21	1.09	2.31	0.57
1	339.105	100 Year	4.94	214.23	215.49	215.17	215.52	0.001954	0.99	7.85	16.61	0.31
1	334.48		Bridge									
1	313.996	Regional	10.00	213.32	214.25	214.51	215.03	0.064494	4.41	3.12	9.33	1.66
1	313.996	2 Year	1.32	213.32	213.80	213.80	213.98	0.028608	1.89	0.70	1.95	1.01
1	313.996	100 Year	4.94	213.32	214.15	214.27	214.52	0.034032	2.90	2.22	8.74	1.18
1	300.246*	Regional	10.00	212.83	213.87	214.01	214.32	0.032482	3.47	4.46	14.42	1.21
1	300.246*	2 Year	1.32	212.83	213.25	213.30	213.50	0.042753	2.18	0.60	1.85	1.22
1	300.246*	100 Year	4.94	212.83	213.65	213.77	214.04	0.035874	2.96	2.16	8.70	1.21
1	257.388*	Regional	10.00	211.29	212.31	212.47	212.82	0.037360	3.66	4.19	14.23	1.29
1	257.388*	2 Year	1.32	211.29	211.75	211.76	211.94	0.030604	1.94	0.68	1.93	1.04
1	257.388*	100 Year	4.94	211.29	212.10	212.23	212.50	0.036119	2.96	2.15	8.69	1.21
1	214.53	Regional	10.00	209.74	210.77	210.93	211.26	0.035261	3.58	4.30	14.31	1.26
1	214.53	2 Year	1.32	209.74	210.17	210.22	210.41	0.042039	2.17	0.61	1.85	1.21
1	214.53	100 Year	4.94	209.74	210.56	210.69	210.96	0.035968	2.96	2.16	8.70	1.21
1	199.07	Regional	10.00	209.19	210.13	210.37	210.81	0.054157	4.13	3.35	9.48	1.53
1	199.07	2 Year	1.32	209.19	209.57	209.66	209.89	0.063933	2.52	0.52	1.76	1.48
1	199.07	100 Year	4.94	209.19	209.96	210.13	210.51	0.052507	3.40	1.77	8.43	1.44
1	0	Regional	10.00	197.50	198.43	198.68	199.20	0.062929	4.37	3.15	9.35	1.64
1	0	2 Year	1.32	197.50	197.90	197.97	198.19	0.054153	2.38	0.56	1.79	1.37
1	0	100 Year	4.94	197.50	198.25	198.44	198.91	0.064929	3.67	1.57	8.28	1.59

Home Farm Channel 2014 Plan: Plan 02 2/19/15

Home Farm Channe 1

Elevation (m)

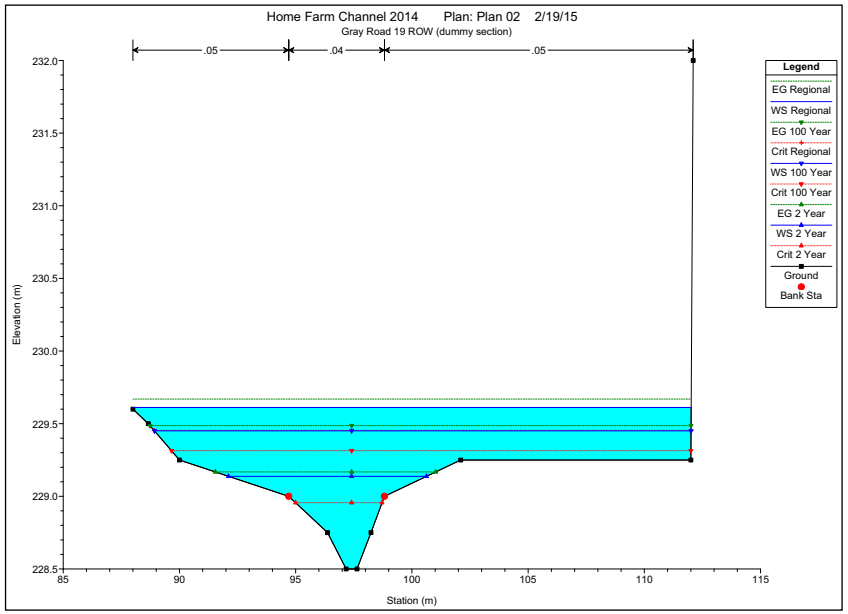
230
225
220
215
210
205
200
195

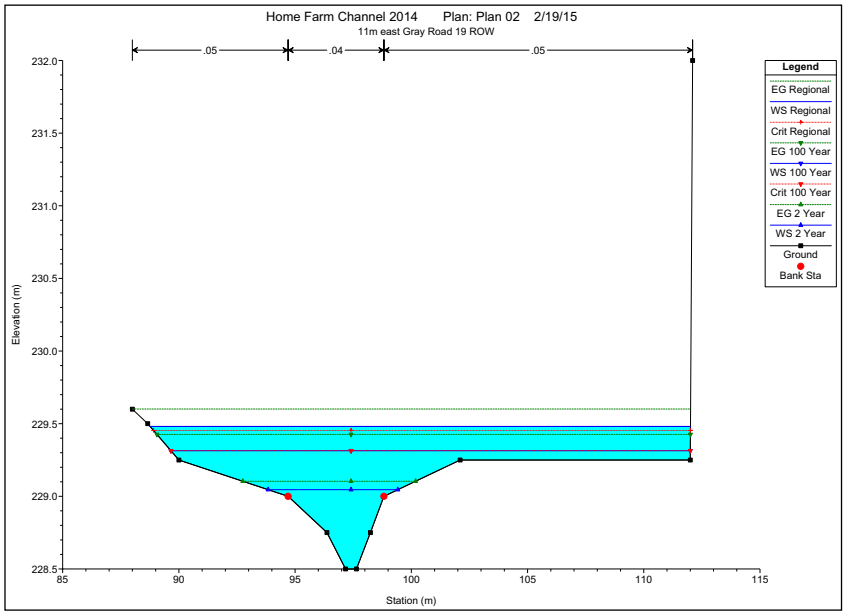
0
200
400
600
800
1000

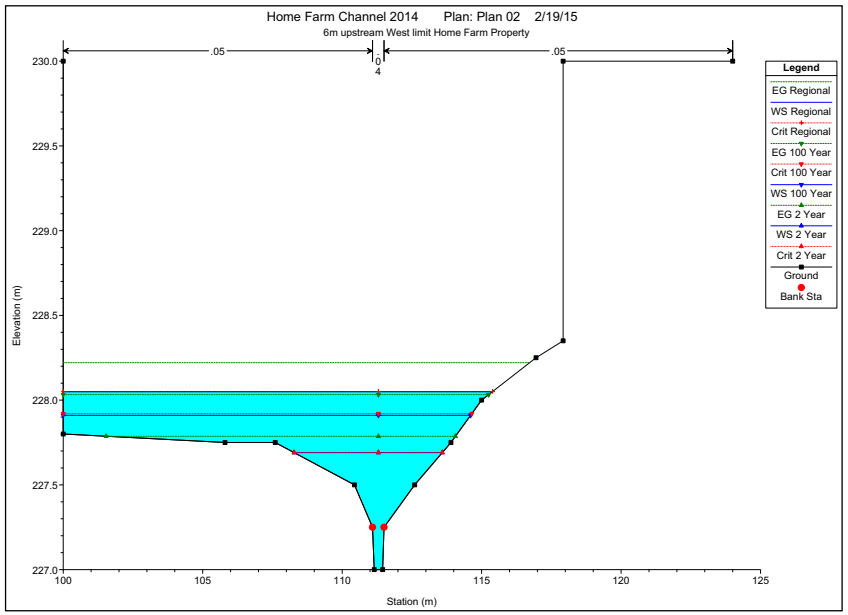
Main Channel Distance (m)

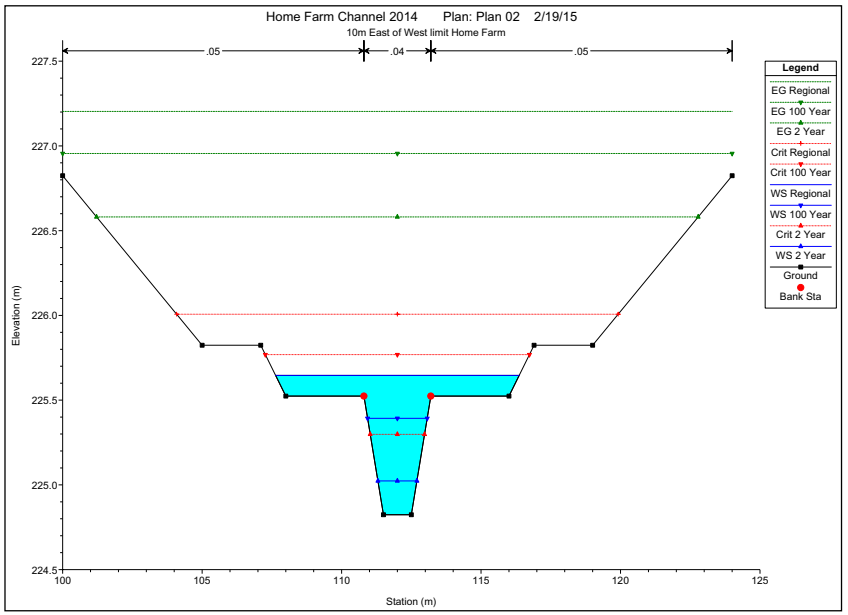
Legend

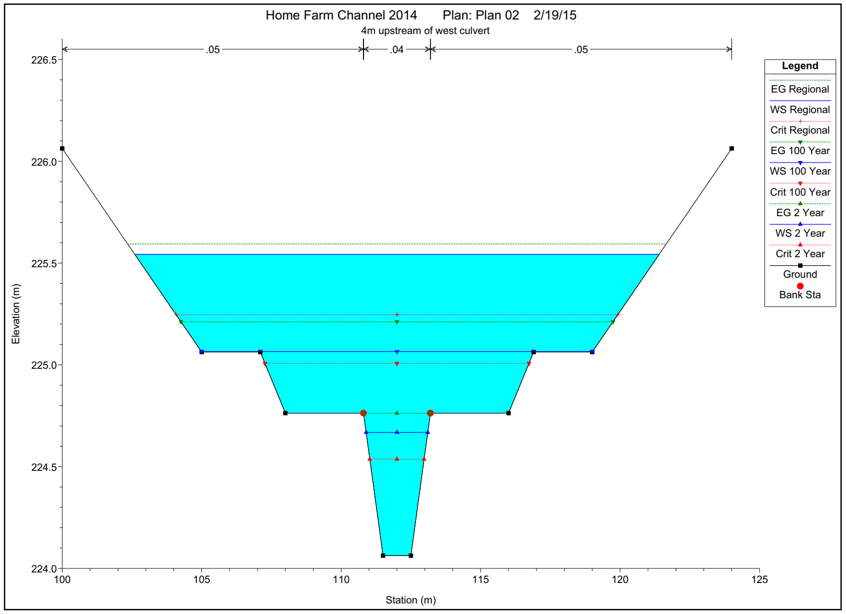
EG Regional
EG 100 Year
Crit Regional
Crit 100 Year
WS Regional
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground

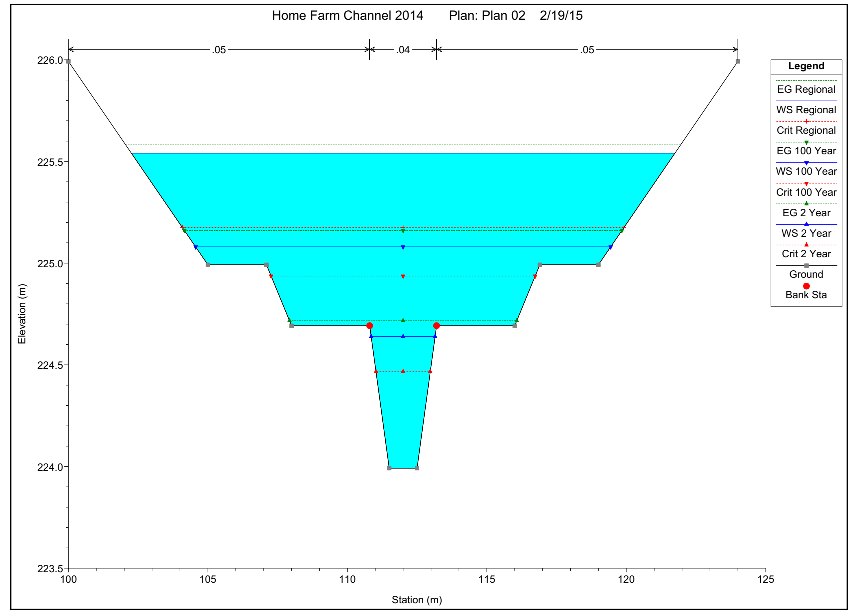

Home Farm Channel 2014 Plan: Plan 02 2/19/15
Gray Road 19 ROW (dummy section)
.05
.04
.05
Legend
EG Regional
WS Regional
EG 100 Year
Crit Regional
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

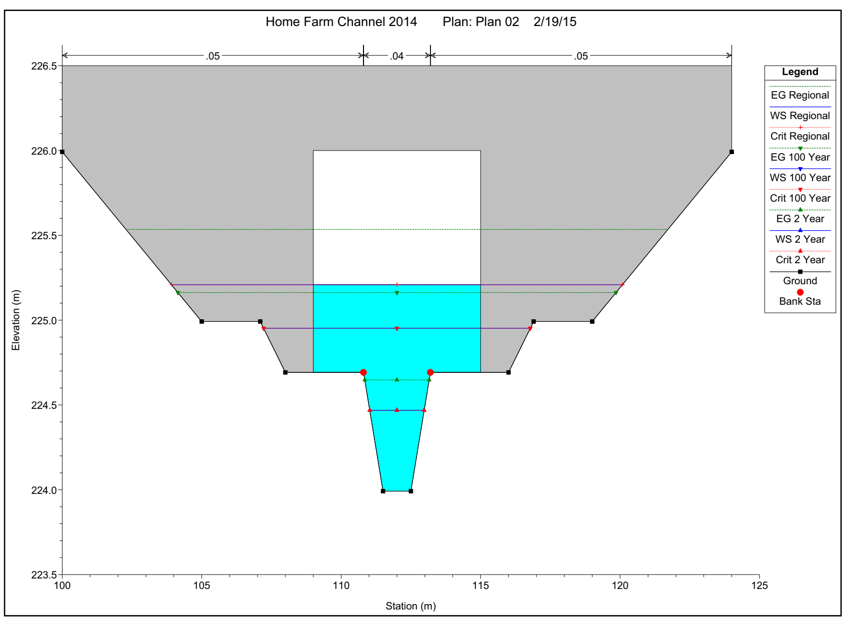

Home Farm Channel 2014 Plan: Plan 02 2/19/15
11m east Gray Road 19 ROW
.05
.04
.05
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

