

Van Gaal Drain Flood Plain Mapping Extensions

Comments, Concerns, Questions and Corresponding Responses

Re: The Floodplain Mapping for the Van Gaal and Arbuckle Municipal Drains in the Village of Richmond

	Comment	Response
September 10th Meeting		
1.	<p>Some landowners have relied on previous flood plain mapping which did not identify any flood prone areas north of Perth Street or west and south of the flood prone area between Fortune and Perth, as part of their due diligence when they purchased property as an investment.</p> <p>The new mapping now indicates that overbank flooding extends further upstream, affecting the value of their investments.</p>	<p>RVCA Response:</p> <p>In the 2005 flood plain mapping produced for RVCA by PSR Group, the flood lines closed across the watercourses at the upper ends of the study area.</p> <p>A more appropriate mapping procedure in 2005 would have been to identify “limit of study” across the watercourse - indicating that flood levels further upstream were not estimated and corresponding flood lines were not plotted.</p> <p>It is acknowledged that 2005 mapping is somewhat ambiguous in terms of the information it conveys regarding the flood susceptibility of the lands north of Perth Street, or lands further upstream on some of the drains flowing into the Van Gaal Drain.</p> <p>For the flood line mapping extensions being completed under the present study we will identify “limits of study” across watercourses, at the upstream limit of the hydraulic modeling and/or topographic mapping, and will provide more specific guidance for land use, development and drainage planning for lands that are beyond (upstream of) the limits of study.</p>

2.	<p>July 2009 was the wettest month on record in the Ottawa area according to Environment Canada, but there was no overbank flooding at any time this summer. Have you used this summer's rainfall events to check the accuracy of your hydrologic models? How big is the 1:100 year event that you are simulating in the model?</p>	<p>JFSA Response: An important note to make here is the wide variation of rainfall intensities that can occur at different parts of Ottawa at a given point in time. One part of the city could receive an intense storm while an area less than 20 km away could remain relatively dry. If we take a look at the July 24th, 2009 storm for example, the rainfall data provided by RVCA for hourly precipitation at various rain gauge stations illustrates this point. The maximum hourly rainfall intensity for the March Road rain gauge for that day was 45 mm/hr while the Richmond rain gauge showed a maximum intensity of 7 mm/hr. To put this into perspective the maximum average intensity for the 1:100 year 24 hour SCS Type 2 Storm in the City of Ottawa is 48.25 mm/hr.</p> <p>There appears to be a perception that a large rainfall event in Ottawa means this event happens everywhere across the city, when in fact this is not often the case. As well, in our hydrologic modeling, we are less interested in monthly rainfall as we are in specific events (hourly/daily).</p> <p>With regards to the comment "there was no overbank flooding at any time this summer", the hydrologic models for this floodplain mapping exercise do not account for any storage created from manmade infrastructure (such as the culverts along Joys Road), as per standard practice. Although areas of the Village may be benefitting from this storage at the present time, there is no guarantee that these culverts will remain as fixed infrastructure in the future. Given this fact, although the models may show out of bank flow for certain design storms, this does not necessarily mean out of bank flow would actually occur under present conditions. However, the approach taken is necessary considering it is possible for these culverts to be modified or removed in the future.</p>
3.	<p>Why did the study extend beyond the Village Limits along some of the drains but stop short of the Village Limits along other Drains?</p>	<p>RVCA Response: In general, the study limits extended as far upstream on each tributary as was possible with the available information on the topography of the overbank areas (from the base mapping) and the geometry of the low flow channel (from field survey or from other sources such as the Municipal Drain engineer's reports). All the study limits are clearly shown on the maps.</p>
4.	<p>Why is the Cedarstone Subdivision (now known as Richmond Oaks Phase 1) shown on the map with cross-hatching, and why don't the flood lines extend across the westerly boundary of the subdivision lands?</p>	<p>RVCA Response: The subdivision was approved and constructed (with grade raises on the residential lots) after the date of the base mapping that is being used for this study (September 2001). The topography of the subdivision area is no longer as shown in the base mapping.</p>

