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BURNCO AGGREGATE PROJECT, HOWE SOUND, BC

Erosion and Sediment Control Plan

Submitted to:
BURNCO Rock Products Ltd.
1A, 2760 Emerson Street
Abbotsford, BC
V2T 3J6

Attention: Derek Holmes

REPORT

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1.0 INTRODUCTION

The BURNCO Aggregate Project (the "Project") is located on a flat, glacial fan-delta deposit comprising sand and gravel on the west shore of Howe Sound in Thornbrough Channel, north of Gambier Island. The Project is located approximately 22 kilometres (km) west-southwest of Squamish and 35 km northwest of Vancouver (Figure 1), with geographic coordinates of 49° 34' 00"N, 123°23' 20"W. Detailed Project description and plans can be found in the BURNCO Aggregate Project Description report (Golder 2011).

This Erosion and Sediment Control Plan (ESCP) addresses recommendations in the *Joint Application Information Requirements for Mines Act and Environmental Management Act Permit* and *Technical Guidance 3* of the *Environmental Management Act* (BC Ministry of Energy and Mines [MEM] and BC Ministry of Environment [MoE] 2014, BC MoE 2015).

The purpose of this ESCP is to present strategies and measures for the prevention of erosion and subsequent sediment transport during the surface preparation, construction, operation and closure phases of the Project. This includes plans for the mine site, access roads and utility corridors.

2.0 SCOPE

This document provides an overview of best management practices, site conditions and Project overview, areas susceptible to erosion and sediment transport, proposed erosion and sediment control measures and structure locations, ESCP implementation, and applicable monitoring plans. This report does not does not include detailed discussion on the marine environment and proposed barge loading facilities.

With surface soil reclamation for habitat and ecosystem restoration, and a fresh water lake proposed for the pit area after closure; the average annual soil loss rates under natural and undisturbed conditions for the site will not vary considerably from post disturbance conditions. Therefore, a detailed soil loss and sediment yield prediction using the Revised Universal Soil Loss Equation for Application in Canada (RUSLEFAC) was not conducted for this assessment.

3.0 SITE CONDITIONS

The following information has been summarized from existing Golder reports (Golder 2010, 2011, 2013 and 2016).

3.1 Physiographic and Geologic Setting

The Project Area is located on a generally flat, unconsolidated sand and gravel fan-delta near sea level (10 to 50 metres [m] above sea level [asl]). The fan-delta is located at the mouth of a glaciated coastal mountain valley that terminates on the northern shore of the Howe Sound fjord. The Project Area is located west of McNab Creek, the active stream that transects the fan-delta.

Bedrock of the Coast Plutonic Complex underlies the valley area and is composed mainly of granitic type rocks. The buried bedrock surface is likely to be undulating and irregular, with the thickness of the overlying sediments ranging between about 50 to 100 m (Golder 2011).

3.2 Soils, Vegetation and Climate

Soils Project Area are assumed to be Capilano and Delta, and possibly in small areas, Banford soils (Golder 2016). Capilano and Delta soils are noted as fine to coarse textured deltas and glacial outwash deposits that are well to rapidly drained and varying from non-stony to excessively stony. Branford soils are comprised of organic material floodplains; it is likely that any existing organic materials have already been heavily disturbed. Soils within the Project Area have been rated as Fair to Poor for reclamation suitability (Golder 2016a).

The Project is located in the Coastal Western Hemlock very wet maritime biogeoclimatic zone, submontane (CWHvm1) variant (Golder 2011). The area consists of a wet climate, with cool summers and mild winters with relatively little snow and a prolonged moderate temperature growing period. Precipitation is predominantly rain, with occasional snowfall.

3.3 Key Watercourses

The Project site comprises a portion of the McNab Creek valley and watershed which contains several watercourses that flow into the marine foreshore of the Project Area. Three watercourses are located near the Project boundary and include: McNab Creek, Harlequin Creek, and a small ephemeral watercourse (WC5).

The lower 1 km reach of the McNab Creek is located between 50 and 200 m north and northeast of the Project boundary. The fish-bearing stream has a low-gradient channel dominated by gravel and cobble bars. This lower reach was deemed to have a Moderate to High risk of avulsion; setbacks and training berms (flood control) were recommend in previous studies (Golder 2013) and have been applied to the Project.

The fish bearing Harlequin Creek flows eastward towards the western Project boundary before turning and flowing south toward Howe Sound along the west side of an existing logging road (Figure 2). The stream flows under the logging road bridge a short distance upstream from its mouth on Howe Sound.

Another small, ephemeral unnamed watercourse (WC5) flows through an existing cutblock immediately north of Harlequin Creek. This stream flows into an interception ditch along an existing road, and eventually drains into the marine foreshore of the site (Figure 2). The watercourse was noted as potentially being fish bearing, experiencing limited flows during summer months.

4.0 PROPOSED PROJECT OVERVIEW

4.1 Project Description

The Project has three general stages: construction, including surface site preparation; operations (aggregate extraction and processing and progressive reclamation) and mine closure. Project components comprise the aggregate pit area, a processing area, constructed berms along the northern and southern Property boundaries and along the processing area, and a barge-loading facility (Figure 2). All components of the Project will be outside of existing riparian areas and mature forest stands, and will not encompass any natural watercourses.

The proposed sand and gravel aggregate pit development is located within a 70 hectare [ha] clearcut that was logged between 2002 and 2004 (Figure 2). As proposed sand and gravel extraction proceeds through the Project's life span, soil will be salvaged and stockpiled in designated Soil Deposit Areas Figure 2). This material will be combined with the inorganic fines extracted during processing, and will be used for future site reclamation (Golder 2016a).

