

13.0 MONITORING AND ENVIRONMENTAL MANAGEMENT PLANS

13.1 Background

The monitoring and environmental management plan framework outlined herein is designed around three central principles of environmental protection:

- Do no harm culture;
- Respect for Aboriginal culture and values;
- Continuous improvement; and
- Compliance with all environmental approvals and authorizations.

The Provincially-approved Amended Terms of Reference (ToR; Appendix C-1) provides for the development of a monitoring framework for compliance and effects monitoring, as part of the environmental assessment (EA), with consideration being given to comments put forward by government agencies, Aboriginal groups and other stakeholders, including any follow-up monitoring programs (FMPs) developed through the Federal EA process. The approved Amended ToR also recognizes that monitoring details will be defined in part through the environmental approvals and permitting process that would follow EA approval.

The Federal Environmental Impact Statement (EIS) Guidelines similarly state that the:

...finalization of a detailed monitoring program will occur through consultation with Federal and Provincial government agencies, Aboriginal groups, the public and other stakeholders [and that] this may occur after the environmental assessment but will be consistent with the information presented in the EIS.

In accordance with *Canadian Environmental Assessment Act, 2012 (CEAA, 2012)* the purpose of the FMPs is to:

- Verify the accuracy of the environmental assessment of a designated project; and
- Determine the effectiveness of any mitigation measures.

In addition, the FMP is expected to:

- Provide for adaptive management in the event environmental effects are different from expected, new information becomes available, or mitigation measures prove to be less effective than anticipated; and
- Communicate the FMP results to Rainy River Project (RRP) stakeholders and Aboriginal groups who are party to the program, and to provide for their input into program results.

The FMP applies to the construction, operation, active closure and decommissioning (active closure), and post-closure phases of the RRP, as appropriate.

Mitigation measures applicable to each valued ecosystem component (VEC) / valued socio-economic component (VSEC) are described in Section 7. Government agency, Aboriginal and general public comments and concerns with respect to environmental effects, received thus far by Rainy River Resources (RRR), are also documented in Section 7.

Consistent with the above, this section of the EA Report provides a framework for components to be included in the FMP. Further monitoring details be developed through ongoing stakeholder consultation during the EA process, and through conditions placed on regulatory instruments such as permits, authorizations and approvals, issued by the Federal and Provincial regulatory agencies. Most environmental approvals issued for the construction, operation and closure of the RRP will come from the Province.

The details of these programs will be developed in consultation with Federal and Provincial governments and with local Aboriginal involvement.

In developing and carrying out the FMP, particular focus is provided through *CEAA, 2012* on determining the effectiveness of mitigation and adaptive management measures as related to Aboriginal peoples and associated Treaty rights.

RRR expects that it will be responsible to carry out the FMP; and further, that the involved Federal and Provincial agencies and authorities will have a review and monitoring role regarding the implementation of the FMP by RRR and will require RRR to take corrective action for non-compliance as appropriate. Local Aboriginal groups are considered by RRR to be involved parties for the purposes of the FMP, and accordingly, local First Nations and Métis will be provided the results of the FMP.

It is expected that the FMP may be reviewed from time to time to determine whether or not changes to the FMP are required. Specific details relevant to VECs and VSECs recommended for inclusion in the FMP are described below.

13.2 Air Quality FMP

13.2.1 Context and Objectives

Air quality modelling predicts that with appropriate mitigation applicable O.Reg. 419/05 point of impingement criteria will be met at the RRP property boundary (Section 7.3). In the absence of such mitigation there is concern that air quality contaminants such as SO₂, dust and metals in sufficient concentration, could have the potential to adversely affect humans and the environment. The environmental effects assessment also considered greenhouse gas

emissions associated with onsite fuel combustion, mainly associated with mobile heavy equipment operation.

Air quality monitoring requirements are expected to be stipulated in the Provincial Environmental Compliance Approval(s) (Air) for the construction and operations phases. Typically the Environmental Compliance Approvals will refer to the proponent's Best Management Plan or a separate monitoring protocol referenced in the Environmental Compliance Approval and approved by the Ministry of the Environment (MOE), for both air and sound monitoring details. The Best Management Plan is typically submitted as part of the approval application. The monitoring protocol is usually submitted to the MOE after the Environmental Compliance Approval is issued. The Best Management Plan and monitoring protocol will define staff training requirements, monitoring locations, monitoring methods, parameters measured and assessment criteria. Reporting and auditing requirements will be specified in the main body of the Environmental Compliance Approval.