5.	<p>You have told us that there is uncertainty in the hydrologic and hydraulic analysis. Given the very flat terrain in the study area, relatively small margins of error in the flow and/or water level calculations can translate into significant margins of error in the position of the flood line. Did you perform sensitivity analyses?</p>	<p>JFSA Response: A sensitivity analysis has been completed on the 1:100 year flows used in the hydraulic analysis. The Spring and Summer flows along the Van Gaal drain were increased by 20% and decreased by 20%. The results of this analysis show that for an increase in design flow of 20%, the change in governing water levels along the drain is a rise up to a maximum of 0.26 m noted just upstream of the Joys Road culvert (approximately 630 m South East from Garvin Road). For a decrease in design flow of 20%, the change in governing water levels along the drain is a drop up to a maximum of 0.37 m noted again at the upstream side of the Joys Road culvert. For the area between Perth Street and approximately 740 m upstream, the change in water level under a 20% increase in flow is between 0.03 m and 0.15 m and for a 20% decrease in flow the change is between -0.01 m and -0.17 m. For the area between Perth Street and Fortune Street, the change in water level under a 20% increase in flow is between 0 m and 0.13 m and for a 20% decrease in flow the change is between 0 m and -0.04 m.</p> <p>Further discussion of the sensitivity analysis is included in the revised report.</p>
6.	<p>Why haven't you accounted for the proposed Arbuckle Municipal Drain improvements (as per the 2008 engineer's report) in this analysis?</p>	<p>RVCA Response: The existing stream profile and cross-sections, as shown in the engineer's report were used in the modeling, but the proposed future profile and cross-sections were not used because it is not yet certain that the drainage works will proceed to construction. Important steps under the Drainage Act have to be completed before any work can proceed.</p> <p>JFSA Response: Drainage works have been proposed by Robinson Consultants along the Arbuckle and Moore Branch drains in 2008. These works are proposed from Perth Street culvert, downstream to the Jock River as well as along the Moore Branch which feeds into the main Arbuckle drain approximately 800 m upstream of the Jock River. Although we have not been provided a copy of the report associated with these proposed works to date, we have been supplied with a drain profile and cross sections showing existing and proposed conditions.</p> <p>If these drainage works were to be undertaken our analysis shows that compared with the water levels derived using existing geometry, the proposed changes to the drain will have little impact on the governing water levels used for floodplain mapping. Along the main Arbuckle branch the maximum change in water level is estimated to be approximately 0.05 m.</p>

7.	<p>A number of options were mentioned to reduce the size of the flood plain:</p> <ul style="list-style-type: none"> - a series of engineered culverts - storm water retention ponds - culvert improvements at Fortune & Perth St 	<p>RVCA Response: Flood risk mapping takes into account current conditions. If it is apparent that existing man-made features or historical changes on the landscape may have contributed to present day flood risks, it is reasonable to investigate the feasibility and economic merits of remedial flood level/flood damage reduction measures. That kind of investigation is beyond the defined scope of the assignment that JFSA was contracted to complete. However, an attempt will be made to identify remedial measures that could be investigated.</p> <p>JFSA Response: We did take another look at the analysis of the Fortune Street Culvert. Due to recent updates to the Summer flows (through the revision of CN values); the scenarios which govern the floodplain have changed. Currently it is the Jock River spring event that governs water levels up to approximately 1200 m upstream from the Jock River.</p> <p>Changes to the Fortune Street culvert under this scenario have negligible impact on the 1:100 water levels. Changes to the Perth Street culvert to improve the entrance losses (from 0.5 to 0.2) have minimal effect on the 1:100 year water levels. The change in governing water level would be approximately 0.04 m lower under this condition.</p>
8.	<p>Landowners were pleased that RVCA offered to include a discussion on engineering and other options in the Report going to BOD</p>	<p>RVCA Response: As alluded to above, a comprehensive flood control/flood plain management program can include both preventive and remedial measures. Flood plain mapping identifies hazardous areas where development should be restricted, but can also identify flooding problems for which remedial measures may be appropriate.</p>
9.	<p>Landowners were pleased to be offered a copy of the RVCA Staff Report before it goes to BOD</p>	<p>RVCA Response: It is our intent to inform the stakeholders so that they can fully participate in the decision making process.</p>
10.	<p>Citizens prefer that the City/RVCA design a long term solution (as opposed to ad hoc additions to mapping)</p>	<p>RVCA Response: Flood plain mapping is based on existing conditions. It does not preclude remedial flood control measures. An attempt will be made to identify remedial measures that could warrant further investigation.</p>

11.	If landowners give permission for surveying, will it change the flood lines?	<p>RVCA Response: Additional surveying is not expected to significantly affect the outcome of the study. The most important modeling inputs are:</p> <p>The geometry of the existing channels – the surveys undertaken by drainage engineers in connection with the Van Gaal and Arbuckle municipal drain projects have been used</p> <p>The topography of the overbank areas – the detailed topographic mapping based on 2001 aerial photography – there may be a small difference between the mapped elevations and true geodetic elevations, and that difference will also apply between the mapped 1:100 year flood elevation and the true 1:100 year elevation when tied to geodetic datum. However the expected depth of flood waters on overbank areas is not affected by the inherent difference between mapped elevation and true geodetic elevations. We have a very high level of confidence that the topographic mapping accurately portrays the contours of the land; in one specific location a landowner has submitted additional survey information that indicates a small change in the landform that had taken place some time after 2001 (see #25).</p> <p>The type and geometry of road culverts – information on the dimensions of existing culverts used in the modeling work is contained in Appendix K of the November 2009 JFSA report. In the case of private culverts, JFSA relied on information from drainage engineer’s reports</p>
September 12th Meeting		
12.	There are many uncertainties and approximations in the mapping process. When will we know things for sure?	<p>RVCA Response: Uncertainties can never be completely eliminated in hydrologic studies aimed at predicting the consequences of infrequently occurring extreme rainfall or snowmelt events that will happen in the future. In order to avoid future flooding problems, it is necessary to make conservative assumptions (i.e. to err on the safe side) while recognizing that there can also be economic costs associated with excessively over-estimating flood levels.</p>