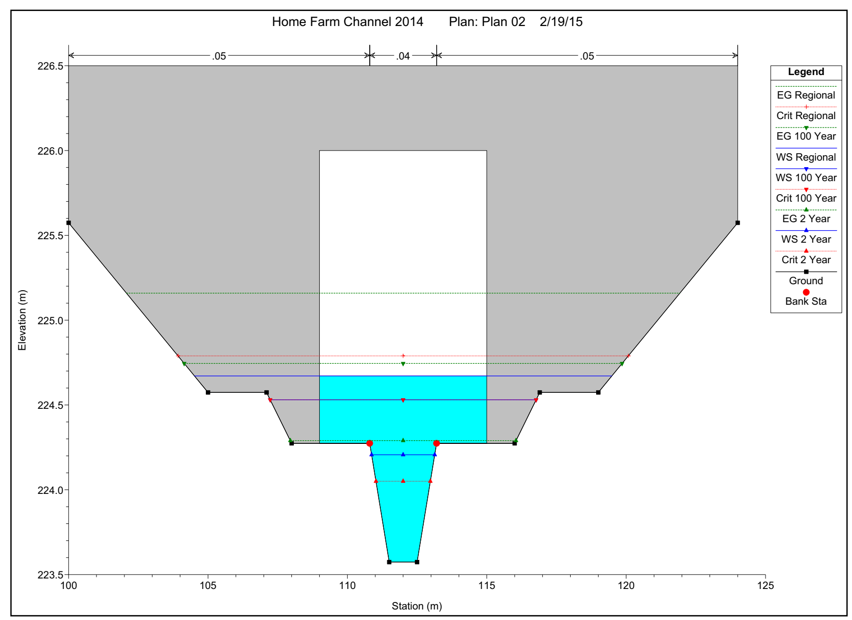

Home Farm Channel 2014 Plan: Plan 02 2/19/15
6m upstream West limit Home Farm Property
.05
.05
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

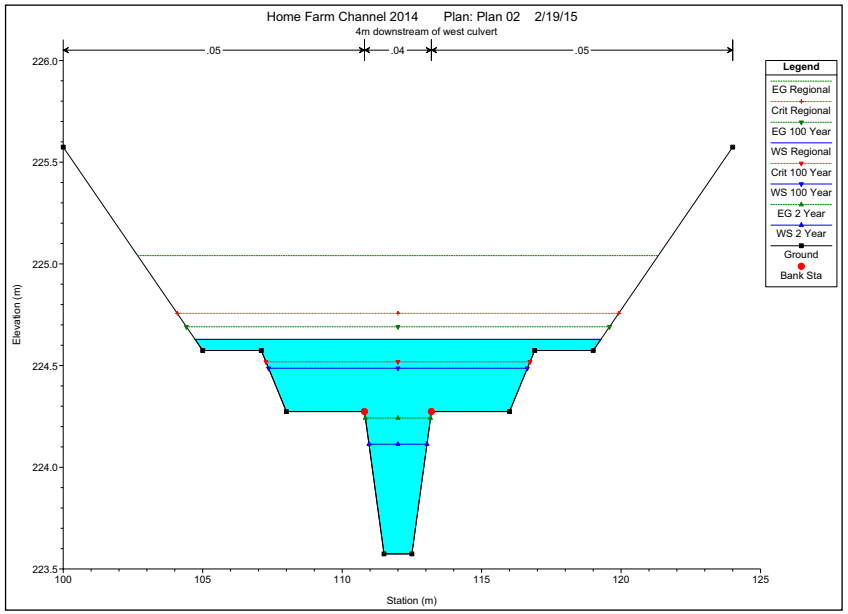

Home Farm Channel 2014 Plan: Plan 02 2/19/15
10m East of West limit Home Farm
.05
.04
.05
Legend
EG Regional
EG 100 Year
EG 2 Year
Crit Regional
Crit 100 Year
WS Regional
WS 100 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

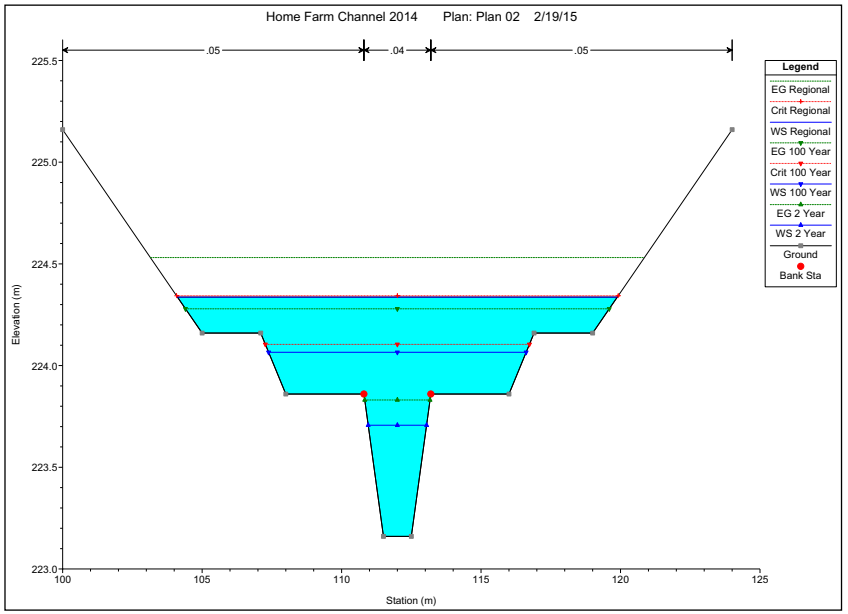

Home Farm Channel 2014 Plan: Plan 02 2/19/15
4m upstream of west culvert
.05
.04
.05
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

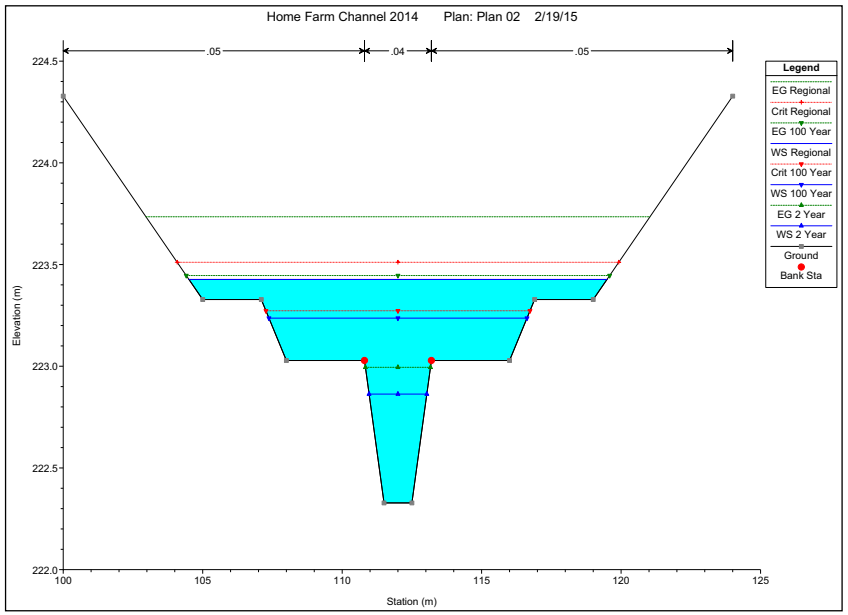

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

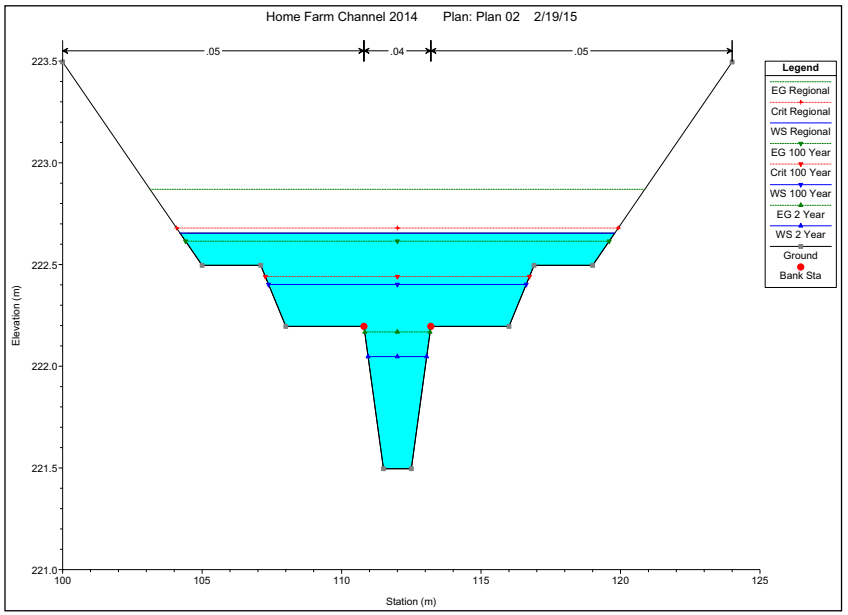

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

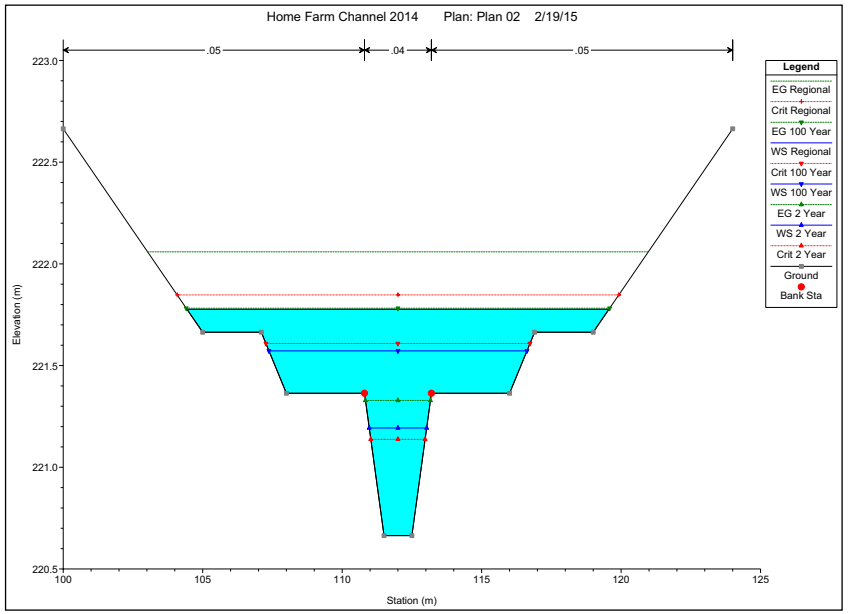

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
Crit Regional
EG 100 Year
WS Regional
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

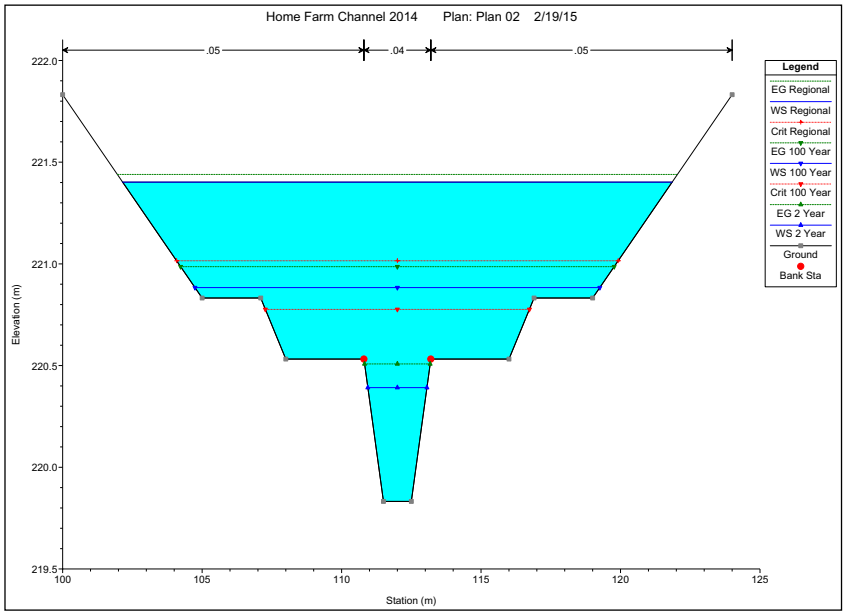

Home Farm Channel 2014 Plan: Plan 02 2/19/15
4m downstream of west culvert
.05
.04
.05
Legend
EG Regional
Crit Regional
EG 100 Year
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

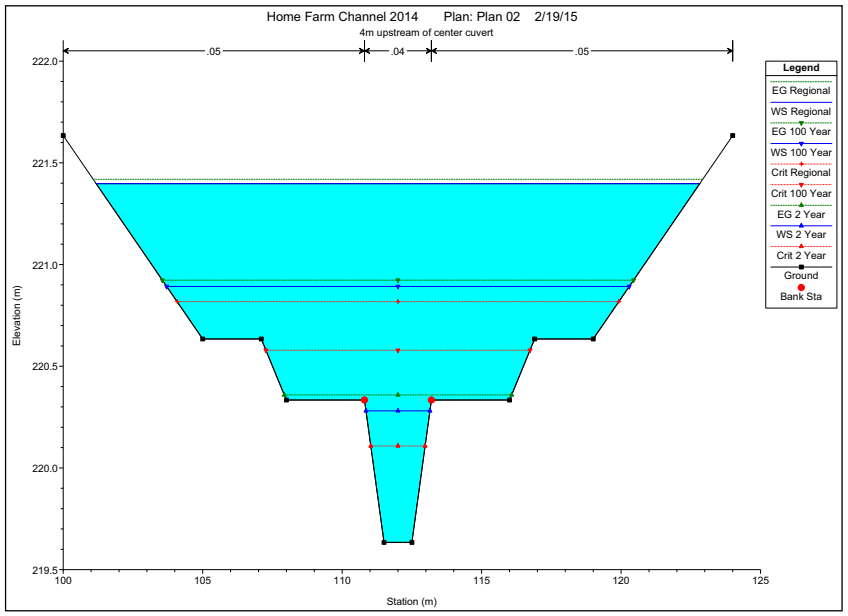

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
Crit Regional
WS Regional
EG 100 Year
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

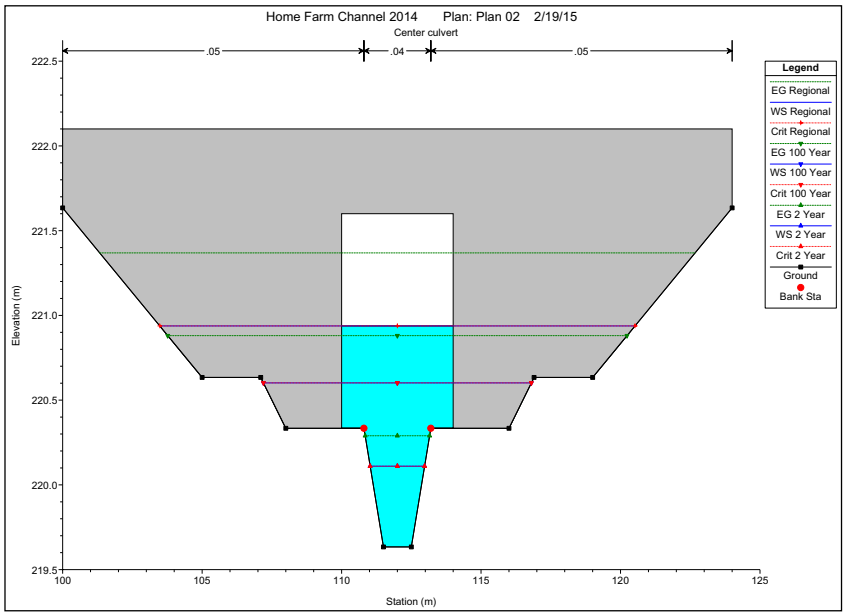

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
Crit Regional
EG 100 Year
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