Except where defined differently in future Environmental Compliance Approvals issued by the MOE, the air quality monitoring program objectives for the RRP will include the following:

- Monitor visible emissions and record pertinent equipment operational details to show that equipment and operations are performing consistent with EA predictions, and that emissions are as predicted in the EA Report. This will demonstrate that emissions are in compliance with applicable regulations and standards (most notably O.Reg. 419/05 point of impingement criteria); and
- Determine the significant changes to air quality that result from the Project, and provide data that can be used, if required, to account for any unanticipated environmental effects.

13.2.2 Methods for Measuring Effects

RRR will directly manage emissions from point sources such as bag houses as stipulated in applicable Provincial Environmental Compliance Approvals.

For fugitive dust from roads, stockpiles and open pit operations, RRR will assess the effectiveness of planned dust control measures both visually by plume assessment, and using dust fall jars and high-volume samplers for total particulate and PM_{2.5}. Dust fall samples will be collected monthly during the non-winter period for the construction, operation and active reclamation project phases. Select filter samples will be assessed for metals (full metal scan and including mercury, arsenic, cadmium and lead). Two monitoring stations will be set up at the approximate property boundary locations shown in Figure 13-1 subject to power availability and location specific constraints. Equipment siting, operations, auditing and reporting will following all appropriate MOE requirements as provided in the Operations Manual for Air Quality Monitoring in Ontario (MOE 2008).

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Monitoring results will be compared with predictions in the EA Report (Section 7.3.1; Appendix Q), and with applicable O.Reg. 419/05 criteria. Passive SO₂ and NO₂ monitors will also be established at the same locations. Although there are no specific standards for comparing results of longer term passive samplers, comparison to modelling results for those timeframes will provide confirmation of emissions and environmental effects.

A fully instrumented weather station was installed at the RRP site in 2009. This station provides data on temperature, precipitation, relative humidity, wind speed and direction, barometric pressure and solar radiation. The station was located in accordance with appropriate siting criteria. The equipment will continue to operate at the site.

Greenhouse gas emissions will be calculated annually on the basis of onsite fuel consumption.

13.2.3 Adaptive Management Measures

Control of dust emissions is an iterative process that can be adjusted by increasing the frequency of water spraying (with or without approved additives) during dry periods. Any additional mitigation measures required to control air emissions, beyond those described in Section 7.3.1, will be considered if and as required to meet point of impingement air quality standards at the RRP site boundary and to reduce onsite visible emissions.

13.2.4 Reporting

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results will be provided to the parties involved in the FMP annually during the construction, operation and active reclamation phases of the RRP.

Additional reporting mechanisms are expected to be prescribed in the Provincial Environmental Compliance Approvals.

13.3 Sound and Vibration FMP

13.3.1 Context and Objectives

Sound modelling predicts that the RRP will meet applicable MOE NPC-232 guidelines for a Class 3 Area (45 dBA during the daytime, and 40 dBA during the night time) at the nearest off property receptors (permanent or seasonal residences; Section 7.4) for standard operating equipment. If sound mitigation measures should prove less effective than determined through modelling or equipment is louder than predicted, sound limits may exceed the NPC-232. Compliance with NPC-232 and may require operational sound monitoring to show compliance with the Class 3 limits, as part of the Environmental Compliance Approval. Irrespective of guideline values, operation of the RRP may have the potential to disturb adjacent residents, as

well as sensitive wildlife species. Operational sound monitoring is required to address potential resident sound complaints.

The assessment of blasting sound (also known as overpressure) predicts that based on the maximum expected charge size, the overpressure sound level will be within the sound cautionary limit (120 dBL), and blasting vibration predicts that the ground-borne vibration will be within the cautionary vibration limit (10 mm/sec), as outlined in MOE NPC-119 guidelines at the nearest off property receptors (Section 7.4.1; Appendix R-2). With the application of the cautionary limits, sound and vibration for blasting is not a requirement under NPC-119.

