



January 25, 2016

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Mr. Bill Asham  
Pineridge Village Mobile Home Park  
300 Dunning Road East  
West Pine Ridge, Manitoba  
R1C 0G7

**K-168.03**

**P&R 8.268 JRCC**

**Via mail and email**

Dear Mr. Asham,

**RE: Letter Report for the Pineridge Village Trailer Park Lagoon Assessment**

JR Cousin Consultants Ltd. (JRCC) has completed this Letter Report assessing the Pineridge Village Trailer Park wastewater treatment lagoon and providing recommendations for repairs.

## 1.0 INTRODUCTION

The Pineridge Village wastewater treatment lagoon is located approximately 15 km northeast of Winnipeg, near Birds Hill Park, in the RM of St. Clements. The lagoon is a three-cell facultative lagoon currently operating under Environment Act Licence (No. 1210).

Based on a recent inspection of the lagoon site by Manitoba Conservation, a notice was issued to the lagoon owner advising that erosion had been observed on the interior of the north dike of the primary cell, and that inspection of the lagoon dikes was required by a qualified engineer to determine the extent of the erosion and to provide recommendations for repair and/or placement of rip rap. In addition, it was noted that the south dike of the secondary cell was infested with rodents and many burrows were observed during the inspection. Rodent control measures were required and burrows within the dike require repairs with compacted clay or bentonite.

The Pineridge Village Trailer Park requested that JR Cousin Consultants Ltd. (JRCC) conduct an assessment of the wastewater treatment lagoon to determine the repairs required for the lagoon to be brought into compliance with the Environment Act Licence and notice issued by Manitoba Conservation.

The assessment of the wastewater treatment lagoon was conducted during a site investigation and a review of regulatory requirements. Options for addressing these concerns have been identified in this report for consideration by Pineridge Village, to address the concerns of Manitoba Conservation.

## 2.0 PROJECT SCOPE, DESCRIPTION AND BACKGROUND

### 2.1 Project Scope

The following activities were undertaken as part of this report:

- reviewed existing documentation (i.e. past reports, mapping, geotechnical information, notices)

- reviewed provincial guidelines and regulations and the Environment Act Licence requirements for the lagoon construction and operation
- conducted site assessment and GPS survey of the existing lagoon dikes to determine the extent of the slope erosion
- reviewed field data and results of laboratory soil analysis
- completed an assessment of the quantities of materials needed for repair
- completed a letter report outlining the results of the investigation and recommending repairs
- completed cost estimates for the recommended repairs needed.

## 2.2 Project Description

This project assessed the current condition of all three of the existing facultative lagoon cells for the Pineridge Village wastewater treatment lagoon. In addition, recommendations have been provided for repairing the lagoon to meet the requirements of the Environment Act Licence (No. 1210) and the notices from Manitoba Conservation.

## 2.3 Background Information

The Pineridge Village wastewater treatment lagoon was originally constructed as a single cell lagoon in 1971 and a secondary cell was constructed in 1975. The lagoon was expanded in 1988 with the construction of a new primary cell to the north of the existing cells and the two existing cells were converted into secondary storage cells, with a portion of the intercell dike removed between the two existing cells.

The lagoon receives wastewater through the wastewater collection piping from the trailer park only. There is no truck dump into the lagoon from septic haulers, and the lagoon discharge is located in the west dike of the secondary cell.

The lagoon dikes were originally constructed with 3H:1V inner and outer slopes. Based on information from the lagoon owner, the east and west inner slopes of both the primary and secondary cells had undergone erosion in the past and was repaired by adding compacted soil material to rebuild the 3H:1V slopes, along with the addition of rip rap stone along the inner slopes to prevent further erosion.

### 2.3.1 Previous Studies

The original Clean Environment Commission Order No. 43 was reviewed for the first cell constructed along with the variation of Order No. 43 for the construction of a secondary cell. It was noted that the original lagoon primary cell constructed in 1971 had an overall depth of 4.5 m, and the original secondary cell constructed in 1975 had an overall depth of 2.4 m.

