CLEARWATER COUNTY COUNCIL AGENDA
July 25, 2017
9:00 AM
Council Chambers
4340 – 47 Avenue, Rocky Mountain House, AB

A. CALL TO ORDER

B. AGENDA ADOPTION

C. CONFIRMATION OF MINUTES
1. July 11, 2017 Regular Meeting Minutes

D. PUBLIC WORKS
1. Town of Rocky Mountain House, 2017 Lagoon Improvements Staging Plan Draft Report

E. MUNICIPAL
1. Draft Bylaw 1029/17 – Corrections Bylaw
2. Bylaw 967/12 – Municipal Ward Bylaw Review
3. Broadband Engagement Strategy
4. Cancellation of Regular Agenda and Priorities Committee Meeting in September

F. INFORMATION
1. CAO's Report
2. Public Works Director's Report
3. Councillor's Verbal Report
4. Accounts Payable Listing
5. Councillor Remuneration

G. IN CAMERA*
1. Third Party Interest – Repsol Canada
2. Labour – Council
3. Land Development – Third Party Interest
4. Land

* For discussions relating to and in accordance with: a) the Municipal Government Act, Section 197 (2) and b) the Freedom of Information and Protection of Privacy Act, Section 17(1), 21(1), 24(1)(a), 39 (1)(a) and section 40.

H. ADJOURNMENT

TABLED ITEMS

Date	Item, Reason and Status
06/13/17	**213/17 identification of a three-year budget line for funding charitable/non-profit organizations' operational costs pending review of Charitable Donations and Solicitations policy amendments.**
06/13/17	**227/17 commenting and/or recommending amendments on the revised preliminary draft Clearwater – North Rocky Major Area Structure Plan pending Councillors individual review.**

AGENDA ITEM

PROJECT: Town of Rocky Mountain House, 2017 Lagoon Improvements Staging Plan Draft Report		
PRESENTATION DATE: July 25th, 2017		
DEPARTMENT: Public Works	**WRITTEN BY:** Kurt Magnus	**REVIEWED BY:** Marshall Morton/ Rodney Boyko, Acting CAO
BUDGET IMPLICATION: ☒ N/A ☐ Funded by Dept. ☐ Reallocation		
LEGISLATIVE DIRECTION: ☒None ☐ Provincial Legislation (cite) ☐ County Bylaw or Policy (cite)		
STRATEGIC PLAN THEME: Theme 2: Well Governed and Leading Organization	**PRIORITY AREA:** Objective – 2.6 Ensure timely compliance with statutory and regulatory obligations.	**STRATEGIES:** Ensure the County operates effective and efficient water and wastewater systems that meet or exceed Provincial requirements.
ATTACHMENT(S): 1. Town of Rocky Mountain House July 11, 2017 Council Agenda Item – *Presentation of draft Lagoon Staging Plan report*; 2. WSP May 26, 2017 Draft Report - *Town of Rocky Mountain House Wastewater Upgrading Options Draft Report, R2*; and 3. WSP PowerPoint - *Town of Rocky Mountain House 2017 Lagoon Improvements Staging Plan Wastewater Upgrading Options Draft Report R2*.		
RECOMMENDATION: That Council directs Administration to review the Town of Rocky Mountain House *2017 Lagoon Improvements Staging Plan* Draft Report and report back to Council any implications on future budgets.		

BACKGROUND:

As per the request from Councillor Laing, Rod Fraser, Director of Planning & Infrastructure, with the Town of Rocky Mountain House, is here today to provide the Council of Clearwater County with a summary of the WSP Wastewater Upgrading Options Draft Report. Earlier this year, testing was conducted on the Town Lagoon which revealed increased levels of toxicity, that occasionally exceeded the new federal requirements. As such, additional testing was completed to ascertain if the toxicity failures were linked to un-ionized ammonia. If other agents were identified as a significant contributor, further Toxic Identification Evaluations would be undertaken to isolate the toxicants.

As referenced in the Town's attached July 11 agenda item, "the Town engaged the engineering consulting firm of WSP Group to complete a Lagoon Improvement Staging Plan to:

A.) Determine the reason for the occasionally non-compliant tests with regards to Federal Wastewater Effluent Regulations

B.) Identify interim steps that can be taken to address existing lagoon issues and develop a staged plan to upgrade the lagoons."

July 11, 2017

TOWN OF ROCKY MOUNTAIN HOUSE

REPORT TITLE: Presentation of draft Lagoon Staging Plan report				
PRESENTER: **Rod Fraser, C.E.T.** **Director of Planning & Infrastructure**			**FILE #**	
DEPARTMENT: **Planning & Infrastructure**			**AGENDA DATE:** **July 11, 2017**	
DISCUSSIONS: **Chief Administrative Officer**			**ATTACHMENTS:** **N/A**	
APPROVALS:	**Rod Fraser** **Department Head**	**July 6, 2017** **Date**	**Todd Becker** **CAO**	**July 7, 2017** **Date**

Conformance to existing laws and Town Council Plans:

Conforms with:	Yes/No/ Partial/NA	Comments:
Bylaws/Laws/Policies	NA	
Sustainability Plan	NA	
Council Strategic Plan/Priorities	Partial	
Budget/Long Term Plans	Yes	
Effects on future budgets	Yes	
Regional Impacts	NA	

Recommended Communications:

This draft report would also be presented to Clearwater County Council for their information as they are a user of the Lagoon facility.

Background/Introduction:

The Town engaged the engineering consulting firm of WSP Group to complete a Lagoon Improvement Staging Plan to:

- Determine the reason for the occasionally non-compliant tests with regards to Federal Wastewater Effluent Regulations
- Identify interim steps that can be taken to address existing lagoon issues and develop a staged plan to upgrade the lagoons.

Mr. Craig Suchy of WSP Group will present the draft report prepared by WSP Group.

Options:

That Council accept this report as information.

Recommendation:

That Council accept the draft Lagoon Staging Plan report as information.

D1

TOWN OF ROCKY MOUNTAIN HOUSE

WASTEWATER UPGRADING OPTIONS
DRAFT REPORT, R2

MAY 26, 2017

FOR INTERNAL USE

wsp

D1

WASTEWATER UPGRADING OPTIONS

DRAFT REPORT, R2

TOWN OF ROCKY MOUNTAIN HOUSE

FOR INTERNAL USE

PROJECT NO.: 171-02263-00
DATE: MAY 26, 2017

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May 26, 2017

FOR INTERNAL USE

Town of Rocky Mountain House
5116 50th Avenue
Box 1509
Rocky Mountain House, AB T4T 1B2

Dear Sir:

Subject: Rocky Mountain House - Wastewater Upgrading Options

We are pleased to submit 1 electronic copy of our draft report titled *Rocky Mountain House Wastewater Upgrading Options*.

If you have any questions or concerns please contact me to discuss.

Yours truly,

Eric C. Pettit, P.Eng., FEC
Senior Project Engineer

EP/dn

WSP ref.: 171-02263-00

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks				
Date				
Prepared by				
Signature				
Checked by				
Signature				
Authorised by				
Signature				
Project number				
Report number				
File reference				

SIGNATURES

2017-05-26

PREPARED BY

Eric C. Pettit, P.Eng. FEC
Senior Project Engineer
Municipal Infrastructure

REVIEWED BY

Michael Williston, P.Eng. P.E.
Senior Infrastructure Engineer

This report was prepared by WSP for the account of Town of Rocky Mountain House, in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

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1 EXECUTIVE SUMMARY

1.1 CURRENT INITIATIVES

Additional testing has been coordinated to ascertain if the toxicity failures are linked to un-ionized ammonia. Definitive results of this testing should be available by early June. If other agents are identified as a significant contributor, further Toxic Identification Evaluations will be undertaken to isolate the toxicants.

In the event that un-ionized ammonia is confirmed as the major contributor, pH reduction of the lagoon effluent can be designed and implemented to drop the un-ionized portion of the ammonia. This would remain in place while the other phases are implemented as a back-up process to protect the receiving environment.

1.2 WASTEWATER UPGRADE PHASES

Phase 1, installing on-line instrumentation and completing additional testing, will provide the hard data necessary to make the necessary further changes to incrementally upgrade the waste water treatment system. Incremental improvements, as necessary, will allow the Town and the County to proceed with projects in a cost effective manner rather than a single major investment requiring major federal provincial grants to proceed. The accumulated data and ongoing monitoring will also form a basis for funding applications going forward.

All of the Phases build upon each other, with Phase 1 being the key element. It allows for constant monitoring of operation and efficiencies of each cell of the lagoon, as well as tracking influent quality changes.

1.2.1 *RECOMMENDATION*

We recommend that the Town prepare to proceed with Option 1 in the fall of 2017, after the toxicity root causes have been finalized. This will allow time for discussions with the County relative to cost sharing and contributions. Phase 1 will provide improved operations of the existing system, and accumulate the necessary information to determine the extent and timing of future upgrading. It would be premature at this time to fix on a time or cost schedule for Phases 3 or 4 until there is at least one full season of operational data.

The design of the Headworks (Phase 2) would be recommended to commence after 3 to 6 months of online data has been obtained, anticipated to be in the summer or early fall of 2018. The tender and construction portion of the headworks would be anticipated to occur sometime around the spring or early summer of 2019, depending on the availability of funding from senior levels of government.

1.2.2 *COST SHARING*

The impact of the leachate from the County has not been fully quantified at this time, but is a contributor. The treatment loading from the septage hauling through the SRS is on the order of an additional 20% to the system. This is based on BOD and TSS loading, not on the hydraulic volumes, as the septage has at least 10 times the loading per cubic metre. Based on this, plus the leachate impact, we would recommend that the Town and County share the cost of Phase 1 on the following basis.

- **Town** **75%**
- **County** **25%**

2 EXISTING OPERATIONS

2.1 CURRENT TREATMENT LAGOONS

The existing lagoon system consists of three treatment cells, all at a similar operating depth of 2.5 metres. The lagoons were upgraded to this configuration in 1986, and additional blower capacity, suspended aerators, and anchored surface aerators have been installed in various upgrades over the recent years.

While total lagoon volumes are important, the usable volume for treatment must consider the loss of volume as a result of sludge depth, and the loss due to ice cover in winter. We have estimated sludge depths and ice thickness as shown. The approximate volumes and cell areas are in the following table.

Table 1 - Lagoon Volumes

Lagoon Cell	Surface Area (ha)	Sludge Depth (m)	Sludge Volume (m^3)	Usable Volume (m^3)	Ice Depth (m)	Ice Volume (m^3)	Total Volume (m^3)
1	3.18	0.30	7,800	56,100	0.20	6,300	70,200
2	3.26	0.25	6,500	56,500	0.25	8,100	71,100
3	4.59	0.20	7,900	82,400	0.30	13,600	103,900

Sludge Depths are based on an assumed 15 to 20 year sludge accumulation.

2.2 CURRENT TOWN FLOW CONDITIONS

The recent report on the Lagoon Capacity[1] analyzed flow data from 2011 through to 2015, and showed that the Average Annual Daily Flow for the community has remained very consistent at a level of just under 400 litres/capita/day. The maximum monthly flows for the same five year period were, on average, 25% higher than the average flows. (Approximately 500 litres/capita/day.)

During the last 3 to 4 years, the lagoons have regularly met the BOD5 requirement in their approval. In the summer period, they have often gone slightly above their TSS values, primarily due to algae in the final cell.

2.2.1 *CURRENT POPULATION INFORMATION*

The census data for 2016 was recently released.[2] The numbers show a drop in population for the Town of almost 300, dropping from 6,933 in 2011 to 6,635 in 2016.

[1] Town of Rocky Mountain House-Lagoon Capacity Assessment; Stantec Consulting Ltd.; Sept. 2016
[2] Statistics Canada, 2016 Census of Population, Catalogue no. 98-316-X2016001, Ottawa, Feb. 2017.

2.3 COUNTY TRUCKED SEPTAGE

Up until late 2010, septage dumping was done sporadically by haulers who put a hose through the fence into a small receiving lagoon. This became problematic, and around November of 2010 the procedure was stopped by gate and fence construction. In late 2013 a Septage Receiving Station (SRS) was constructed as an addition to the lagoon treatment system. This involved cleaning out and dredging an earlier dumping cell, and installing a rock trap, chopper, and flow meter in a heated building. This unit allows the septage trucks to drop their loads and the volumes are measured for invoicing to the haulers. Operations started in early 2014, and the system has been operating since that time.

There is now three years of data for the installation, starting in 2013 and running through to 2016. Over the three year period the average monthly flow has been approximately 1,450 cubic metres. Flows for the cold weather period from November to April (highlighted in blue) are typically around 50% of the average flow. The summer period from June through to September (highlighted in red) has flows that are 125% to 210% of the average flow. The shoulder months of May and October (un-highlighted) are close to average.

The highest recorded flows for a one month period were for August of 2016 (highlighted in yellow), when 3,892.9 cubic metres were handled. Data is presented below.