The processing area will be located in cleared areas near existing warehouses and land-based log sorting areas south of a BC Hydro right-of way (RoW). The sorted aggregate products will be conveyed from the processing area to barges via a barge-loading facility located within an existing foreshore lease and log dump area at the southwest corner of the Property (Figure 2). An existing gravel road along western side of the valley will be utilized as a haul road during all phases of the Project (Figure 2). BURNCO has no plans to improve the direct road access to the site.

To address extreme high flow and accommodate the 1 in 200 year return period for McNab Creek, the McNab Creek Flood Protection Dyke construction is proposed to the north of the pit and the Pit Lake Containment Berm to the south of the pit (Golder 2010). Fines produced during processing will be transported from the Processing Area to the northern portion of the Project property, and stockpiles in the Fines Storage Area alongside of the northern flood control berm. A Processing Area Dirt Berm will also be constructed along the Property boundary of the processing area (Figure 2).

Final site reclamation will include development of a ground- and surface water-fed pit lake and Pit Lake Containment Berm and landscape re-contouring and revegetating as per Project habitat and ecosystem recommendations.

4.2 Water Management Plans

Water management plans for the Project are summarized below and are based on existing surface water and hydrologic and hydraulic characterization reports (Golder 2010).

The surficial soils are highly permeable; the primary approach to stormwater management is collection and infiltration. No point source discharges of surface water are proposed. Within the processing area, water will be recycled from settling ponds; processing water will not be discharged. A backup stormwater management system will include a pumping system which will convey excess storm water to either the aggregate washing system or into the pit lake.

Surface water runoff from slopes above the western portion of the Project Area will be collected in the existing ditch and will not reach the soil management sites. Runoff on-site will be directed away from the stockpile, dyke and berm areas and collected within the Project Area. Excess stormwater will be directed to the aggregate washing system or into the pit lake (Golder 2016).

5.0 EROSION AND SEDIMENT CONTROL

5.1 Erosion and Sediment Sources

5.1.1 Soil Erosion Susceptibility

Potential sources of erodible soils include: areas cleared during surface preparation (i.e., clearing and grubbing); salvaged soils used for dyke and berm construction, and stockpiled soils generated during construction and operational stages. Existing roads outside of and adjacent to the western Project boundary may also be prone to erosion due to increased traffic. The associated ditch that will convey diverted flow from the ephemeral watercourse may be subject to erosion during storm events

Soils are coarse textured and will be susceptible to erosion by water but will have relatively low potential for sediment transport. Fine textured soils will be produced during processing of the aggregate but and will be managed to reduce erosion potential as discussed in the Project Reclamation and Effective Closure Plan (Golder 2016). It is expected that standard sediment control practices will effectively limit transport of the majority of any entrained sediment.

Segregated fines produced in the Processing Area will be susceptible to both water and wind erosion; with a high potential for sediment transport. Produced fines will be subject to separate handling and storage processes with storage areas designed to mitigate erosion and sediment transport.

Stockpiled soils and constructed berms may take a number of years to regain characteristics required to support the targeted post closure ecosystems. Potential consequences of soil erosion include loss of growing medium for end land use objectives, and sediment transport to sensitive receptors.

Any significant erosion caused by traffic on the existing road could potentially introduce sediment into adjacent ditches and watercourses. Traffic along the road will be limited to vehicles accessing the site during construction/closure, and during operations transporting salvaged soil from the Processing Area (fines management) and aggregate pit areas. Ditches and watercourses will require erosion control measure to mitigate potential road use erosion, or accidental haul truck material loss.

5.1.2 Critical Areas

Critical areas with sensitive receptors include the existing haul road crossings of watercourse WC5, an approximately 200 m section of haul road that lies immediately adjacent to the lower reach of Harlequin Creek (across from Processing Area), and Property boundaries adjacent to mature second growth forests along McNab Creek and the existing BC Hydro Right of Way (Figure 2).

5.2 Best Management Practices

Erosion and Sediment control Best Management Practices (BMPs) are intended to reduce erosion by stabilizing exposed soil or reducing surface runoff flow velocity and to mitigate sediment transport to sensitive receptors (BC Ministry of Energy and Mines, Volume I and II 2002). BMPs guide effective management of surface water and sediment runoff by:

- Limiting land disturbance, where possible;
- Avoiding sediment entrainment by isolating and/or diverting surface water from disturbed areas;
- Reducing water velocities across the ground (e.g., surface roughening and re-contouring specifically in wet areas);
- Preventing rill erosion of steep slopes by utilizing cover practices (e.g., mulch, matting);
- Protecting natural drainages and ditches connected to sensitive receptors (e.g., check dams, sediment traps, armouring channels);
- Constructing BMP protective works downslope of disturbed sites and along the toe of bank above high water mark (e.g., silt fencing); and,
- Progressively rehabilitating disturbed land and restricting access to rehabilitated areas.

Erosion and sediment control strategies are associated with earthworks, steep slopes, works in and near watercourses, road and ditch maintenance, and weather shutdown guidelines. All earthworks, including hauling along existing road, should be carried out under dry conditions. If earthworks must be conducted under wet conditions, work should be restricted to areas that will not increase sediment erosion and sites should be assessed for properly functioning structures and back up erosion control measures as required. Descriptions of planned BMPs actions and control measures for the above noted site activities are provided below.