The Environmental Report for the Lagoon Expansion (JRCC, February 1988) was reviewed for background information on the design parameters, proposed development features and layout of the lagoon expansion. The 1988 lagoon expansion included construction of a new

primary cell to the north of the existing lagoon cells with a depth of 2.4 m and the conversion of the existing lagoon cells into two storage cells.

### 2.3.2 Background Geotechnical Information

A geotechnical investigation was conducted in 1988, prior to the lagoon expansion, as part of the Environment Act Proposal. This investigation included test holes excavated to the north of the original lagoon cells and the soil testing results indicated that the soil conditions were excellent for lagoon construction. Uniform heavy plastic clay existed from 150 mm below the surface to the bottom of the test holes and the permeability of the soils was estimated to be less than  $1 \times 10^{-7}$  cm/sec.

### 2.3.3 Regulatory Requirements

Environment Act Licence No. 1210 for the Pineridge Trailer Park lagoon was reviewed for site specific requirements in the construction, maintenance and operation of the lagoon. With regards to the lagoon dikes, the Environment Act Licence describes the following requirements:

- The applicant shall construct any alteration or expansion to the wastewater treatment lagoon system with clay or other suitable material such that all interior surfaces of the said expansion to the system are underlain with a minimum of 1 metre of soil having a hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec or less.
- Lagoon dykes are to be lined with clay or other suitable material to a minimum thickness of 1 metre measured perpendicular to the face of the side wall.
- The applicant shall, in the case of a physical or mechanical breakdown of the wastewater collection and/or treatment system:
  - identify the repairs required to the wastewater collection and or treatment system
  - complete the repairs in accordance with the written instructions of the Director.

## 3.0 SITE INVESTIGATION

A site investigation was conducted by JRCC on November 3, 2015 to review the site conditions and conduct a GPS survey of the existing lagoon dikes.

### 3.1 Site Observations

The existing lagoon top and outside dike slopes were covered with grasses, which had been recently cut. The dike top and outside dike slopes appeared to be in good condition, with the exception of some depressions in the intercell top of dike, possibly from vehicle travel. The lagoon cells had been recently discharged and therefore the liquid level was at an elevation of approximately 1.4 m below the top of dike elevation. Photos of the lagoon condition at the time of the investigation are attached.

### *Primary Cell*

The north and south inner slopes of the primary cell dikes were covered with longer grasses and had exposed and eroded soil. The east and west inner slopes of the primary cell dikes were covered with rip rap stone from the top of the dike to the cell floor.

### *Secondary Cell*

The north and south inner dike slopes of both secondary cells were covered with thick grass, reeds and cattails. The east and west perimeter dike inner slopes were covered with rip rap stone and long grass from the top of dike to the cell floor. The remaining intercell dike between the two secondary cells was covered with long grasses and reeds. A channel had been cut between the intercell dike, connecting the two secondary cells.

## **3.2 Topographic Investigation**

A topographical survey was conducted of the lagoon dikes using GPS survey equipment, to determine the existing dike slopes and the extent of the erosion of the dikes, as identified by Manitoba Conservation. The average top of dike elevation was recorded at 233.35 m and the average water level in the lagoon cells was recorded at 231.92 m.

## **4.0 LAGOON DIKE ASSESSMENT**

The inner slopes of the lagoon dikes were compared to the design slopes [3H:1V] to determine the extent of erosion. Based on the topographic survey of the lagoon inner dike slopes, the inner slopes of the primary cell have experienced erosion and require repair.

### *Primary Cell*

Based on site observations and the GPS survey, the inner slope of the primary cell north dike has experienced significant erosion which has changed the slope to steeper than 3H:1V. There was only minor erosion detected on the inner slope of the primary cell south dike that also requires repair. The location of erosion is indicated on the attached plan. While there was only minor erosion indicated by the survey of the south dike inner slope, it was observed that erosion is occurring along the full length of this dike, but at a slower rate than the north dike. The erosion along the inner slope consisted of a 0.4 m – 0.8 m near vertical drop in the dike slope beginning at an average of 0.5 m below the top of dike, as seen in the photos attached. From the bottom of the drop the dike appeared to continue at a 4:1 or 5:1 slope to the cell floor, due to accumulation of eroded soils.