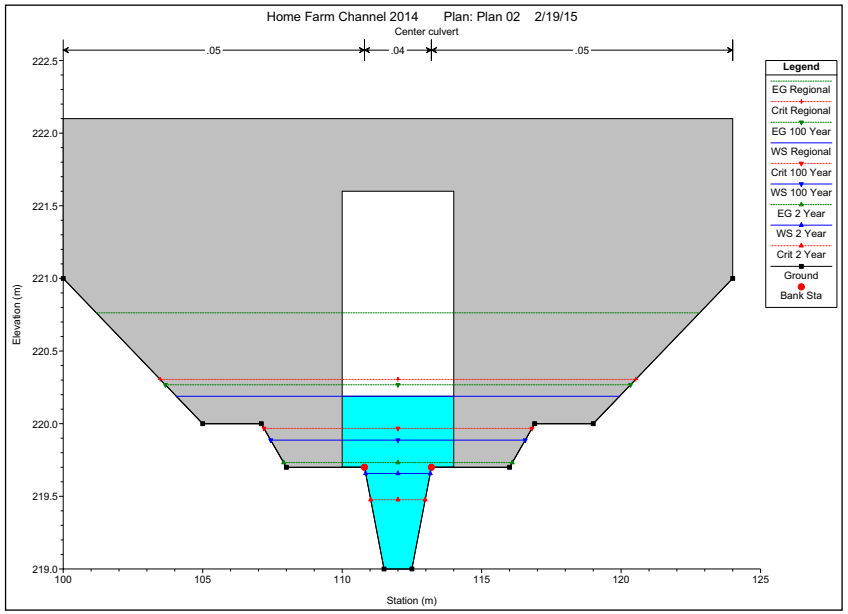

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
Crit Regional
WS Regional
EG 100 Year
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

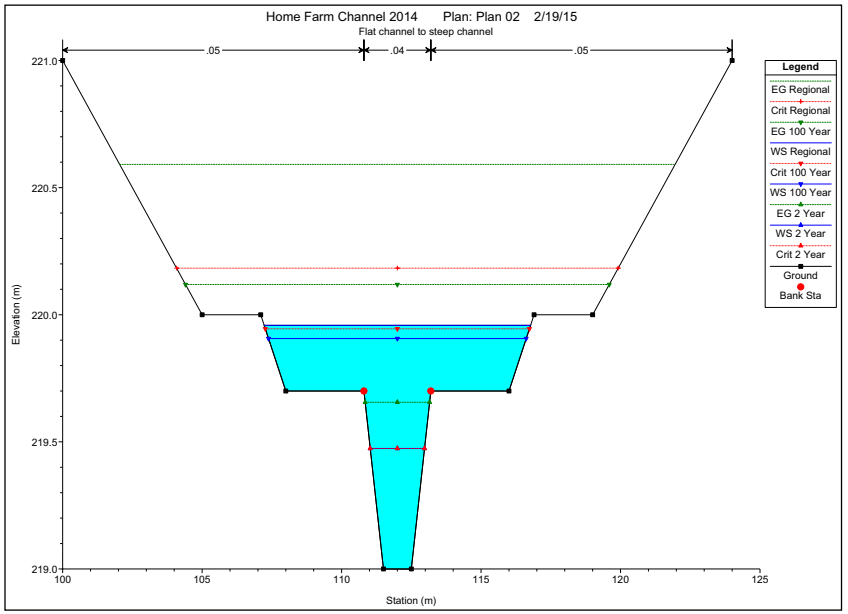

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
Crit Regional
EG 100 Year
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

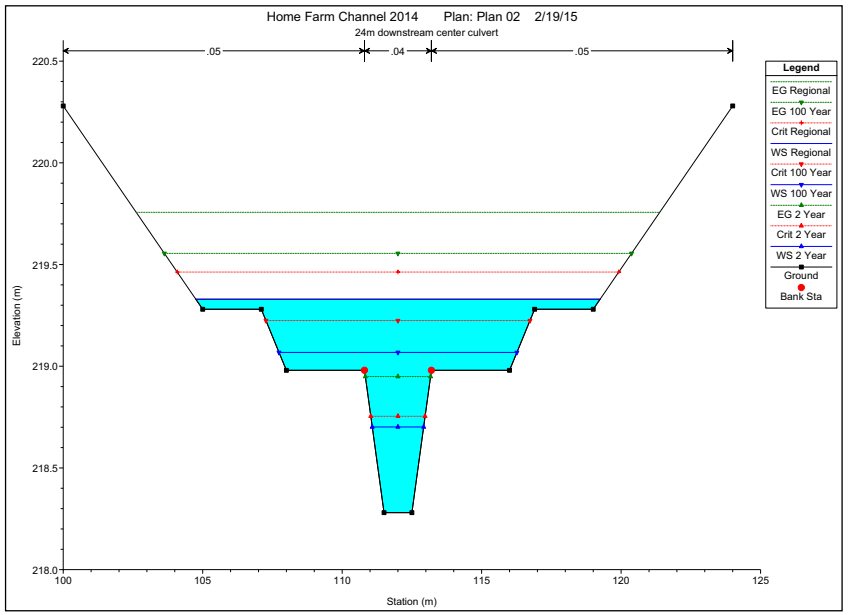

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

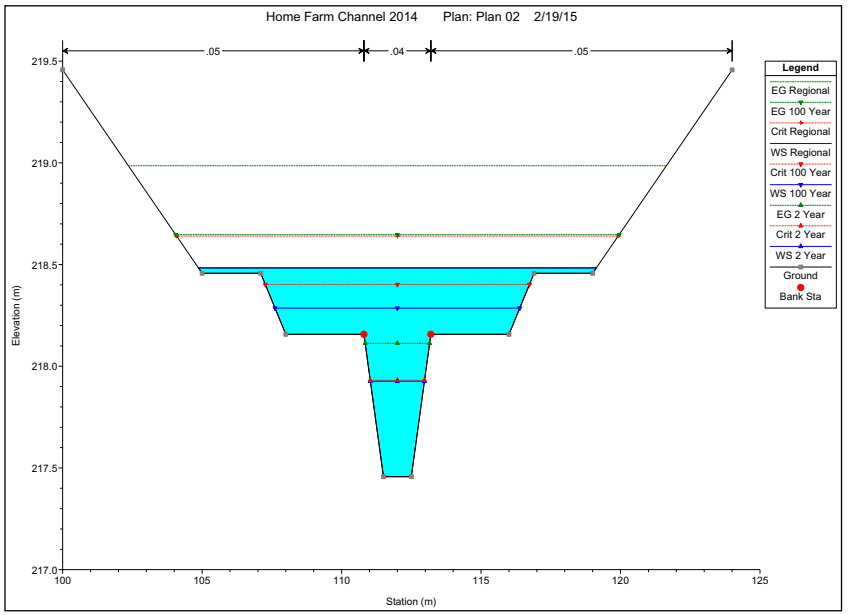

Home Farm Channel 2014 Plan: Plan 02 2/19/15
4m upstream of center cuvert
.05
.04
.05
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Crit Regional
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

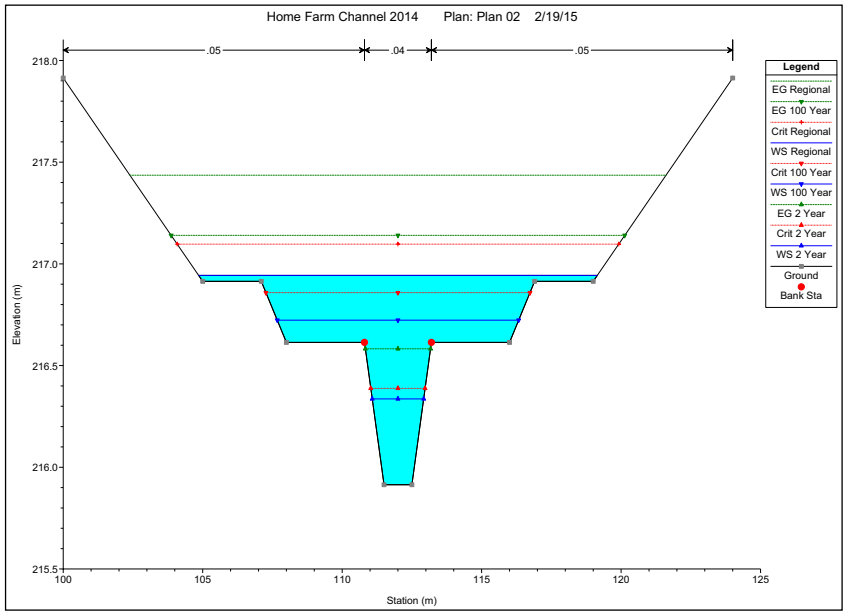

Home Farm Channel 2014 Plan: Plan 02 2/19/15
Center culvert
.05
.04
.05
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

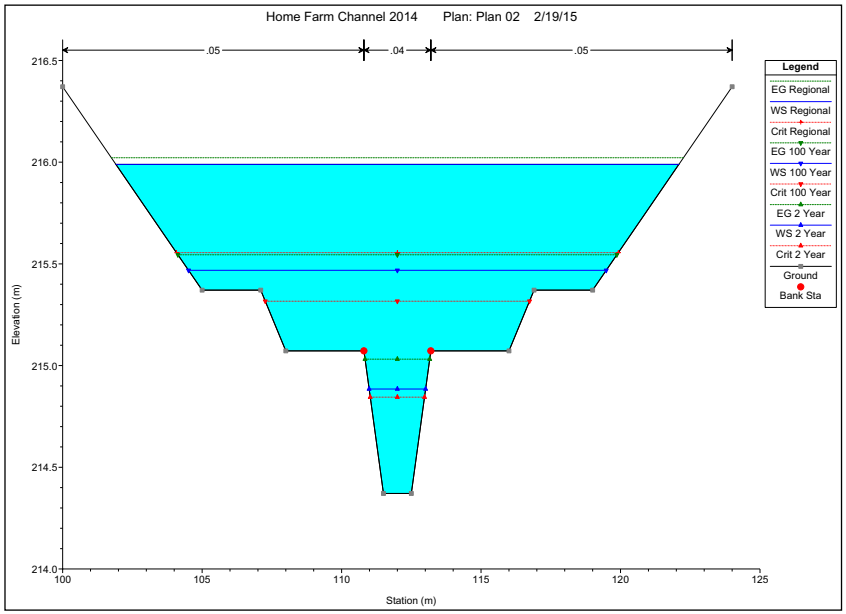

Home Farm Channel 2014 Plan: Plan 02 2/19/15
Center culvert
.05
.04
.05
Legend
EG Regional
Crit Regional
EG 100 Year
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

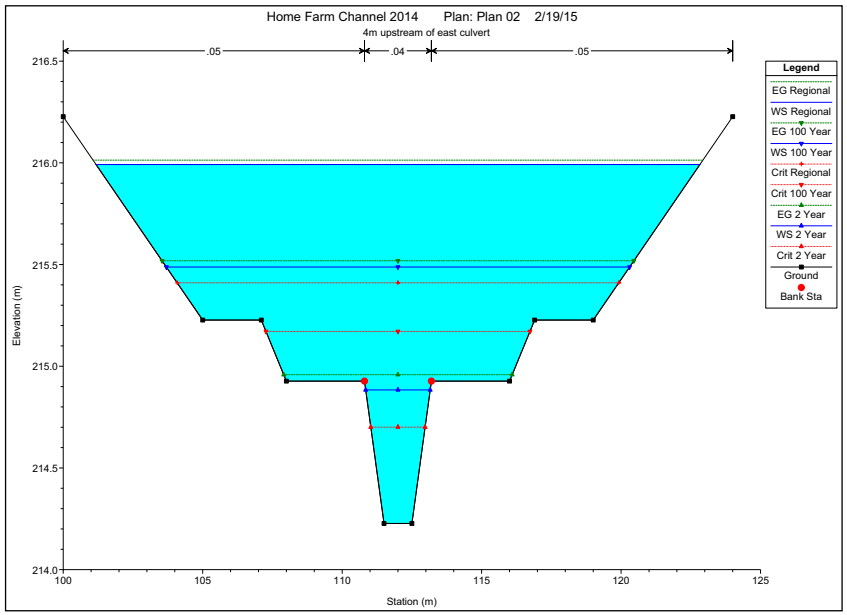

Home Farm Channel 2014 Plan: Plan 02 2/19/15
Flat channel to steep channel
.05
.04
.05
Legend
EG Regional
Crit Regional
EG 100 Year
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

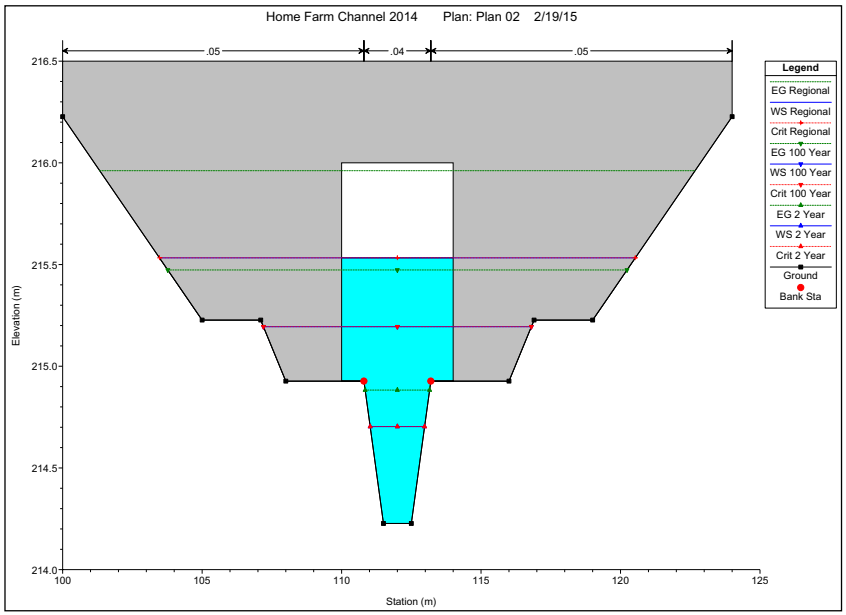

Home Farm Channel 2014 Plan: Plan 02 2/19/15
24m downstream center culvert
.05
.04
.05
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

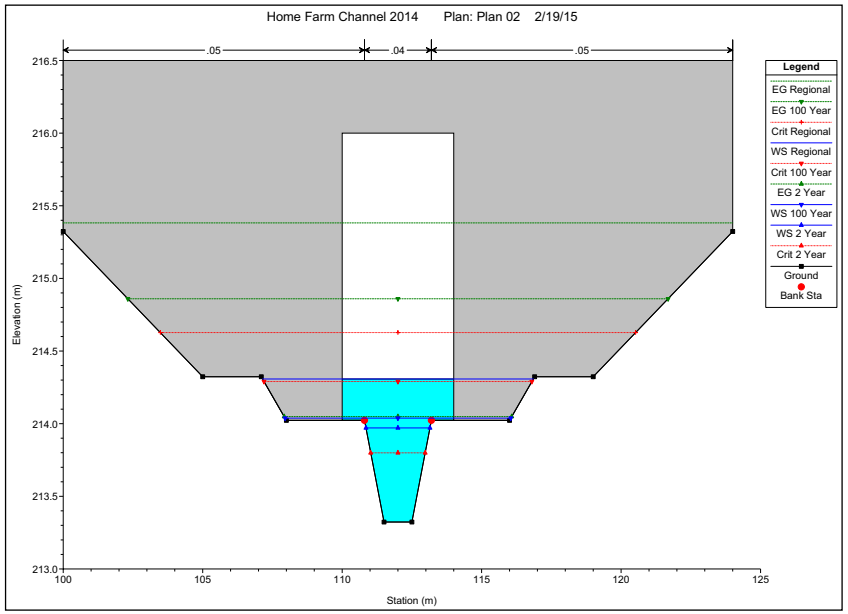

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta
Elevation (m)
Station (m)