5.2.1 Surface Roughening / Re-contouring

On-site grade reworking will be conducted during dry conditions to minimize erosion potential. Ground reworking will provide short term or semi-permeant erosion control for bare soil and where vegetation cover has yet to be established. Surface roughening methods, such as track walking, will allow for an increase of surface water infiltration, help reduce erosion, and support vegetative cover by providing more favorable moisture conditions and helping seed germination. Re-contouring creates shorter slope lengths and creates small troughs or irregular surfaces that can reduce surface flow velocity. Earthworks are typically carried out by a tracked machine with an appropriately experienced operator.

5.2.2 Vegetation and Stabilizing Covers

Natural and synthetic slope covers aid with erosion control and vegetation management on-site.

5.2.2.1 Mulches

Mulches are a protective layer of plant residue (e.g., straw, wood/brush fibre and chips, bark) or inorganic material (e.g., chemical based). Mulches provide temporary erosion protection in areas awaiting grading works or revegetation (United States Environmental Protection Agency (US EPA) 1976). Mulches conserve soil moisture, insulate soil, dissipate energy from rain drops, and can suppress week growth. Material used for mulching must be clean of potential contaminants (e.g., undesirable seed species, chemicals used for wood processing).

5.2.2.2 Other Erosion Control Covers

Erosion control revegetation matting (ECRM) and geosynthetic sheets can be used to cover non-vegetated slopes along the dyke and berms in addition to or in place of mulching if mulching is unsuccessful. The covers should be fitted to the groomed ground surface and anchored with stakes or rocks (Ministry of Transportation and Highways 1997).

5.2.3 Check Dams and Ditch Armouring

BMPs for ditches include installation of check dams, channel armouring, and adequate connectivity to sediment pools. Check dams are small temporary rock dams that will be placed along the existing ditch. Check dams act to reduce flow velocities, encourage sediment settling and provide temporary storage of sediment. Armouring ditches (e.g., with riprap or channel liners) where bank or channel erosion is likely will also aid in dissipating energy and sediment transport potential. Check dams and armouring are long term erosion control structures that require regular inspection.

5.2.4 Silt Fencing

Silt fence will be installed as perimeter barriers along outer Project boundaries and along the edge of the existing road along Harlequin Creek – (across from the Processing area). Silt fences are temporary barriers constructed of geotextile fabric supported by posts anchored in the ground. The fabric is keyed into the underlying soil between the posts. Silt fences are typically placed at catch points along toe of slopes, and along the toe of bank of watercourses. Placement allows for maximizing ponding and settlement of sediment. These structures limit sediment transport by filtering sediment from sediment laden runoff.

Where sediment volume is greater than 30% behind silt fences, capacity should be addressed and cleaning carried out as required. Silt fencing requires regular inspection and will be phased out as dyke and berm slopes stabilize with vegetation.

BMPs for ESCP Implementation and Monitoring are discussed in Section 7.0.

5.2.5 Temporary Sediment Traps

As a backup measure, sediment traps may be required upslope of road crossings along at Harlequin Creek and the WC5 watercourse. Sediment traps are small temporary basins created by excavation or construction of an embankment that intercept and temporarily retain sediment laden runoff in order to facilitate sediment settling (US EPA 1976). General BMP design criteria for sediment traps are listed below; and are modified from sediment trap/pool guidelines (BC MoE 2001, 2011, 2015; BC Ministry of Forests [MOF] 2002, 2012; US EPA 1976):

- Located in area to obtain maximum storage, facilitate clear out and disposes of trapped sediment to minimize construction interference;
- Designed as a minimum to withstand a 1 in 200-year flood event;
- Trap allowed to fill with sediment to 50% of its effective depth with 1.5 m minimum depth of trap liquid above sediment;
- An energy dissipater should be located at inlet;
- Outlet/discharge should be armoured; and,
- Include suitable monitoring plans.

6.0 PROPOSED EROSION AND SEDIMENT CONTROL MEASURES

The following sections describe the Project activities and measures to be implemented for erosion and sediment control. Activities and erosion control measures are discussed for each stage of the Project: construction including surface preparation, operation, and reclamation and closure (to meet end land use objectives).

Figure 2 presents an overview of proposed erosion and sediment control measures for surface preparation, construction and operation activities. Figure 3 provides an overview of erosion and sediment control measures for closure and post closure activities.

Erosion and sediment control measures will be installed prior to surface preparation, maintained throughout construction and operations, and monitored following closure. Monitoring plans are discussed in Sections 7.0 and 8.0.

6.1 Construction

6.1.1 Surface Preparation

Prior to initiation of site preparation, the limits of clearing will be clearly demarcated with snow fencing or similar material. Site preparation will include grading, dyke and berm construction, compaction and placing of gravel base within the Project Area and limited improvements to existing access roads and infrastructure. Wet weather shutdown guidelines will be established at the outset and clearing and grubbing activities will be halted based on these guidelines.

Where clearing limits coincides with Project boundaries and in areas of mature second growth forests along McNab Creek and the BC Hydro Right of Way, temporary bales composed of straw and clear brush material will be placed across the bases of berms and preliminary soil stockpiles to intercept sediment with increased flow velocities. Once dyke and berm construction has commenced, silt fencing will be installed along the base of the northern dyke and southern berms. Based on initial inspections (see Section 7.1), silt fencing may be required along the eastern Property Area between the two berms.

Any earthworks to take place near streams WC5 and Harlequin Creek will be preceded by installation of temporary silt fencing and gravel berms (where feasible) along the length of the road. Check dams may be installed if temporary measures are not trapping eroded sediment. If in-stream works are required (e.g., culvert replacement or repair), the work should be undertaken during low flow periods and may require temporary flow diversion.