Table 2 - Septage Hauling Records (m^3)

	2014	2015	2016	Avg.
Jan	355.4	691.8	824.7	624.0
Feb	458.3	778.0	691.1	642.5
Mar	714.4	1,414.1	736.4	955.0
Apr	853.8	982.9	559.6	798.8
May	1,308.3	1,588.8	1,060.0	1,319.0
Jun	1,548.8	2,156.3	1,342.4	1,682.5
Jul	2,806.2	3,535.3	2,908.9	3,083.5
Aug	2,790.3	3,114.2	3,892.9	3,265.8
Sep	1,378.7	2,533.2	2,060.9	1,990.9
Oct	1,827.9	1,271.7	1,126.2	1,408.6
Nov	740.9	659.3	748.6	716.3
Dec	805.2	651.7	680.6	712.5
Average	1,299.0	1,614.8	1,386.0	1,433.3

2.4 TREATMENT LOADING

The sewage and septage loading for the region has been well documented in previous reports,[3] and the numbers presented are well within the typical ranges anticipated for a municipality of this size. The principal constituents of concern for the treatment options and design are as follows:

Table 3 - Town Sewage Loading

	Town Sewage	Ranges[4]
BOD_5	240 mg/l	200 mg/l
TSS	300 mg/l	240 mg/l
Ammonia - N	No current testing	30 mg/l

Table 4 - County Septage Loading

	County Septage	Ranges[4]
BOD5	2,000 mg/l	3,000 mg/l
TSS	4,000 mg/l	5,000 mg/l
Ammonia - N	400 mg/l	350 mg/l

Table 5 - County Landfill Leachate Loading

	Landfill Leachate[5]	Ranges[4]
BOD_5	529 mg/l	400 mg/l
TSS	116 mg/l	Insignificant
Ammonia - N	8.2 mg/l	200 mg/l

3 Memo, Town of Rocky Mountain House-Preliminary Capacity Assessment for Immediate, 5 and 10 year Upgrades; Stantec Consulting Ltd.; June 2013.
4 Design of Municipal Treatment Plants, Fourth Edition, WEF and ASCE, 1998
5 Cell 1 Leachate_test results.xlsx, 2014/11/12 results, spread sheet provided by Town of Rocky Mountain House.

3 CURRENT ISSUES

3.1 PROVINCIAL APPROVAL

The lagoon is permitted by Alberta Environment as attached in Appendix A. The effluent quality has typically been within the values under the permit. (CBOD less than or equal to 25 mg/l monthly arithmetic mean of weekly samples.)

3.2 FEDERAL REGULATIONS

The *Wastewater Systems Effluent Regulations (WSER)*[6] under the *Fisheries Act* was declared in July 2012. Under the transition sections of the regulations, reporting, monitoring, and identification requirements came into effect on January 1st, 2013.

Table 6 - Effluent Quality Criteria

Parameter	WSER Compliance Limit	Compliance Basis
CBOD	Less Than 25 mg/l	Quarterly Average
Total Suspended Solids	Less Than 25 mg/l	Quarterly Average
Un-ionized Ammonia Nitrogen (NH_3 – N)	Less Than 1.25 mg/l	Quarterly Average
Total Chlorine Residual	Less Than 0.02 mg/l	Quarterly Average

In general, the lagoons have been meeting the above requirements. There have been a few excursions in the TSS values, due to algae issues, predominately in the summer periods.

In addition to the above parameters, Section 11 (1) of the Regulations requires Acute Lethality Testing quarterly, but at least 60 days after any other sample.

3.3 ACUTE LETHALITY TEST FAILURES

Lethality Testing with Rainbow trout started in July of 2014, and initial quarterly tests were run regularly. After an initial failure of the acute lethality test, the Regulations required that grab samples must be taken twice a month until three consecutive samples are not acutely lethal. This was not immediately implemented in 2014. Since June of 2016, the frequency of toxicity testing has been substantially increased, with two samples per month typically being tested. This increased testing has been ongoing. Earlier discussions and analysis have attributed the failures to un-ionized ammonia nitrogen levels.

As part of the ongoing testing, we have arranged for parallel pH adjusted tests to be run in conjunction with the regulatory non-adjusted test. The results reported for regulatory purposes will be based on the non-adjusted test. These pH adjusted tests should help to clarify the impact of the un-ionized ammonia on the toxicity results. Review of the raw toxicity test data, including the ammonia and un-ionized ammonia levels, has raised some questions. Some of the high lethality events

6 Wastewater Systems Effluent Regulations, SOR/2012-139, Environment Canada.

have preceded a spike in un-ionized ammonia levels, rather than occurring at the same time. This could indicate than an unknown agent is causing an acute toxicity response with the rainbow trout, and also inhibiting/impacting the autotrophic bacteria responsible for nitrification/denitrification. This inhibition would then cause ammonia levels to rise, extending the acute lethality.

Additional testing that is currently underway will help to determine the impact of the un-ionized ammonia versus other potential toxins/inhibitors.

4 SEWAGE TREATMENT OVERVIEW

When sewage enters any secondary treatment facility, it is typically screened and/or ground or macerated. This is a preliminary step utilized prior to treatment. When treating wastewater to reduce BOD_5 and TSS, there are typically four stages of treatment considered. These are briefly described in the following sections.

4.1 PRIMARY TREATMENT

Primary Treatment typically consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while allowing oil, grease and lighter solids to float to the surface. The settled and floating materials are removed and the remaining liquid is subjected to further treatment or discharged.

→ Typical Primary Treatment effluent levels:

- BOD_5 Less than 130 mg/l
- TSS Less than 130 mg/l

In the last 20 to 30 years, many mechanical plants have gone to screening technologies to take the place of primary clarifiers. They have a significantly smaller footprint to a clarifier, enhanced stability, and easier operation. In many lagoon systems, there is a minimum of 4 anaerobic lagoons at the start, to perform the primary treatment stage.

4.2 SECONDARY TREATMENT

Secondary Treatment removes dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation or clarification process to remove the micro-organisms from the effluent prior to discharge or tertiary treatment. This biomass results in "sludge" that is either recycled back through the secondary treatment process as more "food" for the microorganisms, or removed mechanically and pumped to other process treatment units. In lagoons, the sludge is retained for a number of years, and then removed and dewatered, often as part of de-commissioning of the lagoon cells.

→ Typical Secondary Treatment effluent levels:

- BOD_5 Less than 45 mg/l
- TSS Less than 45 mg/l

4.3 ADVANCED SECONDARY TREATMENT

Advanced Secondary Treatment is employed when conventional secondary treatment cannot meet effluent objectives, or if specific organic and inorganic constituents must be removed. Advanced Secondary Treatment plants typically operate their secondary stage to achieve 20 to 25 mg/l of BOD_5 and TSS, followed by some form of filtration. Secondary bioreactors that contain membranes are also used to provide a similar level of treatment.

→ Typical Advanced Secondary Treatment effluent levels:

- BOD_5 Less than 10 mg/l
- TSS Less than 10 mg/l

4.4 TERTIARY TREATMENT

Tertiary Treatment consists of additional processes to remove nutrients in order to allow disposal into a highly sensitive or fragile ecosystem. This can include removals of nitrogen to prevent un-ionized ammonia toxicity, or removal of phosphorous in sensitive watersheds.

4.4.1 *DISINFECTION*

In addition to the four stages of treatment identified above, disinfection may be required if the receiving environment can be adversely impacted by high levels of Fecal Coliform. Disinfection is commonly done with UV or Chlorine. Ozone is used in other areas, predominantly Europe, but is not currently common in Canada or the USA for sewage disinfection.

Recent technology advances in disinfection of wastewater include pasteurization, as well as dosing with peracetic acid (PAA).

4.5 TYPICAL SECONDARY/ADVANCED SECONDARY TREATMENT PROCESSES

Figure 1 following shows the most common biological secondary treatment processes.

The current process, *Lagoon*, has been highlighted in Grey. A lagoon is the simplest suspended growth process, but has the largest footprint, requiring significant areas of land. Note that Rocky Mountain House does not have anaerobic lagoons at the start of the system, and are thus taking all effluent to secondary treatment.

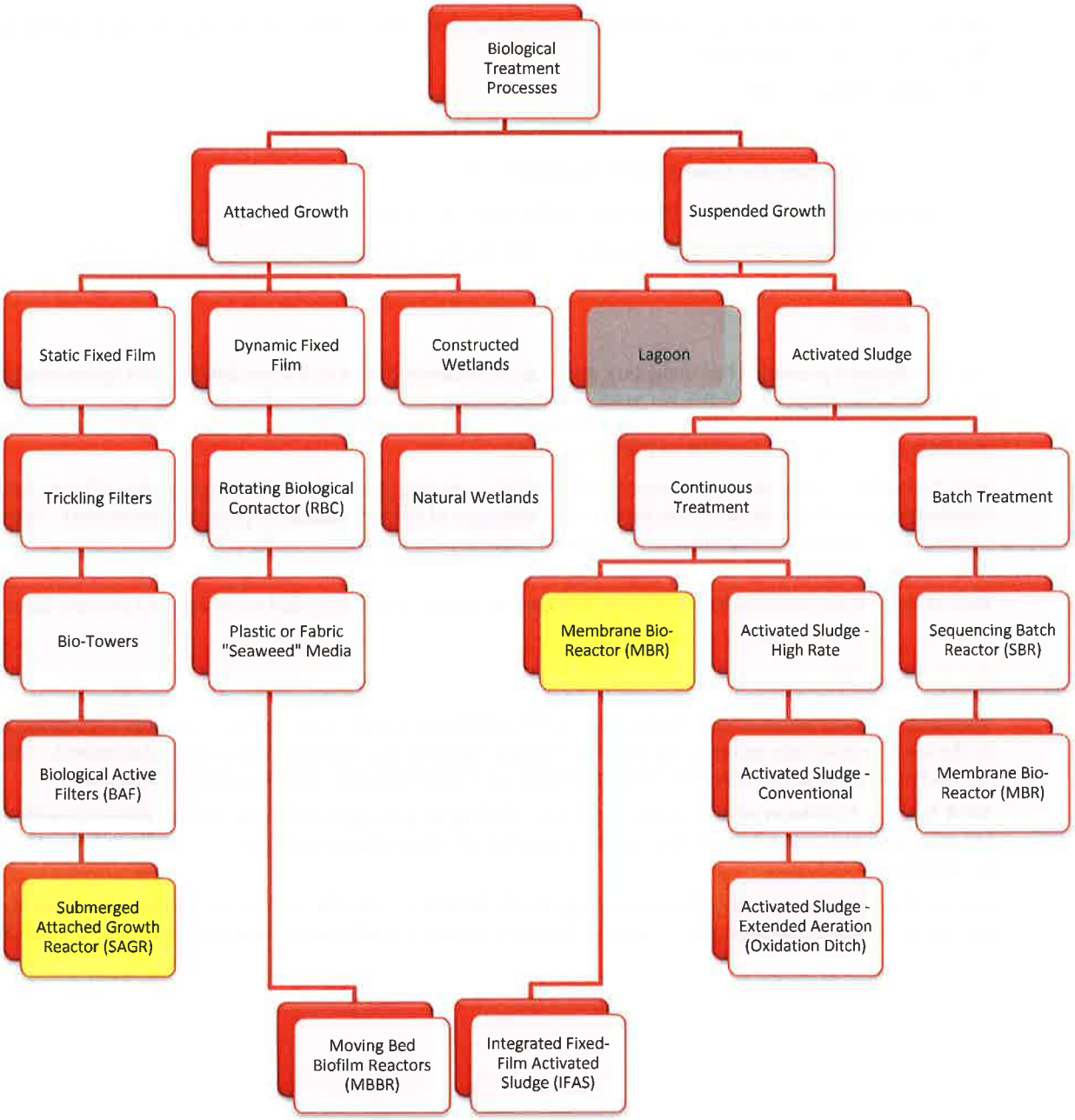
The proposed processes identified by the Stantec report[7] has been highlighted in Yellow.

These included the potential to use a Membrane Bio-Reactor (MBR) in place of the lagoons, and an option to retain the Lagoons, and add a Submerged Attached Growth Reactor (SAGR) after the lagoons to deal with the high Ammonia N levels. These are discussed in more detail in the next section.

At this point in time, the majority of the treatment options in Figure 1 following are still considered viable technologies for future consideration. Upon completion of the testing and evaluation phase of the project as identified in 6.1, an evaluation process would be used to determine the optimum upgrading, if and when required.

7 Town of Rocky Mountain House-Lagoon Capacity Assessment; Stantec Consulting Ltd.; Sept. 2016

Figure 1 - Biological Secondary Treatment Processes



5 PREVIOUS UPGRADING OPTIONS

5.1 ORIGINAL OPTIONS

The 2016 Lagoon Capacity Report[8] identified, screened, and presented three options for consideration as upgrades to the design year of 2043. These were:

- Replace Lagoons with:
  - Membrane Bio-Reactor (MBR) Constructed in Place
  - Membrane Bio-Reactor (MBR) Package Plant
- Retain lagoons as Secondary Treatment, and add tertiary process:
  - Addition of Submerged Attached Growth Reactor (SAGR) at back end of existing lagoons

5.1.1 *MBR*

The MBR Options presented had budgetary estimates of between 20 and 30 million dollars, with operational costs estimated in the range of $700,000 per year. MBR technology is an enhanced activated sludge process which uses a membrane to retain a high concentration of suspended growth, reducing the footprint required. The membrane also acts as a filter, providing very low TSS on the effluent side.

MBR Technology has made major inroads in the last 20 years, due primarily to their high quality effluent, with the membrane protecting against system upsets and discharges of effluent outside of permit requirements. They are utilized in many package treatment plants for camps and temporary facilities, often integrated into containers for easy shipping and set-up.