Construction activities will contribute to a temporary increase in sound levels at the RRP site, as is typical of any site development work. Construction works are not regulated by sound limits in Ontario, and construction monitoring is not mandatory. RRR may consider implementing monitoring to address any public complaints related to construction sound due to the potential for nuisance and annoyance perception associated with some construction activities.

There are no vibration-generating operations of significance to warrant vibration monitoring aside from blasting activities. Blasting may be required as part of construction, but construction blasting charge sizes are expected to be significantly lower than those assessed for operational blasting. Therefore, provided that construction blasting is limited to the cautionary levels in NPC-119, blast sound and vibration monitoring is not required. Also, due to the relatively short duration of typical construction blasting, monitoring to address public concern is not anticipated to be warranted.

Except where defined differently in the future operations Environmental Compliance Approval (Air) issued by the MOE, the sound monitoring program objectives for the RRP site will include the following:

- Monitor and record sound levels at selected (representative) nearest, off property receptors (residences), to show that they are consistent with EA Report and Environmental Compliance Approval predictions, and NPC-232 guidelines; and
- Determine the changes to the sound environment that result from the RRP, and provide data that that can be used, if required, to account for any unanticipated effects.

13.3.2 Methods for Measuring Effects

Subject to consultation and support from area residents and the regulatory agencies, RRR plans to measure sound levels at (or near) residences positioned around the RRP site (Figure 13-1).

These would include:

- One residence to the south of the mine site in Black Hawk;
- One residence to the east of the mine site on Gallinger Road;
- One residence to the southeast of the mine site on south Gallinger Road;
- One residence to the west of the mine site in Dearlock; and
- One residence to the northwest of the mine site on Highway 600.

A dedicated remote monitoring system may be used to provide a real time access system. All sound monitors will conform to MOE NPC-103 measurement protocols. As per MOE protocols, sound level measurements are to be taken at each measurement location. Hourly Leq, L10, L90 and Lmax will be recorded. Audio samples based on trigger levels will also be recorded. Trigger levels, with automated alerts will be developed for addressing exceedances. Monitoring results will be stored for later analysis, processing and comparison with EA Report, Environmental Compliance Approval requirements and MOE sound guidelines.

As vibration monitoring is not a requirement for NPC-119 since cautionary limits have been used, vibration monitoring is not proposed.

13.3.3 Adaptive Management Measures

Sound control for the RRP was optimized as described in Section 7.4.1.3. Any additional mitigation measures required to control sound levels beyond those described in Section 7.4.1.3 would be considered if and as required to meet MOE guidelines.

13.3.4 Reporting

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results will be provided to the parties involved in the FMP annually during the construction and operation phases of the RRP.

Additional reporting mechanisms may be prescribed in the Provincial approval(s). Any exceedances of NPC-232 guidelines due to RRP activities will be reported to the MOE, following verification of the data. Additional reporting may also be required to address any public sound complaints relating to the RRP. Sound data to address public complaints will be reported by RRR to the public on verification of the data.

13.4 Geochemistry FMP

13.4.1 Context and Objectives

Baseline investigations concluded that the ore, tailings and a substantive portion of the mine rock are expected to be potentially acid generating (PAG; Section 5.5, Appendix G) which poses a potential concern for effluent and receiver quality. The majority of the PAG mine rock is expected to take several decades to produce any acid rock drainage given the mitigation program proposed.

To control the potential for adverse geochemical effects to the environment a number of mitigation measures have been developed and are proposed to be implemented at the RRP:

- Alkalinity will be added to the mill tailings as part of ore processing;
- Tailings will be left exposed to the elements in the tailings management area for generally not more than one year before being covered with fresh tailings;
- At closure the major portion of the tailings will be flooded to limit exposure to oxygen or covered with clay / clay till overburden;
- A segregation program will be implemented during mining to separate PAG and non-potentially acid generating (NPAG) mine rock, such that PAG mine rock can be progressively encapsulated with a complex, engineered clay till and NPAG mine rock cover to limit exposure to oxygen; and
- Any problematic runoff and seepage from low grade ore and encapsulated east mine rock stockpiles will be collected and managed, both during operations and as part of mine closure.