With respect to road use, where runoff from main roads has the potential to transport sediment to sensitive areas, riparian areas will be maintained, and check dams will be installed at appropriate intervals along the existing north-south access road ditch (see Figure 2). All cross-drain culverts and outlets will be armoured with riprap. If substantial road use erosion and sediment transport is observed, and erosion control measures are not detaining sediment, the necessity for additional silt fencing or small sediment traps at watercourse crossings may be required. Specifically, silt fencing should be installed along the length of the ditch from WC5 crossing and north to the Project boundary area. Also, small scale sediment traps could be installed at the south end of the ditch immediately upstream of the road crossing of stream WC5, and at the Harlequin Creek crossing along just southwest of the processing area.

Temporary soil stockpiles created during earthworks and preliminary salvage will be protected from erosion by covering with straw mulch or erosion control revegetation matting (ECRM's) or by revegetation.

6.1.2 Construction Activities

Table 1 below provides a summary of construction activities and recommended erosion control measures. Refer to Figure 2 for overview of erosion control structure locations.

Table 1: Construction Phase Erosion and Sediment Control Plan

Project Area/ Activities	Erosion/Sediment Concern	Control Measures	Description/Purpose
Processing Area/Adjacent Road	Earthworks on site and vehicle traffic to/from site could potentially generate and deliver sediment to Stream WC5, Harlequin Creek and foreshore area	Silt fencing, gravel berms along road edge Wheel wash, gravel pads Processing Area Dirt berm construction	Mitigate transport of sediment to areas of sensitive receptors outside of processing area
Dyke and Berm Construction (McNab Creek Flood Protection Dyke, Pit Lake Containment Berm, Fines Storage Area, Processing Area Dirt Berm)	Slope rilling, erosion and sediment transport outside of Project Area boundaries (forested area leading to McNab Creek and BC Hydro RoW) Sediment erosion and transport within Project Area at base of Fines Storage Area and soil stockpiles near edge of aggregate pit; potentially leading to deterioration of available topsoil Loss of sediment through erosion may lead to deterioration of dyke and berm function.	Silt fencing along Project perimeters	Temporary straw and clear brush material made into bales and placed across base of stockpiles and berm to intercept sediment with increased water flow velocities Implementation of geotextile silt fences at base of slopes to inhibit transport of eroded sediment (fines) to areas outside the Project boundary
		Apply erosion control revegetation matting (ECRM) to slopes	Temporary organic cover (straw mulch) to protect soil slopes from erosion until appropriate growing medium and vegetation can be applied
		Vegetation covers (top soil and seeding)	Ongoing application of suitable growth medium / seeding and fertilizing for vegetation to stabilize slopes typically at gradients of 2:1 of less Slope gradients steeper than 2:1, may experience sloughing and erosion downslope. Eroded sediment will be trapped by silt fencing at base of slope along perimeters and transported back to stockpile or soil deposit area
Soil Stockpiling (soil deposit areas)	Erosion and sediment transport within Soil Deposit area and along aggregate pit perimeters Deterioration of topsoil (collapse of soil structure, loss of nutrients) available topsoil during pre-clearing; deterioration of soil available for reclamation	Erosion control revegetation matting; application of straw mulch to slopes Vegetation covers (top soil and seeding)	Temporary organic cover (straw mulch) to protect soil slopes from erosion until appropriate growing medium and vegetation can be applied Ongoing phased application of suitable vegetation to stabilize slopes; re-grading/stockpiling of sloughed soil

Project Area/ Activities	Erosion/Sediment Concern	Control Measures	Description/Purpose
Existing haul road ditch north of WC5 crossing	Increasing transport of fine material along ditch leading to WC5 watercourse	Armour WC5 crossing outlets with riprap and/or geotextile Ditch line armour, check dams; potential installation of along-ditch silt fencing Potential installation of sediment trap upstream side of inlet of Stream WC5 crossing structure	Permanent measures to be maintained to limit erosion and sediment by reducing flow velocity in ditches If deemed necessary, temporary silt fencing can be installed along edge of road during wet seasons or high flows/ precipitation events If deemed necessary, a small sediment trap will aid in the removal of sediment before reaching WC5
		Resurfacing with coarse gravel in sections where exposed fines occur Routine watering during dry periods	Minimize dust along roads and reducing sediment available for transport to adjacent ditch and watercourse
Aggregate Pit Development	Tracking of sediment onto haul roads; deterioration of future phase topsoil	Wheel wash, gravel pads	Use of wheel wash facilities and/or gravel pads will mitigate tracking of sediment to areas outside of the pit

6.2 Operations

Table 2provides a summary of operations based Project activities and recommended erosion control measures. Refer to Figure 2 for overview of erosion control structure locations.

Table 2: Operation Phase Erosion and Sediment Control Plan

Project Area / Activities	Erosion/Sediment Concern	Control Measures	Description / Purpose
Processing Area/Adjacent Road	Sediment delivery to Harlequin Creek due to increased road traffic and area, and transport of Fines from Processing Area to Fines Storage Area egress sites	Silt fencing, gravel berms along road edge to Harlequin Creek Wheel wash installations/gravel pads Processing Area Dirt Berm maintenance	Temporary perimeter sediment barriers to mitigate off-site sediment transport. Check dams will decrease flow velocities and facilitate temporary sediment storage
Dyke and Berm Maintenance (McNab Creek Flood Protection Dyke, Pit Lake Containment Berm, Fines Storage Area, Processing Area Dirt Berm)	Erosion and sediment transport within Project Area at base of Fines Storage Area and soil stockpiles near edge of aggregate pit; potentially leading to deterioration of available topsoil Loss of sediment through erosion may lead to	Temporary slope cover (straw mulch) until revegetation is established	Temporary straw and clear brush material made into bales and placed across base of stockpiles, dyke and berm to intercept sediment with increased water flow velocities Implementation of geotextile silt fences at base of slopes to inhibit transport of eroded sediment (fines) to areas outside the Project boundary

