

January 21, 2019

Our File: 1327

Clint Richards, C.E.T., EPT.
Manager of Drainage, Utilities and Aggregate Resources
Parkland County Centre
53109A Highway 779
Parkland County, AB
T7Z 1R1

Dear Mr. Richards:

Mallard Park Drainage Assessment

We have completed our assessment of the Mallard Park subdivision drainage issue. The Mallard Park subdivision is located in Parkland County (the County), on the NE 33-051-27 W4M, just south of the City of Spruce Grove. The subdivision parallels the south shore of a wetland – locally known as Mallard Lake – which drains east, through Range Road 273 and eventually to the North Saskatchewan River.

The Mallard Park Subdivision is located along the Mallard Lake shoreline, and the topography is flat. Therefore, minor alterations to drainage can cause flooding, particularly during the spring freshet and notable rainfall events. When the natural swales and ditches are unobstructed, runoff from the land drains slowly but this works well with the knob and kettle character of the land, which offers a degree of natural retention and increases the absorption of the water into the soil. The natural drainage removes the excess water after each event there by keeping the land dry and prevents flooding. When these natural drainage paths become obstructed, the knobs and kettles fill to much higher levels and would serve to saturate the soil. In the case of a number of consecutive wet years where the drainage pathways are raised, the flood risk for such lands will increase significantly.

Project Background

The drainage issue involves four residential lots within the Mallard Park Subdivision: lots 7 and 8 on the south side of Teal Drive, and lots 8 and 9 on the North side of Teal Drive. The two lots on the south side of Teal Drive must drain north, through a County culvert, to Mallard Lake. The two landowners on the north have landscaped their properties, and maintain that the County culvert diverts water, from the south, onto their land with the potential to cause property damage. In addition, the residence on lot 7, south of Teal Drive, includes a basement and, to keep it dry, the owner pumps groundwater, which adds to the volume of water draining north across Teal Drive. The four landowners may also be in a conflict situation, which adds to the difficulty in finding a solution to facilitate drainage.

The County has reviewed the drainage issue and concluded that some alterations may have been made to the natural drainage pattern on the two lots north of Teal Drive. However, they want an independent assessment of the drainage concerning the area of dispute within Mallard Park, to accurately describe the historic patterns of the area and to provide solutions to solve the problem. The County engaged Sameng Inc. (Sameng) to provide that independent assessment.

The assessment is to include a desktop analysis to identify the pre-development drainage patterns, and how they may have been altered as a result of the subdivision development. As a

sub-consultant to Sameng, Hydrogeological Consultants Ltd. (HCL) is to provide an estimate of the volumes of groundwater pumped from lot 7. The results of the assessment are to be summarized in a letter report. A meeting and field site inspection is to be undertaken to confirm the conclusions and recommendations of the desktop analysis.

This letter report summarizes the results of our desktop analysis, including the groundwater review by HCL. Our analysis included a review of the LiDAR and topographic survey data provided by the County, historical air photos, 1:50,000 scale NTS topographic maps, historic orthophotos provided by the County and Google Earth imagery.

Review of NTS Maps and LiDAR Data

Based on the 1:50,000 scale NTS maps and LiDAR data, the Mallard Lake is located within the North Saskatchewan River drainage basin. The 1:50,000 scale NTS maps were used to determine general drainage patterns surrounding Mallard Lake. The more accurate LiDAR data was used to determine the local drainage patterns through the four lots in question and the contributing drainage areas. However, even the LiDAR data was not accurate enough to determine the actual paths the flows follow, within the overall drainage patterns. Nevertheless, the lands in question must drain to Mallard Lake and the Lake itself drains east and then south to the North Saskatchewan River.

The contributing drainage area to Mallard Lake is primarily from the north and northwest. The four residential lots in question are located along the south side of Mallard Lake. The contributing drainage area to the four lots (area 2) is primarily from the southeast towards northwest and is approximately 38 hectares (ha) in size, as shown on Figure 1.

Historical Air Photo Review

A search of the Alberta Environment and Parks (AEP) Air Photo Library was undertaken to determine available air photos for the Mallard Park Subdivision. As the subdivision was initially developed in 1973/74, air photos for 1962, 1973, 1974, 1982 and 2005 were used in the review, to allow examination of the land both before and after the subdivision and the development of the homes. Of the air photos reviewed, the 1974 photos, with a scale of 1:12,000, were the best photos available to identify the pre-development drainage patterns.