Based on the topographic survey, the dikes will require approximately 525 m<sup>3</sup> of soil material to reconstruct the inner dike slopes to 3H:1V. While the inner dike slopes have experienced erosion, it is unlikely that the lagoon liner has been compromised, given the nature of the lagoon construction. The full cross section of the lagoon dikes were constructed with compacted high plastic clay material, with no distinct vertical cut-off wall. As the entire 3 m thickness of the centre of dike is not affected by the erosion, it is likely that a minimum 1 m thickness of soil material at  $1 \times 10^{-7}$  cm/sec or less is still maintained.

### *Secondary Cell*

The inner slopes of the secondary cell dikes have not experienced any significant erosion requiring repair. The vegetation growing on the inner dikes however does require regular trimming to a height of no more than 0.3 m, to ensure the roots do not create permeable channels through the dikes. The small ruts on the intercell dike top also requires some minor repairs for ease of future grass maintenance.

## **5.0 LAGOON DIKE REPAIR STEPS**

Steps considered for the lagoon inner dike repairs on the primary cell only included:

- Step 1 - adding compacted high plastic clay soil to the inner dike slopes (north and south dike) to achieve a slope of 3H:1V
- Step 2 - adding rip rap stone on the surface of the repaired 3H:1V slopes (north dike only)
- Step 3 (optional) - adding rip rap stone on the surface of the repaired and existing 3H:1V slopes (south dike only).

Costs for the above steps were included in Section 6.0 below.

### **5.1 Compacted Soil**

#### *Step 1*

The soil material required for the inner slope repair could likely be obtained from the lagoon owner's land surrounding the lagoon cells, as the geotechnical investigation from the 1988 lagoon expansion indicated consistent high plastic clay soils at the site. To add soil material to the inner slopes, the lagoon owner would need to ensure that construction works occur shortly after the lagoon cells are discharged and liquid levels are low, and allowing the inner slopes to dry slightly. Drier conditions on the inner slopes would make compacting the soils on the slope more effective. Shaping of the inner dikes would also be required prior to placing the soil material, for ease of construction and compaction.

### **5.2 Rip Rap**

#### *Step 2*

This step requires adding a layer of rip rap stone on the repaired slope of the primary cell north dike. This step is recommended, due to the extent of the erosion experienced on that slope.

Rip rap stone would be placed on the inner slope to reduce/prevent soil erosion from wave action. A non-woven geotextile would first be placed on the dike slope prior to placing the rip rap stone. The minimum recommended amount of rip rap would extend from 0.6 m above the high water level to the discharge pipe invert depth (0.3 m above the cell floor). The rip rap stone would consist of 150 mm to 300 mm clean limestone or granite rock, depending on local availability. If similar rip rap stone material as that utilized on the east and west dike slopes could be obtained, that would also be suitable.



### Step 3 (Optional)

This step requires adding a layer of rip rap stone on the repaired and unrepaired inner slope of the primary cell south dike. This step is also recommended, however as this dike has not experienced erosion at the same rate as the north dike, it can be completed after the north slope is covered in rip rap, if the owner wishes to complete the works in phases.

## 6.0 COST ESTIMATE

The cost estimate is based on the steps outlined in Section 5.0 above, for the repair of the existing lagoon dike inner slopes, including excavating soil from a surrounding borrow area, shaping the inner slopes, placing and compacting soil material, placing geotextile fabric, and placing rip rap stone as indicated above. Costs for mobilization and demobilization have only been included once, however if the owner conducts the works in phases requiring a contractor to mobilize and demobilize more than once, this cost would be additional. Costs for engineering services in preparing the Notice of Alteration, design work or site supervision have not been included.