In addition, a program of ongoing geochemical test work will continue throughout the RRP mine life. This program will build upon already completed and ongoing geochemical test work. It is proposed to include further field trials to better simulate oxidative processes likely to be encountered during the exposure of the ore, mine rock and tailings.

The objectives of the geochemical monitoring program will therefore be to:

- Confirm geochemical model predictions regarding the potential onset of acidic conditions and the level of such conditions, and the potential for the release of neutral soluble metals such as zinc and cadmium; and
- Confirm the effectiveness of proposed mitigation strategies.

The offsite discharge of effluents from the RRP site will be governed by the Environmental Compliance Approval, the Closure Plan and the Metal Mining Effluent Regulations.

13.4.2 Methods for Measuring Effects

The direct release of geochemical oxidation products from the low grade ore and mine rock stockpiles, and from tailings, will be monitored through the collection and analysis of site discharge, and runoff and seepage as described in Section 13.5. Data analysis will include the long term tracking of seasonal and annual trends in pH, acidity, SO₄, alkalinity and metals concentrations, together with applicable meteorological and hydrological data necessary to calculate trends in parameter loadings.

In addition, RRR will carry out the following geochemical monitoring program:

- As part of the ongoing mine rock management plan, collect and analyze blast hole drill cuttings for analysis of total inorganic carbon and total sulphur, using a Leco furnace, as a means of segregating PAG and NPAG materials for optimal management of PAG mine rock;
- Submit a subset of Leco furnace samples, collected as part of the ongoing mine rock management plan, for acid base accounting static testing and metals analysis;
- Collect and analyze mill composite tailings samples, on an approximate monthly basis, for acid base accounting static testing and metals analysis; and
- Conduct additional geochemical testing on an as required basis to provide further information on Project specific aspects, such as any conditions of note evolving out of developing trend analyses.

13.4.3 Adaptive Management Measures

Adaptive management measures may be required to respond to developing trends in RRP site effluent quality, or to unanticipated variations in geochemical oxidation rates.

The adaptive management measures will include criteria to define the circumstances under which further actions might be required to better manage site effluents, drainage and runoff during operations, and following mine closure. If planned mitigation measures appear not to be able to meet their intended purpose, RRR will consider either changes to site operations or implementation of additional mitigation measures.

Monitoring results will normally be reported as described below. If trends appear to be developing that might require more urgent attention, RRR will report such conditions directly to the appropriate Provincial and Federal government agencies.

13.4.4 Reporting Mechanisms

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results of this assessment will be provided to the parties of the FMP annually during the construction, operation and active reclamation phases of the RRP.

Additional reporting mechanisms are anticipated to be prescribed in Provincial and Federal regulatory approvals and will also be met.

13.5 Surface Water Systems FMP

13.5.1 Context and Objectives

Local surface water system VECs include the:

- Minor creek systems; and
- Pinewood River.

The EA Report effects analysis provides for the displacement and compensation of local creek habitats (minor creek systems), and protection of Pinewood River water quality and flows. In the latter case, it was concluded that no significant adverse effects to the Pinewood River were anticipated.

RRP site minor creek systems include, from east to west: Clark Creek / Teeple Drain, West Creek, Marr Creek and Loslo Creek / Cowser Drain. The upper portion of Clark Creek (up gradient of the east mine rock stockpile) will be diverted away from the RRP site, and the lower portion of Clark Creek / Teeple Drain will be overprinted by the east mine rock stockpile and by the mine rock pond. Runoff and seepage collected by the mine rock pond will be directed to the process plant with no direct release to the environment. Flows and water quality from the mine rock pond will be monitored as part of the overall site water inventory management program. Clark Creek upstream of the east mine rock stockpile will remain a natural system discharging to the Pinewood River through a diversion channel connect to an unnamed creek, and is intended to support a viable fish community (Section 7.5). It is therefore appropriate to monitor this system for water quality, flow and biota.