Prior to the development of the Mallard Park Subdivision, the N½ 33 was in agricultural cultivation with a narrow riparian area left around Mallard Lake. Figure 2 shows the 1962 (pre-subdivision construction) and 1974 (post-subdivision construction) air photos with the Mallard Park subdivision superimposed on them. The air photos show the natural drainage pattern commencing in the southeast corner of the subdivision and traversing the subdivision in a northwest direction, through lots 7 and 8, south of Teal Drive, and lots 8 and 9, north of Teal Drive, into Mallard Lake. No low spots, or water ponding, are evident on lots 7 or 8, south of Teal Drive to suggest that the drainage pattern does not continue north through lots 8 and 9, north of Teal Drive. Therefore, the natural drainage pattern from the southeast is directly through the area of dispute, to Mallard Lake without any apparent obstruction. This remains to be the case for some time after the development of the subdivision and the development of Lots 8 and 9 north of Teal Drive.

Orthophotos and Google Earth Imagery

The 2004, 2007, 2009, 2011, 2013 and 2015 orthophotos provided by the County for the area of dispute were reviewed. The County showed their survey data on an orthophoto dated 2016. Similarly, Google Earth imagery for 2011, 2012, 2013, 2015 and 2017 were reviewed. Copies of the Google Earth images are included in Appendix 1, attached. The orthophotos and Google

Earth imagery all suggest that no landscaping was undertaken on lot 8 within the overall drainage pattern.

The orthophotos and Google Earth imagery indicate that the lot 9 landowner has undertaken extensive landscaping works within the natural drainage pattern, commencing some time between 2004 and 2007. The 2007 orthophoto suggests that the drainage path, north of Teal Drive, is located within lot 9, along the east property boundary. That drainage path is not apparent in the subsequent orthophotos.

The 2011 and subsequent orthophotos suggest that vegetation has been cleared and fill material brought in and placed in the northeast corner of lot 9. This activity is corroborated by the Google Earth imagery, which shows the area filled and stockpiles of fill materials located on the filled area. In addition, the 2016 orthophoto shows, what appears to be, a constructed drainage path through the fill area, which extends to the north, into the riparian area. That drainage path is not apparent in the 2017 Google Earth imagery. The 2017 Google Earth imagery also suggests that additional vegetation was removed at the south end of the property, where the County culvert outlets onto lot 9, and the entire area of concern filled and re-landscaped.

This all suggests that the lot 9 landowner has altered the natural flow path and drainage pattern, impeding the flows and/or potentially diverting them onto lot 8. Detailed field surveys, particularly on lot 9, are required to confirm this.

County Surveys

The survey data collected by the County was reviewed. The surveys included profiles along the Teal Drive north and south road ditches, two profiles along the lots 8 and 9 property boundaries a profile along the municipal reserve and a topographic survey of lot 8, north of Teal Drive. Unfortunately, no topographic survey is available for lot 9.

The topographic surveys of lot 8 suggest that the drainage is from east to west with the natural drainage path to Mallard Lake located at, or west of, the lots 8 and 9 property boundary. Without the lot 9 topographic surveys, the exact location of the natural drainage path cannot be determined. Given the fill and landscape work undertaken on lot 9, determining the natural drainage path may no longer be possible.

The County drawing 'Lot 9 Profiles', dated June 15, 2017, shows a low, natural ridge within the Mallard Lake riparian area, north of the lot property lines. A site inspection and detailed field surveys may be required to confirm whether the natural drainage path into Mallard Lake circumvents this natural ridge or not. If not, it may also impede flows north into Mallard Lake, which could result in flooding of lots 8 and 9. Based on the LiDAR data, the residences on lots 8 and 9 should not be affected as they appear to be located higher than the top of the ridge.

Groundwater

A desktop groundwater assessment was completed by Hydrogeological Consultants Ltd. (HCL), to estimate the volume of groundwater pumped from the lot 7 residence. A copy of the HCL report is included in Appendix 2, attached.