Project Area / Activities	Erosion/Sediment Concern	Control Measures	Description / Purpose
	deterioration of dyke and berm functions	Vegetation covers (top soil, seeding) and revegetation (willow stakes) Compacting/re-grading/re-contouring may also be used to reduce rilling	Vegetation covers will assist with ongoing stabilization along slopes and graded areas
		Silt fences at base of slopes	Geotextile silt fencing and rill erosion anticipated along slopes; minimize sediment transported off-site
Soil Stockpiling	Erosion of temporary soil stockpiles	Cover with straw mulch, ECRMs, organic debris and/or establish temporary revegetation	Prevent erosion of temporary stockpiles
Existing haul road ditch north of WC5 crossing	Erosion of channel and banks of ditches and WC5 crossing area	Ongoing maintenance of ditch armour WC5 crossing Potential installation of silt fencing along length of ditch; potential installation of sediment trap at WC5 crossing	Prevent channel and bank erosion of ditch line and WC5 Prevent sediment-laden road runoff from entering ditch and WC5
Pit development	Erosion of temporary windrowed topsoil stockpiles for each phase Tracking sediment to existing haul roads adjacent to sensitive receptors	Cover with temporary ECRMs Wheel wash, gravel pads	Prevent erosion of temporary stockpiles awaiting transfer to soil deposit areas Mitigation of tracking of sediment to areas outside of the Project Area Add course material along temporary on-site routes as required

6.3 Closure and Post Closure

Table 3 below provides a summary of project activities and recommended control measures to be applied during site closure and during end land use reclamation works. Refer to Figure 3 for overview of erosion control structure locations.

Table 3: Closure and Post Closure – Erosion and Sediment Control Plan

Project Area/ Activities	Erosion/Sediment Concern	Control Measures	Description/Purpose
Removal of land-based infrastructure	May focus surface runoff resulting in increased erosion locally	Resurfacing/re-contouring/ surface roughening	Return site to pre-disturbance levels with respect to habitat and ecosystems
Site reclamation	Continuing erosion of disturbed areas	Landscaping and re-vegetation of processing area, dyke and berms (McNab Creek Flood Protection Dyke, Pit Lake Containment Berm, Fines Storage Area, and Processing Area Dirt Berm)	Completion of the pit lake and shoreline and bank landscaping and re-vegetation intended to provide suitable habitat and ecosystem in the freshwater pit area

7.0 EROSION AND SEDIMENT CONTROL PLAN IMPLEMENTATION

Implementation of the ESCP will require appropriate training for all operation staff including construction contractors, and delegation of responsibilities to appropriate qualified environmental technicians. The environmental technician's responsibility will be to evaluate and report on the effectiveness of the prescribed erosion and sediment control measures and strategies. Reports and recommendations will be reviewed and approved by qualified Project environmental managers.

On-site plans will be reviewed prior to initiation of Project activities, and a scheduling plan for on-site inspections, sampling, monitoring and reporting will be prepared. Contingency responses for specific site condition triggers will be provided.

7.1 Inspection, Maintenance, and Monitoring

ESCP measurements will require regular monitoring and inspection to ensure adequate performance. Inspections will include description of pre-site activity conditions, implementation of erosion and sediment control measures, monitoring of control measures and records of visual observations. Based on this site monitoring information, recommendations for maintenance and/or improvements to the erosion and sediment control structures will be provided in detailed reports (see Section 7.2).

Scheduled weekly inspections will be conducted during surface preparation, construction, operation, and closure phases. General maintenance procedures include assessing for damaged erosion and sediment control structures, removing accumulated sediment, and maintaining prescribed vegetation erosion control measures.

Erosion control measurements should be inspected prior to expected storm events. Structures should be reassessed within 24 hours of storm event, or where greater than 100 mm precipitation is reached within a 24-hour period (British Columbia Timber Sales [BCTS] 2010).

Critical monitoring sites will be developed immediately upstream and immediately downstream of disturbed areas in order to compare sediment inputs against background levels.

7.1.1 Surface Preparation and Construction Activities

Prior to surface preparation and construction, the erosion and sediment control structure locations and general site condition will be assessed. Inspections and monitoring will be conducted during activities and immediately after control measures have been installed.

Surface preparation and initial construction activities will require regularly scheduled visual inspections and reporting by qualified technicians as per (BC Ministry of Energy and Mines, Volume I and II 2002). Specifically, check dams and sediment traps, if needed, will require weekly and monthly inspections and maintenance to ensure adequate performance. This includes cleaning check dams and sediment traps when 50% capacity is reached, regular inspection at outlets for evidence or erosion and immediate repairs to any damage.

Inspection and cleaning all of erosion and sediment control measures in anticipation of storm events will be conducted. Where sediment volume is greater than 30% behind silt fences, capacity should be addressed and cleaning carried out as required Inspection of silt fences and temporary brush berms at the base of slopes prior to expected precipitation events and following all significant storm events or periods of extended rain will be conducted on an event basis.

7.1.2 Operation Activities

Erosion control measures and site conditions will be monitored on a weekly and monthly basis throughout operations. Increased inspections will be conducted as required by changing site conditions (e.g., severe rains flooding, culvert blocks, emergency events, spills).

Inspect berm and soil stockpile slopes for development of rills; re-grade/re-contour where possible. For all revegetation areas monitoring of vegetation growth for rend land use objectives will be required (e.g., seeding, fertilizing).