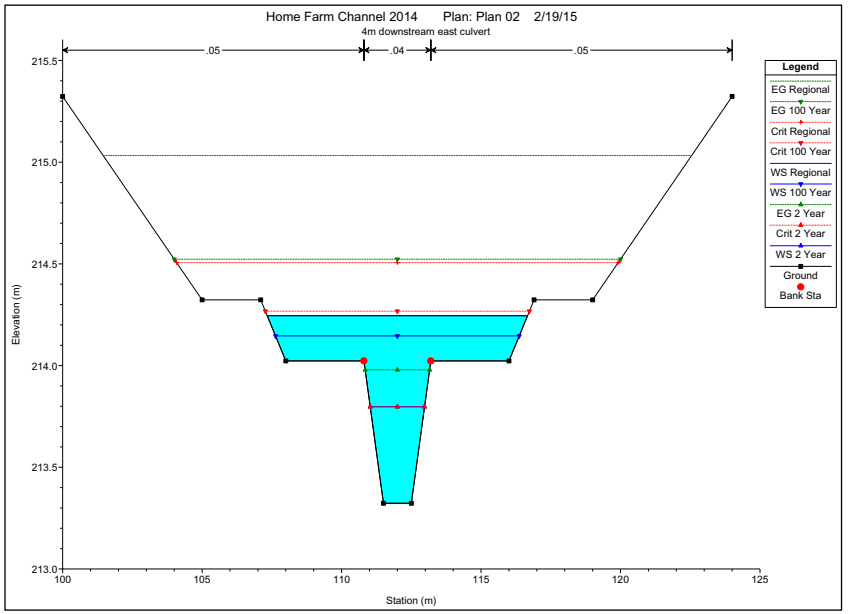

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
218.0
217.5
217.0
216.5
216.0
215.5
Elevation (m)
100
105
110
115
120
125
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta

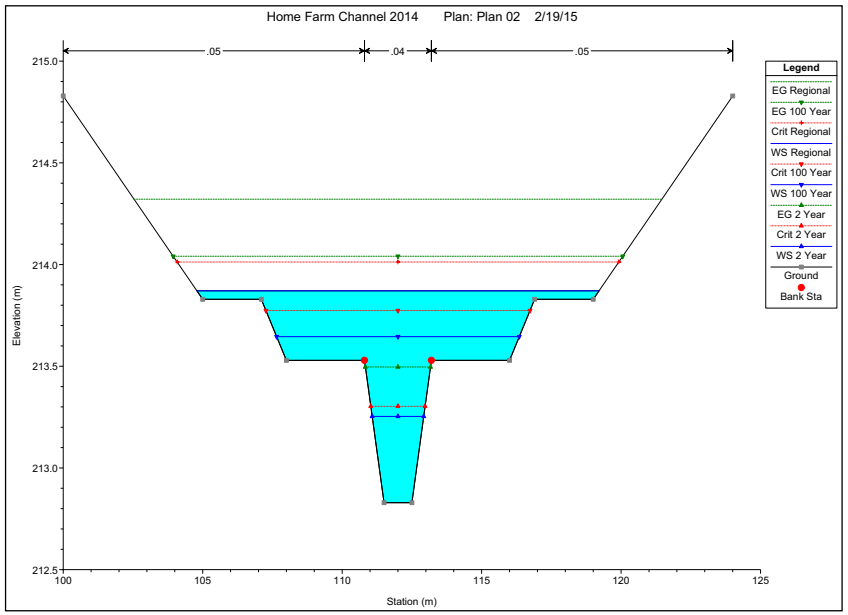

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
216.5
216.0
215.5
215.0
214.5
214.0
Elevation (m)
100
105
110
115
120
125
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta

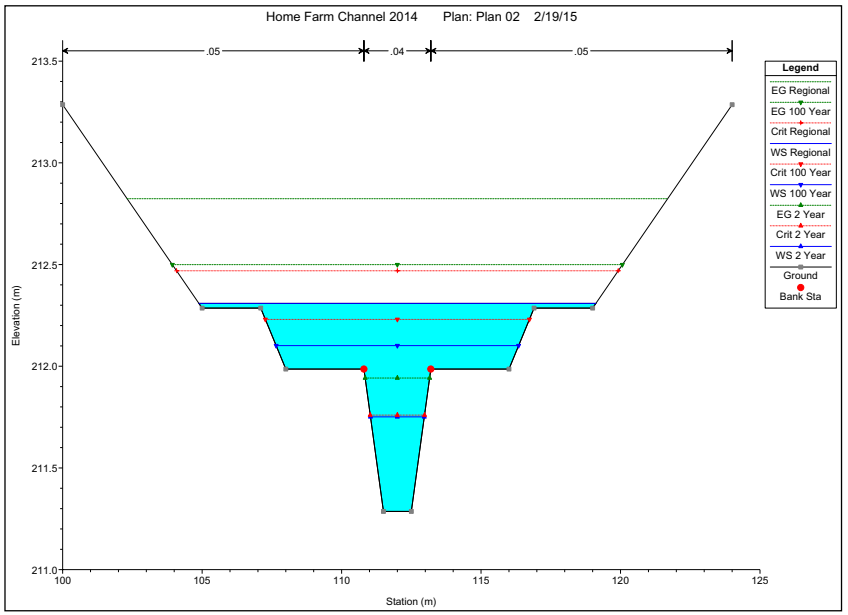

Home Farm Channel 2014 Plan: Plan 02 2/19/15
4m upstream of east culvert
.05
.04
.05
216.5
216.0
215.5
215.0
214.5
214.0
Elevation (m)
100
105
110
115
120
125
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Crit Regional
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta

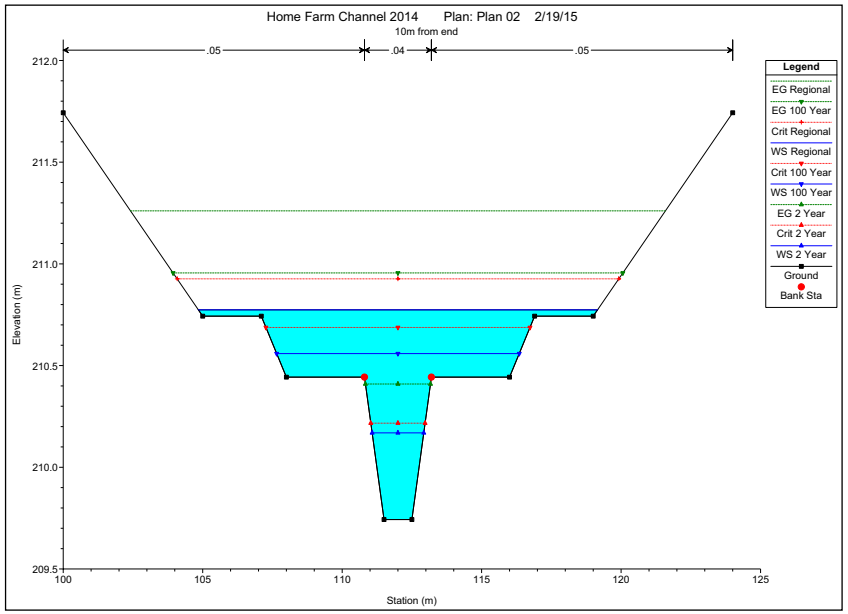

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
216.5
216.0
215.5
215.0
214.5
214.0
Elevation (m)
100
105
110
115
120
125
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
EG 2 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta

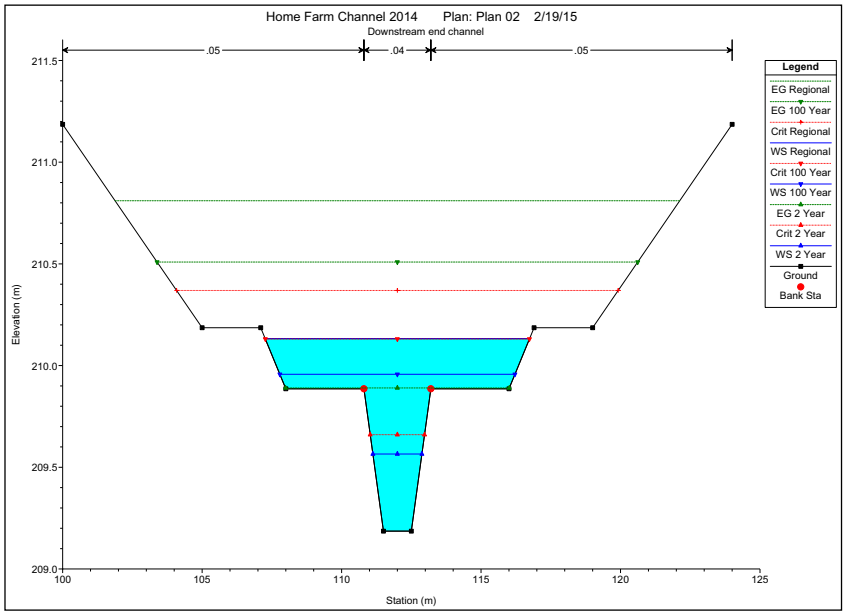

Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Elevation (m)
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
EG 2 Year
WS 100 Year
WS 2 Year
Crit 2 Year
Ground
Bank Sta

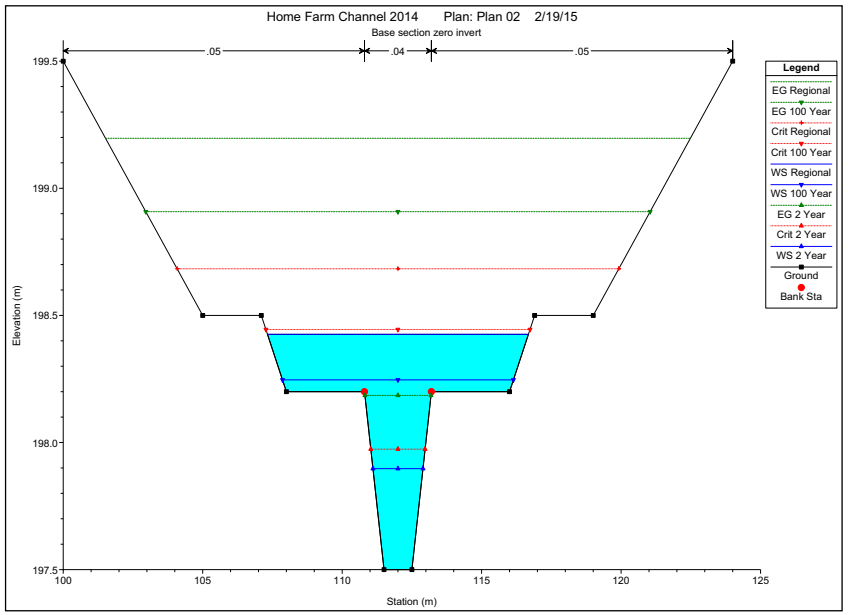

Home Farm Channel 2014 Plan: Plan 02 2/19/15
4m downstream east culvert
.05
.04
.05
Elevation (m)
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
Crit 100 Year
WS Regional
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta


Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Elevation (m)
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta


Home Farm Channel 2014 Plan: Plan 02 2/19/15
.05
.04
.05
Elevation (m)
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta


Home Farm Channel 2014 Plan: Plan 02 2/19/15
10m from end
.05
.04
.05
212.0
211.5
211.0
210.5
210.0
209.5
Elevation (m)
100
105
110
115
120
125
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta

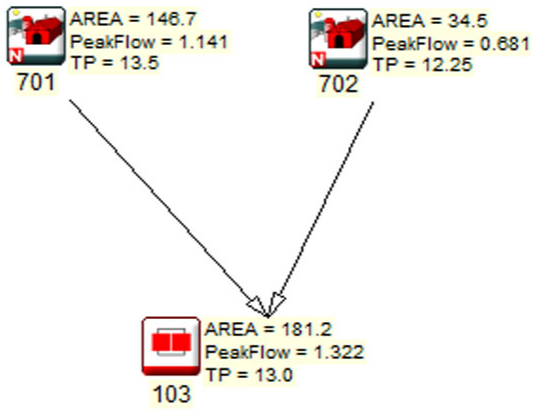

Home Farm Channel 2014 Plan: Plan 02 2/19/15
Downstream end channel
.05
.04
.05
211.5
211.0
210.5
210.0
209.5
209.0
Elevation (m)
100
105
110
115
120
125
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
WS Regional
Crit 100 Year
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta


Home Farm Channel 2014 Plan: Plan 02 2/19/15
Base section zero invert
.05
.04
.05
199.5
199.0
198.5
198.0
197.5
Elevation (m)
100
105
110
115
120
125
Station (m)
Legend
EG Regional
EG 100 Year
Crit Regional
Crit 100 Year
WS Regional
WS 100 Year
EG 2 Year
Crit 2 Year
WS 2 Year
Ground
Bank Sta