HCL estimated that the non-pumping groundwater elevation is approximately 1.8 metres below the ground. Assuming the basement floor is completed approximately 2.8 metres below ground, the groundwater elevation would need to be lowered approximately 1 metre. Therefore, on the average, approximately 2019 cubic metres per year (m³/year) of groundwater would need to be diverted, using a sump pump, to maintain a groundwater level below the lot 7 residence basement floor. This may vary somewhat from season to season and year to year.

According to County files, authorization was issued to the lot 7 owner to construct a dugout on his property, presumably to pump his groundwater into. The area of the dugout is approximately 400 m² and potential evapotranspiration for the Mallard Park subdivision is approximately 900 millimeters per year. Therefore, approximately 360 m³/year is lost from the dugout to evapotranspiration, leaving approximately 1650 m³ of pumped groundwater that will be diverted downstream along the natural drainage patterns. Spread over the entire year, this 1650 m³ is equivalent to approximately 4.5 m³/day or 0.05 liters per second (l/s). A groundwater discharge of 0.05 l/s from lot 7 is considered negligible from a system capacity perspective compared to the surface water runoff resulting from a typical rainfall event.

With a typical weeping tile system, the sump pump operates as water collects around the foundation of the house. Usually, that occurs during the spring freshet and/or after extended rainfall events that saturates the soil, and the sump pump will operate intermittently. In the case of the lot 7 residence, the house foundation is below the non-pumping groundwater level and the sump pump has to operate to bring the groundwater level down, below the house foundation. If the pump stops, the groundwater will recover back to the non-pumping elevation, flooding the basement. Therefore, the sump pump will operate more consistently, throughout the year, to keep the basement dry.

AEP was contacted regarding any regulatory requirements for the groundwater pumping on lot 7. Whether or not this situation is the same as a typical weeping tile and sump pump system in a country residential subdivision, is questionable, and a *Water Act* approval may be required. The County should follow-up with Andrew Patton of the Regional Office to confirm this. His contact information is:

Andrew Patton
Water Team Lead
Regional Approvals
Environment and Parks
1st floor, Twin Atria Building
4999-98 Avenue
Edmonton, AB, T6B 2X3
Phone: 780-427-0903
E-mail: andrew.patton@gov.ab.ca

The operation of residential sump pumps and the associated discharge of water should be addressed in Provincial and/or the local municipality's building codes.

Conclusions and Recommendations

Figure 1 shows that the natural drainage through the Mallard Park Subdivision is primarily from the southeast to northwest, into Mallard Lake. The primary outlet into Mallard Lake is through that area along the lots 8 and 9 property boundary, north of Teal Drive, as shown on Figure 2. Therefore, to maintain that natural drainage path, a culvert across Teal Drive is required in the general location of the existing County culvert.

Based on our assessment, the landscaping undertaken on lot 9 has altered the natural flow path and drainage pattern, impeding the flows and/or potentially diverting them onto lot 8.

Section 36 of the *Water Act* requires a proponent to obtain an approval or authorization for any activity within a water body. Schedule 1 of the Water (Ministerial) Regulation exempts landscaping, '... except where it ... changes the flow or volume of water on an adjacent parcel of land or adversely affects an aquatic environment'.

To maintain the natural drainage through the Mallard Park Subdivision, the County should submit a formal complaint to Regional Compliance Manager of Alberta Environment and Parks (AEP) to enforce the removal of any manmade obstructions and the re-establishment of the flow path within the natural drainage pattern. The Regional Compliance Manager is:

Michael Aiton
Regional Compliance Manager
Regional Compliance
Environment and Parks
1st Floor, Twin Atria Building
4999-98 Avenue
Edmonton, AB, T6B 2X3
Phone: 780-643-0775
Email: Michael.aiton@gov.ab.ca

If AEP is not prepared to initiate any enforcement action, the County may have to re-establish a new drainage flow path to Mallard Lake. With the fill on lot 9, the lot 9 lands are now higher, and the County culvert does not drain properly. Moreover, the natural flow path may not be readily found and re-established. Therefore, a new drainage flow path will need to be created, which may require relocation of the culvert. A spring inspection and detailed field surveys will be required to determine the best route to re-establish a flow path to Mallard Lake. As the County already has topographic surveys of lot 8, the field surveys should include topographic surveys of lot 9 and the riparian area north of the properties.