Both of the options included headworks for Primary Treatment, which included screening and primary filter technologies.

5.1.2 *SAGR*

The SAGR proposal assumes that the lagoons would continue to operate as secondary treatment with nominal upgrading of the aeration over time as required. The SAGR would deal with the high TSS and un-ionized ammonia. This is a large buried bed of select gravel materials with an aeration grid to provide the necessary dissolved aeration.

SAGR facilities have been relatively successful as a polishing step on lagoon effluent, as they retain enough residual heat in the ground to maintain nitrification over the winter period, when lagoon nitrification typically fails due to lower temperatures.

The SAGR process has been developed and proposed by Nexom (previously Nelson Environmental). Their budgetary estimates for this technology were 15 million dollars, with operational costs estimated in the range of $500,000 per year.

8 Town of Rocky Mountain House – Lagoon Capacity Assessment, Stantec Consulting Ltd., Sept. 2016

5.2 DISCUSSION

5.2.1 *MBR*

The option of a mechanical plant, with the increased operational requirements and major capital costs, is not a favoured option at this time. In addition to the major capital costs, it will require significantly more operational expertise, requiring upgrading and training of the existing operators. The MBR has very significant operational costs, including periodic membrane replacements, particularly if damaged.

5.2.2 *SAGR*

The SAGR option relies on the upstream lagoon treatment to reduce the BOD and TSS to the range of 20 to 25 mg/l in order to effectively operate without clogging. Once constructed, a SAGR can often take upwards of six months of operation before it becomes fully effective at ammonia removal. A SAGR is also not easy to expand, so they typically are installed at maximum capacity in their initial installation. The key advantage to a SAGR is the simplicity of operation.

A downside with the SAGR option is the potential for clogging, and an inability to easily access the media for rehabilitation or inspection.

5.3 OTHER OPTIONS

This report was commissioned to evaluate/review other potential options to the major upgrading proposed by Stantec, as well as to provide some conceptual phasing options to allow a more gradual increase in treatment/capacity. These options and Phases are discussed in later sections of the report.

6 PHASING OPTION OVERVIEW

6.1 PHASE 1 - TESTING AND MONITORING

Starting now and continuing through the next five years we would recommend an enhanced level of testing, sampling, and monitoring of the waste water treatment plant operations. This would include the installation of on-line instrumentation, as well as the eventual integration into a SCADA system, complete with a data historian.

The additional sampling and testing will be critical to assess if the current Acute Lethality test failures are caused by high un-ionized ammonia, or by other toxic agents. While un-ionized ammonia is a likely contributor, it is prudent to rule out other potential causes. The introduction of landfill leachate to the treatment process could be bringing in deleterious materials. These could be disrupting/inhibiting the normal lagoon biological processes, as well as impacting the acute lethality testing on the rainbow trout.

Following in Table 7 is a partial list of compounds that are known to inhibit nitrification: [9]

Table 7 - Inhibitory Compounds

Pollutant	Inhibitory Concentration in mg/l	Pollutant	Inhibitory Concentration in mg/l
Cadmium	5-9	Nickel	0.25-5
Chloride	180	Silver	0.25
Chromium	0.25-1	Zinc	0.01-1
Copper	0.05-0.5	Sulphide	4
Cyanide	0.3-20	Methanol	160
Lead	0.5-1.7	Methylamine	330
Magnesium	50	Ethanol	400
Mercury	2-12.5		

Increased testing and monitoring reflects the over-arching philosophy that you can't control what you don't measure. The regulatory testing required by the Approval, as well as the WSER, are not intended for process control. Mapping out and implementing a suitable testing regime for process control will enhance operations, optimize control, reduce energy consumption, and provide the key information for all future upgrading selection/development.

[9] A.B. Hooper and K.R. Terry, Specific Inhibitors of Ammonia Oxidation in Nitrosomonas. J. Bact 115:480-485

6.2 PHASE 2 - HEADWORKS AND PRELIMINARY TREATMENT

Any future mechanical treatment plant options for the Town of Rocky Mountain House will require a headworks, consisting of coarse screening and primary treatment. The addition of headworks to the existing lagoons will also significantly improve the lagoon operations, including sludge removal and maintenance. The preferred methodology recommended would be Primary Filters, which provide significant reductions in BOD and TSS. As this level of treatment is a prerequisite for any mechanical system, we are suggesting that it be implemented in the mid-term as an upgrading, retaining the lagoons as the secondary/advanced secondary treatment process.

6.3 PHASE 3 - LAGOON UPGRADING/REPLACEMENT

Future upgrading or replacement of the secondary treatment process (lagoons) will eventually be required. Until a baseline of information is acquired from the testing and monitoring, the extent and timing is difficult to formalize. Increased population, as well as changes in the sewage brought on by industrial development will be the driver for most requirements. The balance of sewage from the Town and the County can also change over time, particularly with oil and gas operations in the surrounding areas.

Upgrading options for the existing lagoons could include:

- Selective sludge removal from the lagoons.
  - After completion and commissioning of the headworks, sludge could potentially be pumped from the lagoons selectively into the SRS holding cells. This would then be screened and de-watered for disposal by the headworks.
- Lagoon Baffling
  - Installation of floating baffles to improve hydraulics and minimize short circuiting will improve efficiencies.
- Additional Aeration/Re-located Aeration.
  - Following the headworks upgrading, loading to the three cells will see a significant reduction. Based on the testing and monitoring results obtained from the first year of operation, the overall aeration system will need to be evaluated and re-assessed. Cell 1 may have excessive aeration, and Cell 3 may require additional to reduce algae blooms with the subsequent pH increases.
  - Additional aeration in Cell 3 after BOD reduction in Cells 1 and 2 will assist in Nitrification.
  - Aeration operations could be controlled by SCADA based on measured DO levels in the Cells, reducing power consumption.
- Addition of Natural Polishing
  - Constructed Wetlands

Potential future replacement options for the lagoon could include some form of mechanical treatment plant, such as:

- Activated Sludge, Conventional (CAS)
- Sequencing Batch Reactors (SBR)
- Membrane Bio-Reactors (MBR)
- Biological Activated Filters (BAF)
- Moving Bed Bio-Reactors (MBBR)
- Integrated Fixed Film Activated Sludge (IFAS)

6.4 PHASE 4 - NITRIFICATION UPGRADING

After the initial upgrades, and after the lagoons have been upgraded to their maximum potential and/or replaced, the increased system loads may start to cause un-ionized ammonia to rise to levels that are approaching the WSER requirements. This could occur prior to Phase 3, or during the Phase 3 upgrading. At this time, some form of biological nitrogen removal (BNR) will likely be necessary.

6.4.1 *KEY FACTORS*

OXYGEN SUPPLY

Nitrification requires large amounts of oxygen. For every kilogram of ammonia to be oxidized, 4.6 kilograms of oxygen are required. A minimum DO operating level of 2.0 mg/l is required, and a DO level of 5 mg/l is considered optimal.

BOD LOADING

Nitrifying bacteria (Autotrophic bacteria) do not compete well against the BOD reducing bacteria (Heterotrophic bacteria). For nitrification to take place, the BOD must be significantly reduced to eliminate the competition. Generally speaking, a BOD of less than 20 mg/l is optimal.

PH AND ALKALINITY

Nitrifiers consume alkalinity when reducing ammonia, and generally require 7 mg of alkalinity for every mg of NH_3. Alkalinity at influent to nitrification process should be in excess of 150, and the effluent alkalinity should be above 50, or the reactions are inhibited. The nitrification rate is also pH sensitive, and rates decline significantly at pH values below 6.8. The optimal nitrification rates occur at pH values in the 7.5 to 8.0 range.[10]

NITRIFIER MASS

There must be a significant population or mass of nitrifying bacteria in order to nitrify. As the autotrophic bacteria are an "attached growth organism", it is critical to have a suitable substrate or objects for the bacteria to grow. They are also slow growing. Nitrosamines typically divide every 8 hours, compared to heterotrophs which divide every 20 minutes.

WATER TEMPERATURE

Water temperature is one of the more difficult factors to control in colder climates, and the nitrifiers are significantly inhibited as temperatures drop. The optimal rate for nitrification has been shown to be between 28 degrees C and 36 degrees C. As temperatures drop, the efficiencies drop. In order to achieve 90% nitrification, a minimum temperature of 15 degrees C is required. At temperatures of 10 degrees C, Maximum nitrification is usually limited to 50%. Nitrification stops completely by 0 degrees C.

6.4.2 *TERTIARY PROCESSES FOR NITRIFICATION*

MOVING BED BIO-REACTOR (MBBR)

MBBR technology was originally developed in Norway for nitrification, and has since also become a significant process for BOD removal as well. They have been successfully utilized as tertiary treatment behind lagoons in a NitrOX™ configuration. This utilizes a heat exchanger to increase the temperature entering the reactor, and then recovering most of the waste heat as the effluent is discharged. During the colder 3 months of the year, supplemental heating is often provided to improve nitrification.

10 Introduction to Environmental Engineering and Science, 2008, Masters, Gilbert M., Wendell Ela.

SUBMERGED ATTACHED GROWTH REACTOR (SAGR)

The SAGR process is a proven technology for colder climates without supplemental seasonal heating by retaining a large volume/mass of nitrifiers below ground, where the thermal mass can help the system coast through the colder periods. This is a large footprint/high capital cost option, with relatively low operational costs, limited to air supply.

7 PHASE 0 – INTERIM CONTROL STEPS

7.1 TOXICITY DETERMINATION

The Town of Rocky Mountain House has sent additional effluent to the laboratory in order to run some parallel testing to the standard LC50 testing. The additional samples will be pH corrected prior to LC50 testing, with one sample taken to pH 6.75, and the second sample taken to a pH approximately halfway between the base sample and pH 6.75. After pH correction, all three samples will be tested to the following protocol, with 5 concentrations and one control:

- Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments,
- Environment Canada(2008) EPS 1/RM/50,

If the data received from this testing indicates that un-ionized ammonia is the major contributor to the toxicity failures, we are recommending the Town proceed with design and installation of a pH correction system at a suitable location on the effluent line from lagoon 3.

If the data indicates other toxicants are involved, we are recommending additional Toxic Identification Evaluation testing be conducted in order to isolate and confirm the primary agent or agents.

7.2 PH CORRECTION

If un-ionized ammonia is the primary toxicant, pH reduction of the effluent prior to discharge is proposed as an interim control mechanism. Reduction of the pH to a value around 6.75 will result in negligible levels of un-ionized ammonia (NH_3), with the majority being in the form of NH_4^+. This is intended to be an interim control, due to the longer lead times necessary in the other treatment improvements to reduce the total ammonia loading.

There are two components necessary for a cost effective pH correction system. These are:

- A flow monitoring station on the effluent line to permit flow-paced chemical addition
- An insulated container for chemical storage and flow paced addition, complete with necessary worker safety equipment, including emergency shower and eye-wash. Power will also be necessary for the facility.

When the Phase 1 on-line equipment and SCADA are installed, this equipment would be integrated to provide improved control and safety, enhancing the ability to respond to short term toxicity spikes. Data would be tracked in the Historian for reporting purposes.

8 PHASE 1 – TESTING AND MONITORING

8.1 IN-LINE INSTRUMENTATION

One of the significant difficulties with monitoring lagoons is the adverse environmental conditions for the sample points, with ice, snow, wind, and access being major impediments. We have addressed this in the past by using small pumps to provide a constant sample flow from the desired locations to a central heated facility. (Lab Trailer). The pumps maintain a constant small flow to the lab, with all of the unused effluent flowing back to the start of the treatment process. This small re-circulation flow is insignificant compared to the overall system flow. The supply lines to the lab trailer are insulated and heat traced small diameter HDPE, which has minimal effect on any of the test parameters. Temperatures of the samples is measured by thermocouples at the sample points, as the heat trace insulated line will impact the temperature prior to the lab trailer. Thermocouples are rugged, reliable, and low energy consumers with minimal calibration issues in the remote locations.

The reliability of the on-line testing system is periodically confirmed by grab samples when they can be safely obtained. With multiple sample locations continually available in the lab, samples can be conveniently and safely taken for more technical laboratory testing at any time.

The preliminary data will significantly enhance the later design process for the Headworks and Lagoon Upgrading/Replacement by providing significant data on the incoming sewage quality and quantity, as well as loading parameters.

The online equipment would be maintained in operation after the initial testing and monitoring phase. This will confirm the quality of effluent after the improvements, provide valuable base-line operational data for the revised treatment system, as well as provide the necessary information to reduce blower operations to the optimum level for treatment.

Optimizing blower operations to optimum treatment levels can often result in 10% to 15% reduction's in power consumption. With power costs for 2016 of $ 130,927.10, savings could easily be on the order of $15,000 per year.

8.1.1 *DISSOLVED OXYGEN (DO METERING)*

DO metering at varied locations through the lagoon is both a system monitor, as well as a means to reduce overall energy consumption in the system. On-line DO levels provides a lot of operational data and subsequently adding equipment to control the blowers can be a significant cost saver. This information will also provide the necessary data after 12 to 18 months of operation to start to review options for minor modifications to the lagoon system.

Having the monitoring and on-line systems in place for a bare minimum of 3 months prior to the headworks upgrading provides factual data of the efficiencies obtained by any improvements.