Comments from Landowners group Meeting, September 24th (Received from Gisele Moore on Sept. 28th)

13. In the 2006 floodplain mapping, the mouth of the Jock River elevation is marked at 93.07 m, VanGaal drain is 94.01 m. The lands North of Perth St. are 94.3 m and therefore were deemed no flood area for the 1:100 year flooding. Taken from RVCA correspondence dated August 27, 2009-- "for lands north of Perth Street we confirm that, at the present time, the regulation limit in the current regulations mapping does not extend to the north of Perth Street. Technical information available when O.Reg. 174/06 came into effect indicated that the lands to the west of and further than 30 metres from the creek, upstream of Perth Street, are not prone to flooding during a 1:100 year flood.

RVCA Response:

The references made here to various elevations in the 2006 flood plain mapping are not clear.

In the 2006 floodplain mapping the 1:100 year water surface of the Jock River at the Van Gaal Drain outlet is 94.09 metres, the 1:100 year water surface on the Van Gaal Drain extended horizontally at this elevation as far upstream as the study limit on the south side of Perth Street.

The final JFSA mapping makes use of updated topographic mapping for the area north of Perth Street which was not available when the 2006 mapping was completed

The 1:100 year flood elevation immediately upstream of Perth Street is now estimated to be 94.45 metres at cross-section 1488 – for both 1:100 year flood conditions (spring snowmelt or summer rainstorm).

Portions of the fields to the west of the Drain and north of Perth Street are subject to shallow depth overbank flooding (generally not deeper than 20 centimetres), at the water surface elevations that have been computed in this analysis.