To re-establish a flow path to Mallard Lake, the County must obtain a drainage easement through lot 8 and/or 9. The County may wish to consider the following alternatives:

1. Obtain a drainage easement from the lot 8 and/or 9 landowners, which is registered against their titles; or
2. Subdivide and purchase a public utility lot from the lot 8 and/or 9 landowners.

In either case, detailed surveys would be required to delineate the area required to contain the drainage flow path. In the case of the registered easement, the County could still compensate the landowners, but the County would operate and maintain the easement. The landowners would still have use of the easement provided no infrastructure, such as storage sheds, is placed and no woody vegetation, such as trees or shrubs, are planted within the easement.

Assuming a 15 metre wide easement, the estimated cost of re-establishing a drainage flow path to Mallard Lake is approximately \$75,500, as detailed below.

Description	Total Cost
Land	
Purchase	\$10,000
Legal Services & Registration	\$5,000
Engineering	
Surveys	\$5,000
Design & Construction Engineering	\$15,000
Construction	
Channel Excavation	\$30,000
Culvert Relocation	\$8,000
Water Act Approvals	\$2,500
Total	\$75,500

If the drainage issue cannot be resolved following our suggested procedures, the County's only other option may be to litigate against the lot 9 landowner.

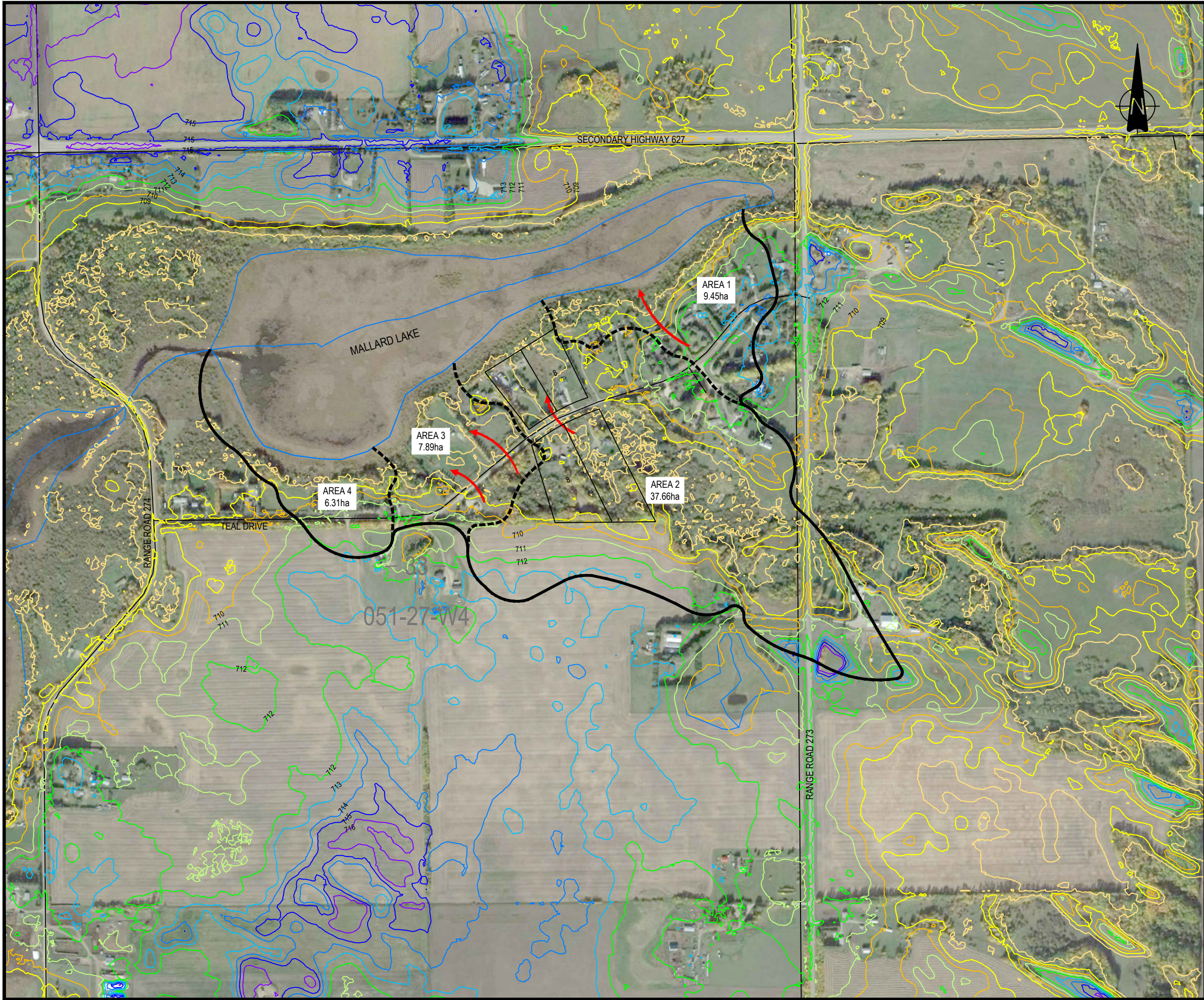
We trust this helps the County to move forward and resolve this difficult water management issue. If you have any questions or concerns, please contact me.