Silt fences and sediment traps will be inspected prior to expected precipitation events and following all significant storm events or periods of extended rain. Sediment accumulation in existing ditches, potential slumping or other blockages will be addressed.

7.1.3 Closure/Post Closure Activities

Reclamation plans for closure and post closure end land use targets consist of returning Project Area to pre-disturbance levels with respect to habitats and ecosystems. This includes development of a fresh water pit lake, landscaping and re-vegetating to provide the end land use objectives.

Vegetation growth for remediation will be assessed on a weekly and then monthly basis, until an established vegetation/forest cover and structural stage has been approved. Berms will require appropriate vegetation percent establishment to accommodate slope stabilization.

7.2 Contingency Plans

Contingency plans for the Project will be active and adaptive, with ongoing inspection, maintenance and re-evaluation for all BMP control measures and surrounding site conditions.

Routine and specific event monitoring will be conducted to identity BMPs/control measures that may not be functioning adequately. The following steps will be taken:

1) Confirm control measure/feature installed correctly;

2) Assess if appropriate size or length/depth of control method with site circumstances;

3) Determine if alternate BMP/control method required; and,

4) Assess if increased maintenance/inspections required.

Processing area includes segregating fines and stockpiling/storing; maintaining stockpiles, and implementing a backup storm water management system in the processing area that will include a pumping system which will convey excess storm water to either the aggregate washing system or into the post closure planned pit lake. Temporary ditch barriers will be placed along the existing haul road ditch.

In anticipation of a major storm, all erosion and sediment control measures will be inspected and maintained/repaired in advance of the event. For unforeseen storm events, wet weather shutdown guidelines will apply.

8.0 ENVIRONMENTAL SAMPLING AND REPORTING

8.1 Sampling

Baseline soil nutrient and metal data for surface soils will be collected prior to surface preparation in accordance with the Reclamation and Effective Closure Plan (Golder 2016). This information will be used for phased reclamation planning. Surface water is anticipated to infiltrate into the coarse soils on-site, with no on-site/off-site drainage anticipated. Therefore, no on-site surface water sampling and analysis is recommended.

Sampling and analysis plans for groundwater resources, surface water quality and fish and fish habitat for adjacent waterways, including total suspended solids, will be addressed in the pending Project Mine Permit Application.

8.2 Reporting

Reports based on the ESCP will be prepared to document site conditions and provide Project activity summaries including: progress reports and environmental management efforts, scheduling plans, on-site and external communications; and upcoming activities. Appropriate data collection and information management systems will be utilized. Detailed site notes, photographs and accurate location of inspection sites will be recorded. Both progressive reporting and annual reports will be provided as noted below:

Progressive Erosion and Sediment Control reports will be completed on a weekly/monthly basis, and when site specific events occur (e.g., severe storm events). Progressive Reports will outline the following:

- On-site plan reviews;
- On-site inspections;
- Communications/training strategy for all contractors and mining operations staff to ensure knowledge of ESCP;
- Construction scheduling and activities;
- Ongoing environmental management efforts, with specific corrective issues and resolutions;
- Type and location of samples collected;
- Incident reports; and,
- Contingency reports.

Annual Reports will provide activity summaries for:

- Sampling and laboratory analysis results for soil and water;
- Maintenance activities;
- Inspection results (including daily logs of site conditions);
- Assessment of effectiveness of BMPs based on sampling results;
- Unauthorized discharge (spill or emergency); and,
- Post closure effectiveness reports.

Responsibilities of the qualified environmental technicians and specialists are to inspect work areas and activities for compliance and provide appropriate reports identifying and assessing actual and potential issues regarding erosion and sedimentation. All reports should be checked by qualified environmental supervisor for QA/QC purposes. Reporting will include recommendations for additional prevention and mitigation measures, and implementation of action and response plans for erosion and sediment control.

9.0 CLOSURE

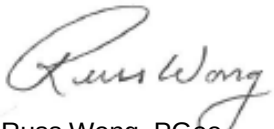
We trust that the information contained in this report meets your requirements. Should you have any questions, or require further information, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Wanda Miller, BSc, PGeo, PAg
Geoscientist

Jeff Fillipone, PhD, PEng
Principal, Senior Geologist

Reviewed by:



Russ Wong, PGeo
Associate, Senior Geoscientist
WM/JF/RW/asd/kn

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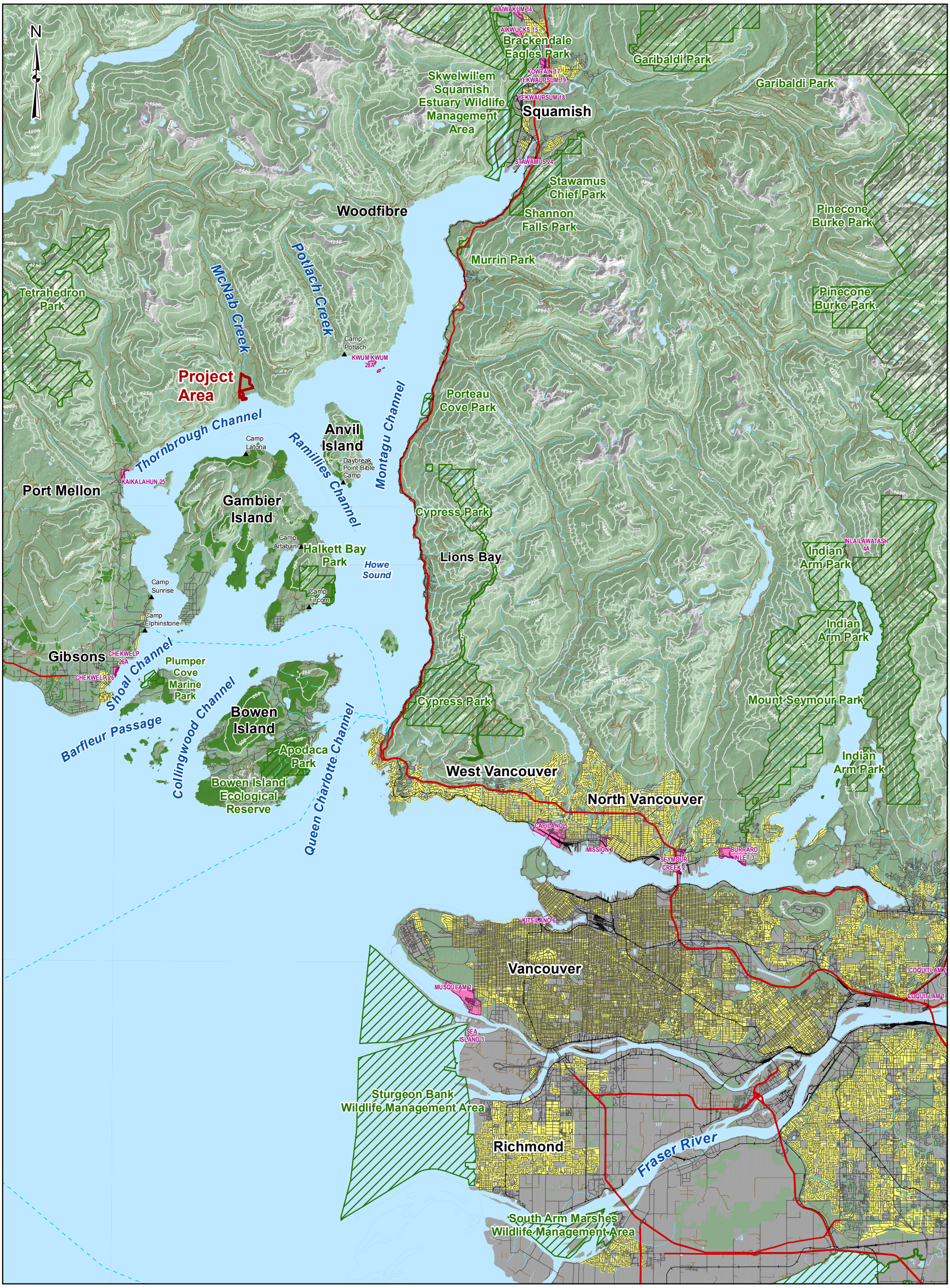

LEGEND

- Project Area
- Park / Protected Area
- Sensitive Environmental Area
- Vegetation
- Indian Reserve
- Residential Area
- Waterbody
- Highway
- Road
- Resource Road
- Railway
- Watercourse
- Ferry
- Contour (250m)
- Camp

8 0 8

SCALE 1:230,000 KILOMETRES

REFERENCE

Parks/protected areas and sensitive areas from the Province of British Columbia. Elevation and indian reserves from Geobase. Base data from CanVec. Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

LOCATION OF BURNCO AGGREGATE PROJECT

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	WM	15 Feb. 2016	SCALE AS SHOWN	REV. 1
GIS	DL	31 Mar. 2016		
CHECK	WM	23 Feb. 2016		
REVIEW	JF	23 Feb. 2016		

FIGURE 1

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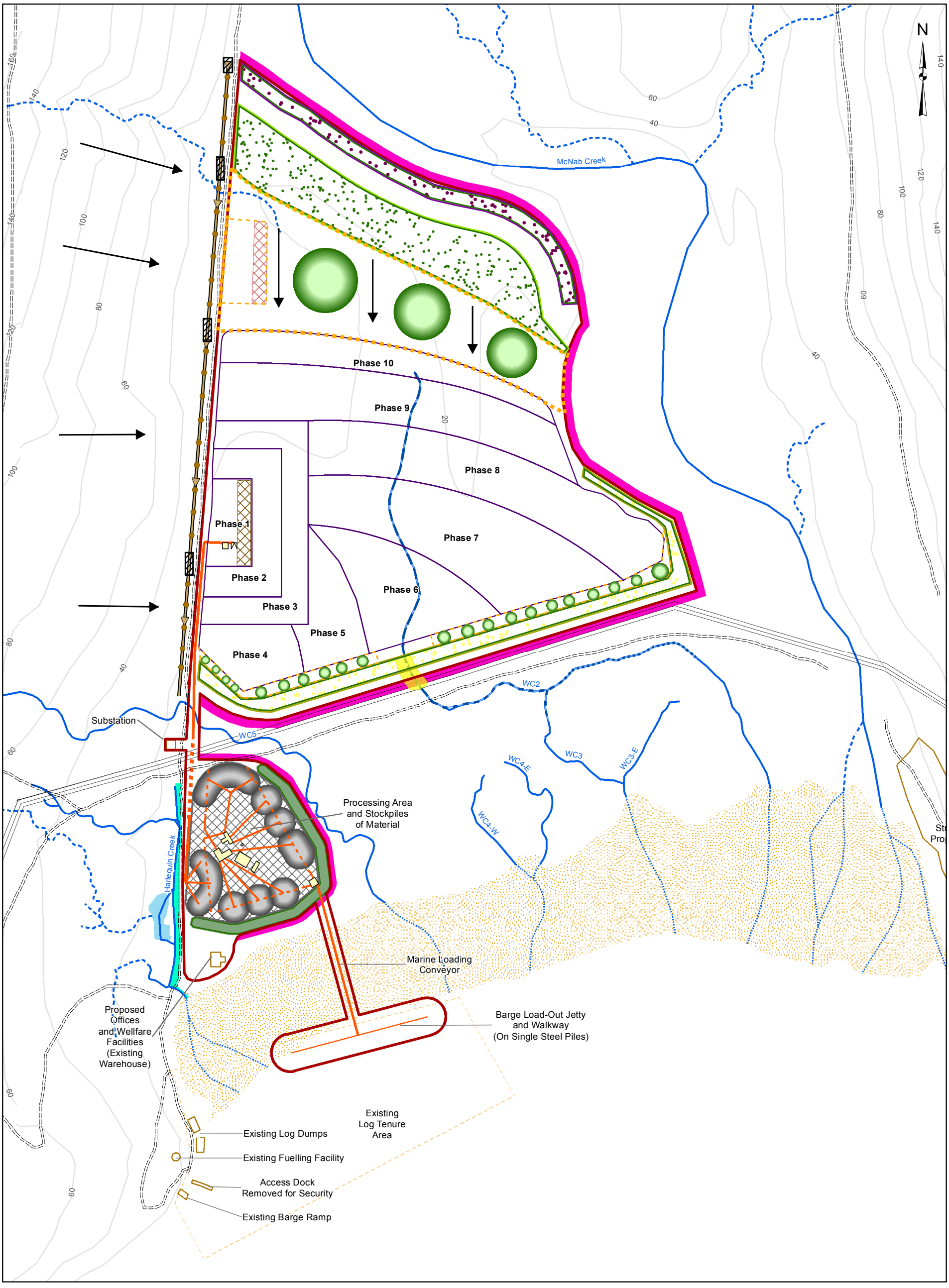