West Creek will be impounded midstream (West Creek pond) and the lower portion of West Creek will be diverted around the west margin of the overburden stockpile and west mine rock stockpile (Figure 4-1). The re-aligned West Creek will connect with Loslo Creek / Cowser Drain. West Creek upstream of its confluence with Loslo Creek will be isolated from all site effluents,

with the exception of managed runoff and seepage deriving from the overburden and west mine rock stockpile sedimentation ponds (sediment ponds #1 and #2; Figure 4-1), and will therefore comprise a modified natural system intended to support a viable fish community (Section 7.5). It is therefore appropriate to monitor this system for water quality, flow and biota.

Marr Creek will be overprinted by the tailings management area, overburden stockpile and west mine rock stockpile, and will therefore cease to exist as a watercourse. Post-development monitoring of Marr Creek is therefore not possible.

Loslo Creek / Cowser Drain will be substantively overprinted by the tailings management area and the constructed wetland, such that the portion of the original channel that will remain unaltered will be the approximately 1,300 m long lower creek section. This lower portion of Loslo Creek will be monitored.

For the Pinewood River it is expected that Provincial Water Quality Objectives (PWQO) for the protection of aquatic life or background values, will be maintained in the river. Flow reduction effects are similarly expected to be modest, such that significant adverse effects to the Pinewood River biotic community are not anticipated to occur (Section 7.6). Water quality, water flows and aquatic biota will need to be monitored to verify EA predictions, and to provide information in the event that additional adaptive management measures are required to protect fish and aquatic habitat.

Mitigating measures have been proposed to protect water quality and to manage potential system flow reductions in local aquatic systems (Sections 7.5 and 7.6). RRR and the Provincial and Federal government agencies recognize the need to verify that all mitigation measures to protect fish and fish habitat are effective, and for RRR to be able to take actions based on FMP results to allow conclusions and commitments in the EA to be respected throughout the life of the RRP.

Effluent and water quality monitoring requirements are expected to be included in Provincial approvals (Environmental Compliance Approvals and Permits to Take Water) issued by the MOE pursuant to the *Ontario Water Resources Act*, and are also governed by the Metal Mining Effluent Regulations. The terms and conditions of Provincial approvals, including monitoring methods, reporting and remedial actions, will be determined by the MOE with due consideration to other Provincial and Federal approvals and authorizations.

It is anticipated that RRR will be required to develop Adaptive Management Strategies for the protection of fisheries resources and fish habitat. The details of these programs are being developed in consultation with Federal and Provincial governments through the working group established in 2012 and with the involved Aboriginal groups.

The objectives of the surface water system FMP are to:

- Monitor the ability of water treatment and management facilities to produce effluents and runoff which meet Provincial and Federal environmental statutory requirements;
- Determine and confirm the effects of effluent discharges and runoff on the water quality, flows and biota of West Creek and the Pinewood River, and assess whether additional mitigation measures might be required as part of adaptive management; and
- Assess the success of fish habitat mitigation and compensation measures and determine if additional measures are necessary.

13.5.2 Methods for Measuring Effects

The following surface water system monitoring is proposed.

- A. Collect and analyze samples, and measure rates of flow, as appropriate, from site discharges, and runoff and seepage collection facilities, at the start of their respective operations, including:
- Tailings management area discharges to the Pinewood River both directly by pipeline discharge and through the constructed wetland;
 - Sedimentation Pond #1 and #2 discharges to West Creek;
 - Aggregate operation(s), discharges (if any);
 - Sewage effluent discharge; and
 - Runoff and seepage collected from site operations areas (tailings management area, overburden and mine rock stockpiles, plant site area and haul roads) in accordance with Metal Mining Effluent Regulations and Environmental Compliance Approval requirements.
- B. For each of the above, where there is a discharge to a receiver (West Creek or Pinewood River) monitor on a monthly basis (commencing at least three months before the first anticipated discharge / release) the quality of waters upstream and downstream of discharge and runoff / seepage releases at proposed monitoring locations shown in Figure 13-2, inclusive of three stations on West Creek and five stations on the Pinewood River (including Pinewood River baseline monitoring stations SW10, SW3 and SW15. The two current baseline monitoring stations on the Rainy River (SW16 and SW17) would also be maintained for monthly monitoring. Quarterly samples from selected water quality

sampling stations will be collected for trace analysis of total and methyl mercury in discussion with the MOE.