8.1.2 *TEMPERATURE AND PH*

Temperature would be measured at the inlet to the pumps to ensure conditions are accurately evaluated. Temperature will also be measured in the trailer along with the other tests, as it is critical in calibrating the equipment.

The pH will be measured upon the arrival of the sample.

8.1.3 *OXIDATION-REDUCTION POTENTIAL (ORP METERING)*

ORP is the indication of a solutions ability to oxidize or reduce another substance. Everything in the water has this potential, and the ORP is the sum of all of the potentials. Negative ORP values can be thought of as septic, and as the solution is aerated, the ORP will increase, becoming positive. As a control mechanism, it shows the influence of all materials, not just the dissolved oxygen. For various processes to occur, we need certain ranges of ORP.

- Aerobic BOD Reduction +50 to +250 mV
- Nitrification +100 to +300 mV
- Denitrification +50 to -50 mV
- Orthophosphate release -100 to -250 mV
- Sulfide Formation -50 to -250 mV
- Methane Production -175 to -400 mV

8.1.4 *AMMONIA – N METERING*

Selective probes, now available in multi-probe configurations, can provide monitoring of the ammonium and Nitrate. This equipment allows for control and troubleshooting of nitrification/denitrification processes, allowing operators to react in time to prevent high levels to flow to the final effluent.

8.2 PHASE 1 A – SLUDGE REDUCTION

Sludge in lagoons can increase the Ammonia – N levels at some times of the year, particular in later cells. If the early on line testing identifies that the sludge build up is contributing to high ammonia levels, partial removal could be looked at early in the process. There are two significant options for sludge removal/reduction.

- Bypass, drainage, and excavation during the summer period.
  - During the summer, effluent quality is often adversely impacted by the third cell. Removal during this period has minimal impact on operations, reducing costs.
- Microbial reduction of sludge by introduction of select organisms.
  - This maintains the cell in operation, and can reduce sludge volumes by a significant amount. This does not remove inorganics, such as would be found in Cell 1 near the inlet area. The majority of inorganics will be in the first two cells.

8.3 PHASE 1 B – SUSPENSION OF LEACHATE ACCEPTANCE

If the testing phase identifies an issue with the acceptance of the landfill leachate, acceptance could be suspended to remove the toxins from the system. This would only be recommended if the testing confirms inhibitory actions.

9 PHASE 2 – HEADWORKS

9.1 HEADWORKS FOR TOWN SEWAGE FLOWS

Headworks for the Town's sewage flow would need to be located below grade to permit gravity flow into the primary treatment units. The small footprint of the filter units would allow the underground structure to be relatively small, as typical filter units[11] fit in a 2400mm x 2400mm footprint. (8' by 8'). Clearance is required for servicing and maintenance, and a minimum of three units would be likely.

Due to the hydraulic grade break, pumping of the filtered effluent will be required to get the filtrate into the lagoons for treatment. This pumping is simplified substantially by the removal of all of the detritus from the effluent, and will not be a major energy consumer. The energy saved on downstream reduction in air demand will more than compensate for the pumping energy.

The system can be designed to accommodate power interruptions by bypassing the flow directly to the lagoon for the short term. This will avoid the need for a standby power system.

The solids leaving the headworks would typically be in the range of 30% to 50% Total Solids, depending on the vendors and technologies. This material is suitable for direct hauling to the landfill, and can be loaded directly into bins for pick-up with standard transfer trucks. The underground building could have a vehicle ramp to allow for direct removal of containers. Storage in an underground area prior to hauling will avoid odour, freezing, and nuisance animal and bird issues.

9.2 HEADWORKS FOR COUNTY SEPTAGE FLOWS

Headworks for the County septage flows could be located near the SRS, but integration with the town's sewage headworks will have the maximum cost benefit. The septage flows have a substantially higher BOD5 and TSS loading, on the order of 10 times the standard municipal sewage from the community. By adding a temporary storage cell external to the existing SRS cell, the received septage could be blended into the low flow periods from the town, enhancing the overall efficiency of the operation.

9.3 ANTICIPATED BENEFITS WITH INTEGRATION

Primary Screening/Solids Separation Technologies are now mature, having been in operation in many countries for 20 or more years. They have significant advantages to primary clarification and settling technologies, both in foot-print and capabilities. The development and use of membrane technologies in secondary treatment have been a significant driver for the technology, as the membranes are very susceptible to damage from foreign material. The Screening/Solids Separation process removes grits, foreign matter, and a significant portion of the overall organic loading.

A typical unit on municipal sewage will reduce the BOD_5 by 20%, while reducing TSS by 50%. This has very major benefits for the lagoon system.

11 www.Salsnes-Filter.com/products/
www.hydro-int.com/en/products/hydro-microscreen
www.nexom.com/ecobelt

9.3.1 BOD_5 REDUCTION

The 20% reduction of BOD_5 will reduce the aeration demands in the short term, permitting a significant reduction in energy demand if linked with DO monitoring and control within the lagoons. This will leave existing aeration capacity available to assist with Nitrification/Denitrification.

In the longer term, there is an increased capacity of the lagoon treatment system, as the lower loading permits higher volumes to be processed in the existing footprint.

9.3.2 TSS REDUCTION

The majority of the TSS (Total Suspended Solids) that are removed in the existing lagoons end up as sludge on the lagoon bottoms. A significant amount of the TSS is non-organic, and thus does not break down over time in the lagoons. In addition, it is very difficult to remove the settled sludge from the lagoons, due to the operating equipment and continual flow.

The reduction of sludge entering the lagoons, particularly the inorganics, increases the effective lagoon volume by close to 10%. This further increases the operational capacity of the lagoons

9.3.3 NITROGEN REDUCTION

The headworks will not provide substantial Nitrogen reduction from the raw town sewage, as approximately 65% of the total nitrogen is soluble, leaving only 35% for removal as particulates. We would normally assume approximately 10% to 15% reduction in total nitrogen by primary treatment of the sewage with screening technologies.

Nitrogen reduction of the septage will be substantial, as most sources[12] identify septage as having in the range of 65% to 75% of the total nitrogen in particulate form. With primary treatment, we expect to remove approximately 50% of the particulate matter. (50% TSS removal efficiency). This will provide a total Nitrogen reduction of approximately 35% on the septage Nitrogen loading.

9.3.4 PHOSPHOROUS REDUCTION

Phosphorous reduction will not be substantial from the raw town sewage, as approximately 65% of the total phosphorous is soluble, leaving only 35% for removal as particulates. We would normally assume approximately 10% to 15% reduction in total phosphorous with primary treatment of this sewage.

Phosphorous reduction of the septage will be significant, as most sources[12] identify septage as having in the range of 50% to 60% of the total phosphorous in particulate form. With primary treatment, we can expect to remove approximately 50% of the particulate phosphorous. (50% TSS removal efficiency). This will provide a total phosphorous reduction of approximately 25% on the septage phosphorous loading.

9.4 LEACHATE TREATMENT

Processing of the leachate through the primary treatment system is not anticipated to have any significant advantage. The particulate phase of the BOD5, Nitrogen, and Phosphorous are all negligible, with the majority being soluble. There is a negligible contribution of TSS, so reductions are not necessary.

12 Design of Municipal Treatment Plants, Fourth Edition, WEF and ASCE, 1998:
Handbook of Advanced Treatment Review Issues, Environmental Protection Agency, 1984

10 PHASE 3 – LAGOON UPGRADING OR REPLACEMENT

It is anticipated that the process monitoring and headworks additions done in the earlier stages will deal with effluent quality issues for a significant period. However, based on the possibility of increased growth in the region, additional upgrades may be required as effluent volumes increase and/or additional restrictions are imposed on effluent quality by the Provincial or Federal Government.

While we are currently targeting this phase to be around a population equivelant of 8,400, which is expected to be at least 8 years out on the schedule, this could be revised based on the data coming in from the on line testing over time.

10.1 LAGOON UPGRADING

The following are discussed as possible options for upgrading the lagoons in the future as increasing demand or more restrictive regulations trigger the need. They are discussed in this section as concepts only, and detailed evaluation and selection of alternatives (Scoping) will need to be done at the time of upgrading.

10.1.1 *SELECTIVE SLUDGE REMOVAL FROM THE LAGOONS.*

After completion and commissioning of the headworks, sludge could potentially be pumped from the lagoons selectively into the SRS holding cells. This would then be screened and de-watered for disposal by the headworks. This could be a regular part of the process, or a single one time operation.

The key advantages of this option are:

- → Lagoon operation is maintained during sludge removal
- → Sludge is treated through the headworks and dewatered for suitable disposal at minimal costs or impact to operations

10.1.2 *LAGOON BAFFLING*

Installation of floating baffles to improve hydraulics and minimize short circuiting will improve efficiencies. This would typically anticipate sludge removal in the area prior to installation of the baffles.

Baffling to create separate zones in the later cells will allow for improved oxygen control to increase nitrification processes.

10.1.3 *ADDITIONAL AERATION/RE-LOCATED AERATION.*

Following the headworks upgrading, loading to the three cells will see a significant reduction. Based on the testing and monitoring results obtained from the first year of operation, the overall aeration system will need to be evaluated and re-assessed. Cell 1 may have excessive aeration, and Cell 3 may require additional aeration to reduce algae blooms with the subsequent pH increases.

Additional aeration in Cell 3 after BOD reduction in Cells 1 and 2 will assist in Nitrification.

Aeration operations could be controlled by SCADA based on measured DO levels in the Cells, reducing power consumption.

10.1.4 *ADDITION OF NATURAL POLISHING*

With the land available to the district, constructed wetlands could be an option for final polishing. Constructed wetlands are similar to a SAGR in operation, with granular material providing filtration and a media for organic growth. They require more land than a SAGR, but rely on natural processes rather than mechanical aeration to provide the nutrient removal. They do not have the same efficiencies in winter operation, as they are shallower and rely on vegetative growth.

10.2 LAGOON REPLACEMENT

The following are discussed as possible options for replacing the lagoons in the future as increasing demand or more restrictive regulations trigger the need. These could be considered either in lieu of upgrading the lagoons at the first trigger stage, or could be considered as options after the lagoons have been upgraded to their maximum potential, and increased capacity or quality is still required. They are discussed in this section as concepts only, and detailed evaluation and selection of alternatives will need to be done at the time of upgrading. Potential future replacement options for the lagoon could include some form of mechanical treatment plant, such as:

- Activated Sludge, Conventional (CAS)
- Sequencing Batch Reactors (SBR)
- Membrane Bio-Reactors (MBR)
- Biological Activated Filters (BAF)
- Moving Bed Bio-Reactors (MBBR)
- Integrated Fixed Film Activated Sludge (IFAS)

All of the potential lagoon replacement operations are smaller footprint, and increased complexity. As such, the regulations require significant redundancy to ensure that the system can continue to treat with part of the equipment out of operation.

11 PHASE 4 – NITRIFICATION REACTOR

It is anticipated that the process monitoring and headworks additions done in the earlier stages will deal with effluent quality issues for a significant period. However, based on the possibility of increased growth in the region, additional upgrades may be required as effluent volumes increase and/or additional restrictions are imposed on effluent quality by the Provincial or Federal Government.

Assuming upgrading of the lagoons is a selected option, ammonia toxicity may re-emerge as necessary after a period of time, or if the upgrades are not providing adequate levels of nutrient removal during all seasons or conditions. This could occur prior to the upgrade triggers of Phase 3, or at a similar time frame. They are discussed in this section as concepts only, and detailed evaluation and selection of alternatives will need to be done at the time of upgrading. If a mechanical plant replacement is scoped, the nitrification reactor would be part of the mechanical plant operations.

11.1 IN-LAGOON ATTACHED GROWTH SYSTEM

There are numerous companies providing fabric ribbon options that are added in secondary lagoons to provide an attachment site for autotrophs, to increase their stability and density. These systems enhance the ammonia removal significantly during warmer weather, but suffer from low lagoon temperatures in the winter.

A system of aerated domes that reside on the bottom of the lagoons has shown some advantages in the cooler winter period, due to the depth in the lagoon and the warmth provided by the aeration. This technology is termed Bio-Domes, and is marketed by Wastewater Compliance Systems Inc. The technology was developed by the University of Utah.

In lagoon treatment systems are generally all limited in performance in the winter, but provide an economical option for the remainder of the seasons.

11.2 MOVING BED BIO-REACTOR (MBBR)

As a tertiary process to lagoon treatment, there are a few suppliers that have combined MBBR technologies with heat exchangers and supplementary heating. By heating the effluent to closer to optimal treatment temperatures for ammonia removal, the MBBR reactor can be quite small and provide significant reductions at all times of the year. By utilizing heat exchangers, the majority of the heat can be recovered prior to discharge, pre-heating the effluent prior to the reactor. Supplemental heat is only added as needed in cooler periods.

These technologies are represented by:

- Lagoon Guard by Veolia,
- NitrOx Process by Triplepoint Environmental

As MBBR technology was originally developed as a nutrient removal technology, they are very efficient and require a small footprint. The downside of the technology is the increase in TSS following the process, as a result of the sloughed bacteria from the media. This is usually dealt with by discharging to the polishing cell for settlement.