This cost estimate is based on information obtained during the site investigation and survey, and is an opinion of probable construction costs. This opinion is based on assumptions as to the actual conditions that will be encountered onsite; the specific decision and design of other design professionals engaged i.e. geotechnical soils analysis; the means and methods of construction the contractor will utilize; the costs and extent of labour, equipment and materials the contractor will employ; contractor's techniques in determining prices and market conditions at the time; and other factors over which JRCC has no control. Given the assumptions that must be made, JRCC cannot guarantee the accuracy of the cost estimate.

The following is the summarization of the capital costs for the overall required works for a 2016 construction season. The detailed cost estimates have been attached. The costs for each year after 2016 should be adjusted per prevailing inflation and market conditions. A contingency value of 15% has been included in the cost estimate. GST costs have not been included.

### Class C Cost Estimate

Description	Total
Step 1 – Repair Erosion with Compacted Soil	\$22,800
Step 2 – Add Rip Rap Stone to North Slope	\$67,300
Step 3 – Add Rip Rap Stone to South Slope	\$67,300
<b>Total Construction</b>	<b>\$157,400</b>

## 7.0 CONCLUDING REMARKS

This lagoon assessment report indicated that significant erosion has occurred along the north inner slope of the primary cell and minor erosion was noted along the south inner slope of the primary cell. No notable

erosion was detected along the inner slopes of the secondary cell. Repairs to the inner dike slopes of the primary cell are required and would consist of:

- Excavating high plastic clay soil material from the land surrounding the lagoon cells as borrow material.
- Shaping the inner dike slopes of the primary cell where soil placement is required.
- Placing and compacting this borrow soil material onto the inner dike slopes of the primary cell to obtain a 3H:1V slope, based on the original lagoon design.
- Placing geotextile fabric on the repaired slopes.
- Placing rip rap stone on the geotextile at a height of 0.6 m above the maximum liquid level (1.5 m) and extending to the cell floor.

### Next Step

The next step in the process is for the lagoon owner to decide on an option for repair of the lagoon dikes, and submit a notice of alteration to Manitoba Conservation for review, which outlines the described lagoon repair methodology. Once the notice of alteration is accepted by Manitoba Conservation, lagoon repair works can commence.

If you have any questions, please contact the undersigned.

Yours truly,

**JR Cousin Consultants Ltd.**



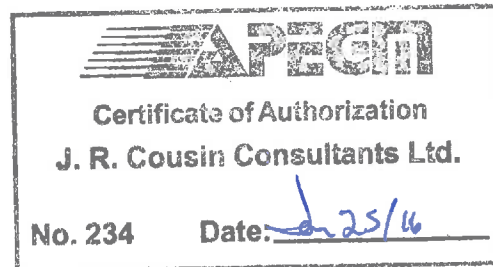
Oswald Wohlgemut, M.Sc.  
Environmental Scientist

Reviewed by:


T.J. Schatkowsky, Eng.  
Senior Municipal Engineer

Attach Lagoon Slope Repair Layout Plan  
Photos  
Detailed Cost Estimates



## **Attachments**

Lagoon Slope Repair Layout Plan

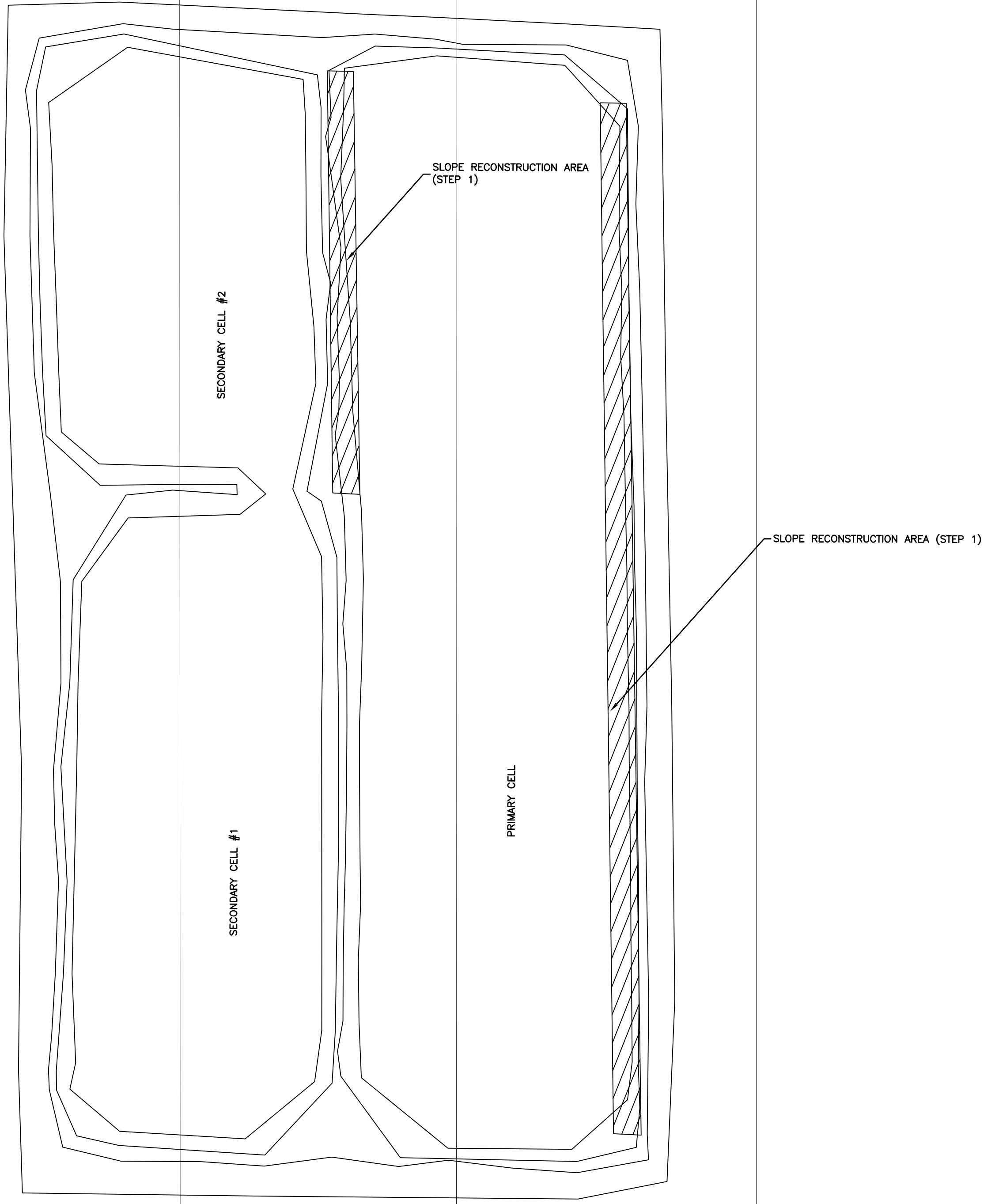
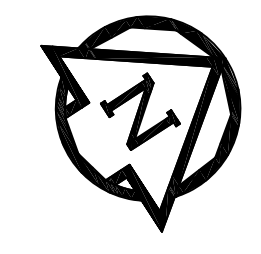
Photos