LEGEND

Soil Erosion Measures
- Silt Fencing (Sediment Traps)
- Silt Fencing / Gravel Berm
- Check Dam
- Ditch Armour

Soil Management
- McNab Creek Flood Protection Dyke (Progressive Revegetation)
- Fines Storage Area (Progressive Revegetation)
- Pit Lake Flood Containment Berm (Progressive Revegetation)
- Processing Area Dirt Berm (Progressive Revegtation)
- Soil Deposit Area (Stockpiles)
- Organic Matting / Vegetation
- Temporary Topsoil Stockpiles
- Temporary Topsoil Windrows (Approximate Location)
- Non-Contact Water Diversion Ditch
- Direction of Flow / Runoff

Proposed Project Plans
- Project Area
- Proposed Aggregate Pit Phase
- Processing Area and Stockpiles of Material
- Product Stockpiles
- Possible Processing Plant Configuration
- Channel Infill, Riprap and Filter Zone (WC2 Plug)
- Elevated Conveyor
- Underground Conveyor
- Barge Load-out

Base Map Data & Existing Features
- Existing Log Tenure Area
- Existing Feature
- Intertidal Zone
- Road (Existing)
- Transmission Line
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Intertidal Watercourse
- Contour (20m)

REFERENCE

Watercourses from the Province of British Columbia and field data. Base data from the Province of British Columbia. Contours from TRIM positional data. Additional detailed site features provided by McElhanney. Projection: UTM Zone 10 Datum: NAD 83

200 0 200

SCALE 1:6,000 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

EROSION CONTROL MEASURES - SURFACE PREPARATION, CONSTRUCTION, OPERATIONS

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	WM	15 Feb. 2016	SCALE AS SHOWN	REV. 1
GIS	DL	31 Mar. 2016		
CHECK	WM	23 Feb. 2016		
REVIEW	JF	23 Feb. 2016		

FIGURE 2

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LEGEND

Base Map Data
- Existing Log Tenure Area
- Existing Feature
- Intertidal Zone
- Mature Forest
- Road (Existing)
- Existing Road Ditch
- Transmission Line
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Intertidal Watercourse
- Contour (20m)

Project Site
- Project Area
- Soil Deposit Area
- Final Pit Lake Outline

Reclaimed Areas
- McNab Creek Flood Protection Dyke (Re-vegetation/Planted Forest)
- Fines Storage Area (Re-vegetation/Planted Forest)
- Pit Lake Containment Berm (Re-vegetation/Planted Forest)
- Reclaimed Surface (Re-vegetated)

Proposed WC2 Extension (~770 m)
- Proposed Extension: Year 1 Construction
- Proposed Extension: Project Closure Construction
- Top of Bank
- Riparian
- Channel Infill, Riprap and Filter Zone (WC2 Plug)
- Proposed Amphibian Pond (Combined Area ~1250 m^2)
- Outlet Structure with Spillway and Low-Level Outlet
- Wood Debris

REFERENCE

Watercourses from the Province of British Columbia and field data. Base data from the Province of British Columbia. Contours from TRIM positional data. Imagery from Google Earth Pro. Additional detailed site features provided by McElhanney.
Projection: UTM Zone 10 Datum: NAD 83

200 0 200
SCALE 1:6,000 METRES

PROJECT
BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE
EROSION CONTROL MEASURES - CLOSURE AND POST CLOSURE

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	WM	15 Feb. 2016	SCALE AS SHOWN	REV. 1
GIS	DL	31 Mar. 2016		
CHECK	WM	23 Feb. 2016		
REVIEW	JF	23 Feb. 2016		

FIGURE 3

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As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
2nd floor, 3795 Carey Road
Victoria, British Columbia, V8Z 6T8
Canada
T: +1 (250) 881 7372

Golder Associates