11.3 SUBMERGED ATTACHED GROWTH REACTOR (SAGR)

The SAGR reactors developed by Nelson Environmental (now operating as Nexom) is a proven technology for ammonia removal in northern climates. They rely on a very significant thermal and biological mass that continues ammonia removal through the winter, albeit at a slower rate. The overall principal is that the summer periods develop a large bio-mass in the gravel bed during the summer which continue to function during the winter as the reactor bed slowly cools down.

When the effluent warms back up in the spring, it starts replacing the bio-mass that was reduced over the winter. The flow of the effluent through the submerged gravel also provides some filtration, reducing the TSS. If TSS and BOD are too high entering the SAGR, there can be some issues of plugging at the inlet side of the reactors.

12 SCHEDULING

Much of the works proposed involves decisions and budgets to be made by two municipal authorities, the Town of Rocky Mountain House, as well as Clearwater County. The negotiation of a formal cost sharing arrangement is anticipated to take some time, and is highly dependent upon the schedules of the two authorities. Individual budget approvals and selection of consultants for the various phases and scopes will also take significant blocks of time, depending on the structuring of the process. Due to the variability of the political processes, we have not made allowance for these time intervals in the following schedules.

Approvals will also be required from Alberta Environment at various stages, depending on the overall process and implementation. Some of the simpler changes/modifications may be handled relatively quickly if they are treated as ongoing maintenance and operational changes by the Ministry. Others will require a more formal approval process, adding additional time to the overall process. We have not made allowance for the Ministry Approval process at this time in the following schedules. Once the political process has reached a consensus, the Ministry would be formally brought into the process and approval processes and timelines could be established for the ongoing upgrades and improvements from the Ministry prospective.

The schedules presented below represent our estimation of the time necessary for design development, normal tender procedures, and construction/implementation. Some items are relatively fixed duration, such as current testing, while others further in the future are rough estimates, depending on the scope definitions still to be developed. These are provided for guidelines only, and are not intended to represent a fixed schedule, as the final scope of each of the phases has not yet been determined.

12.1 PHASE 0 – INTERIM CONTROL STEPS

Initial testing is currently underway, with initial results being anticipated in mid-June. If additional testing is required, we would anticipate a 4 to 6 week turn-around, depending on toxicants being isolated. Upon completion of testing and approval of Councils to proceed, design could be commenced and Ministry approval processes negotiated.

Design development, tender, and construction implementation of pH correction infrastructure is estimated as follows:

- Design development and tender documents — 6 to 8 weeks
- Tender Phase — 4 to 6 weeks
- Construction/Implementation — 3 to 4 months

12.2 PHASE 1 – TESTING AND MONITORING

The start of this phase is dependent upon a political decision/agreement between the two authorities, as well as the necessary budget/funding coordination's. Based on discussions to date, we would anticipate that the earliest start on this phase would be September of 2017.

Design development, tender, and construction implementation of integrated on-line instrumentation and SCADA infrastructure is estimated as follows:

- Design development, tender documents, and RFP development — 8 to 12 weeks
- Tender/RFP Phase — 6 to 8 weeks
- Construction/Implementation — 4 to 5 months

12.2.1 PHASE 1 A – SLUDGE REDUCTION

If a biological treatment is selected, the process is more of an RFP and Vendor selection, rather than a conventional design, tender, build.

RFP development, and implementation of biological treatment is estimated as follows:

- Development of RFP — 2 to 3 weeks
- RFP Phase — 4 to 6 weeks
- Implementation — 3 to 4 months

During the implementation phase, a sludge survey would be conducted for all three lagoons to quantify locations, volumes, and volatile percentages.

12.2.2 PHASE 1 B – SUSPENSION OF LEACHATE ACCEPTANCE

This phase, if acted on, requires no duration other than the discussions between the Town and County relative to the impact on their landfill operations.

12.3 PHASE 2 – HEADWORKS

This upgrading is highly dependent upon the data being produced in Phase 1 above. While it would be ideal to have a full year of data from the Stage 1 works, design could be commenced with a minimum of 3 months of data.

Design development, tender, and construction implementation of headworks infrastructure is estimated as follows:

- Preliminary design and equipment RFP development — 6 to 8 weeks
- Equipment RFP and Vendor selection — 5 to 7 weeks
- Shop drawing development and approval — 6 to 9 weeks
- Detailed design development and tender documentation — 7 to 10 weeks
- Tender Phase — 4 to 6 weeks
- Construction/Implementation — 4 to 6 months
- Commissioning, startup, and training. — 3 to 4 weeks

This upgrading, upon completion, should push back the next stages of upgrading for an estimated 5 years, depending on population changes and environmental regulations. With the implemented headworks reducing the load to the lagoons, it is anticipated that effluent quality requirements can be met until an approximate population equivalent of 8,400.

12.4 PHASE 3 – LAGOON UPGRADING OR REPLACEMENT

The design scope decisions and the detailed design for Phase 3 should start being planned at or around a design population equivalent of 8,000, or if there are indications from the regular trending data on the performance of the lagoons that quality is deteriorating. While we have shown the schedule based on a single project, this phase could easily be broken down into multiple phases if the lagoons are being retained/upgraded.

This phase will be a significant nexus, as the options of expanding/upgrading the lagoons will need to be weighed against the options/opportunities of going to a smaller footprint mechanical plant.

Scoping, Design development, tender, and construction implementation of upgrading of the secondary treatment process is estimated as follows:

- Scoping — 10 to 12 weeks
- Design development and tender documents — 8 to 20 weeks
- Tender Phase — 4 to 6 weeks
- Construction/Implementation — 4 to 24 months

It is possible based on the lagoon performance that Phase 4 could move forward in priority to Phase 3. This would likely be the case if the decision to upgrade/expand the lagoons was made in lieu of a mechanical plant, as Phase 4 will be far more effective for nutrient removal than lagoon options.

12.5 PHASE 4 – NITRIFICATION REACTOR

The design scope decisions and the detailed design for Phase 4 should start being planned when there are indications from the regular trending data on the performance of the lagoons that ammonia toxicity is likely to become a problem. If this occurs before the Phase 3 trigger, both Phase 3 and Phase 4 should be examined in the context of lagoon upgrading/expansion versus mechanical plant. If mechanical plant is the chosen path, the nitrification reactor would be part of the mechanical plant development and scope. If lagoon expansion/upgrading is the preferred choice, then a nitrification reactor will require scoping and design.

Scoping, Design development, tender, and construction implementation of upgrading of the secondary treatment process is estimated as follows:

- Scoping — 8 to 10 weeks
- Design development and tender documents — 8 to 14 weeks
- Tender Phase — 4 to 6 weeks
- Construction/Implementation — 3 to 12 months
- Commissioning, start-up, and training. — 6 to 8 weeks

13 CONCEPTUAL COST ESTIMATES

The costs following are presented as **feasibility** or **order-of magnitude** costs. These are based on numerous assumptions, including exchange rates against the US dollar, as much of the equipment/supplies originate or are distributed from the USA. Costs are expressed in 2017 dollars.

Cost sharing with the County needs to be discussed and resolved, but on a preliminary basis we are recommending that the Town consider a 75%/25% split as discussed in 1.2.2

13.1 PHASE 0 – INTERIM CONTROL STEPS

The testing being undertaken, and possible additional testing, including sampling, shipping, coordination, and handling, is estimated to be in the range of:

→ **$ 2,000 to $ 3,500.**

The design and provision of a flow monitoring location, along with a chemical storage and injection facility, is estimated to be in the range of:

→ **$ 55,000 to $ 115,000.**

13.2 PHASE 1 - TESTING AND MONITORING

The establishment of online testing at four locations, in conjunction with establishing a SCADA system complete with Historian, is estimated to cost in the range of:

→ **$ 250,000 to $ 350,000.**

This equipment will not only provide the raw data, but will enable process control and monitoring in future, including options to significantly reduce the electrical consumption. This system is heavily integrated with SCADA for trending and a Historian for data retention. With the need to keep probes and other equipment operational and calibrated, a budget of $35,000 a year should be set aside for maintenance and probe replacement.

13.2.1 *PHASE 1 A – SLUDGE REDUCTION*

There is not a lot of information on the volume or extent of sludge build up in Cell 3. Based on assumptions of 5,000 to 8,000 cubic metres, biological removal may be a strong option. Based on current estimates, remediation is estimated to be in the range of:

→ **$ 75,000 to $ 125,000.**

If dewatering and physical removal is required, estimated costs are in the range of:

→ **$ 150,000 to $ 225,000.**

While physical removal and dewatering is substantially more expensive, it also permits the option of doing some baffling, inlet and outlet improvements, and/or aeration modifications in a cost effective manner while the lagoon is out of operation.

13.2.2 *PHASE 1 B – SUSPENSION OF LEACHATE ACCEPTANCE*

Suspension of leachate acceptance, if deemed necessary, does not have a quantifiable cost implication to the town at this time. It will impact operations and cost of the landfill to the County, which will have an effect on the rates charged to the Town in future.

13.3 PHASE 2 – HEADWORKS

Design and subsequent construction of primary treatment headworks for the lagoons, including modification to the existing Septage Receiving Station (SRS) to permit blending during low flow periods for sludge reduction, is estimated to cost in the range of:

→ **$ 2,500,000 to $ 4,000,000**

The total impact of this system will be quantified by the information obtained from Phase 1, which will continue in operation. Operational costs of this phase will consist of regular maintenance and sludge hauling. Operational maintenance and repairs are estimated to cost in the range of $40,000 per year. Sludge hauling will be very dependent upon the filter efficiencies, as well as the de-watering efficiencies of the unit selected. Estimates of sludge hauling costs would be premature at this time.

13.4 PHASE 3 – LAGOON UPGRADING OR REPLACEMENT

Due to the numerous options and considerations during this Phase, cost ranges have not been estimated at this time. After completion of Phase 1 and 2, the Scoping portion of Phase 3 will generate recommended alternatives along with capital and operating cost estimates.

13.5 PHASE 4 – NITRIFICATION REACTOR

Due to the numerous options and considerations during this Phase, cost ranges have not been estimated at this time. After completion of Phase 1 and 2, and possibly the completion or initiation of Stage 3, the Scoping portion of Phase 4 will generate recommended alternatives along with capital and operating cost estimates.

APPENDIX

ALBERTA ENVIRONMENT

APPROVAL 1110-02-00

- EFFECTIVE MARCH 2, 2011
- EXPIRY MARCH 1, 2021

Government of Alberta ■

Environment

APPROVAL

PROVINCE OF ALBERTA

ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT
R.S.A. 2000, c.E-12, as amended.

APPROVAL NO. 1110-02-00

APPLICATION NO. 009-1110

EFFECTIVE DATE: March 2, 2011

EXPIRY DATE: March 1, 2021

APPROVAL HOLDER Town of Rocky Mountain House

ACTIVITY: Construction, operation and reclamation of a wastewater system

for the Town of Rocky Mountain House

is subject to the attached terms and conditions.

Designated Director under the Act .....

Todd Aasen, P. Eng.

Date Signed March 2, 2011

TERMS AND CONDITIONS ATTACHED TO APPROVAL

PART 1: DEFINITIONS

SECTION 1.1: DEFINITIONS

1.1.1 All definitions from the Act and the regulations apply except where expressly defined in this approval.

1.1.2 In all PARTS of this approval:

(a) "Act" means the *Environmental Protection and Enhancement Act*, R.S.A. 2000, c.E-12, as amended;

(b) "application" means the written submissions to the Director in respect of application number 009-1110 and any subsequent applications for amendments of approval number 1110-02-00;

(c) "approved laboratory" means laboratory accredited to the requirements of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories,* for the wastewater tests methods specified by the Director;

(d) "arithmetic mean" means the sum of all the sample analysis results divided by the total number of samples per reporting period;

(e) "BOD_5" means the Biochemical Oxygen Demand in milligrams per litre measured at 20°C over a 5 day period;

(f) "CBOD" means the carbonaceous BOD_5 in milligrams per litre which is measured after the nitrogenous demand has been inhibited with an inhibitory chemical;

(g) "chemical" means any substance that is added or used as part of the treatment process;

(h) "composite sample" means a composite of samples of the stream collected over a 24 hour period, which is representative of the stream sampled, collected every 15 minutes in a quantity proportional to the flow rate of the stream;

(i) "continuous monitoring" means sampling or flow measurement through equipment that creates an uninterrupted output of the analysis or flow measurement;

(j) "day" means calendar day;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(k) "Director" means an employee of the Government of Alberta designated as a Director under the Act;

(l) "geometric mean" means the calculated n^{th} root of the product of all the sample analyses within the reporting period, where n equals the total number of samples within the reporting period, as follows;

Geometric Mean: $\sqrt[n]{S_1 x S_2 x S_3 x ... x S_n)}$

where,
n = the total number of samples within the reporting period
S_1 = the 1st sample analysis value
S_n = the nth sample analysis value

(m) "grab sample" means an individual sample collected in less than 30 minutes and which is representative of the substance sampled;

(n) "ISO" means the International Organization for Standardization;

(o) "regulations" means the regulations issued pursuant to the Act and as amended;

(p) "TSS" means the total suspended solids or non-filterable residue (NFR) measured in milligrams per litre;

(q) "uncommitted hydraulic reserve capacity" means the design capacity of the wastewater treatment plant minus the sum of the peak daily flow and the peak daily flow that would be used by development that is approved but not yet built;

(r) "wastewater treatment plant" means the physical components of the wastewater system that are used to treat wastewater including components associated with the management of any wastes generated during treatment and includes the land located within: the SW of Section 34, Township 39, Range 7, West of the 5th Meridian, that is being or has been used or held for or in connection with the wastewater treatment plant;

(s) "week" means calendar week; and

(t) "year" means calendar year.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

PART 2: GENERAL

SECTION 2.1: GENERAL

2.1.1 The approval holder shall immediately report by telephone any contravention of the terms and conditions of this approval to the Director at 1-780-422-4505.