APPENDIX C

Visual Otthymo - Watersheds 701 and 702

- Output



Watershed 701/ 702 Schematic

```
================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 2.1
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M M M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files\Visual OTTHYMO 2.3.1\voin.dat
Output filename: E:\Files\VO2-Projects\Homefarm\Original.out
Summary filename: E:\Files\VO2-Projects\Homefarm\Original.sum

DATE: 6/19/14 TIME: 2:38:09 PM

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

READ STORM	Filename: E:\Files\VO2-Projects\Homefarm\storms\Timmins.stm
Ptotal=193.00 mm	Comments: Timmins Regional Storm -INTENSITIES IN m

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	15.00	4.00	3.00	7.00	43.00	10.00	13.00
2.00	20.00	5.00	5.00	8.00	20.00	11.00	13.00
3.00	10.00	6.00	20.00	9.00	23.00	12.00	8.00

CALIB NASHYD (0701) ID= 1 DT=15.0 min	Area (ha)= 146.70 Curve Number (CN)= 77.0 Ia (mm)= 6.70 # of Linear Res.(N)= 2.15 U.H. Tp(hrs)= 1.13

NOTE: RAINFALL WAS TRANSFORMED TO 15.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 3.650

PEAK FLOW (cms)= 7.966 (i)
TIME TO PEAK (hrs)= 9.000
RUNOFF VOLUME (mm)= 131.984
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .684

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB NASHYD (0702) ID= 1 DT=15.0 min	Area (ha)= 34.50 Curve Number (CN)= 71.0 Ia (mm)= 5.50 # of Linear Res.(N)= 2.00 U.H. Tp(hrs)= .22

Unit Hyd Qpeak (cms)= 4.070

PEAK FLOW (cms)= 2.637 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 108.518
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .562

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0701):	146.70	7.966	9.00	131.98
+ ID2= 2 (0702):	34.50	2.637	7.00	108.52
ID = 3 (0103):	181.20	9.595	9.00	127.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************


--------------------
|    READ STORM    |    Filename: E:\Files\VO2-Projects\Homefa
|                  |              rm\storms\SCS-24HR-100YR.STM
| Ptotal= 96.41 mm |    Comments: 100 YEAR 24 HOUR SCS TYPE II
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.10	.00	6.10	1.93	12.10	108.68	18.10	1.45
.20	.00	6.20	1.93	12.20	108.68	18.20	1.45
.30	.97	6.30	1.93	12.30	19.32	18.30	1.45
.40	.97	6.40	1.93	12.40	19.32	18.40	1.45
.50	.97	6.50	1.93	12.50	12.07	18.50	1.45
.60	.97	6.60	1.93	12.60	12.07	18.60	1.45
.70	.97	6.70	1.93	12.70	8.69	18.70	1.93
.80	.97	6.80	1.93	12.80	8.69	18.80	1.93
.90	.97	6.90	1.93	12.90	8.21	18.90	1.45
1.00	.97	7.00	1.93	13.00	8.21	19.00	1.45
1.10	.97	7.10	1.93	13.10	5.80	19.10	1.45
1.20	.97	7.20	1.93	13.20	5.80	19.20	1.45
1.30	.97	7.30	1.93	13.30	4.83	19.30	1.93
1.40	.97	7.40	1.93	13.40	4.83	19.40	1.93
1.50	.97	7.50	1.93	13.50	4.83	19.50	1.45
1.60	.97	7.60	1.93	13.60	4.83	19.60	1.45
1.70	.97	7.70	1.93	13.70	4.83	19.70	1.93
1.80	.97	7.80	1.93	13.80	4.83	19.80	1.93
1.90	.97	7.90	1.93	13.90	4.83	19.90	1.45
2.00	.97	8.00	1.93	14.00	4.83	20.00	1.45
2.10	.97	8.10	1.93	14.10	4.83	20.10	1.93
2.20	.97	8.20	1.93	14.20	4.83	20.20	1.93
2.30	.97	8.30	2.90	14.30	2.90	20.30	1.45
2.40	.97	8.40	2.90	14.40	2.90	20.40	1.45
2.50	.97	8.50	2.90	14.50	2.90	20.50	1.45
2.60	.97	8.60	2.90	14.60	2.90	20.60	1.45
2.70	.97	8.70	2.90	14.70	2.90	20.70	.97
2.80	.97	8.80	2.90	14.80	2.90	20.80	.97
2.90	.97	8.90	2.90	14.90	2.90	20.90	1.45
3.00	.97	9.00	2.90	15.00	2.90	21.00	1.45
3.10	.97	9.10	2.90	15.10	2.90	21.10	1.45
3.20	.97	9.20	2.90	15.20	2.90	21.20	1.45
3.30	.97	9.30	2.90	15.30	2.41	21.30	.97
3.40	.97	9.40	2.90	15.40	2.41	21.40	.97
3.50	.97	9.50	2.90	15.50	2.41	21.50	1.45
3.60	.97	9.60	2.90	15.60	2.41	21.60	1.45
3.70	.97	9.70	2.90	15.70	2.41	21.70	.97
3.80	.97	9.80	2.90	15.80	2.41	21.80	.97
3.90	.97	9.90	2.90	15.90	2.41	21.90	1.45
4.00	.97	10.00	2.90	16.00	2.41	22.00	1.45
4.10	.97	10.10	2.90	16.10	2.41	22.10	.97
4.20	.97	10.20	2.90	16.20	2.41	22.20	.97
4.30	1.93	10.30	5.31	16.30	2.41	22.30	.97
4.40	1.93	10.40	5.31	16.40	2.41	22.40	.97
4.50	1.93	10.50	5.31	16.50	2.41	22.50	1.45
4.60	1.93	10.60	5.31	16.60	2.41	22.60	1.45
4.70	1.93	10.70	5.31	16.70	2.41	22.70	.97
4.80	1.93	10.80	5.31	16.80	2.41	22.80	.97

4.90	1.93	10.90	5.31	16.90	2.41	22.90	1.45
5.00	1.93	11.00	5.31	17.00	2.41	23.00	1.45
5.10	1.93	11.10	5.31	17.10	1.45	23.10	.97
5.20	1.93	11.20	5.31	17.20	1.45	23.20	.97
5.30	1.93	11.30	7.24	17.30	1.45	23.30	.97
5.40	1.93	11.40	7.24	17.40	1.45	23.40	.97
5.50	1.93	11.50	10.63	17.50	1.93	23.50	.97
5.60	1.93	11.60	10.63	17.60	1.93	23.60	.97
5.70	1.93	11.70	25.60	17.70	1.45	23.70	1.45
5.80	1.93	11.80	25.60	17.80	1.45	23.80	1.45
5.90	1.93	11.90	53.13	17.90	1.93	23.90	.97
6.00	1.93	12.00	53.13	18.00	1.93	24.00	.97

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| CALIB            |
| NASHYD    (0701) |   Area    (ha)= 146.70   Curve Number   (CN)= 77.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 2.15
--------------------   U.H. Tp(hrs)=   1.13

        NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.

                              ---- TRANSFORMED HYETOGRAPH ----
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.250	.19	6.250	1.93	12.250	90.81	18.25	1.45
.500	.97	6.500	1.93	12.500	16.42	18.50	1.45
.750	.97	6.750	1.93	12.750	10.05	18.75	1.74
1.000	.97	7.000	1.93	13.000	8.31	19.00	1.55
1.250	.97	7.250	1.93	13.250	5.60	19.25	1.55
1.500	.97	7.500	1.93	13.500	4.83	19.50	1.74
1.750	.97	7.750	1.93	13.750	4.83	19.75	1.74
2.000	.97	8.000	1.93	14.000	4.83	20.00	1.55
2.250	.97	8.250	2.13	14.250	4.44	20.25	1.84
2.500	.97	8.500	2.90	14.500	2.90	20.50	1.45
2.750	.97	8.750	2.90	14.750	2.90	20.75	1.16
3.000	.97	9.000	2.90	15.000	2.90	21.00	1.35
3.250	.97	9.250	2.90	15.250	2.80	21.25	1.35
3.500	.97	9.500	2.90	15.500	2.41	21.50	1.16
3.750	.97	9.750	2.90	15.750	2.41	21.75	1.16
4.000	.97	10.000	2.90	16.000	2.41	22.00	1.35
4.250	1.16	10.250	3.38	16.250	2.41	22.25	.97
4.500	1.93	10.500	5.31	16.500	2.41	22.50	1.16
4.750	1.93	10.750	5.31	16.750	2.41	22.75	1.16
5.000	1.93	11.000	5.31	17.000	2.41	23.00	1.35
5.250	1.93	11.250	5.70	17.250	1.45	23.25	.97
5.500	1.93	11.500	8.60	17.500	1.64	23.50	.97
5.750	1.93	11.750	19.61	17.750	1.64	23.75	1.26
6.000	1.93	12.000	47.62	18.000	1.84	24.00	1.06

```
    Unit Hyd Qpeak  (cms)=   3.650

    PEAK FLOW       (cms)=   4.116 (i)
    TIME TO PEAK    (hrs)=  13.250
    RUNOFF VOLUME    (mm)=  48.454
    TOTAL RAINFALL   (mm)=  96.407
    RUNOFF COEFFICIENT   =    .503
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(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| NASHYD    (0702) |   Area    (ha)=  34.50   Curve Number   (CN)= 71.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.50   # of Linear Res.(N)= 2.00
-------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=   4.070

     PEAK FLOW       (cms)=   2.492 (i)
     TIME TO PEAK    (hrs)=  12.250
     RUNOFF VOLUME    (mm)=  38.167
     TOTAL RAINFALL   (mm)=  96.407
     RUNOFF COEFFICIENT   =    .396

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD   (0103) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0701):   146.70   4.116    13.25    48.45
        + ID2= 2 (0702):    34.50   2.492    12.25    38.17
          ================================================
          ID = 3 (0103):   181.20   4.936    12.50    46.50

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************


-------------------
|    READ STORM    |    Filename: E:\Files\VO2-Projects\Homefa
|                  |              rm\storms\SCS-24HR-25YR.STM
| Ptotal= 80.24 mm |    Comments: 25 YEAR 24 HOUR SCS TYPE II
-------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .10     .00 |  6.10    1.61 | 12.10   90.45 | 18.10    1.21
                 .20     .00 |  6.20    1.61 | 12.20   90.45 | 18.20    1.21
                 .30     .80 |  6.30    1.61 | 12.30   16.08 | 18.30    1.21
                 .40     .80 |  6.40    1.61 | 12.40   16.08 | 18.40    1.21
                 .50     .80 |  6.50    1.61 | 12.50   10.05 | 18.50    1.21
                 .60     .80 |  6.60    1.61 | 12.60   10.05 | 18.60    1.21
                 .70     .80 |  6.70    1.61 | 12.70    7.24 | 18.70    1.61
                 .80     .80 |  6.80    1.61 | 12.80    7.24 | 18.80    1.61
                 .90     .80 |  6.90    1.61 | 12.90    6.83 | 18.90    1.21
                1.00     .80 |  7.00    1.61 | 13.00    6.83 | 19.00    1.21
                1.10     .80 |  7.10    1.61 | 13.10    4.82 | 19.10    1.21
                1.20     .80 |  7.20    1.61 | 13.20    4.82 | 19.20    1.21
                1.30     .80 |  7.30    1.61 | 13.30    4.02 | 19.30    1.61
                1.40     .80 |  7.40    1.61 | 13.40    4.02 | 19.40    1.61
                1.50     .80 |  7.50    1.61 | 13.50    4.02 | 19.50    1.21
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                1.60     .80 |  7.60    1.61 | 13.60    4.02 | 19.60    1.21
                1.70     .80 |  7.70    1.61 | 13.70    4.02 | 19.70    1.61
                1.80     .80 |  7.80    1.61 | 13.80    4.02 | 19.80    1.61
                1.90     .80 |  7.90    1.61 | 13.90    4.02 | 19.90    1.21
                2.00     .80 |  8.00    1.61 | 14.00    4.02 | 20.00    1.21
                2.10     .80 |  8.10    1.61 | 14.10    4.02 | 20.10    1.61
                2.20     .80 |  8.20    1.61 | 14.20    4.02 | 20.20    1.61
                2.30     .80 |  8.30    2.41 | 14.30    2.41 | 20.30    1.21
                2.40     .80 |  8.40    2.41 | 14.40    2.41 | 20.40    1.21
                2.50     .80 |  8.50    2.41 | 14.50    2.41 | 20.50    1.21
                2.60     .80 |  8.60    2.41 | 14.60    2.41 | 20.60    1.21
                2.70     .80 |  8.70    2.41 | 14.70    2.41 | 20.70     .80
                2.80     .80 |  8.80    2.41 | 14.80    2.41 | 20.80     .80
                2.90     .80 |  8.90    2.41 | 14.90    2.41 | 20.90    1.21
                3.00     .80 |  9.00    2.41 | 15.00    2.41 | 21.00    1.21
                3.10     .80 |  9.10    2.41 | 15.10    2.41 | 21.10    1.21
                3.20     .80 |  9.20    2.41 | 15.20    2.41 | 21.20    1.21
                3.30     .80 |  9.30    2.41 | 15.30    2.01 | 21.30     .80
                3.40     .80 |  9.40    2.41 | 15.40    2.01 | 21.40     .80
                3.50     .80 |  9.50    2.41 | 15.50    2.01 | 21.50    1.21
                3.60     .80 |  9.60    2.41 | 15.60    2.01 | 21.60    1.21
                3.70     .80 |  9.70    2.41 | 15.70    2.01 | 21.70     .80
                3.80     .80 |  9.80    2.41 | 15.80    2.01 | 21.80     .80
                3.90     .80 |  9.90    2.41 | 15.90    2.01 | 21.90    1.21
                4.00     .80 | 10.00    2.41 | 16.00    2.01 | 22.00    1.21
                4.10     .80 | 10.10    2.41 | 16.10    2.01 | 22.10     .80
                4.20     .80 | 10.20    2.41 | 16.20    2.01 | 22.20     .80
                4.30    1.61 | 10.30    4.42 | 16.30    2.01 | 22.30     .80
                4.40    1.61 | 10.40    4.42 | 16.40    2.01 | 22.40     .80
                4.50    1.61 | 10.50    4.42 | 16.50    2.01 | 22.50    1.21
                4.60    1.61 | 10.60    4.42 | 16.60    2.01 | 22.60    1.21
                4.70    1.61 | 10.70    4.42 | 16.70    2.01 | 22.70     .80
                4.80    1.61 | 10.80    4.42 | 16.80    2.01 | 22.80     .80
                4.90    1.61 | 10.90    4.42 | 16.90    2.01 | 22.90    1.21
                5.00    1.61 | 11.00    4.42 | 17.00    2.01 | 23.00    1.21
                5.10    1.61 | 11.10    4.42 | 17.10    1.21 | 23.10     .80
                5.20    1.61 | 11.20    4.42 | 17.20    1.21 | 23.20     .80
                5.30    1.61 | 11.30    6.03 | 17.30    1.21 | 23.30     .80
                5.40    1.61 | 11.40    6.03 | 17.40    1.21 | 23.40     .80
                5.50    1.61 | 11.50    8.84 | 17.50    1.61 | 23.50     .80
                5.60    1.61 | 11.60    8.84 | 17.60    1.61 | 23.60     .80
                5.70    1.61 | 11.70   21.31 | 17.70    1.21 | 23.70    1.21
                5.80    1.61 | 11.80   21.31 | 17.80    1.21 | 23.80    1.21
                5.90    1.61 | 11.90   44.22 | 17.90    1.61 | 23.90     .80
                6.00    1.61 | 12.00   44.22 | 18.00    1.61 | 24.00     .80
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-------------------
| CALIB           |
| NASHYD    (0701) |   Area    (ha)= 146.70   Curve Number   (CN)= 77.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 2.15
-------------------   U.H. Tp(hrs)=   1.13

        NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
```

.250	.16	6.250	1.61	12.250	75.58	18.25	1.21
.500	.80	6.500	1.61	12.500	13.67	18.50	1.21
.750	.80	6.750	1.61	12.750	8.36	18.75	1.45
1.000	.80	7.000	1.61	13.000	6.91	19.00	1.29
1.250	.80	7.250	1.61	13.250	4.66	19.25	1.29
1.500	.80	7.500	1.61	13.500	4.02	19.50	1.45
1.750	.80	7.750	1.61	13.750	4.02	19.75	1.45
2.000	.80	8.000	1.61	14.000	4.02	20.00	1.29
2.250	.80	8.250	1.77	14.250	3.70	20.25	1.53
2.500	.80	8.500	2.41	14.500	2.41	20.50	1.21
2.750	.80	8.750	2.41	14.750	2.41	20.75	.96
3.000	.80	9.000	2.41	15.000	2.41	21.00	1.13
3.250	.80	9.250	2.41	15.250	2.33	21.25	1.13
3.500	.80	9.500	2.41	15.500	2.01	21.50	.96
3.750	.80	9.750	2.41	15.750	2.01	21.75	.96
4.000	.80	10.000	2.41	16.000	2.01	22.00	1.13
4.250	.96	10.250	2.81	16.250	2.01	22.25	.80
4.500	1.61	10.500	4.42	16.500	2.01	22.50	.96
4.750	1.61	10.750	4.42	16.750	2.01	22.75	.96
5.000	1.61	11.000	4.42	17.000	2.01	23.00	1.13
5.250	1.61	11.250	4.74	17.250	1.21	23.25	.80
5.500	1.61	11.500	7.16	17.500	1.37	23.50	.80
5.750	1.61	11.750	16.32	17.750	1.37	23.75	1.05
6.000	1.61	12.000	39.64	18.000	1.53	24.00	.88

Unit Hyd Qpeak (cms)= 3.650

PEAK FLOW (cms)= 3.033 (i)
TIME TO PEAK (hrs)= 13.250
RUNOFF VOLUME (mm)= 36.086
TOTAL RAINFALL (mm)= 80.239
RUNOFF COEFFICIENT = .450

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0702)	Area	(ha)= 34.50	Curve Number	(CN)= 71.0	
ID= 1 DT=15.0 min	Ia	(mm)= 5.50	# of Linear Res.	(N)= 2.00	
	U.H. Tp(hrs)=	.22			

Unit Hyd Qpeak (cms)= 4.070

PEAK FLOW (cms)= 1.822 (i)
TIME TO PEAK (hrs)= 12.250
RUNOFF VOLUME (mm)= 28.135
TOTAL RAINFALL (mm)= 80.239
RUNOFF COEFFICIENT = .351

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0701):	146.70	3.033	13.25	36.09
+ ID2= 2 (0702):	34.50	1.822	12.25	28.14

==========
ID = 3 (0103): 181.20 3.602 12.50 34.57

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 4 **
****

READ STORM | Ptotal= 60.57 mm |
Filename: E:\Files\VO2-Projects\Homefarm\storms\SCS-24HR-5YR.STM
Comments: 5 YEAR 24 HOUR SCS TYPE II

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.10	.00	6.10	1.21	12.10	68.29	18.10	.91
.20	.00	6.20	1.21	12.20	68.29	18.20	.91
.30	.61	6.30	1.21	12.30	12.14	18.30	.91
.40	.61	6.40	1.21	12.40	12.14	18.40	.91
.50	.61	6.50	1.21	12.50	7.59	18.50	.91
.60	.61	6.60	1.21	12.60	7.59	18.60	.91
.70	.61	6.70	1.21	12.70	5.46	18.70	1.21
.80	.61	6.80	1.21	12.80	5.46	18.80	1.21
.90	.61	6.90	1.21	12.90	5.16	18.90	.91
1.00	.61	7.00	1.21	13.00	5.16	19.00	.91
1.10	.61	7.10	1.21	13.10	3.64	19.10	.91
1.20	.61	7.20	1.21	13.20	3.64	19.20	.91
1.30	.61	7.30	1.21	13.30	3.04	19.30	1.21
1.40	.61	7.40	1.21	13.40	3.04	19.40	1.21
1.50	.61	7.50	1.21	13.50	3.04	19.50	.91
1.60	.61	7.60	1.21	13.60	3.04	19.60	.91
1.70	.61	7.70	1.21	13.70	3.04	19.70	1.21
1.80	.61	7.80	1.21	13.80	3.04	19.80	1.21
1.90	.61	7.90	1.21	13.90	3.04	19.90	.91
2.00	.61	8.00	1.21	14.00	3.04	20.00	.91
2.10	.61	8.10	1.21	14.10	3.04	20.10	1.21
2.20	.61	8.20	1.21	14.20	3.04	20.20	1.21
2.30	.61	8.30	1.82	14.30	1.82	20.30	.91
2.40	.61	8.40	1.82	14.40	1.82	20.40	.91
2.50	.61	8.50	1.82	14.50	1.82	20.50	.91
2.60	.61	8.60	1.82	14.60	1.82	20.60	.91
2.70	.61	8.70	1.82	14.70	1.82	20.70	.61
2.80	.61	8.80	1.82	14.80	1.82	20.80	.61
2.90	.61	8.90	1.82	14.90	1.82	20.90	.91
3.00	.61	9.00	1.82	15.00	1.82	21.00	.91
3.10	.61	9.10	1.82	15.10	1.82	21.10	.91
3.20	.61	9.20	1.82	15.20	1.82	21.20	.91
3.30	.61	9.30	1.82	15.30	1.52	21.30	.61
3.40	.61	9.40	1.82	15.40	1.52	21.40	.61
3.50	.61	9.50	1.82	15.50	1.52	21.50	.91
3.60	.61	9.60	1.82	15.60	1.52	21.60	.91
3.70	.61	9.70	1.82	15.70	1.52	21.70	.61
3.80	.61	9.80	1.82	15.80	1.52	21.80	.61
3.90	.61	9.90	1.82	15.90	1.52	21.90	.91
4.00	.61	10.00	1.82	16.00	1.52	22.00	.91
4.10	.61	10.10	1.82	16.10	1.52	22.10	.61
4.20	.61	10.20	1.82	16.20	1.52	22.20	.61

4.30	1.21	10.30	3.34	16.30	1.52	22.30	.61
4.40	1.21	10.40	3.34	16.40	1.52	22.40	.61
4.50	1.21	10.50	3.34	16.50	1.52	22.50	.91
4.60	1.21	10.60	3.34	16.60	1.52	22.60	.91
4.70	1.21	10.70	3.34	16.70	1.52	22.70	.61
4.80	1.21	10.80	3.34	16.80	1.52	22.80	.61
4.90	1.21	10.90	3.34	16.90	1.52	22.90	.91
5.00	1.21	11.00	3.34	17.00	1.52	23.00	.91
5.10	1.21	11.10	3.34	17.10	.91	23.10	.61
5.20	1.21	11.20	3.34	17.20	.91	23.20	.61
5.30	1.21	11.30	4.55	17.30	.91	23.30	.61
5.40	1.21	11.40	4.55	17.40	.91	23.40	.61
5.50	1.21	11.50	6.68	17.50	1.21	23.50	.61
5.60	1.21	11.60	6.68	17.60	1.21	23.60	.61
5.70	1.21	11.70	16.08	17.70	.91	23.70	.91
5.80	1.21	11.80	16.08	17.80	.91	23.80	.91
5.90	1.21	11.90	33.38	17.90	1.21	23.90	.61
6.00	1.21	12.00	33.38	18.00	1.21	24.00	.61

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--------------------
| CALIB            |
| NASHYD    (0701) |   Area    (ha)= 146.70   Curve Number   (CN)= 77.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 2.15
--------------------   U.H. Tp(hrs)=   1.13
```

NOTE: RAINFALL WAS TRANSFORMED TO 15.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.250	.12	6.250	1.21	12.250	57.06	18.25	.91
.500	.61	6.500	1.21	12.500	10.32	18.50	.91
.750	.61	6.750	1.21	12.750	6.31	18.75	1.09
1.000	.61	7.000	1.21	13.000	5.22	19.00	.97
1.250	.61	7.250	1.21	13.250	3.52	19.25	.97
1.500	.61	7.500	1.21	13.500	3.03	19.50	1.09
1.750	.61	7.750	1.21	13.750	3.03	19.75	1.09
2.000	.61	8.000	1.21	14.000	3.03	20.00	.97
2.250	.61	8.250	1.34	14.250	2.79	20.25	1.15
2.500	.61	8.500	1.82	14.500	1.82	20.50	.91
2.750	.61	8.750	1.82	14.750	1.82	20.75	.73
3.000	.61	9.000	1.82	15.000	1.82	21.00	.85
3.250	.61	9.250	1.82	15.250	1.76	21.25	.85
3.500	.61	9.500	1.82	15.500	1.52	21.50	.73
3.750	.61	9.750	1.82	15.750	1.52	21.75	.73
4.000	.61	10.000	1.82	16.000	1.52	22.00	.85
4.250	.73	10.250	2.12	16.250	1.52	22.25	.61
4.500	1.21	10.500	3.34	16.500	1.52	22.50	.73
4.750	1.21	10.750	3.34	16.750	1.52	22.75	.73
5.000	1.21	11.000	3.34	17.000	1.52	23.00	.85
5.250	1.21	11.250	3.58	17.250	.91	23.25	.61
5.500	1.21	11.500	5.40	17.500	1.03	23.50	.61
5.750	1.21	11.750	12.32	17.750	1.03	23.75	.79
6.000	1.21	12.000	29.92	18.000	1.15	24.00	.67

Unit Hyd Qpeak (cms)= 3.650

PEAK FLOW (cms)= 1.834 (i)
TIME TO PEAK (hrs)= 13.250
RUNOFF VOLUME (mm)= 22.303
TOTAL RAINFALL (mm)= 60.575
RUNOFF COEFFICIENT = .368

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| CALIB            |
| NASHYD    (0702) |   Area    (ha)=  34.50   Curve Number   (CN)= 71.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.50   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   .22
```

Unit Hyd Qpeak (cms)= 4.070

PEAK FLOW (cms)= 1.094 (i)
TIME TO PEAK (hrs)= 12.250
RUNOFF VOLUME (mm)= 17.169
TOTAL RAINFALL (mm)= 60.575
RUNOFF COEFFICIENT = .283

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD   (0103) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0701):   146.70   1.834    13.25    22.30
       + ID2= 2 (0702):    34.50   1.094    12.25    17.17
         ================================================
         ID = 3 (0103):   181.20   2.147    12.50    21.33
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************


--------------------
|    READ STORM    |    Filename: E:\Files\VO2-Projects\Homefa
|                  |              rm\storms\SCS-24HR-2YR.STM
| Ptotal= 47.50 mm |    Comments: 2 YEAR 24 HOUR SCS TYPE II
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.10	.00	6.10	.95	12.10	53.55	18.10	.71
.20	.00	6.20	.95	12.20	53.55	18.20	.71
.30	.48	6.30	.95	12.30	9.52	18.30	.71
.40	.48	6.40	.95	12.40	9.52	18.40	.71
.50	.48	6.50	.95	12.50	5.95	18.50	.71
.60	.48	6.60	.95	12.60	5.95	18.60	.71
.70	.48	6.70	.95	12.70	4.28	18.70	.95
.80	.48	6.80	.95	12.80	4.28	18.80	.95
.90	.48	6.90	.95	12.90	4.05	18.90	.71

1.00	.48	7.00	.95	13.00	4.05	19.00	.71
1.10	.48	7.10	.95	13.10	2.86	19.10	.71
1.20	.48	7.20	.95	13.20	2.86	19.20	.71
1.30	.48	7.30	.95	13.30	2.38	19.30	.95
1.40	.48	7.40	.95	13.40	2.38	19.40	.95
1.50	.48	7.50	.95	13.50	2.38	19.50	.71
1.60	.48	7.60	.95	13.60	2.38	19.60	.71
1.70	.48	7.70	.95	13.70	2.38	19.70	.95
1.80	.48	7.80	.95	13.80	2.38	19.80	.95
1.90	.48	7.90	.95	13.90	2.38	19.90	.71
2.00	.48	8.00	.95	14.00	2.38	20.00	.71
2.10	.48	8.10	.95	14.10	2.38	20.10	.95
2.20	.48	8.20	.95	14.20	2.38	20.20	.95
2.30	.48	8.30	1.43	14.30	1.43	20.30	.71
2.40	.48	8.40	1.43	14.40	1.43	20.40	.71
2.50	.48	8.50	1.43	14.50	1.43	20.50	.71
2.60	.48	8.60	1.43	14.60	1.43	20.60	.71
2.70	.48	8.70	1.43	14.70	1.43	20.70	.48
2.80	.48	8.80	1.43	14.80	1.43	20.80	.48
2.90	.48	8.90	1.43	14.90	1.43	20.90	.71
3.00	.48	9.00	1.43	15.00	1.43	21.00	.71
3.10	.48	9.10	1.43	15.10	1.43	21.10	.71
3.20	.48	9.20	1.43	15.20	1.43	21.20	.71
3.30	.48	9.30	1.43	15.30	1.19	21.30	.48
3.40	.48	9.40	1.43	15.40	1.19	21.40	.48
3.50	.48	9.50	1.43	15.50	1.19	21.50	.71
3.60	.48	9.60	1.43	15.60	1.19	21.60	.71
3.70	.48	9.70	1.43	15.70	1.19	21.70	.48
3.80	.48	9.80	1.43	15.80	1.19	21.80	.48
3.90	.48	9.90	1.43	15.90	1.19	21.90	.71
4.00	.48	10.00	1.43	16.00	1.19	22.00	.71
4.10	.48	10.10	1.43	16.10	1.19	22.10	.48
4.20	.48	10.20	1.43	16.20	1.19	22.20	.48
4.30	.95	10.30	2.62	16.30	1.19	22.30	.48
4.40	.95	10.40	2.62	16.40	1.19	22.40	.48
4.50	.95	10.50	2.62	16.50	1.19	22.50	.71
4.60	.95	10.60	2.62	16.60	1.19	22.60	.71
4.70	.95	10.70	2.62	16.70	1.19	22.70	.48
4.80	.95	10.80	2.62	16.80	1.19	22.80	.48
4.90	.95	10.90	2.62	16.90	1.19	22.90	.71
5.00	.95	11.00	2.62	17.00	1.19	23.00	.71
5.10	.95	11.10	2.62	17.10	.71	23.10	.48
5.20	.95	11.20	2.62	17.20	.71	23.20	.48
5.30	.95	11.30	3.57	17.30	.71	23.30	.48
5.40	.95	11.40	3.57	17.40	.71	23.40	.48
5.50	.95	11.50	5.24	17.50	.95	23.50	.48
5.60	.95	11.60	5.24	17.60	.95	23.60	.48
5.70	.95	11.70	12.61	17.70	.71	23.70	.71
5.80	.95	11.80	12.61	17.80	.71	23.80	.71
5.90	.95	11.90	26.18	17.90	.95	23.90	.48
6.00	.95	12.00	26.18	18.00	.95	24.00	.48

CALIB					
NASHYD (0701)	Area	(ha)=	146.70	Curve Number	(CN)= 77.0
ID= 1 DT=15.0 min	Ia	(mm)=	6.70	# of Linear Res.(N)=	2.15
	U.H. Tp(hrs)=		1.13		

NOTE: RAINFALL WAS TRANSFORMED TO 15.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.250	.10	6.250	.95	12.250	44.74	18.25	.71
.500	.48	6.500	.95	12.500	8.09	18.50	.71
.750	.48	6.750	.95	12.750	4.95	18.75	.86
1.000	.48	7.000	.95	13.000	4.09	19.00	.76
1.250	.48	7.250	.95	13.250	2.76	19.25	.76
1.500	.48	7.500	.95	13.500	2.38	19.50	.86
1.750	.48	7.750	.95	13.750	2.38	19.75	.86
2.000	.48	8.000	.95	14.000	2.38	20.00	.76
2.250	.48	8.250	1.05	14.250	2.19	20.25	.90
2.500	.48	8.500	1.43	14.500	1.43	20.50	.71
2.750	.48	8.750	1.43	14.750	1.43	20.75	.57
3.000	.48	9.000	1.43	15.000	1.43	21.00	.67
3.250	.48	9.250	1.43	15.250	1.38	21.25	.67
3.500	.48	9.500	1.43	15.500	1.19	21.50	.57
3.750	.48	9.750	1.43	15.750	1.19	21.75	.57
4.000	.48	10.000	1.43	16.000	1.19	22.00	.67
4.250	.57	10.250	1.67	16.250	1.19	22.25	.48
4.500	.95	10.500	2.62	16.500	1.19	22.50	.57
4.750	.95	10.750	2.62	16.750	1.19	22.75	.57
5.000	.95	11.000	2.62	17.000	1.19	23.00	.67
5.250	.95	11.250	2.81	17.250	.71	23.25	.48
5.500	.95	11.500	4.24	17.500	.81	23.50	.48
5.750	.95	11.750	9.66	17.750	.81	23.75	.62
6.000	.95	12.000	23.47	18.000	.90	24.00	.52

Unit Hyd Qpeak (cms)= 3.650

PEAK FLOW (cms)= 1.141 (i)
TIME TO PEAK (hrs)= 13.500
RUNOFF VOLUME (mm)= 14.227
TOTAL RAINFALL (mm)= 47.505
RUNOFF COEFFICIENT = .299

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0702)	Area	(ha)=	34.50	Curve Number	(CN)= 71.0
ID= 1 DT=15.0 min	Ia	(mm)=	5.50	# of Linear Res.(N)=	2.00
	U.H. Tp(hrs)=		.22		

Unit Hyd Qpeak (cms)= 4.070

PEAK FLOW (cms)= .681 (i)
TIME TO PEAK (hrs)= 12.250
RUNOFF VOLUME (mm)= 10.883
TOTAL RAINFALL (mm)= 47.505
RUNOFF COEFFICIENT = .229

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD   (0103) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0701):   146.70   1.141    13.50    14.23
         + ID2= 2 (0702):    34.50    .681    12.25    10.88
           ================================================
           ID = 3 (0103):   181.20   1.322    13.00    13.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 FINISH
================================================================================================
```