<p>14.</p>	<p>With reference to by-law No 2007-298:</p> <p>a) The Hamilton Drain watershed, which went to the Jock River, was diverted into the Van Gaal Drain when Cedarstone was going through the approval process for its subdivision. No stormwater ponding was made to accommodate heavy rainfall. This is a large contributing factor to the increased water flow and speed into the Van Gaal Drain.</p> <p>b) Why is ponding now not required in the 2nd phase of Cedarstone to help alleviate this problem?</p> <p>c) When the subdivisions were being planned (Cedarstone/Hyde Park) the VanGaal Drain North of Perth St only was cleaned out and not continued on South down to the Jock River. This naturally would have resulted in a bottleneck affect as well as silt etc. build-up. Had the cleaning out been completed there would be better flow for the summer waters.</p> <p>d) The purpose of this by-law was originally meant for subdivision (i.e. sheds being build on drainage swales) and doesn't make sense/apply equally in rural lands as a farmer for example would easily be an offender simply by plowing his fields.</p> <p>e) The city was to examine all the lands within the Village limits for floodplain, that includes Cedarstone subdivision, Richmond Gate subdivision (Nixon Farm Drive), Hyde Park, Kings Grant, Lands east of Shea Road and west to McBean Street, and lands west of McBean to the westerly Village limit at the Legion.</p> <p><i>By-law No 2007-298, Drainage Section 2 (1) "No Owner or Occupant shall, or shall permit any person to, alter, fill block, interfere with, obstruct, or cause or contribute to the obstruction of a drain, private drain or lot grade such that the flow of storm, rain, ground, surface or subsurface water is increased, impaired or deviates from the existing drainage pattern or approved grading and drainage pattern."</i></p>	<p>RVCA Response:</p> <p>a) A 1989 report entitled "Village of Richmond Master Drainage Report, Phase 1" (A.J. Robinson and Associates Inc for Township of Goulbourn) identifies the divide between the Hamilton Drain and the Van Gaal Drain catchment areas and indicates that about 8.7 hectares of the Cedarstone Subdivision lands were within the Hamilton Drain catchment area. As approved, the Cedarstone Subdivision's drainage system discharges to the Van Gaal Drain at Perth St. The contributing drainage area of the Van Gaal Drain at Perth Street has therefore increased by 8.7 hectares. This represents a 1% increase in the Van Gaal Drain catchment area at Perth Street and a 0.8% increase in its drainage area at the outlet to the Jock River.</p> <p>b) RVCA's clearance of conditions for approval of the Cedarstone Subdivision were based on an expressed commitment by the Township of Goulbourn to undertake a subwatershed study as was recommended in the Richmond Master Drainage Plan (Robinson Consultants Inc. for Twp of Goulbourn, March 1998). Goulbourn Council, by resolution dated August 11, 1998 established a "cash-in-lieu of stormwater management" policy under which future developments within a defined area were to contribute funds, on a per unit basis, that would be used by the municipality to define and implement a comprehensive storm water management plan for the Village (including the Van Gaal Drain catchment) and its implementation. RVCA considered potential downstream erosion impacts along the Van Gaal Drain to be a more significant issue than potential changes to the flood plain limits, since flood plain limits up to Perth Street were established by the 1:100 year Jock River spring flood event and would not be significantly affected. RVCA concerns about potential downstream erosion were addressed in a technical analysis undertaken by PSR Group Inc., engineering consultants.</p> <p>c) While extending the clean-out further downstream from Perth Street to the outlet may remove silt and debris from the creek bed and improve the channel's efficiency when the Jock River is at low levels, doing so will not have any significant effect on flood levels along the drain that are associated with backwater effects from the Jock River when it is at 1:100 year flood stage.</p> <p>d) RVCA is not in a position to comment on the purpose or proper interpretation of the City's Drainage By-law.</p> <p>e) The areas for which flood plain mapping extensions were required are as shown in Appendix B of the finalized report by JF Sabourin and Associates.</p>
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15.	<p>Now that things have changed, i.e. summer rainfall being considered a new issue, why wasn't the area east thru to Huntley studied? Elevations in this area are lower in many parts to those in the newly Studied Area North of Perth St. All these areas should to be treated with the same standard.</p>	<p>RVCA Response: Summer rainfall events are not a new issue. In Eastern Ontario, it is standard practice in flood plain mapping to consider the possibility of both 1:100 year spring snowmelt events and 1:100 year summer rainstorm events – for any watercourse, regulatory flood lines are based on the higher of the two possible events.</p> <p>In the finalized mapping, “spill sections” are identified at the upstream terminus of the flood plain mapping along two branches of the drainage ditch network coming from the north and east. While these drains flow towards the Van Gaal Drain under bankfull (and lower) flow conditions, it is recognized that when flow spills out of the main branch of the drain between sections 2076 and 3086, the resulting shallow depth overland flow tends to be directed eastward towards the lower lying lands in the headwaters of what is known as the Hamilton Drain. The hydrology and hydraulics of the Hamilton Drain system have not been examined in this study to determine hydraulic grade line in the area to the east of the Cedarstone subdivision – an urban drainage analysis (not a flood plain study) is required for the lands in question to determine if the fairground lands and surrounding residential developments have an adequate major drainage system.</p>
16.	<p>The problem identified (summer 1:100 year flooding) appears to have a solution if ponding was to be available. The Arbuckle Drain South of Perth is surrounded by City property and adjacent to the fire station. Why could this area of the drain either be increased or have holding pond made which would then slow down the water flow, hold excess water and perhaps also serve as emergency water filling ponds for the fire trucks.</p>	<p>RVCA Response: Table 4 in the revised JFSA report (dated November 2009) indicates that dominant event on the VGD is the 1:100 Jock River spring flood as far upstream as Section 1212 – just south of Perth Street. Upstream of Perth Street the dominant event alternates between 1:100 year VGD summer event and the 1:100 year VGD spring snowmelt event – the water surface elevations above Perth Street for these two events are within 2 centimetres of one another – for practical purposes, they are the same elevation.</p> <p>Additional ponding won't be effective for reducing flood levels in the Perth Street area unless the additional runoff storage capacity is created further upstream in the drainage system (adding to the natural storage that is already present in the wetland areas); there is practically no opportunity to establish additional storage because of the very flat topography. Ponding depths would be relatively small, so the storage area would have to be large (likely involving the construction of lengthy containment dykes) in order to affect significant flow reductions.</p>