2.1.2 In addition to reporting pursuant to 2.1.1, the approval holder shall submit, within 7 days from any contravention of the terms and conditions of this approval, a written report to the Director.

2.1.3 The terms and conditions of this approval are severable. If any term or condition of this approval or the application of any term or condition is held invalid, the application of such term or condition to other circumstances and the remainder of this approval shall not be affected thereby.

2.1.4 *Environmental Protection and Enhancement Act* Approval No. 1110-01-00 is cancelled.

SECTION 2.2: RECORD KEEPING

2.2.1 The approval holder shall record and retain all the following information in respect of any sampling conducted or analyses performed for a minimum of three years:

(a) the place, date and time of sampling;

(b) the dates the analyses were performed;

(c) the analytical techniques, methods or procedures used in the analyses;

(d) the names of the persons who collected and analyzed each sample; and

(e) the results of the analyses.

SECTION 2.3: ANALYTICAL REQUIREMENTS

2.3.1 Collection, preservation, storage, handling and analysis of samples, and reporting shall be conducted in accordance with the following:

(a) the *Standard Methods for the Examination of Water and Wastewater* published jointly by the American Public Health Association, American Water Works Association, and the Water Environment Federation, as amended; or

(b) a method authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

2.3.2 The approval holder shall have all samples that are required to be obtained by this approval analyzed:

(a) in a laboratory accredited for those specific parameters analysed pursuant to ISO/IEC 17025 standard, as amended, for the specific parameter(s) to be analysed;

(b) the wastewater treatment plant lab; or

(c) as otherwise specified in writing by the Director.

2.3.3 The term sample as used in clause 2.3.2 does not include samples directed to continuous monitoring equipment, until specifically required in writing by the Director.

2.3.4 The approval holder shall comply with the terms and conditions of any written authorization issued by the Director under 2.3.2.

PART 3: CONSTRUCTION AND UPGRADING REQUIREMENTS

SECTION 3.1: CONSTRUCTION AND UPGRADE

RECEIVING WATER QUALITY AND PLANT CAPACITY ASSESSMENT

3.1.1 The approval holder shall submit to the Director a proposal for a *Receiving Water Quality and Wastewater Treatment Plant Capacity Assessment* on or before March 1, 2013 or another date authorized in writing by the Director.

3.1.2 The *Receiving Water Quality and Plant Capacity Assessment* proposal in 3.1.1 shall:

(a) be in accordance with Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater & Storm Drainage Systems,* January 2006 and Alberta Environment's *Water Quality Based Effluent Limits Procedure Manual*, as amended, where appropriate; and

(b) include recommendations on wastewater effluent quality, and on operational and/or upgrade improvements.

3.1.3 The approval holder must receive written authorization from the Director, accepting the *Receiving Water Quality and Plant Capacity Assessment* proposal as submitted in 3.1.1 and 3.1.2.

3.1.4 The approval holder shall complete the finalized *Receiving Water Quality and Plant Capacity Assessment* within two (2) year of the Director's written authorization in 3.1.3, or as otherwise authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

3.1.5 Within six (6) months of completion of the *Receiving Water Quality and Plant Capacity Assessment* as per 3.1.3 unless otherwise authorized in writing by the Director, the approval holder shall submit an implementation plan for the recommendations in 3.1.2.

3.1.6 Six (6) months prior to any wastewater treatment plant upgrade in the implementation plan described in 3.1.4, the approval holder shall submit to the Director an application for the upgrade and shall obtain a written authorization or an amendment to this approval prior to the commencement of the upgrade.

PART 4: OPERATIONS

SECTION 4.1: DRAINAGE SYSTEMS

WASTEWATER COLLECTION AND TREATMENT

4.1.1 The approval holder shall not release any substances from the wastewater system to the surrounding watershed except as authorized by this approval.

4.1.2 The approval holder shall operate a wastewater system which shall include:

(a) a wastewater collection system; and

(b) an aerated wastewater stabilisation pond(s) and includes all of the following:

(i) two (2) partially mix cells;

(ii) one (1) polishing cell; and

(iii) treated wastewater outfall discharging directly to the North Saskatchewan River located in the SE 33-39-7-W5M.

SECTION 4.2: CERTIFIED OPERATOR REQUIREMENTS

4.2.1 At all times, the operation of the:

(a) wastewater treatment plant shall be performed by, or under the direction of a person who holds a valid wastewater treatment certificate of qualification at a minimum of Level I Wastewater Treatment (WWT) Operator; and

(b) the wastewater collection system shall be performed by, or under the direction of a person who holds a valid wastewater collection certificate of qualification at a minimum of Level II Wastewater Collection (WWC) Operator.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

SECTION 4.3: SLUDGE DISPOSAL

4.3.1 The approval holder shall only dispose of sludge at a registered or approved facility, or as otherwise authorized in writing by the Director.

SECTION 4.4 CHEMICALS USED

4.4.1 The approval holder shall not use any chemicals in the wastewater treatment process unless authorized in writing by the Director.

SECTION 4.5: IRRIGATION

4.5.1 The approval holder shall not dispose of treated wastewater by way of irrigation except as provided in this approval or as otherwise authorised in writing by the Director.

PART 5: LIMITS

SECTION 5.1: WASTEWATER

5.1.1 The approval holder shall ensure that the treated wastewater discharge from the wastewater polishing cell(s) complies with the limits specified in TABLE 5-1.

TABLE 5-1 LIMITS

Parameters	Limit
Treated wastewater prior to discharge	
CBOD	≤ 25 mg/L monthly arithmetic mean of weekly samples

5.1.2 Treated wastewater from the wastewater stabilization pond polishing cell(s) shall be discharged, from the outfall, as follows:

(a) continuously to the North Saskatchewan River located in the SE 33-39-7-W5M.

PART 6: MONITORING AND REPORTING

SECTION 6.1: WASTEWATER

6.1.1 The approval holder shall monitor the wastewater system as required in TABLE 6-1.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

TABLE 6-1: MONITORING

Parameter	Frequency (Minimum)	Sample Type	Sampling Location
UNTREATED WASTEWATER			
BOD_5	Weekly	Composite	Untreated wastewater entering the wastewater treatment plant.
TSS	Weekly	Composite	Untreated wastewater entering the wastewater treatment plant.
Volume of flow	Continuous, recorded daily	Calculated	Untreated wastewater entering the wastewater treatment plant.
Septage received	Total Volume	Estimated	Septage receiving station (s)
TREATED WASTEWATER			
CBOD	Weekly	Grab	Treated wastewater being discharged to the storage cells
TSS	Weekly	Grab	Treated wastewater being discharged to the storage cells
UNAUTHORIZED RELEASES			
Release Volume	Total Volume	Estimated	Wastewater bypassing the wastewater treatment plant, accidental spills or overflows.
Release Volume	Total Volume	Estimated	Wastewater bypassing the lift station(s), accidental spills or overflows.
Release Volume	Total Volume	Estimated	Wastewater bypasses, accidental spills or overflows from the wastewater collection system.
BOD_5, TSS, Phosphorus, and Ammonia-Nitrogen	During the unauthorized discharge	Grab	At the release point.
SLUDGE DISPOSAL			
Sludge Volume	Total Volume	Estimated	Amount of sludge being trucked to a registered or approved landfill or as otherwise authorized in writing by the Director

SECTION 6.2: GROUNDWATER MONITORING

6.2.1 The approval holder shall collect a sample once every five years from each of the existing groundwater monitoring wells or new groundwater monitoring wells

TERMS AND CONDITIONS ATTACHED TO APPROVAL

authorized in writing by the Director in SW 34-39-7-W5M and analyze the samples for the following parameters:

(a)	pH;	(l)	ammonia-nitrogen;
(b)	conductivity;	(m)	chloride;
(c)	calcium;	(n)	fluoride;
(d)	magnesium;	(o)	sulphate;
(e)	total hardness;	(p)	carbonate;
(f)	sodium;	(q)	bicarbonate;
(g)	potassium;	(r)	total alkalinity;
(h)	iron;	(s)	total dissolved solids (TDS);
(i)	silica;	(t)	total Kjeldahl nitrogen (TKN); and
(j)	nitrate-nitrogen;	(u)	chemical oxygen demand (COD);
(k)	nitrite-nitrogen;		

or as otherwise authorized in writing by the Director.

SECTION 6.3: WASTEWATER REPORTS

MONTHLY WASTEWATER REPORT

6.3.1 The approval holder shall compile a Monthly Wastewater Report which shall include the following:

(a) the values of each parameter monitored, as outlined in TABLE 6-1;

(b) the name of the supervising operator responsible for the operation of the wastewater system;

(c) a summary of any incidents which required reporting in accordance with 2.1.1; and

(d) a summary of any operational problems.

6.3.2 Submission of the Monthly Wastewater Report is not required unless notified in writing by the Director.

ANNUAL WASTEWATER REPORT

6.3.3 The approval holder shall compile an Annual Wastewater Report which shall include the following:

(a) the values of each parameter monitored, as outlined in TABLE 6-1;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(b) the analytical results, and recommendations, if any, of the GROUNDWATER MONITORING in 6.2;

(c) the name of the supervising operator responsible for the operation of the wastewater system;

(d) a summary of any incidents which required reporting in accordance with 2.1.1;

(e) a calculation of the uncommitted hydraulic reserve capacity for the wastewater treatment plant; and

(f) a summary of any operational problems.

6.3.4 The approval holder shall submit one copy of the Annual Wastewater Report to the Director on or before February 28 of the year following the year in which the information on which the report is based was collected.

6.3.5 If the approval holder monitors for any substances or parameters which are the subject of operational limits as set out in this approval more frequently than is required and using procedures authorized in this approval, then the approval holder shall provide the results of such monitoring as an addendum to the Annual Wastewater report required by this approval.

PART 7: RECLAMATION AND DECOMMISSIONING

SECTION 7.1: GENERAL

7.1.1 Within six months of the wastewater treatment plant permanently ceasing operation, the approval holder shall:

(a) submit a decommissioning and land reclamation plan to the Director; and

(b) not commence reclamation or decommissioning until the approval holder has received written authorization from the Director.

DATED March 2, 2011

DESIGNATED DIRECTOR UNDER THE ACT
TODD AASEN, P. ENG.

Town of Rocky Mountain House
2017 Lagoon Improvements Staging Plan
Wastewater Upgrading Options
Draft Report R2

wsp

- Team Members
- RFP Deliverable
  - "Develop a staged plan to upgrade lagoons for the immediate and 5 and 10 year horizons.
- Key Deliverables
  - Focusing on the immediate concern of Environment Canada, regarding toxicity failures.
- AEP Approvals
  - Town is currently meeting Provincial guidelines.
  - Future guidelines change with additional parameters.

INTRODUCTION

wsp

- Phasing
- Scheduling
- Costs

REPORT SUMMARY

- Sampling
  - To confirm if un ionized ammonia is the major issue.
  - If not additional sampling to determine other toxicants.
- PH Correction
  - If un-ionized ammonia, PH can be corrected to reduce levels, by adding chemicals (interim measure)

PHASE 0 – SAMPLING AND PH CORRECTION

- Enhanced level of T & M
- Install on-line Instrumentation
- This will provide a better understanding of how the system is operating
- Various component can be isolated (ie, The receiving end, secondary treatment, or the various cells)
- Next 5 years
- Allows optimization system

PHASE 1 – TESTING AND MONITORING

- If testing shows sludge build up contributing to high ammonia, then removal may be required.
- Two options – Biological or Physical Removal

PHASE 1 – SLUDGE REDUCTION

- Required for any future mechanical plant
- Involves coarse screening and primary treatment (filters)
- This will allow the ex. Lagoons to be used for secondary and advanced secondary treatment.

PHASE 2 - HEADWORKS

- At the time it is difficult to determine the best option.
- Previous testing and monitoring will help determine the required upgrades.
  - **Options**
    - Select sludge removal
    - Lagoon baffling
    - Additional aeration
    - Addition of natural polishing (constructed wetlands)

PHASE 3 – LAGOON UPGRADING / REPLACEMENT

- After previous upgrades, increased system loads may cause increase in un-ionized ammonia.
- This will require some form of biological nitrogen removal.
- Based on discussion with Alberta Environment, likely need to swap Phase 3 and Phase 4. Phase 4 will improve nitrogen removal and will also allow for Phosphorous removal.

PHASE 4 – NITRIFICATION UPGRADING

- PHASE 0, Sampling and PH Correction - June 2017 to October 2017
- PHASE 1, Testing - September 2017 to April/May 2018 (Design and Construction)
- PHASE 2, Headworks - September 2018 to November 2019 (Design and Construction)
- PHASE 3, Lagoon Upgrading/Replacement - 2024 to 2025 or population of 8,400 (Design and Construction)
  - At this time, a decision on continuing with the Lagoons, is a mechanical plant will most likely be required.
  - Based on AEP discussions, we may need to move Phase 4 up to 2020, possibly sooner.
- PHASE 4, Notification Upgrading - If a decision to keep lagoons is made this phase could move up to Phase 3 timeline.