Detailed Cost Estimates



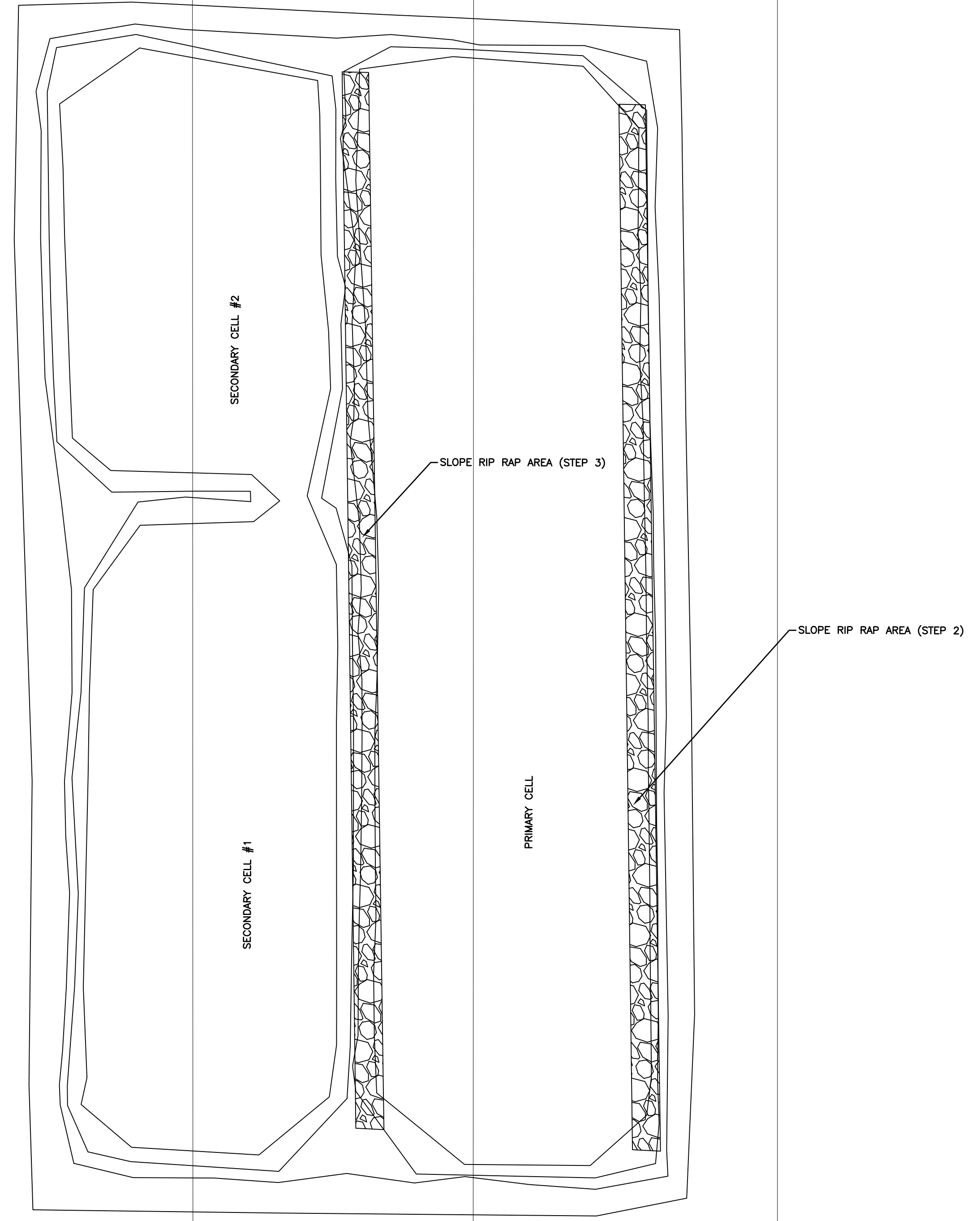
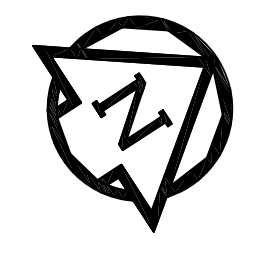
# Lagoon Slope Repair Layout Plan

ROSS FARM ROAD

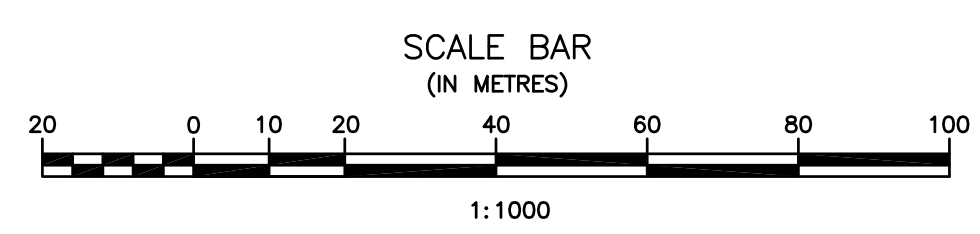


DIKE SLOPE RECONSTRUCTION LOCATION

ROSS FARM ROAD



DIKE SLOPE RIP RAP PLACEMENT LOCATION



No.	REVISIONS	DATE	INITIALS

B.M. EL.