17.	If some simpler obvious drainage corrections were made, couldn't the rest be solved in the stormwater management process of the development?	<p>RVCA Response:</p> <p>The purpose of stormwater management ponds associated with new development is to mitigate the effect that the increased imperviousness of the new land uses have on downstream erosion rates, flood peaks and water quality control - not to reduce pre-development flood peaks.</p> <p>If it is determined that existing man-made features such as weirs, culverts and flood plain encroachments have contributed to higher estimated flood levels, the removal or modification of those features could be considered as appropriate remedial measures.</p> <p>As noted in #15 above, a close examination of the major overland flows throughout the Village and the interconnectedness of adjacent drainage systems (VGD, Hamilton Drain, Flowing Creek) during infrequent rainstorm or snowmelt events might reveal opportunities direct a certain portion of the runoff from those events to alternate outlets (other than the VGD), thereby remediating the adverse effects of historical changes in drainage patterns in the area. This could be done within a more comprehensive wet weather management strategy for the Village.</p>
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<p>18.</p>	<p>The VanGaal Drain is now a municipal drain, and under the Drainage Act provides a legal procedure to handle newly identified flooding problems. Section 23(1) provides for the reassessment for “outlet liability” on up stream landowners, whose water has been identified by JF Sabourin as causing the flooding to downstream landowners. Section 23(2) provides “injury liability” for the lands affected where water is artificially caused by means to flow upon and injure any other land. Section 78(1) provides expedient change to reconstruct or extend embankments or walls by any Municipality or City whose duty it is to maintain and repair the drainage works. Now that the City of Ottawa has identified a problem through its own study, the City must reconstruct the drain. Section 79(1) provides affected landowners the power to compel repairs, upon forty-five days notice in writing served by any person affected by the condition of a drainage works, upon the head or clerk of the local municipality (City of Ottawa) whose duty it is to repair and maintain the drainage works. The City is compelled by order of the referee to exercise the powers and perform the duties. The City is liable in damages to the owners whose property is so injuriously affected. Section 79(2) states the Municipality (City of Ottawa) is liable for damages caused by non-repair.</p>	<p>RVCA Response:</p> <p>Comments and questions regarding the Drainage Act and how it applies should be referred to the City of Ottawa.</p> <p>However, as previously noted, adjustments to the low flow channel of the creek will not have any effect on the flood lines downstream of Perth Street, since the dominant event on the lower reach of the creek (Perth Street to the outlet) is associated with “backwater” from the Jock River when it is at its 1:100 year spring flow.</p> <p>RVCA’s understanding is that municipal drains are generally designed, built and maintained to provide adequate outlet for relatively frequently occurring runoff events, and to provide an outlet for tile drainage systems that remove water from the uppermost soil horizons on agricultural lands that, in nature, are poorly drained as a result of topography and/or soil type. Municipal drains are not typically designed or built to completely contain the flow generated by extreme rainfall or snowmelt events.</p>
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<p>19.</p>	<p>The City commissioned the mapping which identified the potential downstream flooding problem. The onus is therefore on the City to correct the problem, the liability is held equally with the upstream watershed/municipal drains.</p>	<p>RVCA Response: This comment implies that the flood prone nature of some downstream lands is the consequence of some unspecified upstream changes that have occurred in the past.</p> <p>As noted above, one relatively small 8.7 hectare area appears to have been diverted to the VGD watershed since 1989, in connection with the Cedarstone Subdivision, and the implications of this were to be addressed through the completion and implementation of a subwatershed study, according to the Council-approved Richmond Master Drainage Plan of 1998.</p> <p>In the course of this study it has been realized that the local drainage system has evolved such that the existing watershed boundaries for the Van Gaal Drain (as identified in the final report) varies from the “natural” watershed boundaries (before the installation of man-made drainage works); as noted above in #15 and #17, the natural overland flow direction for a portion of the VGD is towards the east or southeast to adjacent watercourses. To some extent that we are unable to quantify within the scope of the flood plain study, these historical changes have contributed to the flood prone nature of certain lands in the VGD watershed as identified in the final report. The City of Ottawa should be encouraged to undertake a comprehensive examination of the capacity of all overland flow routes in and around the Village – and the interconnectedness of the local watercourses under rare flood conditions - with a view to optimizing the routing of flows that exceed bankfull capacities, to reduce their net impact on the use of land and property while ensuring that upstream and downstream flood conditions are not exacerbated. If warranted, further revisions to the VGD flood plain mapping, would be made after the implementation of such a strategy for managing extreme storm and snowmelt events in the Village.</p>
<p>20.</p>	<p>In 2008 Mattamy inquired and applied to see what was required to contain floodplain land to current levels. They got a permit from RVCA for berm for lands South of Perth St. No permit was required for lands North of Perth St as they were not in floodplain and therefore only needed to be 30M back from creek (and follow correct conservation precautions of filter paper etc.). Once this work is complete, surveyed with engineer certified levels, remodeled by RVCA so no other landowner is adversely affected by these measures, then the RVCA may redraw the 1:100 floodplain line.</p>	<p>RVCA Response: The comment reflects RVCA’s position with respect to the earthworks that have been carried out north of Perth Street.</p> <p>However, the legal status of the earthworks and how they will perform under 1:100 year flood conditions, in terms of their permeability, ability to withstand hydrostatic pressure, and resistance to erosion will also need to be considered.</p>