Sincerely,

Nico Wyngaarden, P.Eng.
Senior Project Engineer

APEGA Permit to Practice – P02863


Attach.












LEGEND

CONTRIBUTING DRAINAGE AREA BOUNDARY —————


SUB DRAINAGE AREA BOUNDARY - - - - -

DRAINAGE DIRECTION 

CONTOUR LINE ELEVATION (m)


708	
709	
710	
711	
712	
713	
714	
715	
716	

Prepared By:



#201, 17205 106A Avenue, Edmonton, Alberta T5S 1M7
Ph: (780)482-2557
Email: services@sameng.com

Client:



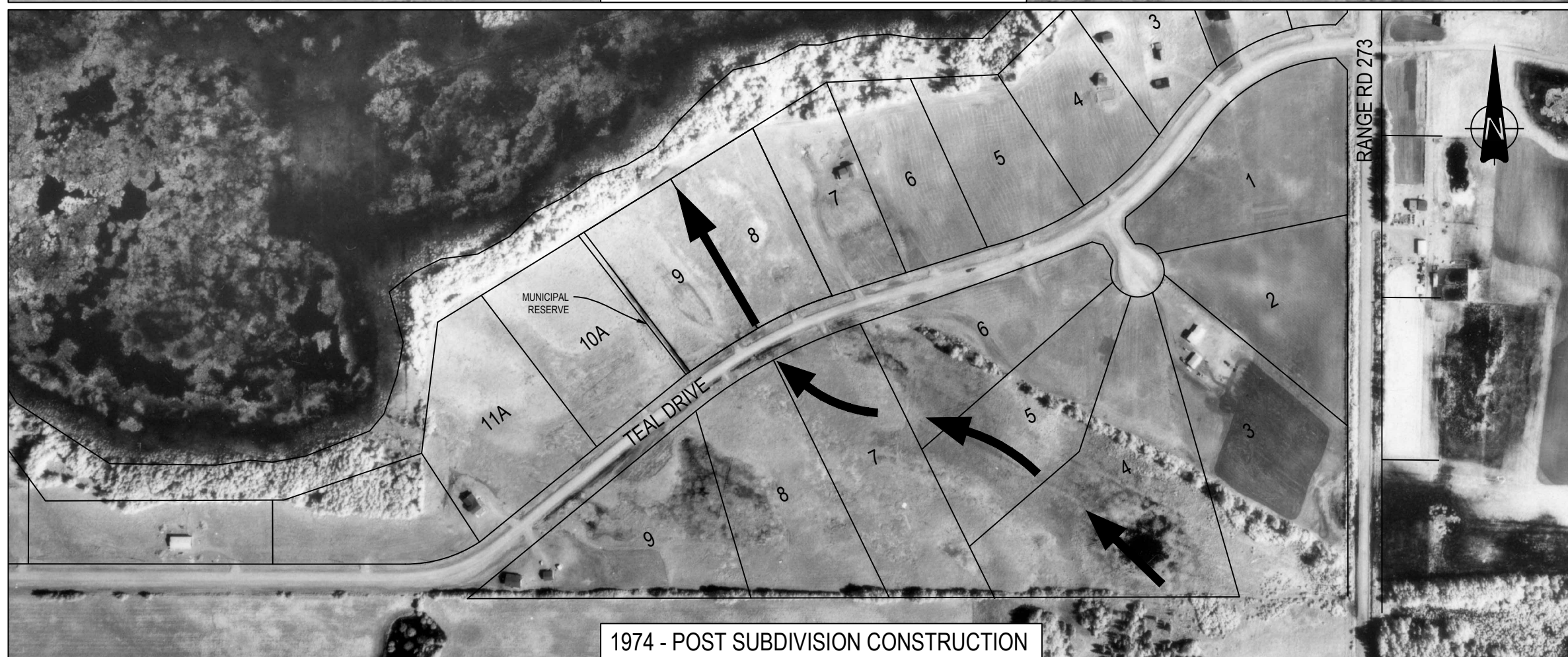
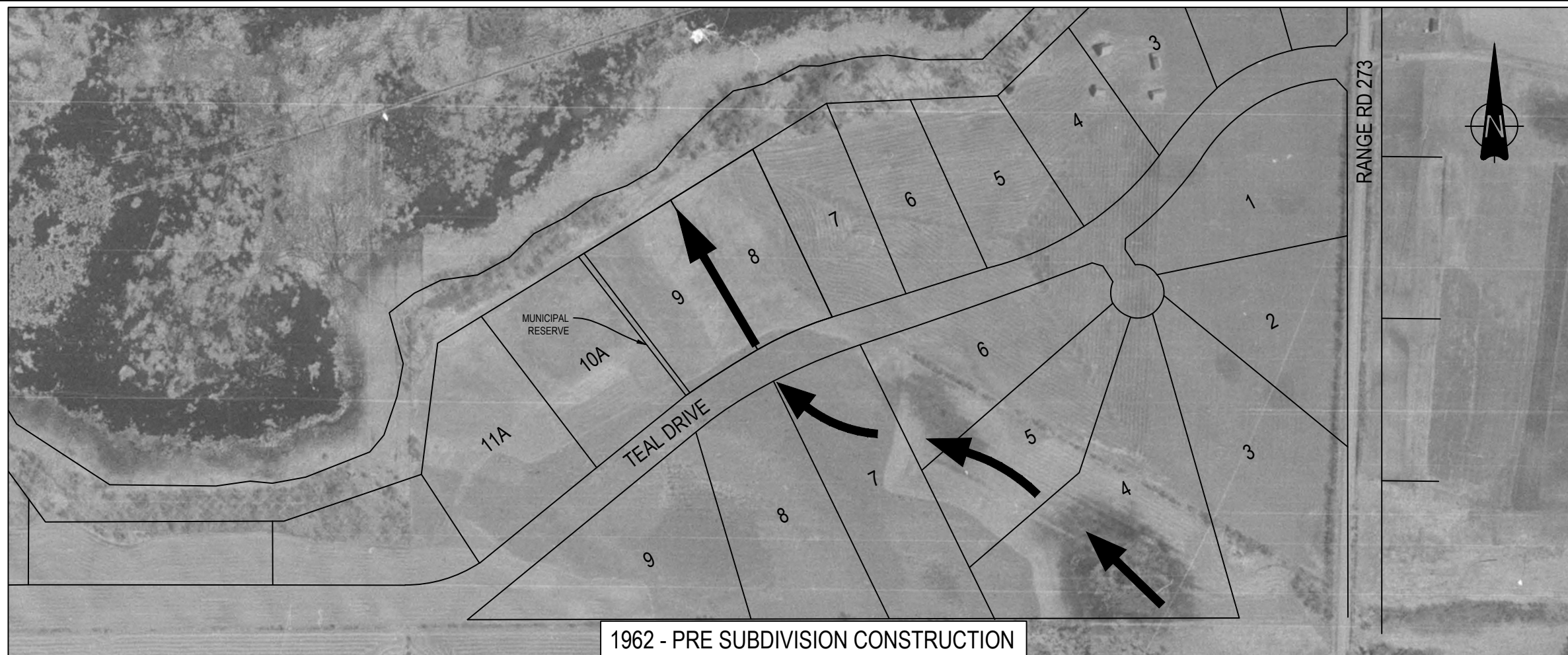
Project:

MALLARD PARK DRAINAGE REVIEW

Title:

CONTRIBUTING DRAINAGE AREA

Scale:	1:8000	Figure:	1
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LEGEND:
 FLOW DIRECTION

Prepared By:

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 better water | better world
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 Email: services@sameng.com



MALLARD PARK DRAINAGE REVIEW

MALLARD PARK SUBDIVISION
 MAY 1962 AND JUNE 1974

N.T.S

Figure:

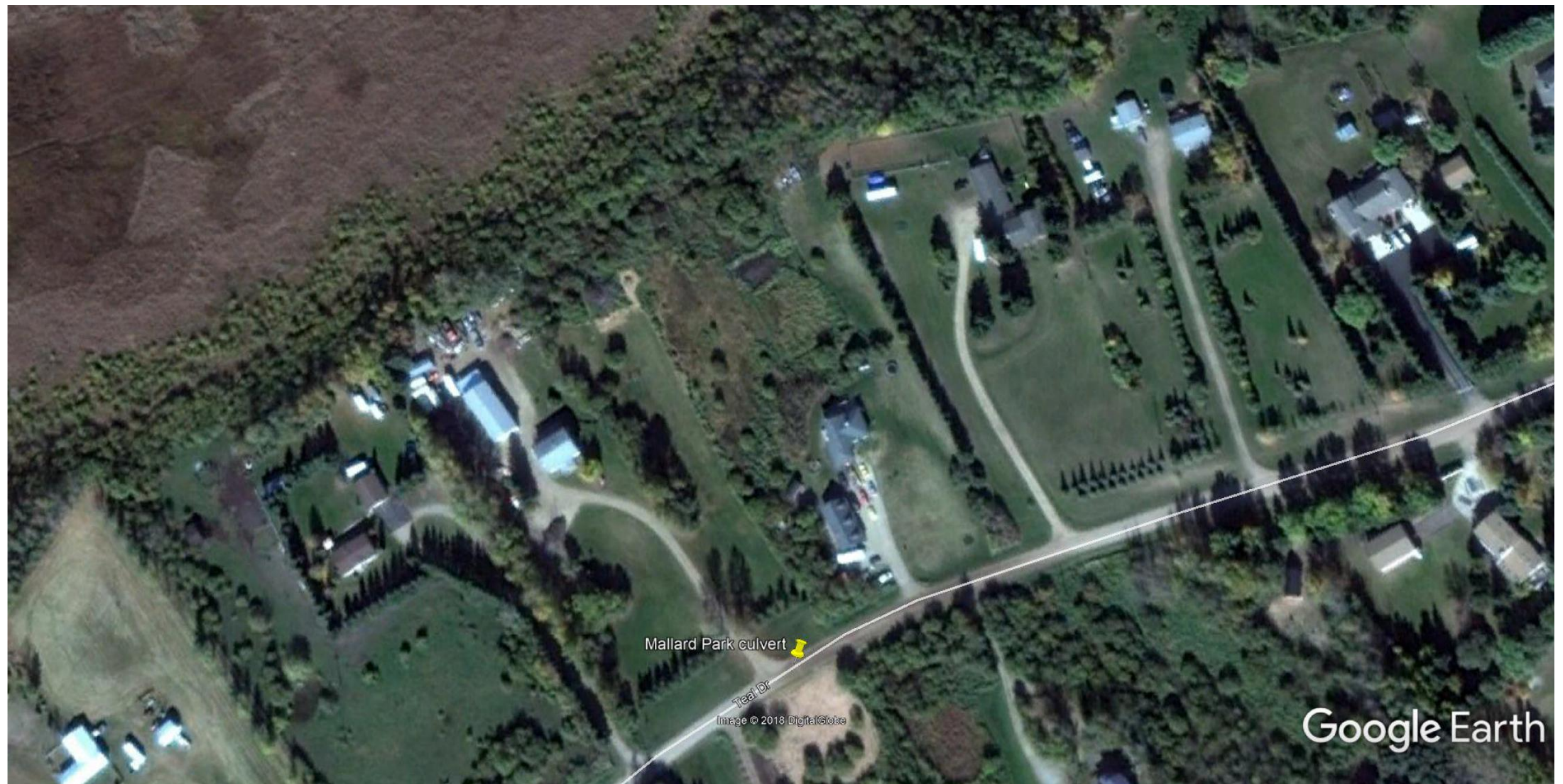
2

Appendix 1 – Google Earth imagery

DRAFT



Google Earth Imagery – August 4, 2011



Google Earth Imagery – September 26, 2012



Google Earth Imagery – September 2, 2013



Google Earth Imagery – September 29, 2015



Google Earth Imagery – July 13, 2017

Appendix 2 – Hydrogeological Assessment

DRAFT

Desktop Study

Mallard Park Subdivision – Parkland County
NE 33-051-27 W4M

Prepared for
Sameng Inc.

