

# JONSON'S POND

## STORMWATER MANAGEMENT PLAN

Submitted To:

**Lacombe County**

Submitted by:



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## **INTRODUCTION**

Erling and Jeanette Jonson wish to subdivide a 4-acre parcel of land from the remainder of the quarter section. To approve the subdivision, Lacombe County required a Concept Plan be developed to illustrate how the remainder of the quarter section could be developed in the future. This would ensure that the currently proposed subdivision would not affect the ability for further future subdivision. One of the requirements of developing a concept plan is the need to develop a stormwater management plan to identify the existing and future drainage conditions. To this end AMEC Infrastructure Limited was engaged by the Jonson's to assist in this regard. This document contains the proposed Stormwater Management Plan (SWM P) for the future Jonson's Pond development.

The SWMP determines the pre-development conditions and demonstrates a suitable post development stormwater management plan. The SWMP complies with regulations set forth by Alberta Environment Protection, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage System, December 1997, established the standards used for the SWM Plan.

## **SITE LOCATION**

The site is generally located between Blackfalds and Lacombe along Highway 2A. It is bounded on the west by the CP Rail right of way and Highway 2A and on the east by the C&E Trail. The site is also bounded on the north by Township Road 40-1 and on the south by an existing rural acreage development. Figure 1 identifies the general site location. The legal description of the subject property is the Remainder of NE1/4, Section 2, Township 40 Range 27, West of the 4th Meridian.

## **PROPOSED DEVELOPMENT**

The currently proposed development will only include one 4-acre parcel, which will not impact the existing drainage in any way, as no grading or site condition modifications are planned at this time. In the future, if and when the site is further developed, the recently completed Concept Plan suggests that the currently proposed single lot sub-division with an additional 21 lots could be developed on this quarter section. The concept included

lots with a minimum of 4-acres in size. The primary accesses would be from County road 40-1, with an internal loop road and one cul-de-sac to the south, which would provide a future road link to the south. The concept is replicated from the Jonson's Pond Concept Plan on Figure 5. Greater detail of the proposed development can be found in the Jonson's Pond Concept Plan.

The predominant feature on the site is a wetland located in the central northern area of the site, immediately south of Township Road 40-1. The wetland has a very well defined embankment where the normal water level is 4 to 5 meters and more lower than the surrounding lands. There is a treed area around the wetland that extends from the water's edge up the embankments and on to the adjacent higher lands. The wetland is home to a large variety of fauna, birds and water born creatures. The existing Jonson home is located on the east side of the wetland where the existing driveway connects to Township Road 40-1. The air photo on the Concept Plan Figure 3, which is included herein, identifies the wetland and treed areas.

### **EXISTING DRAINAGE CONDITIONS**

Drawing No. SWMP-1 depicts the existing over all drainage conditions that affect the development site. The land included within the site drainage area includes a number of depressions that act as infiltration basins. In these areas the stored water would have to become many meters deep to enable the water to overflow the depression. These areas are identified as major trapped lows where runoff will not overflow to the next lower drainage area. These areas are classified as a complete drainage basin. There are also a number of depressions where stormwater could pond to a depth of 1 or 2 meters prior to overflowing to the next lower drainage area. These areas are identified as minor trapped lows and are included within a larger drainage basin.

The primary site drainage basin is the Pond Drainage Basin. This basin includes the development site lands that slope toward the pond, as well as an area north of the development site. This northern area includes a section of Highway 2A, the CP railway and an up-sloping area west of Highway 2A. The off-site area is identified as Area A2 and the on-site area is identified as Area A1. Area A2 includes a culvert crossing under Highway 2A and one under the CP rail line. There is no defined drainage route through the fields from the CP rail culvert crossing to County Road 40-1. There is also no culvert

crossing under County Road 40-1 to convey run-off to the pond. Only very major overland run-off would reach the county road and overflow to the pond.

The development site contributes run-off to two major trapped lows. One is located to the northeast of the site, adjacent to the intersection of C&E Trail and County Road 40-1. This basin includes an area of the development site identified as B1 and the area around C&E Trail, identified as Area B2. The second major trapped low is located in the southeast corner of the development site. The on-site contributing area is identified as Area C1 and two small off-site areas are identified and Areas C2 and C3.

The fourth drainage area affected by the site is one that includes the southwest corner of the development site, which conveys run-off from a small area locate west of Highway 2A and the railway right-of-way.

The major offsite drainage areas are identified on the drawing as the North Area, East Area, West Area and the South Area Drainage Basins. Three of these areas are not specifically addressed in this SWMP, as they are not affected by the proposed development. The South Drainage Basin accepts run-off an off-site area, located west of Highway 2A, identified as Area D2 with an on-site contributing area identified as Area D1.

## **PROPOSED STORMWATER MANAGEMENT PLAN**

The development includes 22 4-acre minimum sized lots, which relatively speaking is a low generator of increased surface run-off as compared to the usual much higher density developments. Smaller lots mean increase hard surfacing, which increases run-off significantly more than larger low-density developments. It is anticipated that the individual lots will include a driveway, parking area and a home, which will increase surface runoff, however the majority of the area of each lot will remain in a natural or landscaped state. The development proposes to include paved rural road sections, which will utilize roadside drainage swales as run-off conveyance systems. The roads will increase run-off, however the run-off will be conveyed by gently sloping wide roadside drainage swales, rather than a deep V shaped ditch. The natural percolation, of the permeable site soils will allow significant seepage to occur in the swales before

the run-off reaches the receiving waters. The gently sloping swales will reduce flow velocities, which will act to intercept silt from the road run-off, which is expected to be low due to the type of development proposed. Driveway and roof drainage will be directed to the surrounding natural or landscaped areas, so the actual increase in lot runoff will be negligible.