21.	<p>During the landowner's presentation of the draft floodplain mapping, it was identified that the bottleneck affect of the culverts on Fowler and Fortune were contributing factors to the flooding. Enlarging these is very expensive (and unfortunately the big picture wasn't looked at when the construction was approved) but it was also mentioned that some simpler solutions, i.e. "wings" at these culverts could very much help.</p>	<p>JFSA/RVCA Response: Wing walls would help improve (i.e. reduce) the entrance losses at Fortune and Fowler, when the velocity of flow through the culverts is higher. But when the culverts are subjected to high tailwater levels (Jock River backwater effects) these improvements will have minimal beneficial effect and won't change the water surface profile or the position of flood lines.</p> <p>This can be seen graphically by referring to the Profile drawing in Appendix D of JFSA's final report. For the reaches south (downstream) of Perth Street (Station 1212) the flood line is based on the Jock River 1:100 spring flood condition – i.e. the nearly horizontal water surface profile indicated by the blue line with triangular spot heights indicated on it.</p> <p>The difference between upstream and downstream water levels at Fowler Street (Section 276) and Fortune Street (Section 668) is insignificant under the dominant flood condition, for the culverts in their present configuration.</p>
22.	<p>With the large area of lands being affected, why is there no sensitivity analysis done, solutions put forward. Much of the problems we are encountering are a result of previous manmade obstacles i.e. culvert sizing, diverted drainage, development. As such there should be a joint effort made to find solutions</p>	<p>JFSA Response: See response #5.</p>
October 8th Meeting		
23.	<p>Is the Fortune Street culvert under designed? Is it choking the flow and causing upstream flooding?</p>	<p>JFSA Response: See response #7 and #21.</p>

24.	Is the berm under construction to the north of Perth Street causing an increase in flooding for other landowners?	<p>RVCA Response: RVCA has analyzed the effect of the berms that were placed on either side of the Drain north of Perth Street, using:</p> <ul style="list-style-type: none">• JFSA's finalized HEC-RAS model and 1:100 year flow estimates for the three main 1:100 year conditions.• Finished grade survey of the "Arbuckle" berm (west overbank) as depicted in drawings dated Oct 8, 2009 by J.D. Barnes Ltd, provided by B. Arbuckle, P.&G. Moore and G. Green, by letter dated Oct.9, 2009.• Finished grades as of October 8th along the "Ralph" berm (east overbank) as depicted in a drawing prepared by Agrodrain Service Ltd., provided by T. Ralph by email on Nov 27, 2009. <p>Preliminary analysis by RVCA indicates that the berms will cause a small, but measurable increase in water surface elevations over a 990 metre length of the Drain (from cross-section 1488 to cross-section 2478); the maximum increase in the estimated water surface elevation attributable to the berms is 12 centimetres (at cross-section 1922)</p> <p>The proponents of the earthworks have been advised that RVCA may be prepared to recognize these site alterations and take them into account in further revisions of the flood plain mapping, but only after it has been satisfactorily demonstrated that:</p> <ul style="list-style-type: none">• the earthworks do not adversely affect the interests of adjacent landowners;• the loss of flood plain storage volume resulting from the confinement of flow to a narrower flood plain will not have adverse downstream consequences• there is no pending litigation under the City's Drainage By-law in respect of the changes that have been made• the berms will perform as effective barriers under 1:100 year flood conditions, in terms of their permeability, ability to withstand hydrostatic pressure, and resistance to erosion
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25.	Some land features along the east side of Van Gaal Drain north of Perth Street, on the Ralph property are not reflected in the base mapping.	<p>RVCA Response: RVCA staff visited the site on October 22, 2009. Recent changes along the east bank of the Van Gaal Drain were noted – i.e. the berm installation referred to above in #24.</p> <p>Via e-mail from T. Ralph on November 27, 2009 RVCA received a drawing showing grades along the east bank of the creek as surveyed by Agrodrain Services Ltd. on October 1, 2009. This drawing indicates the presence of an elevated “ridge” running along the top of the east creek bank between Sections 1488 and 1735 in the JFSA HEC-RAS model, possibly being material that was cast to the side of the drain during clean-out operations done since the date of the base mapping (September 2001). This small ridge is not evident in the base mapping, and has been eliminated by the more recent introduction of the berm referred to above in #24.</p> <p>Aside from this small ridge feature along the east bank, the elevation surveys that have been submitted (referred to in #24 above) are more or less consistent with the base mapping in terms of how they depict the contours of the land. In all topographic mapping products there is expected to be a difference between the mapped elevation and the true elevation of the land. The surveys confirm that the inherent error is within the accuracy specification for the base maps. It is important to understand that the hydraulic modeling makes use of cross-sections cut from the mapped topography, and accordingly the estimated water surface elevations are “tied” to elevations as shown the mapping. If the base mapping is found to be generally lower than the true geodetic elevations of the land by a certain margin, the resulting estimate of the 1:100 year flood will also be lower than its true geodetic elevation by the same margin. In recognition of this inherent error in all topographic mapping, standard practice is to require freeboard allowances in the design and construction of installations that could be affected by flood levels. The minimum acceptable freeboard allowance is 30 centimetres and larger freeboards may be warranted depending on other analytical uncertainties and/or the tolerance for risk associated with the installation. That is the proposed installation must be designed to withstand the effect of flooding to a water level that is at least 30 centimetres higher than the estimated 1:100 year flood level as shown in the flood plain mapping.</p>
26.	If the Van Gaal Drain between Fortune Street and Perth Street is widened and deepened, will it reduce the floodplain?	<p>JFSA Response: This exercise is similar in nature to the proposed Robinson works. See response to #6.</p>