APPENDIX D

Visual Otthymo – Pre / Post Development

- Parameters
- Schematic
- Output

Watershed Parameters
Pre - Development

Project : # 1410
Project : Home Farm

Soil Series / desc.		Catchment Relief (m.) Max	Min	Length	Slope	Component	Area	Percent	Runoff Coef. "C"		Curve No. "CN"		Initial Abstraction "IA"		Tc / Tp Airport Tc (min)	Tc (hr)	Bransby Williams Tc (min)	Tc (hr)	Tp (2/3 Tc)
Area 7021a															(FOR C < 0.4)		(FOR C > 0.4)		
Ksc	Kemble						11.49												
HSG	D					Wetland / Lakes	0.00	0%	0.05	0.00	50	0	0	0.0					
Texture	silty clay loam					Forest / Woodland	10.29	90%	0.35	0.31	73	65	10	9.0					
Drainage	Imperfect					Meadows	0.00	0%	0.38	0.00	76	0	8	0.0					
Slope	0% - 5%					Pasture / Lawn	1.03	9%	0.40	0.04	79	7	5	0.4					
						Cultivated	0.00	0%	0.55	0.00	82	0	7	0.0					
						Impervious	0.17	1%	0.95	0.01	100	1	2	0.0					
		226.5	213	450	3.0%	Weighted	11.49	100%		**0.36**		**74**		**9.4**	35	***0.59***	16	*0.27*	**0.39**
Area 7021b															(FOR C < 0.4)		(FOR C > 0.4)		
Ksc	Kemble						9.40												
HSG	D					Wetland / Lakes	0.00	0%	0.05	0.00	50	0	0	0.0					
Texture	silty clay loam					Forest / Woodland	7.75	82%	0.35	0.29	73	60	10	8.2					
Drainage	Imperfect					Meadows	0.00	0%	0.38	0.00	76	0	8	0.0					
Slope	0% - 5%					Pasture / Lawn	1.32	14%	0.40	0.06	79	11	5	0.7					
						Cultivated	0.00	0%	0.55	0.00	82	0	7	0.0					
						Impervious	0.33	3%	0.95	0.03	100	3	2	0.1					
		225.75	213.50	430	2.8%	Weighted	9.40	100%		**0.38**		**75**		**9.0**	35	***0.58***	16	*0.26*	**0.38**
Area 7021c															(FOR C < 0.4)		(FOR C > 0.4)		
Ksc	Kemble						0.83												
HSG	D					Wetland / Lakes	0.00	0%	0.05	0.00	50	0	0	0.0					
Texture	silty clay loam					Forest / Woodland	0.16	19%	0.35	0.07	73	14	10	1.9					
Drainage	Imperfect					Meadows	0.00	0%	0.38	0.00	76	0	8	0.0					
Slope	0% - 5%					Pasture / Lawn	0.57	68%	0.40	0.27	79	54	5	3.4					
						Cultivated	0.00	0%	0.55	0.00	82	0	7	0.0					
						Impervious	0.11	13%	0.95	0.12	100	13	2	0.3					
		214.50	205.75	227	3.9%	Weighted	0.83	100%		**0.46**		**81**		**5.6**	20	***0.34***	10	*0.17*	**0.22**

AIRPORT
METHOD (Tc hr.)
(FOR C < 0.4)

Tc	= 3.26 x (1.1- C) x (L^0.5) x S^-0.33	
Tc	time of concentration	min.
C	runoff coefficent	
L	watershed length	m
S	watershed slope	%

BRANSBY WILLIAMS
METHOD
(FOR C > 0.4)

Tc	= (0.057 x L) / (S ^0.2) x (A^0.1)	
Tc	time of concentration	min.
C	runoff coefficent	
L	watershed length	m
S	watershed slope	%
A	area of watershed	ha

Watershed Parameters
Post - Development

Project : # 1410
Project : Home Farm

Area	Use	AREA (Ha)	units	XIMP ha.		TIMP ha.		SLPP %	LGP m	DPSI mm	SLPI %	LGI m
7021a												
	OPEN SPACE	0.3853		0.0193	0.05	0.02	0.05					
	RECREATION CENTER	0.8820		0.7056	0.80	0.71	0.80					
	RESIDENDENTIAL (SINGLE)	1.5412	23	0.0925	0.06	0.79	0.51					
	RESIDENTIAL (EXISTING)	0.7972	4	0.0399	0.05	0.16	0.20					
	RESIDENTIAL (SEM)	4.2722	30	0.1982	0.05	2.29	0.54					
	RESIDENTIAL (MULT)		84									
	PUMP STATION	0.0786		0.0047	0.06	0.04	0.51					
	SWM	0.6060		0.0303	0.05	0.03	0.05					
	LANEWAY	0.5797		0.4638	0.80	0.46	0.80					
	ROW & PARKING	2.3495		1.7157	0.73	1.72	0.73					
		11.492	141	3.2698	**0.28**	6.2140	**0.54**	2.5%	38	2	0.5%	0
7021b												
	OPEN SPACE	0.7850		0.0393	0.05	0.04	0.05					
	RESIDENDENTIAL (SINGLE)	2.6193	62	0.1572	0.06	1.34	0.51					
	RESIDENTIAL (SEM)	3.9587	44	0.1836	0.05	2.13	0.54					
	RESIDENTIAL (MULT)		48									
	LANEWAY	0.3120		0.2496	0.80	0.25	0.80					
	ROW & PARKING	1.7247		1.2594	0.73	1.26	0.73					
		9.400	154	1.8891	**0.20**	5.0097	**0.53**	2.5%	38	2	0.5%	0
7021c												
	OPEN SPACE	0.0000		0.0000	0.05	0.00	0.05					
	RESIDENDENTIAL (SINGLE)	0.6422	8	0.0385	0.06	0.33	0.51					
	RESIDENTIAL (SEM)	0.0000	0	0.0000	0.05	0.00	0.54					
	RESIDENTIAL (MULT)		0									
	LANEWAY	0.0000		0.0000	0.80	0.00	0.80					
	ROW & PARKING	0.1912		0.1396	0.73	0.14	0.73					
		0.833	8	0.1782	**0.21**	0.4671	**0.56**	2.5%	38	2	0.5%	0

	Bld sqm/unit	Drive sqm/unit	Lot sqm/unit	XIMP	TIMP
single	270	36	600	0.06	0.51
semi	200	18	375	0.05	0.58
multiple	150	15	335	0.04	0.49
semi/multi (avg)				0.05	0.54
Ex Res	300	100	2000	0.05	0.20

		area sq.m.	paved sq.m.		
Street	pavement	4685	4685		
(entrance)	Boulevard	5063	1265.75		
	total	9748	9748	0.61	0.61
Street				0.85	0.85
Street (avg)				0.73	0.73
Laneway				0.80	0.80
Parking				0.80	0.80
Rec Centre				0.80	0.80
Open Space				0.05	0.05
SWM				0.05	0.05

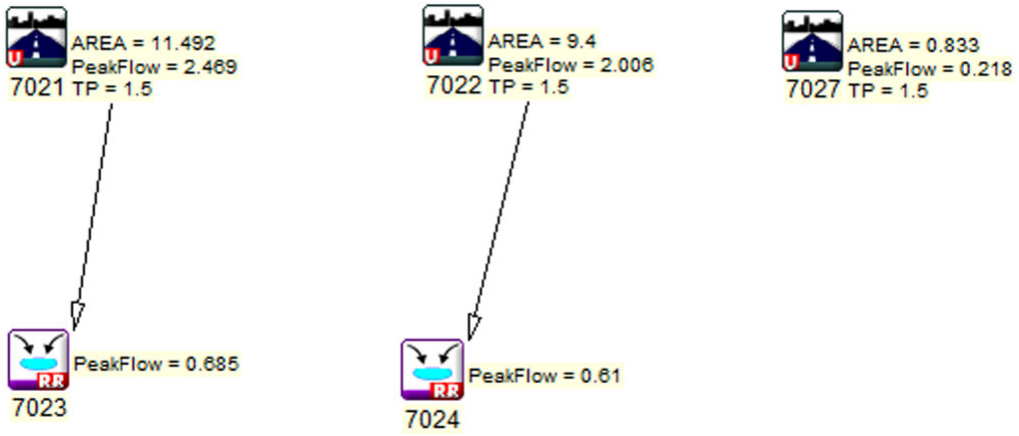
XIMP = DIRECTLY CONNECTED IMPERVIOUS AREA / TOTAL AREA
TIMP = TOTAL IMPERVIOUS AREA / TOTAL AREA
SLPP = Average slope of pervious area
LGP = Overland flow length of pervious area
DPSI = Depression storage over the impervious area
SLPI = Average slope of impervious area
LGI = Overland flow length of impervious area

XIMP		ratio of directly connected impervious areas	
		assumed 50% of TIMP	
TIMP		ratio of total impervious areas	
SLPP =	2.5	min lot grade	Average slope of pervious area
LGP =	38	avg lot depth	Overland flow length of pervious area
MNP	0.25	default	manning coef for pervious area
DPSI =	2	typ	Depression storage over the impervious area
SLPI =	0.5	avg road grade	Average slope of impervious area

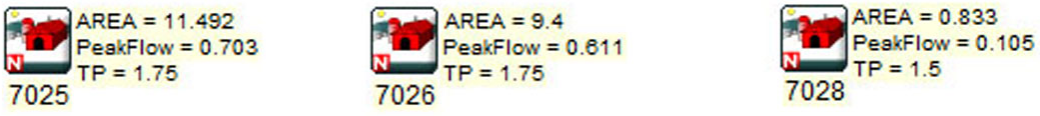
Calculation of runoff coefficient "C" (in calculation of Q=CIAn) from impervoius area

I = (C – 0.2) / 0.7

Runoff Coef.				
7021a	**Area**	**11.49**	**"C" =**	**0.58**
7021b	**Area**	**9.40**	**"C" =**	**0.57**
7021c	**Area**	**0.83**	**"C" =**	**0.59**



Pre-Development Schematic



Post-Development Schematic

```
==============================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 2.1
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M M M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files\Visual OTTHYMO 2.3.1\voin.dat
  Output  filename: E:\Files\VO2-Projects\Homefarm\Post Developed.out
  Summary filename: E:\Files\VO2-Projects\Homefarm\Post Developed.sum


DATE: 7/04/14                             TIME: 2:24:59 PM

USER:


COMMENTS: _____________________________________________________

----------------------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   1 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 854.100
| Ptotal= 33.23 mm |                          B=   7.781
--------------------                          C=    .830
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =   .38

                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                  .08    2.37 |   .83    8.07 |  1.58   10.29 |  2.33    3.57
                  .17    2.56 |   .92   11.14 |  1.67    8.50 |  2.42    3.34
                  .25    2.79 |  1.00   17.74 |  1.75    7.24 |  2.50    3.13
                  .33    3.07 |  1.08   39.66 |  1.83    6.30 |  2.58    2.95
                  .42    3.41 |  1.17  103.05 |  1.92    5.58 |  2.67    2.79
                  .50    3.85 |  1.25   47.46 |  2.00    5.01 |  2.75    2.65
                  .58    4.42 |  1.33   26.04 |  2.08    4.55 |  2.83    2.52
                  .67    5.20 |  1.42   17.46 |  2.17    4.17 |  2.92    2.41
```



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                  .75    6.32 |  1.50   12.99 |  2.25    3.85 |  3.00    2.30

----------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (7021) |   Area    (ha)=  11.49
|ID= 1 DT=15.0 min |   Total Imp(%)=  54.00   Dir. Conn.(%)=  28.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       6.21         5.29
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=     276.80        38.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .250    2.58 | 1.000   12.31 | 1.750    8.68 |  2.50    3.35
                .500    3.44 | 1.250   63.39 | 2.000    5.63 |  2.75    2.80
                .750    5.31 | 1.500   18.83 | 2.250    4.19 |  3.00    2.41

     Max.Eff.Inten.(mm/hr)=      63.39        27.78
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       6.95 (ii)   17.64 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=        .10          .05
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .51          .23          .609 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50         1.25
     RUNOFF VOLUME    (mm)=      31.23        10.36        16.20
     TOTAL RAINFALL   (mm)=      33.23        33.23        33.23
     RUNOFF COEFFICIENT   =        .94          .31          .49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (7022) |   Area    (ha)=   9.40
|ID= 1 DT=15.0 min |   Total Imp(%)=  53.00   Dir. Conn.(%)=  20.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.98         4.42
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=     250.30        38.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      63.39        34.04
```

```
               over (min)       15.00        30.00
     Storage Coeff.  (min)=       6.55 (ii)   16.40 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=        .10          .05
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .30          .24          .406 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50          1.25
     RUNOFF VOLUME    (mm)=      31.23        11.46         15.42
     TOTAL RAINFALL   (mm)=      33.23        33.23         33.23
     RUNOFF COEFFICIENT   =        .94          .35           .46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD    (7025) |   Area    (ha)=  11.49   Curve Number   (CN)= 74.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   9.40   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .39

     Unit Hyd Qpeak  (cms)=   1.125

     PEAK FLOW       (cms)=    .115 (i)
     TIME TO PEAK    (hrs)=   1.750
     RUNOFF VOLUME    (mm)=   4.971
     TOTAL RAINFALL   (mm)=  33.227
     RUNOFF COEFFICIENT   =    .150

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD    (7026) |   Area    (ha)=   9.40   Curve Number   (CN)= 75.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   9.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .38

     Unit Hyd Qpeak  (cms)=    .945

     PEAK FLOW       (cms)=    .102 (i)
     TIME TO PEAK    (hrs)=   1.750
     RUNOFF VOLUME    (mm)=   5.331
     TOTAL RAINFALL   (mm)=  33.227
     RUNOFF COEFFICIENT   =    .160

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD  (7027) |   Area    (ha)=    .83
|ID= 1 DT=15.0 min |   Total Imp(%)=  56.00   Dir. Conn.(%)=  21.00
```



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-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .47          .37
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=      74.50        38.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      63.39        47.64
               over (min)       15.00        15.00
     Storage Coeff.  (min)=       3.16 (ii)   11.77 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=        .11          .08
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .03          .04           .066 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25          1.25
     RUNOFF VOLUME    (mm)=      31.23        14.57         18.05
     TOTAL RAINFALL   (mm)=      33.23        33.23         33.23
     RUNOFF COEFFICIENT   =        .94          .44           .54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  81.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD    (7028) |   Area    (ha)=    .83   Curve Number   (CN)= 81.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.60   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .145

     PEAK FLOW       (cms)=    .019 (i)
     TIME TO PEAK    (hrs)=   1.250
     RUNOFF VOLUME    (mm)=   8.089
     TOTAL RAINFALL   (mm)=  33.227
     RUNOFF COEFFICIENT   =    .243

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (7023) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .4800      .2400
                          .1200      .1200    |    .7000      .3000
                          .2200      .1700    |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (7021)     11.49       .61      1.25      16.20
     OUTFLOW: ID= 1 (7023)     11.49       .12      2.33      16.18
```

```
                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.43
                TIME SHIFT OF PEAK FLOW         (min)= 65.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  .1183

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (7024) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .4200      .1900
                           .1000      .1000   |    .6100      .2300
                           .2000      .1300   |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
    INFLOW : ID= 2 (7022)      9.40       .41      1.25      15.42
    OUTFLOW: ID= 1 (7024)      9.40       .09      2.42      15.39

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.64
                TIME SHIFT OF PEAK FLOW         (min)= 70.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  .0920

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  **************************
  ** SIMULATION NUMBER:   2 **
  **************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1234.576
| Ptotal= 42.93 mm |                          B=   8.297
--------------------                          C=    .851
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =   .38

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .08    2.80 |   .83   10.17 |  1.58   13.13 |  2.33    4.31
                 .17    3.04 |   .92   14.27 |  1.67   10.75 |  2.42    4.01
                 .25    3.33 |  1.00   23.16 |  1.75    9.08 |  2.50    3.75
                 .33    3.68 |  1.08   52.75 |  1.83    7.85 |  2.58    3.53
                 .42    4.11 |  1.17  136.52 |  1.92    6.91 |  2.67    3.33
                 .50    4.67 |  1.25   63.26 |  2.00    6.16 |  2.75    3.15
                 .58    5.40 |  1.33   34.39 |  2.08    5.57 |  2.83    2.99
                 .67    6.40 |  1.42   22.78 |  2.17    5.07 |  2.92    2.84
                 .75    7.87 |  1.50   16.75 |  2.25    4.66 |  3.00    2.71


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (7021) |   Area    (ha)=  11.49
|ID= 1 DT=15.0 min |   Total Imp(%)=  54.00   Dir. Conn.(%)=  28.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       6.21         5.29
     Dep. Storage     (mm)=       2.00         5.00
```



```
     Average Slope     (%)=        .50         2.50
     Length            (m)=     276.80        38.00
     Mannings n           =       .013         .250

        NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .250    3.06 | 1.000   15.87 | 1.750   10.99 |  2.50    4.03
                .500    4.15 | 1.250   84.18 | 2.000    6.97 |  2.75    3.33
                .750    6.56 | 1.500   24.64 | 2.250    5.10 |  3.00    2.85

     Max.Eff.Inten.(mm/hr)=      84.18        46.73
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       6.21 (ii)   14.88 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=        .10          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .70          .44          1.139 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      40.93        16.32          23.21
     TOTAL RAINFALL   (mm)=      42.93        42.93          42.93
     RUNOFF COEFFICIENT   =        .95          .38            .54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (7022) |   Area    (ha)=   9.40
|ID= 1 DT=15.0 min |   Total Imp(%)=  53.00   Dir. Conn.(%)=  20.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.98         4.42
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=     250.30        38.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      84.18        56.39
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       5.84 (ii)   13.89 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=        .10          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .41          .46           .876 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      40.93        17.82          22.44
     TOTAL RAINFALL   (mm)=      42.93        42.93          42.93
     RUNOFF COEFFICIENT   =        .95          .42            .52

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