LOCATIONS OF UNDERGROUND STRUCTURES/UTILITIES AS SHOWN ARE BASED ON AVAILABLE INFORMATION BUT NO GUARANTEE IS GIVEN OR IMPLIED THAT ALL EXISTING UNDERGROUND STRUCTURES/UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL UNDERGROUND STRUCTURES/UTILITIES MUST BE OBTAINED FROM THE APPROPRIATE AUTHORITY/OWNER, BY THE CONTRACTOR, BEFORE PROCEEDING WITH CONSTRUCTION.

PRELIMINARY

ENGINEER'S SEAL

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ENGINEERING EXCELLENCE SINCE 1981

CODE: K-168.03	PROJECT: KEASCHELL PARKS LTD PINERIDGE VILLAGE LAGOON ASSESSMENT
DESIGNED BY: SC	TITLE: LAGOON SLOPE REPAIR LAYOUT PLAN
DRAWN BY: SC	
REVIEWED BY: OW	
SCALE: 1:1000	DATE: 16/01/20
PLAN: 01	SHEET: 01 of 01

Jan 20, 2018 - 1:08pm - C:\Users\jrc\OneDrive\Documents\Projects\16823\_Pineridge Village Lagoon Assessment\04\_Design\Drawings\Design Plans\Designing

Photos



Photo 1: Existing rip rap stone on west slope of primary cell



Photo 2: Erosion on south slope of primary cell





Photo 3: Erosion on north slope of primary cell



Photo 4: Vegetation growth on slopes of Secondary Cell #2





Photo 5: Vegetation growth on slopes of Secondary Cell #1



Photo 6: Portion of dike removed between Secondary Cells #1 and #2



## Detailed Cost Estimates

# COST ESTIMATE

F:\100\168 Keaschell Park\168.03 Pineridge Village Lagoon Assessment\18 Cost Estimates\Cost Estimate for Existing Cell Repair.xlsx\CELL REPAIR

**PINERIDGE VILLAGE LAGOON REPAIR** **K-168.03**  
**PRELIMINARY COST ESTIMATE**  
**Dike Repair and Rip Rap Cost Estimate**

Description	Quantity	Unit	Unit price	Total
<b>Step 1 Dike Repair for Primary Cell Dikes</b>				
Mob and Demob	1	lump sum	\$5,000.00	\$5,000
Cut and Shape Inner Dike Slope	425	metre	\$10.00	\$4,300
Excavation from Borrow and Placement to Repair Dikes	525	cu. metre	\$20.00	\$10,500
			<u>Construction Costs</u>	<u>\$19,800</u>
Contingencies	15	percent	\$	3,000
			<u>Non-Construction Costs</u>	<u>\$ 3,000</u>
			<b>Subtotal \$</b>	<b>22,800</b>
<b>Step 2 Rip Rap for North Dike of Primary Cell</b>				
Filter Cloth for Rip Rap	1,950	sq. metre	\$2.50	\$4,900
Rip-Rap on Slope	1,950	sq. metre	\$27.50	\$53,600
			<u>Construction Costs</u>	<u>\$58,500</u>
Contingencies	15	percent	\$	8,800
			<u>Non-Construction Costs</u>	<u>\$8,800</u>
			<b>Subtotal</b>	<b>\$67,300</b>
<b>Step 3 Rip Rap for South Dike of Primary Cell (Optional)</b>				
Filter Cloth for Rip Rap	1,950	sq. metre	\$2.50	\$4,900
Rip-Rap on Slope	1,950	sq. metre	\$27.50	\$53,600
			<u>Construction Costs</u>	<u>\$58,500</u>
Contingencies	15	percent	\$	8,800
			<u>Non-Construction Costs</u>	<u>\$8,800</u>
			<b>Subtotal</b>	<b>\$67,300</b>
			<b>OVERALL TOTAL: \$</b>	<b>157,400</b>