27.	<p>The Hamilton Drains: The East and West trunks were discussed but the part of the Hamilton drain system that was used to remove the watershed at that time which was going into the large lot of land north of Perth St. and draining into the Jock River while not using the VanGaal/Arbuckle drains had been diverted to the VanGaal/Arbuckle drain system. This added drainage to the VanGaal/Arbuckle system which was never meant to drain in that direction. At the meeting Marc G. didn't know why this had occurred but was something that is supposed to be looked at. (From: G. Moore)</p>	<p>RVCA Response: As noted above in #'s 14, 15, 17 and 19 it is acknowledged that historical evolution of the drainage systems serving lands to the northeast of the Village have changed the shape and size of the area that is tributary to the Van Gaal Drain.</p> <p>What is needed is a comprehensive look at how the major overland flow routes in and around the Village will function and interconnect with one another, when bankfull capacity of local watercourses is exceeded. When a comprehensive strategy for the Village is identified, further adjustments to flood plain mapping may be warranted.</p>
28.	<p>It was mentioned that both water quantity and water flow rate are both looked at when doing floodplain mapping. In the original model, the lands (North of Perth) were looked at from the point of one big area. Now, this same area was looked at as smaller areas. The point was brought up that it shouldn't make any difference as the "sum of the whole equals the whole". In this case it doesn't. The sum of the whole is greater than the whole</p>	<p>RVCA Response: The objective in flood plain mapping is to produce, at the conclusion of the study process, the best estimates of regulatory flood discharge, associated flood levels and flood lines as can be obtained with the available resources. Both analyses that are referred to in the comment were commissioned and eventually accepted by the RVCA as meeting that objective. Insofar as they deal with the Van Gaal Drain catchment area, the present analysis has always been considered to be superior to the earlier analysis, since more resources have been devoted to it allowing for a much more rigorous and detailed examination of the VGD's response to extreme rain and snowmelt events.</p>

Technical Comments from AECOM on JFSA draft final report

29.	<p>This memo was prepared by Paul Frigon, P.Eng. of AECOM and dated October 2, 2009. It was sent to RVCA by Susan Murphy of Mattamy Homes via an email on October 2, 2009, 5:18 pm.</p> <p>The Regulatory Floodline between Fortune Street and Perth Street should be the backwater from the Jock River, from the VGD outlet upstream to Perth Street during Springmelt.</p> <ul style="list-style-type: none">- In the JFSA report summer Flows are too high and should be reduced, reflecting both the influence of wetlands in the headwaters of the VGD as well as a more detailed examination of appropriate CN values, reflecting the current landuse.- The geometry of the model should be adjusted to reflect improved inlet coefficients at Fortune Street and Perth Street, from 0.5 to 0.2, as a result of potential inlet upgrades.	<p>JFSA Response:</p> <p>The 2009 study was a much more detailed analysis of the Van Gaal and Arbuckle drains breaking down the overall drainage area into approximately 18 subcatchments. The 2004 report had only 1 catchment area. A change in the governing scenario is therefore not unreasonable.</p> <p>The survey of farming practices received from AECOM is information that was not available to JFSA during the time the hydrologic models were being developed. Given the survey of farming practices, JFSA has re-evaluated each subcatchment that was proposed to be revised by AECOM. The CN values of subcatchments VG-1A, VG-1C, VG-1F, VG2, VG5, VG6, VG8 were reduced.</p> <p>It should be noted that revised CN values were also used to update Time to Peak (Tp) values. As such, lower CN values produce larger Tp values. The combined effects of lower CN values and larger Tp values generate lower flows.</p> <p>The additional effort made to address the impact of the PSW by using an initial abstraction value of 50mm rather than 4mm is difficult to justify (as noted by AECOM) and therefore could not be introduced in the JFSA models. To address the impact of the PSW, one could look into the storage available upstream of culverts which convey flow from the wetland under Joy's Road toward the Van Gaal and Arbuckle drains. In order to include such an approach into the hydrologic modeling, however, these culverts would have to be deemed fixed infrastructure, in which a change in hydraulic conveyance / capacity would not be permitted in the future. Field surveys would also need to be undertaken to evaluate the available potential storage within this area.</p> <p>Fortune Street and Perth Street Culverts are both Concrete Box culverts. There is no indication in the memo from AECOM as to what changes would constitute a change in the entrance loss coefficient.</p> <p>For additional information refer to "Response to Memo from P. Frigon_20091117.pdf" (letter from JFSA on November 17, 2009)</p>
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Other Comments		
30.	<p>Looking at the topography of the property (on Garvin Rd.) it is higher than the area within the village and has never experienced flooding even with this year's rain, so I am not certain how the back corner of the property can be in the flood plain.</p>	<p>RVCA Response: The mapping is done to estimate the flood risk during a very large flood (one that can be expected only once in 100 years on average), generated by extreme rainfall, snowmelt or some combination of the two. It can be an event that has not happened in the experience of present landowners, even those who have occupied the area for long period of time. For example the probability of a 1:100 year event occurring at least once during any 75 year period is only 53%.</p> <p>A portion of the property on Garvin Rd. that is adjacent to the watercourse is identified as being prone to flooding because the bankfull capacity of the watercourse is exceeded by the estimated 1:100 year flow.</p>
31.	<p>My position is the same as it was and is for the Goulbourn Landowners...No Change of designation without compensation since most buyers of land examine the designation before purchase and should not be penalized for a change made after they are the owners.</p> <p>(From: B.Webster)</p>	<p>RVCA Response: Generating maps showing areas that are expected to be prone to flooding under 1:100 year flood conditions is a technically-based process that makes use of well-established methods in hydrologic and hydraulic analysis.</p> <p>The mapping itself doesn't have the effect of making the land flood prone – but it reveals the flood-susceptible characteristic of the land, and hence its lower value relative to land that is not flood prone.</p> <p>It is Ontario government-directed policy that flood hazard areas must be identified as part of the municipal land use planning and development approval process. We appreciate the effect that the policies have on hazard land values in an informed open market place, and we understand the importance of producing technically defensible flood plain mapping products.</p>