As the majority of the site is sloping toward the pond, the pond will become the primary receiving water body for stormwater runoff from the development. This has been occurring naturally for a long time. The naturally sandy soils of the area have contributed to maintaining, through recent history, the pond water levels as they are today. As the site is generally flat the proposed road configuration can be graded to force the road drainage toward the receiving water of the pond. Drawing No. SWMP-2 depicts the proposed SWMP for the development. This increased the drainage area of A1, which is identified as Area A1/Post. This will also decrease the Areas B1, C1 and D1 slightly.

The roadside drainage swales will be directed toward the pond via four diversion routes. These routes will parallel the proposed walking trails from the internal roads to the pond. These are identified on the drawing. These routes will be grass-lined swales where runoff velocities will be low. The swales will be protected with appropriate erosion protection methods where the velocities are higher. Temporary or permanent erosion control blankets will be utilized where swale velocities are in the intermediate range relative to erosion potential. Velocity check dams and rock riprap will be utilized where velocities dictate a higher erosion protection is necessary. Energy dissipation structures and silt control forebays will be constructed at the end of the swales prior to the point where the run-off enters the pond. These facilities will ensure that water quality is maintained.

The Area A2 will be accommodated by the installation of a culvert under County Road 40-1, when the road is upgraded which is likely to be required in conjunction with this development. Area D2 will be accommodated, by defining a drainage route through the site. This route would then be protected by an easement or right-of-way. If the natural route is less than ideal, then a new route could easily be created that would parallel the west and south property lines and direct the flow through past the development site. As

the development will contribute extremely little extra run-off to this basin, no further improvements are proposed as part of this development.

### **DRAINAGE ANALYSIS**

The analysis completed for this SWMP included estimating the pre-development stormwater flow rates utilized the SWMHYMO computer model. The program utilizes the SCS Curve Number to estimate run-off from farmlands and can also be utilized to estimate run-off from larger residential acreages. The analysis considered the 1 in 5 year and 1 in 100 year return interval storms. The City of Red Deer stormwater Intensity, Duration, Frequency curves were used in the calculations. The program calculates the estimated volume of run-off that is expected from each sub-basin. For Basin A, this volume was then used to calculate the increased depth in the pond as a result of the slightly increased flows from the future development. The other calculated drainage area volumes were used to estimate the possible depth of water that could be found in the major trapped lows as a result of the possible future development.

The input variables to the program reflect the very permeable soils that are on site as indicated by the geotechnical investigation that was required as part of the preparation of the Concept Plan. This is very evident onsite as there is no evidence of any run-off occurring in the identified drainage routes. The SWMHYMO output summary sheets for the analysis are included in the Appendix. Table 1 summarizes the results of the analysis. As a result of the force grading more of the site to drain toward the pond, Area A basin increases in size. The other basins decrease in size.

Table 1 summarizes that pre and post development flow rates and the resulting stormwater detention that is required to reduce the post development flows to pre-development levels. The analysis indicate that approximately 2,400 cubic meters of storage is required to deal with the increase run-off from Area A. This translates into an approximate increase in pond depth of 61mm. This increase will not be noticeable in the pond and would not affect the pond in any way.

It can be seen that the calculated run-off volumes differs between the 1 in 5 year and 1 in 100 year events. This can be explained partially by the methods the program uses to calculate the storage volumes. The method used herein estimates the worst possible

case for a run-off event, which relates to the ability of the drainage swales to convey run-off. The simplified computer analysis completed does not account for any detention storage in the drainage swales. The relatively small amount of storage required in Basins C1 and D1 can easily be contained within the drainage swales. Therefore other than the slight increase in run-off to the pond, which only account for a minor increase in water level, no other stormwater improvements are necessary as a result of the proposed development.

## **BEST MANAGEMENT PRACTICES**

The grass lined drainage swales, will aid in maintaining water quality. The use of appropriate erosion protection measures where run-off velocities are high will ensure that major silt transport will not occur. The installation of rock check dams will maintain lower velocities in steeper drainage swales and the energy dissipation and silt control forbays will minimize any effect on the pond. As the impact on off-site areas will be negligible not other mitigative measures are required.

## **CONCLUSIONS**

- The proposed development includes force grading the roads and some additional areas to drain toward the pond. This increased the drainage basin of the pond.
- The effect of the grading only increases the water depth in the pond, in a 1 in100 year rainfall event by 61 mm at most.
- The grading reduces the size of the other drainage basin, which reduces their stormwater run-off.
- The inclusion of appropriate best management practices will ensure that the pond water quality and site will not be affected by the proposed development.
- Other than the mitigative measures discussed above, no other measures are required.



# APPENDIX

## 1 IN 5 YEAR ANALYSIS

## 1 IN 100 YEAR ANALYSIS