C. Monitor flows as shown in Figure 13-2 commencing as soon as construction is completed on the West Creek pond and the West Creek diversion at:

- West Creek at the West Creek pond outflow;
- West Creek diversion; and
- Pinewood River at Highway 617 (Water Survey of Canada Station; WSC 05PC023).

Flows are already being measured for the Pinewood River at WSC Station 05PC023. Note that given the importance of the WSC station to overall site water management as per Section 4.12, RRR will need to enter into an agreement with WSC to ensure that the station will be maintained throughout the RRP mine life, and that data will be made available to RRR on a daily basis, and that RRR would be immediately informed of any maintenance activities which could influence its operations.

D. As data availability permits, develop annual updated statistical flow estimates for local watercourses based on flow data derived through monitoring, with such estimates to include:

- Monthly averages;
- Annual averages;
- Extreme low flow statistics corresponding to 2, 5, 10 and 20 year return period conditions; and
- Extreme high flow statistics corresponding to 2, 5, 10 and 20 year return period conditions.

E. Carry out an environmental effects monitoring (EEM) program in accordance with the Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring (EC 2012d) to assess the character and quality of aquatic resources at the following locations:

- West Creek diversion; and
- Pinewood River upstream and downstream of the RRP site area.

F. Except as provided for in Item E, above, carry out commencing one year after the date of commercial production and at three year intervals thereafter, fish habitat and fisheries assessments, including sediment and benthos investigations for:

- West Creek;
- Clark Creek (upstream of the east mine rock stockpile); and
- Pinewood River.

G. Monitor contaminants of potential concern in fish tissues from game fish harvested from the Pinewood River coincident with monitoring carried out pursuant to Item F, above.

H. As a component of the RRP stormwater management plan, collect and analyze late winter snow pack samples for pH and metals to help determine the effects of dustfall accumulated within the snow pack during spring melt.

13.5.3 Adaptive Management Measures

RRR is committed to implement mitigation measures to ensure compliance with the fisheries protection and pollution prevention provisions of the *Fisheries Act*. If the monitoring program indicates that any substance deposited may be a deleterious substance within the meaning of the *Fisheries Act*, RRR will assess the cause(s) of the deposit, and will consult with Environment Canada and propose / implement reasonable measures to further limit the deposit or to counteract, mitigate or remedy the adverse effects of any such deposit (such as by reducing effluent concentrations at the point of discharge). Monitoring results will normally be reported as described in the reporting mechanisms below, typically annual reporting to the Provincial and Federal agencies, and any other reporting required under Federal or Provincial regulatory approvals. Should conditions occur that may require immediate action, such as where there is evidence of negative impact on fish, fish habitat or human use of fish, RRR will report such conditions directly to applicable Provincial and Federal regulatory authorities within an appropriate timeframe.

Adaptive management measures related to fish habitat will be included in the West Creek and Clark Creek Adaptive Management Strategies and Pinewood River Adaptive Management Strategy documents to maintain compliance with the *Fisheries Act*. These documents will include criteria to define the circumstances under which further actions might be required to mitigate any significant adverse effects to water flows or water quality in these local drainages. If planned mitigation measures prove ineffective, RRR will consider either changes to site operations or additional improved mitigation measures.

13.5.4 Reporting Mechanisms

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results will be provided to the parties of the FMP annually during the construction, operation and active reclamation phases of the RRP.

Additional reporting mechanisms will be prescribed in Provincial and Federal environmental approvals.

13.6 Groundwater Systems FMP

13.6.1 Context and Objectives

Groundwater modelling predicts that open pit and underground dewatering effects will be modest and that the induced groundwater table cone of depression will not adversely affect adjacent off property wells, and that base flow reductions to the Pinewood River will be of limited significance. Water management plans for the RRP provide for the augmentation of river flow during the low flow periods by utilizing the constructed wetland to offset related flow reduction effects.