SCHEDULING

- PHASE 0, Sampling and PH Correction - $60,000 to $120,000
- PHASE 1, Testing and Monitoring - $250,000 to $350,000
  - (yearly maintenance $35,000)
- PHASE 1, Sludge removal (if required)
  - $75,000 (Biological) to $225,000 (Physical)
- PHASE 2, Headworks - $2,500,000 to $4,000,000
  - (Yearly costs $40,000)
- PHASE 3, Lagoon Upgrading/Replacement – At this time to many variables to provide costs.
- PHASE 4, Nitrification Upgrading – Same as above

- Upgrades are required for two main reasons.
  - Growth (offsite services)
  - Meeting Guidelines (Utility Rates)

COSTS

wsp

QUESTIONS AND ANSWERS

wsp

AGENDA ITEM

PROJECT: Draft Bylaw 1029/17 – Corrections Bylaw		
PRESENTATION DATE: July 25, 2017		
DEPARTMENT: **MUNICIPAL**	**WRITTEN BY:** **Christine Heggart**	**REVIEWED BY:** **Rodney Boyko, Acting CAO**
BUDGET IMPLICATION: ☒ N/A ☐ Funded by Dept. ☐ Reallocation		
LEGISLATIVE DIRECTION: ☒ MGA Section 63		
STRATEGIC PLAN THEME: Well Governed and Leading Organization	**PRIORITY AREA:**	**STRATEGIES:**
ATTACHMENT(S): Draft 1029/17 Corrections Bylaw		
RECOMMENDATION: 1. That Council reviews, amends as required and grants first, second and third reading of Bylaw 1029/17 – Corrections Bylaw.		

BACKGROUND:

During the ongoing Bylaw review and clean-up process, Administration determined that Clearwater County does not yet have a bylaw to reflect the ability under the *Municipal Government Act* (MGA) Section 63 to authorize bylaw revisions (excerpt below).

Attached for Council's consideration is a draft bylaw authorizing the Chief Administrative Officer (or designate) to to correct mistakes in approved bylaws, that do not alter the substance or intent of the original bylaw. The Bylaw would only allow for corrections of clerical, typographical or grammatical errors.

MGA Excerpt Section 63 –
Division 7 - Revision and Consolidation of Bylaws

63(1) *A council may by bylaw authorize the revision of all or any of the bylaws of the municipality.* ***(2)*** *The bylaw may authorize the following:*
(a) consolidating a bylaw by incorporating all amendments to it into one bylaw;
(b) omitting and providing for the repeal of a bylaw or a provision of a bylaw that is inoperative, obsolete, expired, spent or otherwise ineffective;
(c) omitting, without providing for its repeal, a bylaw or a provision of a bylaw that is of a transitional nature or that refers only to a particular place, person or thing or that has no general application throughout the municipality;

(d) combining 2 or more bylaws into one, dividing a bylaw into 2 or more bylaws, moving provisions from one bylaw to another and creating a bylaw from provisions of another or 2 or more others;
(e) altering the citation and title of a bylaw and the numbering and arrangement of its provisions, and adding, changing or omitting a note, heading, title, marginal note, diagram or example to a bylaw;
(f) omitting the preamble and long title of a bylaw;
(g) omitting forms or other material contained in a bylaw that
can more conveniently be contained in a resolution, and adding authority for the forms or other material to be prescribed by resolution;
(h) correcting clerical, grammatical and typographical errors;
(i) making changes, without changing the substance of the bylaw, to bring out more clearly what is considered to be the meaning of a bylaw or to improve the expression of the law.

BYLAW NO. 1029/17

BEING A BYLAW OF CLEARWATER COUNTY, IN THE PROVINCE OF ALBERTA, FOR THE PURPOSE OF SIMPLE REVSIONS TO AN ADOPTED BYLAW.

WHEREAS S.63 of the *Municipal Government Act*, R.S.A. 2000 C.M.- 26 as amended, provides that a Council may by bylaw authorize the revision of all or any of the bylaws of the municipality.

NOW, THEREFORE, upon compliance with the relevant requirements of the *Municipal Government Act*, the Council of the Clearwater County, Province of Alberta, duly assembled, enacts as follows:

1. TITLE

1.1. This Bylaw may be referred to as the "Corrections Bylaw".

2. PURPOSE OF THE BYLAW

2.1 The purpose of this Bylaw is to simplify the bylaw revision process and authorize the Chief Administrative Officer or Designate to correct mistakes unnoticed in approved bylaws.

2.2 Corrections shall not alter the substance or intent of the original bylaw.

3. DEFINITIONS

In this Bylaw:

3.1 “Act” means the *Municipal Government Act*, R.S.A. 2000, Chapter M-26

3.2 "Chief Administrative Officer" or “CAO” means a person appointed by Council to the position under section 205 of the Act.

3.3 "Designate" means a person authorized by the Chief Administrative Officer to carry out the required duties.

4. CORRECTIONS

4.1 Corrections made to the original bylaw may consist of the following:

a) clerical errors
b) typographical errors
c) grammatical errors

5. EFFECTIVE DATE

5.1 This Bylaw comes into force and effect upon third and final reading.

READ A FIRST TIME this 25th day of July A.D., 2017.

READ A SECOND TIME this 25th day of July A.D., 2017.

READ A THIRD AND FINAL TIME this day 25th of July A.D., 2017.

_____
REEVE

_____
CHIEF ADMINISTRATIVE OFFICER

DRAFT

AGENDA ITEM

PROJECT: Bylaw 967/12 – Municipal Ward Bylaw Review		
PRESENTATION DATE: July 25, 2017		
DEPARTMENT: **MUNICIPAL**	**WRITTEN BY:** **Christine Heggart**	**REVIEWED BY:** **Rodney Boyko, Acting CAO**
BUDGET IMPLICATION: ☒ N/A ☐ Funded by Dept. ☐ Reallocation		
LEGISLATIVE DIRECTION: ☒County Bylaw: 967/12 Municipal Ward Bylaw		
STRATEGIC PLAN THEME: Well Governed and Leading Organization	**PRIORITY AREA:**	**STRATEGIES:**
ATTACHMENT(S): **1.Bylaw 967/12** **2. Division 7 map**		
RECOMMENDATION: 1. That Council authorizes Administration's correction to the typo in Bylaw 967/12 Municipal Ward Bylaw.		

BACKGROUND:

Recently, the Returning Officer for the upcoming municipal election received feedback that ward (division) maps were incorrect.

Administration reviewed Council's bylaw 967/12, which sets out the ward boundaries both in complete descriptions and with Schedule A map and Schedule B with a written description of the boundaries. Section 36(1) of the Local Authorities Election Act authorizes the elected authority to divide the jurisdiction into voting subdivisions and from time to time alter boundaries, although not between the time of the giving of the notice of election and election day.

The bylaw was checked against the versions of the individual division maps, used as information for prospective candidates and voters, and all were determined to accurately reflect the boundary adjustments completed prior to the 2013 municipal election.

To better visually depict and for users to identify each of the seven divisions, new version of the election division maps were created, removing all colour from the surrounding divisions – to hopefully minimize any further misinterpretation.

During Staff's review of the bylaw however, there was one typo identified in Schedule B (highlighted on page 2 of the bylaw attached), which Administration intends on correcting.

BY-LAW NO. 967/12

Clearwater County - Municipal Ward By-law

BEING A BYLAW OF CLEARWATER COUNTY (HEREINAFTER REFERRED TO AS "THE COUNTY"), IN THE PROVINCE OF ALBERTA, TO ESTABLISH WARD BOUNDARIES FOR THE COUNTY AND TO ESTABLISH THE NUMBER OF COUNCILLORS TO SERVE ON THE COUNTY COUNCIL

WHEREAS, Section 143(4) of the Municipal Government Act enables a Council to pass a bylaw specifying the number of Councillors to serve on the County Council; and

WHEREAS, Section 148(1) enables a Council to pass a bylaw requiring each Councillor to be nominated by ward and that each Councillor shall serve as the Councillor for the ward in which they were nominated; and

WHEREAS, Section 148(2) of the Municipal Government Act enables a Council to pass a bylaw to establish ward boundaries for its municipality, including the number of wards and the respective numbers for each ward in the County; and

WHEREAS, it is deemed desirable to establish new ward boundaries for the County.

NOW THEREFORE, under the authority, and subject to the provisions of the Municipal Government Act, the Council for Clearwater County, in the Province of Alberta, enacts as follows:

1. The County shall be divided into seven (7) wards as described on the attached map Schedule "A" and described on Schedule "B", and shall exclude any and all incorporated municipalities or First Nation Reserves situated therein.
2. The number of each ward shall be as per attached Schedule 'A', and one (1) Councillor shall be elected from each ward to form a Council of seven (7) members.
3. All existing Councillors at the time of passing this by-law shall remain Councillors for County and continue to represent their respective and current wards until the next general election following the adoption of this by-law.
4. All Councillors must be elected and nominated in accordance with the Local Authorities Election Act.
5. This bylaw takes effect on the final passing thereof.
6. Any and all previous by-laws or Ministerial Orders referring to ward boundaries and council size in the County are hereby rescinded.

READ A FIRST TIME this 27th day of November, A.D., 2012.

_____
REEVE

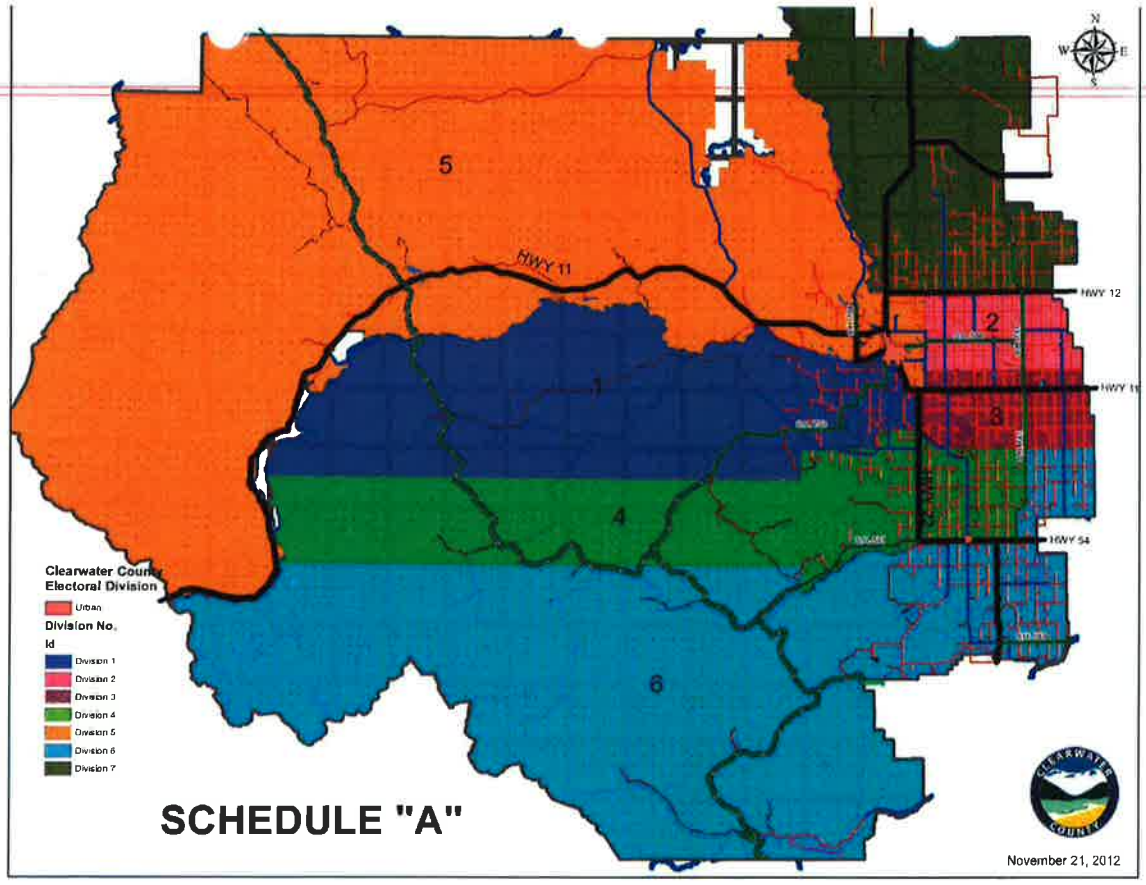
_____
CHIEF ADMINISTRATIVE OFFICER

READ A SECOND TIME this_26___ day of _February____, A.D., 2013.