Prepared by
hydrogeological consultants ltd. **(HCL)**
1.800.661.7972

December 2018

HCL Project No.: 18-0249.01

PERMIT TO PRACTICE

HYDROGEOLOGICAL CONSULTANTS LTD.

Signature _____

Date _____

PERMIT NUMBER P 385

The Association of Professional Engineers and
Geoscientists of Alberta (APEGA)

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Groundwater and Surface Water Solutions for a Changing Environment

December 18, 2018

Nico Wyngaarden
Sameng Inc.
201, 17205 - 106A Avenue NW
Edmonton, AB T5S 1M7

HCL Project No. 18-0249.01

Re: Desktop Study
Mallard Park Subdivision – Parkland County, NE 33-051-27 W4M

Dear Nico:

Hydrogeological Consultants Ltd. (HCL) has completed its desktop hydrogeological analysis for the Mallard Park Subdivision in Parkland County. With regard to the resident situated at Plan 2238TR, Block 2, Lot 7 (Lot 7), that utilizes a sump pump to keep a basement dry, HCL offers the following information.

The Mallard Park Subdivision is situated in an area of aeolian deposits, consisting of well-sorted, medium- to fine-grained sand and minor silt¹. The deposits are generally massive to locally cross-bedded or ripple-laminated and include both active and vegetated dunes and sand sheets. The deposits can be up to 20 metres thick in the area of the Mallard Park Subdivision.

The area of study (AOS) for the desktop hydrogeological analysis encompasses Section 33, Tp 051, R 27, W4M, and the surrounding eight sections. Within the AOS, there are records for 236 water wells; of these, 47 water wells were interpreted to be completed in a sand aquifer that is associated with the surficial deposits. There are 32 water wells with sufficient data to estimate an apparent transmissivity for the sand deposits. A reasonable average transmissivity value based on the aquifer parameters for these 32 water wells is 0.83 metres squared per day (m²/day).

The non-pumping water-level elevation associated with the sand aquifer is 706.5 metres above mean sea level (AMSL). The elevation of the ground at the site of the water well at the Lot 7 residence is 708.3 metres AMSL; therefore, the water level is approximately 1.8 metres below ground level (BGL). If the foundation of the residence were to be excavated and the floor completed at a depth of 2.8 metres BGL, the water level would need to be lowered by 1 metre to ensure that the basement floor stays dry. The area of the basement floor was estimated to be 100 square metres.

It was calculated that approximately 2,019 cubic metres per year [m³/year; 5.5 cubic metres per day (m³/day)] of groundwater would need to be diverted using a sump pump to maintain a water level that is below the basement floor.

The potential evapotranspiration for the AOS is approximately 900 millimetres per year [0.9 metres per year (m/year)]². The depressed area on Lot 7 where the discharged water from the residence accumulates is approximately 400 square metres; therefore, approximately 360 m³/year of water will be lost via evapotranspiration, leaving behind an annual volume of approximately 1,650 cubic metres (4.5 m³/day) of water that will follow the natural drainage patterns.

¹ Fenton, M. M., E. J. Waters, S. M. Pawley, N. Atkinson, D. J. Utting, and K. McKay. 2013. Surficial Geology of Alberta. Alberta Energy Regulator. AER/AGS Map 601.

² <https://open.alberta.ca/dataset/46557167-126e-4bb3-b84f-615ead212b3f/resource/93686041-152d-400d-854e-b12d4d3a5481/download/8938.pdf>

If you have any questions regarding the above information, please contact me at 780.702.6235 or by email at david@hcl.ca.

Yours truly,

David MacIntyre, P.L.(Eng.), C.E.T.
Water Resources Engineer