<p>32.</p>	<p>.....In my opinion, the flood plain on any property should not increase because of anything that is done to the drain downstream, including the construction of a berm.</p> <p>The work to the Arbuckle drain (i.e. cleaning it out, culvert sizing, etc.) south of Perth Street in Richmond, should be completed first in order to do a proper assessment of the effect on the water flow of the Van Gaal drain. In 2006 when the first flood plain mapping exercise was done, south of Perth Street, the water flow was less than in the 2009 study. Why is there a difference?</p> <p>I would like to be advised of what the Rideau Valley Conservation Authority is doing to prevent the impact of this berm. Also, what are the RVCA plans for flood plain regulations upstream of this berm, and what compensation package is being developed for landowners adversely affected? I would like a written response before October 30, 2009, as I have to plan for next years crop rotation before the end of the fall tillage season.</p>	<p>RVCA Response: RVCA will not support any work that can potentially increase the flood risk.</p> <p>The issue of the new berms that are referred to in the comment, and how RVCA will deal with them in any future flood plain map revisions is addressed in #24 above. After the flood mapping based on the base (pre-berm) conditions is finalized and approved by the RVCA Board of Directors, the question of whether a revision to flood mapping is warranted will be considered.</p> <p>In the final report, after adjustments to the hydrologic modeling, the flood levels through the Fortune Street to Perth Street reach are very close to the earlier 2005-06 study except immediately downstream of Perth Street, where the dominant 1:100 year flood event switches from being the Jock River 1:100 spring peak flood to the Van Gaal Drain 1:100 year flow (summer storm and spring snowmelt events being nearly identical). As noted in #28, the difference between the earlier study and this present study is the level of detail in which the hydrologic/hydraulic analysis was completed. The present study is the superior, more technically-defensible analysis.</p>
<p>33.</p>	<p>On behalf of Richmond Creek Estate Subdivision (the landowners of 52.59 ha of land located directly northeast of Shea Road and northwest of Perth Road which lie in and adjacent to the Village of Richmond) we would like to forward you the following questions.</p> <p>The Flood Plain Mapping Study referred to in your email applies to that portion of the Van Gaal Drain from Fortune Street to Garvin Road. Can you confirm whether or not the modeling technique and assumptions used in this study vary from those used by RVCA when they completed that last Floodplain Mapping update for Flowing Creek?</p>	<p>RVCA Response: Studies referred to in question 1 were done according to the accepted methodology in the Province of Ontario – see response to comment #28.</p> <p>The 2005-06 Jock River Flood plain Mapping study covered Flowing Creek from its confluence with the Jock upstream to the unopened road allowance extending eastward from Garvin Road.</p> <p>The dominant 1:100 year flood event throughout this reach of Flowing Creek was found to be the 1:100 year Jock River spring snowmelt event, with water surface elevation at 63.67 metres flood.</p> <p>At some location along Flowing Creek but upstream of Garvin Road, the 1:100 year Jock River spring event will no longer be the dominant 1:100 year flood condition.</p> <p>When and if additional flood plain mapping of Flowing Creek is needed to extend the coverage further upstream, a more rigorous and detailed examination of the Flowing Creek hydrology will be needed (similar to the analysis that has now been done for the Van Gaal Drain).</p>

34.	Please consider this email my request to include the berm located on the east side of the Van Gaal Drain, north of Perth Street, in an impact study in relation to the flood plain mapping of the north side of Perth Street.	RVCA Response: The concern and request is duly noted. See response to comment #24. After the flood mapping based on the base (pre-berm) conditions is finalized and approved by the RVCA Board of Directors, the question of whether a revision to flood mapping is warranted will be considered.
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