READ A THIRD AND FINAL TIME this _26___ day of _February____, A.D., 2013

_____
REEVE

_____
CHIEF ADMINISTRATIVE OFFICER


N
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HWY 11
HWY 12
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4
HWY 54
6
Clearwater County
Electoral Division
Urban
Division No.
Id
Division 1
Division 2
Division 3
Division 4
Division 5
Division 6
Division 7
SCHEDULE "A"
November 21, 2012

BY-LAW NO. 763/03 - Schedule "B"

Description of Clearwater County Wards

Division 1 shall be described as all the lands within a boundary described as follows:

> Commencing at the northeast corner of N.E. 36-38-07-w5th then west following Highway 11 to the southern boundary of Town of Rocky Mountain House, then west following the southerly and westerly boundaries of the Town of Rocky Mountain House to Highway 11A, then west along the southerly boundary of Highway 11A continuing west on County road to the junction of Highway 11A and County road "Old 11A", then west on Old 11A to the westerly boundary of N.W. 05-40-09-w5, then south to the North Saskatchewan River, then south-westerly along the east bank of the North Saskatchewan River/Lake Abraham to Twp. Road 37-3, then east to the northeast corner of N.E. 13-37-9-w5, then north to Twp. Road 38-0, then east to the Rge. Rd. 7-4A, then north to Twp. Road 38-2 to the westerly boundary of Highway 22, then north to the point of commencement;

Division 2 shall be described as all the lands within a boundary described as follows:

> Commencing at the northeast corner of N.E. 20-40-04-w5th, then west along the southerly boundary of Highway 12 to the junction of Highway 12 and the Tiami Road, then south along the westerly boundary of the Tiami Road to Twp. Road 39-2 then east to the County boundary, then north following the County boundary to the point of commencement;

Division 3 shall be described as all the lands within a boundary described as follows:

> Commencing at the northeast corner of the N.E. 11-39-04-w5th, then west along Twp. Road 39-2 to the westerly boundary of the Tiami Road, then south along the Tiami Road to Highway 11, then west along the southern boundary of Highway 11 to the junction of Highway 11 and Highway 22, then south along westerly boundary of Highway 22 to the Angle Road, then south-easterly along the south boundary of the Angle Road to the junction of the Angle Road and the Arbutus Road, then east along Twp. Road 38-0 to the County Boundary then north following the County boundary to the point of commencement;

Division 4 shall be described as all the lands within a boundary described as follows:

E2

Commencing at the northeast corner of N.E. 12-38-07-w5th then west along Twp. Road 38-2 to Range Road 7-4A, then south to Twp. Road 38-0, then west on Twp. Road 38-0 to the northeast corner of N.E. 36-37-09-w5, then south to NE 13-37-9-w5, then west on Twp. Road 37-3 to the easterly bank of Lake Abraham, then south to Twp. Road 36-0, then east to the northeast corner of NE 36-35-09-w5, then south to the Clearwater River, then north-easterly following the westerly bank of the Clearwater River to Highway 54, then east on Highway 54 to the Junction of Highway 54 and Secondary Highway 761, then north on Secondary Highway 761 to Twp. Road 38-0, then west on Twp. Road 38-0 to the Angle Road, then north-westerly following the southerly boundary of the Angle Road to the westerly boundary of Highway 22, then north to the point of commencement;

Division 5 shall be described as all the lands within a boundary described as follows:

> Commencing at the westerly bank of the North Saskatchewan River within N.E. 31-44-08-w5th, then west to the Jasper Park Boundary, then south along County Boundary to the southerly bank of the North Saskatchewan River, then east along the North Saskatchewan River to the westerly boundary of N.W. 05-40-09-w5, then north to County Road "Old 11A", then east along the southerly boundary of Old 11A to the junction of Old 11A and Highway 11A, then east along the southerly boundary of Highway 11A to the Town of Rocky Mountain House, then south following the westerly and southerly boundaries of the Town of Rocky Mountain House to Highway 11, then east along the southerly boundary of Highway 11 to the junction of Highway 11 and Tiami Road, then north along the westerly boundary of the Tiami Road to Highway 12, then west to westerly bank of the North Saskatchewan River, then north to the point of commencement;

Division 6 shall be described as all the lands within a boundary described as follows:

> Commencing at the northeast corner of the N.E. 36-37-04-w5th then west on the Evergreen Road to Secondary Highway 761, then south along the westerly boundary of Secondary Highway 761 to Highway 54, then west along southerly boundary of Highway 54 to the Clearwater River, then south-westerly along the northern bank of the Clearwater River to the westerly boundary of S.W. 19-35-08-w5th, then north to the northeast corner of the N.E. 36-35-09-w5th, then west along Twp. Road 36-0 to the easterly bank of the North Saskatchewan River, then southwest following the North Saskatchewan River to the Banff Park Boundary, then south and east along the Clearwater County boundary to the point of commencement;

Division 7 shall be described as all the lands within a boundary described as follows:

SE 29 (40)-04-W5

> Commencing at the southeast corner of S.E. 29-41-04-w5th, then west along southerly boundary of Highway 12 to the west bank of the North Saskatchewan River, then northerly along the North Saskatchewan River to the northern County boundary within the N.E 13-47-08-w5th, then south along the County boundary to the northeast corner N.E. 36-44-08-w5th, then east to the northeast corner of N.E. 36-40-05-w5th, then south following the County Boundary to the point of commencement.

E2

2017 Clearwater County
Councillor Divisions

DIVISION 7

AGENDA ITEM

PROJECT: Broadband Engagement Strategy		
PRESENTATION DATE: July 25, 2017		
DEPARTMENT: **MUNICIPAL**	**WRITTEN BY:** **Christine Heggart/Rodney Boyko**	**REVIEWED BY:** **Rodney Boyko, Acting CAO**
BUDGET IMPLICATION: ☐ N/A ☐ Funded by Dept. ☒ Reallocation		
LEGISLATIVE DIRECTION: ☒None ☐ Provincial Legislation: County Bylaw/Policy (cite) Bylaw: _____ Policy:_____		
STRATEGIC PLAN THEME: Well Governed and Leading Organization	**PRIORITY AREA:** 3.3 Well-connected and supported community	**STRATEGIES:** 3.3.1 Research opportunities to further advocate and support high speed infrastructure development in Clearwater County.
RECOMMENDATION: 1. That Council endorse a broadband engagement program, including a resident and business survey, open house and continued one-on-one consultation with existing internet service providers. 2. That Council reallocates $60,000.00 from the Internet Reserve to contracted services budget for the purposes of broadband engagement program.		

BACKGROUND:

Following up with Council's discussion on Broadband Internet from the July 11 regular meeting and previous, and in the absence of a policy framework, Administration has developed a preliminary engagement strategy for Council's consideration.

Council's strategic plan supports "research into opportunities to further advocate and support high speed infrastructure development" in the County, and Administration recommends Council's next step towards its development of a broadband policy framework include community engagement program to first gauge interest in County capital investment in broadband. In order for Council to develop a policy framework that benefits the community, we need to know what the public wants and needs.

Staff recommends a representative survey of both the community-at-large (residents and businesses), as well as continuing to engage one-on-one with existing ISP and Telco service providers to keep up to speed on how they plan to move forward.

As Administration staff's workloads for 2017 are already at capacity, both streams of engagement would be completed utilizing third party consultants, and reports would be presented to Council upon completion. The broadband survey is anticipated to be developed in August, with implementation in September/October and final reports to Council in early November.

Similar to the study recently undertaken by the Town of Sundre regarding their broadband strategy, it is expected that the County's broadband engagement survey would answer the main questions of what is the community's view on internet and County investment in internet. A web-based survey and open house would be the recommended engagement forums for both residents and businesses in Clearwater County.

For the continued consultation with ISPs/Telcos, Administration would follow up to determine how they plan to meet the CRTC's 50/15 mandate, what is the anticipated internet standard going forward and over what period of time.

Following completion of public engagement program, the broadband policy framework development will take place.

AGENDA ITEM

PROJECT: Cancellation of Regular Agenda and Priorities Committee meeting in September		
PRESENTATION DATE: July 25, 2017		
DEPARTMENT: **COUNCIL**	**WRITTEN BY:** **Christine Heggart**	**REVIEWED BY:** **Rodney Boyko, Acting CAO**
BUDGET IMPLICATION: ☒ N/A ☐ Funded by Dept. ☐ Reallocation		
LEGISLATIVE DIRECTION: ☒None ☐ Provincial Legislation (cite): _____		
STRATEGIC PLAN THEME: Well Governed and Leading Organization	**PRIORITY AREA:**	**STRATEGIES:**
RECOMMENDATION: **1. That Council cancels the regularly scheduled Agenda and Priorities Committee meeting on September 18, 2017.**		

BACKGROUND:

On June 19, 2017, the Agenda and Priorities (A&P) Committee reviewed the meeting schedule leading up to the municipal election and determined the best course of action would be to cancel the regularly scheduled A&P Committee meeting on September 18 (which is also Nomination Day).

If Council supports the A&P Committee's recommendations, the A&P Committee meeting cancellation will be advertised as per policy and the MGA in the coming weeks.

Clearwater County
Councilor and Board Member Remuneration Statement

For the Year of ....2017.....

Name of Councilor / Board Member .Jim.Duncan.....

Payment Periods

January	**February**	***May***	**June**
March	**April**	**July**	**August**
September	**October**	**November**	**December**

Supervision Rate – $550.00 Monthly
Reeve Supervision Rate - $850.00 Monthly

Date	Type of Meeting Attended	First 4 Hours $159.00	Next 4 Hours $126.00	Next 4 Hours $126.00	Regular Council Meeting $288.00	Lunch $16.00	Mileage @ $0.54 / km
May 2	Provincial ASB Committee	X					
May 2	Landcare	X					40
May 3	ASB- Everdell Weed Program	X					20
May 3	Rec Board		X				40
May 9	Regular Council				X		40
May 10	FCSS Board	X					40
May 15	Canada 150	X					40
May 17	MPC	X					40
May 20	Caroline Parade	X					40
May 20	Clearwater Trails	X					145
May 23	Regular Council				X		40
May 25	Clearwater Trails	X					40
May 26	IDP Committee	X	X				40
May 31	FCM Conference travel	X	X		Supper =	$25	225

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Remuneration Calculation

11	Meetings @ $159.00=	1749.00	790	Kms @ $0.54=	426.60
3	Meetings @ $126.00=	378.00	—	Lunch @ $16.00=	
2	Meetings @ $288.00=	576.00		FCM-Meals * Receipt on File	25.00
	Supervision=	550.00			
	TOTAL=	3253.00		**TOTAL=**	451.60

Signature {Councilor / Board Member} .....

Clearwater County
Councilor and Board Member Remuneration Statement

For the Year of ....2017.....

Name of Councilor / Board Member .Jim.Duncan.....

Payment Periods

January	**February**	**May**	***June***
March	**April**	**July**	**August**
September	**October**	**November**	**December**

Supervision Rate – $550.00 Monthly
Reeve Supervision Rate - $850.00 Monthly

Date	Type of Meeting Attended	First 4 Hours $159.00	Next 4 Hours $126.00	Next 4 Hours $126.00	Regular Council Meeting $288.00	Lunch $16.00	Mileage @ $0.54 / km
June 1	FCM Conference	X	X				
June 2	FCM Conference	X	X				
June 3	FCM Conference	X	X	Receipts Attached	Hotel/Taxi Meals		
June 4	FCM Conference	X	X				
June 5	FCM Conference	X	X			X	225
June 6	IDP Committee	X					40
June 7	Rec Board	X					40
June 8	Bighorn Backcountry Com.	X					40
June 13	Regular Council				X		40
June 15	Canada 150 Committee	X					40
June 19	Agendas and Priorities	X	X				40
June 20	Canada 150 Committee	X					40
June 21	MPC	X					40
June 22	Landcare-NSWA AGM	X	X	X			40
June 23	ASB	X					40

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Remuneration Calculation

16	Meetings @ $159.00=	2544.00	745	Kms @ $0.54=	402.30
8	Meetings @ $126.00=	1008.00	1	Lunch @ $16.00=	16.00
2	Meetings @ $288.00=	576.00		FCM | Meals | Hotel	61.63
	Supervision=	550.00		* Receipts on File	1122.68
	TOTAL=	4678.00		**TOTAL=**	1602.61

Signature {Councilor / Board Member} Jim Duncan

Duncan - June/17

Date	Type of Meeting Attended	First 4 Hours $159.00	Next 4 Hours $126.00	Next 4 Hours $126.00	Regular Council Meeting $288.00	Lunch $16.00	Mileage @ $0.54/ km
June 27	Regular Council				X		40
June 28	Tri-Council	X					40
June 29	Canada 150 MC Banquet Weigh In	X					40

Clearwater County
Councilor and Board Member Remuneration Statement

For the Year of ....2017.....

Name of Councilor / Board Member ....Theresa Laing.....

Payment Periods

January	**February**	**May**	**June**
March	**April**	**July**	**August**
September	**October**	**November**	**December**

Supervision Rate – $550.00 Monthly
Reeve Supervision Rate - $850.00 Monthly

Date	Type of Meeting Attended	First 4 Hours $159.00	Next 4 Hours $126.00	Next 4 Hours $126.00	Regular Council Meeting $288.00	Lunch $16.00	Mileage @ $0.54 / km
May 9/17	Council				✓		14
May 10/17	FCSS	✓					14
May 17	WCDC	✓					14
May 17	RCLC	✓					✓
May 24/17	Fuchia Ponds.	✓					60
May 23/17	Council.				✓		✓
May 24	Nudges.	✓					145.

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Remuneration Calculation

5 Meetings @ 159.00 = 795.00✓

2 Meetings @ 288.00 = 576.00✓

Supervision-May = 550.00✓

TOTAL= 1921.00

297 km @ .54 = 160.38✓

TOTAL= 160.38

Signature {Councilor / Board Member} ....Theresa Laing.....