```
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| NASHYD    (7025) |   Area    (ha)=  11.49   Curve Number   (CN)= 74.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   9.40   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .39

     Unit Hyd Qpeak  (cms)=   1.125

     PEAK FLOW       (cms)=    .221 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   9.066
     TOTAL RAINFALL   (mm)=  42.928
     RUNOFF COEFFICIENT   =    .211

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| NASHYD    (7026) |   Area    (ha)=   9.40   Curve Number   (CN)= 75.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   9.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .38

     Unit Hyd Qpeak  (cms)=    .945

     PEAK FLOW       (cms)=    .198 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   9.600
     TOTAL RAINFALL   (mm)=  42.928
     RUNOFF COEFFICIENT   =    .224

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (7027) |   Area    (ha)=    .83
|ID= 1 DT=15.0 min |   Total Imp(%)=  56.00   Dir. Conn.(%)=  21.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .47          .37
     Dep. Storage     (mm)=      2.00         5.00
     Average Slope     (%)=       .50         2.50
     Length            (m)=     74.50        38.00
     Mannings n          =      .013         .250

     Max.Eff.Inten.(mm/hr)=     84.18        76.34
               over (min)      15.00        15.00
     Storage Coeff.  (min)=      2.82 (ii)    9.95 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
```



```
     Unit Hyd. peak  (cms)=       .11          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .04          .06          .102 (iii)
     TIME TO PEAK    (hrs)=      1.25         1.25          1.25
     RUNOFF VOLUME    (mm)=     40.93        21.98         25.95
     TOTAL RAINFALL   (mm)=     42.93        42.93         42.93
     RUNOFF COEFFICIENT   =       .95          .51           .60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  81.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| NASHYD    (7028) |   Area    (ha)=    .83   Curve Number   (CN)= 81.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.60   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .145

     PEAK FLOW       (cms)=    .035 (i)
     TIME TO PEAK    (hrs)=   1.250
     RUNOFF VOLUME    (mm)=  13.290
     TOTAL RAINFALL   (mm)=  42.928
     RUNOFF COEFFICIENT   =    .310

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (7023) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .4800      .2400
                          .1200      .1200    |    .7000      .3000
                          .2200      .1700    |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (7021)     11.49      1.14      1.25      23.21
     OUTFLOW: ID= 1 (7023)     11.49       .22      2.00      23.19

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.96
                TIME SHIFT OF PEAK FLOW         (min)= 45.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  .1680

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (7024) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .4200      .1900
                          .1000      .1000    |    .6100      .2300
```

```
                        .2000      .1300   |    .0000      .0000

                             AREA     QPEAK     TPEAK       R.V.
                             (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (7022)      9.40       .88      1.25      22.44
     OUTFLOW: ID= 1 (7024)      9.40       .20      1.92      22.42

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.37
                  TIME SHIFT OF PEAK FLOW         (min)= 40.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .1290

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  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1750.276
| Ptotal= 59.01 mm |                          B=   8.303
--------------------                          C=    .862
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.50 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =   .38

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .08    3.05 |  1.00   13.31 |  1.92   11.84 |  2.83    4.22
                 .17    3.28 |  1.08   18.82 |  2.00   10.19 |  2.92    3.99
                 .25    3.54 |  1.17   30.89 |  2.08    8.94 |  3.00    3.78
                 .33    3.85 |  1.25   71.60 |  2.17    7.95 |  3.08    3.60
                 .42    4.23 |  1.33  188.05 |  2.25    7.16 |  3.17    3.43
                 .50    4.68 |  1.42   86.10 |  2.33    6.51 |  3.25    3.28
                 .58    5.25 |  1.50   46.26 |  2.42    5.97 |  3.33    3.14
                 .67    5.98 |  1.58   30.37 |  2.50    5.51 |  3.42    3.01
                 .75    6.94 |  1.67   22.17 |  2.58    5.12 |  3.50    2.89
                 .83    8.27 |  1.75   17.28 |  2.67    4.78 |
                 .92   10.22 |  1.83   14.08 |  2.75    4.49 |


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (7021) |   Area    (ha)=  11.49
|ID= 1 DT=15.0 min |   Total Imp(%)=  54.00   Dir. Conn.(%)=  28.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       6.21         5.29
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=     276.80        38.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
```



```
                .250    3.29 | 1.250   40.44 | 2.250    8.02 |  3.25    3.44
                .500    4.25 | 1.500  106.80 | 2.500    6.00 |  3.50    3.01
                .750    6.06 | 1.750   23.27 | 2.750    4.80 |
               1.000   10.60 | 2.000   12.04 | 3.000    4.00 |

     Max.Eff.Inten.(mm/hr)=     106.80        86.85
               over (min)       15.00        15.00
     Storage Coeff.  (min)=      5.64 (ii)   12.42 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
     Unit Hyd. peak  (cms)=       .11          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .91          .94         1.851 (iii)
     TIME TO PEAK    (hrs)=      1.50         1.50          1.50
     RUNOFF VOLUME    (mm)=     57.01        27.61         35.84
     TOTAL RAINFALL   (mm)=     59.01        59.01         59.01
     RUNOFF COEFFICIENT   =       .97          .47           .61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (7022) |   Area    (ha)=   9.40
|ID= 1 DT=15.0 min |   Total Imp(%)=  53.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.98         4.42
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=     250.30        38.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     106.80       102.12
               over (min)       15.00        15.00
     Storage Coeff.  (min)=      5.31 (ii)   11.66 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
     Unit Hyd. peak  (cms)=       .11          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .54          .95         1.488 (iii)
     TIME TO PEAK    (hrs)=      1.50         1.50          1.50
     RUNOFF VOLUME    (mm)=     57.01        29.71         35.17
     TOTAL RAINFALL   (mm)=     59.01        59.01         59.01
     RUNOFF COEFFICIENT   =       .97          .50           .60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| NASHYD    (7025) |   Area    (ha)=  11.49   Curve Number   (CN)= 74.0

|ID= 1 DT=15.0 min |   Ia      (mm)=   9.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .39

     Unit Hyd Qpeak  (cms)=   1.125

     PEAK FLOW       (cms)=    .478 (i)
     TIME TO PEAK    (hrs)=   1.750
     RUNOFF VOLUME    (mm)=  17.547
     TOTAL RAINFALL   (mm)=  59.005
     RUNOFF COEFFICIENT   =    .297

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (7026) |   Area    (ha)=   9.40   Curve Number   (CN)= 75.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   9.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .38

     Unit Hyd Qpeak  (cms)=    .945

     PEAK FLOW       (cms)=    .419 (i)
     TIME TO PEAK    (hrs)=   1.750
     RUNOFF VOLUME    (mm)=  18.365
     TOTAL RAINFALL   (mm)=  59.005
     RUNOFF COEFFICIENT   =    .311

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (7027) |   Area    (ha)=    .83
|ID= 1 DT=15.0 min |   Total Imp(%)=  56.00   Dir. Conn.(%)=  21.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .47         .37
     Dep. Storage     (mm)=      2.00        5.00
     Average Slope     (%)=       .50        2.50
     Length            (m)=     74.50       38.00
     Mannings n           =      .013        .250

     Max.Eff.Inten.(mm/hr)=    106.80      129.85
               over (min)      15.00       15.00
     Storage Coeff.  (min)=     2.57 (ii)   8.33 (ii)
     Unit Hyd. Tpeak (min)=    15.00       15.00
     Unit Hyd. peak  (cms)=      .11         .09
                                                    *TOTALS*
     PEAK FLOW       (cms)=      .05         .11          .166 (iii)
     TIME TO PEAK    (hrs)=     1.50        1.50         1.50
     RUNOFF VOLUME    (mm)=    57.01       35.35        39.90
     TOTAL RAINFALL   (mm)=    59.01       59.01        59.01
     RUNOFF COEFFICIENT   =      .97         .60          .68
```



```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  81.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (7028) |   Area    (ha)=    .83   Curve Number   (CN)= 81.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .145

     PEAK FLOW       (cms)=    .075 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=  23.333
     TOTAL RAINFALL   (mm)=  59.005
     RUNOFF COEFFICIENT   =    .395

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (7023) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .4800      .2400
                           .1200      .1200    |    .7000      .3000
                           .2200      .1700    |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (7021)     11.49      1.85      1.50      35.84
     OUTFLOW: ID= 1 (7023)     11.49       .47      2.00      35.82

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 25.37
                    TIME SHIFT OF PEAK FLOW         (min)= 30.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  .2380

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--------------------
| RESERVOIR (7024) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .4200      .1900
                           .1000      .1000    |    .6100      .2300
                           .2000      .1300    |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (7022)      9.40      1.49      1.50      35.17
     OUTFLOW: ID= 1 (7024)      9.40       .40      1.92      35.14

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 26.96
```

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                TIME SHIFT OF PEAK FLOW         (min)= 25.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  .1856

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  ***************************
  ** SIMULATION NUMBER:   4 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=2171.754
| Ptotal= 71.27 mm |                          B=   8.303
--------------------                          C=    .867
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.50 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =   .38

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .08    3.59 |  1.00   15.91 |  1.92   14.13 |  2.83    4.98
                 .17    3.85 |  1.08   22.59 |  2.00   12.15 |  2.92    4.70
                 .25    4.17 |  1.17   37.28 |  2.08   10.64 |  3.00    4.46
                 .33    4.54 |  1.25   87.10 |  2.17    9.45 |  3.08    4.23
                 .42    4.98 |  1.33  230.33 |  2.25    8.50 |  3.17    4.03
                 .50    5.53 |  1.42  104.88 |  2.33    7.72 |  3.25    3.85
                 .58    6.21 |  1.50   56.05 |  2.42    7.07 |  3.33    3.69
                 .67    7.08 |  1.58   36.64 |  2.50    6.52 |  3.42    3.54
                 .75    8.23 |  1.67   26.66 |  2.58    6.05 |  3.50    3.40
                 .83    9.84 |  1.75   20.72 |  2.67    5.65 |
                 .92   12.18 |  1.83   16.84 |  2.75    5.29 |


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--------------------
| CALIB            |
| STANDHYD  (7021) |   Area    (ha)=  11.49
|ID= 1 DT=15.0 min |   Total Imp(%)=  54.00   Dir. Conn.(%)=  28.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       6.21         5.29
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=     276.80        38.00
     Mannings n             =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .250    3.87 | 1.250   48.99 | 2.250    9.53 |  3.25    4.04
                .500    5.02 | 1.500  130.42 | 2.500    7.10 |  3.50    3.54
                .750    7.17 | 1.750   28.01 | 2.750    5.66 |
               1.000   12.64 | 2.000   14.37 | 3.000    4.71 |

     Max.Eff.Inten.(mm/hr)=     130.42       118.54
                 over (min)       15.00        15.00
     Storage Coeff.  (min)=       5.21 (ii)   11.19 (ii)
```



```
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=        .11          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.12         1.35         2.469 (iii)
     TIME TO PEAK    (hrs)=       1.50         1.50          1.50
     RUNOFF VOLUME    (mm)=      69.27        37.05         46.07
     TOTAL RAINFALL   (mm)=      71.27        71.27         71.27
     RUNOFF COEFFICIENT   =        .97          .52           .65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (7022) |   Area    (ha)=   9.40
|ID= 1 DT=15.0 min |   Total Imp(%)=  53.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.98         4.42
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=        .50         2.50
     Length            (m)=     250.30        38.00
     Mannings n             =       .013         .250

     Max.Eff.Inten.(mm/hr)=     130.42       138.07
                 over (min)       15.00        15.00
     Storage Coeff.  (min)=       4.90 (ii)   10.53 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=        .11          .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .66         1.35         2.006 (iii)
     TIME TO PEAK    (hrs)=       1.50         1.50          1.50
     RUNOFF VOLUME    (mm)=      69.27        39.54         45.49
     TOTAL RAINFALL   (mm)=      71.27        71.27         71.27
     RUNOFF COEFFICIENT   =        .97          .55           .64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (7025) |   Area    (ha)=  11.49   Curve Number   (CN)= 74.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   9.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .39

     Unit Hyd Qpeak  (cms)=   1.125
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```
     PEAK FLOW       (cms)=    .703 (i)
     TIME TO PEAK    (hrs)=   1.750
     RUNOFF VOLUME    (mm)=  25.080
     TOTAL RAINFALL   (mm)=  71.269
     RUNOFF COEFFICIENT   =    .352

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| NASHYD    (7026) |   Area    (ha)=   9.40   Curve Number   (CN)= 75.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   9.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .38

     Unit Hyd Qpeak  (cms)=    .945

     PEAK FLOW       (cms)=    .611 (i)
     TIME TO PEAK    (hrs)=   1.750
     RUNOFF VOLUME    (mm)=  26.100
     TOTAL RAINFALL   (mm)=  71.269
     RUNOFF COEFFICIENT   =    .366

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD  (7027) |   Area    (ha)=    .83
|ID= 1 DT=15.0 min |   Total Imp(%)=  56.00   Dir. Conn.(%)=  21.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .47          .37
     Dep. Storage     (mm)=      2.00         5.00
     Average Slope     (%)=       .50         2.50
     Length            (m)=     74.50        38.00
     Mannings n           =      .013         .250

     Max.Eff.Inten.(mm/hr)=    130.42       171.37
               over (min)      15.00        15.00
     Storage Coeff.  (min)=     2.37 (ii)    7.53 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
     Unit Hyd. peak  (cms)=       .11          .10
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .06          .16          .218 (iii)
     TIME TO PEAK    (hrs)=      1.50         1.50          1.50
     RUNOFF VOLUME    (mm)=     69.27        46.13         50.99
     TOTAL RAINFALL   (mm)=     71.27        71.27         71.27
     RUNOFF COEFFICIENT   =       .97          .65           .72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  81.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| NASHYD    (7028) |   Area    (ha)=    .83   Curve Number   (CN)= 81.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.60   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .145

     PEAK FLOW       (cms)=    .105 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=  31.826
     TOTAL RAINFALL   (mm)=  71.269
     RUNOFF COEFFICIENT   =    .447

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| RESERVOIR (7023) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .4800      .2400
                          .1200      .1200    |    .7000      .3000
                          .2200      .1700    |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (7021)     11.49      2.47      1.50      46.07
     OUTFLOW: ID= 1 (7023)     11.49       .69      1.92      46.05

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 27.76
                TIME SHIFT OF PEAK FLOW         (min)= 25.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  .2963

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (7024) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .4200      .1900
                          .1000      .1000    |    .6100      .2300
                          .2000      .1300    |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (7022)      9.40      2.01      1.50      45.49
     OUTFLOW: ID= 1 (7024)      9.40       .61      1.92      45.46

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 30.41
                TIME SHIFT OF PEAK FLOW         (min)= 25.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  .2308

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 FINISH
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