If groundwater modelling should underestimate mine dewatering effects, local area groundwater levels and base flow conditions in the Pinewood River could be affected to a greater extent than anticipated. Surface water / groundwater linkages in the area are constrained by the pervasive occurrence of clay and clay till substrate, such that base flow contributions to surface water systems are comparatively small (Sections 5.6 and 5.7). Groundwater inflows to the open pit are also important to the overall RRP water balance and to rates of pit lake water level recovery following mine decommissioning. It is therefore important to monitor the groundwater system response to open pit pumping to verify EA predictions relating to groundwater / surface water system interactions.

Groundwater volume and quality monitoring will be included in Provincial approvals (Environmental Compliance Approvals and Permits to Take Water) issued by the MOE pursuant to the *Ontario Water Resources Act*. The terms and conditions of these approvals, including methods, reporting and remedial actions, will be determined by the MOE with due consideration to other Provincial and Federal approvals and authorizations. Where *Fisheries Act* authorizations are issued in respect of the RRP, groundwater monitoring may also be included as a condition(s) in the authorizations.

It is also anticipated that RRR will be required to develop adaptive management strategy for the protection of surface water systems and associated fisheries and fish habitat, in the event that the response of the groundwater system to mine dewatering is substantively different from that predicted.

The objectives of the FMP in relation to groundwater monitoring are to:

- Monitor volumes of mine water pumped from the open pit and underground mine and compare results to model predictions;

- Confirm the response of the groundwater system to pumping in terms of:
 - Propagation of the drawdown cone of depression;
 - The relationship of this cone of depression to groundwater / surface water interactions in relation to model predictions; and
 - To assess whether additional mitigation measures might be required; and
- Monitor groundwater quality down gradient of the tailings management area and mine rock stockpiles to compare results to the pre-development condition.

13.6.2 Methods for Measuring Effects

RRR will carry out groundwater system monitoring as per the following:

- A. Collect and analyze samples, and measure pumping rates for minewater from the open pit and underground transferred to the mine rock pond (or to the tailings management area during construction);
- B. Establish a groundwater well (piezometer) network around the open pit area to monitor groundwater levels throughout the area on a continuous basis using water level transducers, with transducer downloads to be completed twice per year, commencing at least six months prior to the start of pumping, all as shown in Figure 13-3;
- C. Collect groundwater samples from the groundwater well / piezometer network quarterly except where prevented by freezing conditions, and analyze the samples for applicable parameters as provided for in Provincial approvals; and
- D. Review groundwater monitoring data annually and update the groundwater model on three year intervals, with the first such update to be based on data obtained from the first three full years of pumping; and with the model updates to be completed within nine months of the end of the data collection period.

13.6.3 Adaptive Management Measures

Adaptive management measures may be required to respond to any adverse effects to off property wells, or to greater than anticipated base flow reductions to the Pinewood River and to local creek systems. Adaptive management strategies relating to the latter aspect are considered in Section 13.1.4.

The adaptive management strategy for groundwater systems will include criteria to define the circumstances under which further actions might be required to mitigate any significant adverse effects to off property wells or to surface water systems. If planned mitigation measures prove ineffective, RRR will consider either changes to site operations or additional improved mitigation measures.

Monitoring results will normally be reported as described in the reporting mechanisms below; however, if conditions exist that may require immediate action, such as evidence of significant negative impact to off property wells, RRR will report such conditions directly to applicable Provincial and Federal government agencies within an appropriate timeframe.

13.6.4 Reporting Mechanisms

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results pertinent to Section 13.1.5 of this assessment will be provided to the parties of the FMP on an annual basis during the construction, operation and active reclamation phases of the Project.

Additional reporting mechanisms will be prescribed in Provincial and Federal environmental approvals.

13.7 Terrestrial Systems and Species at Risk FMP

13.7.1 Context and Objectives

The EA Report predicts that approximately 21.7 km² of terrestrial habitat will be directly displaced by RRP developments over the life of the mine. Approximately half of this area (10.9 km²) consists of second growth aspen – birch hardwood forest, which is the dominant forest community type in the natural environment local study area (NLSA). The other community types comprising the largest areas of removal are conifer swamp (1.65 km²), active agricultural land (2.77 km²), and cultural meadows or old fields (1.08 km²). Portions of 27 different boreal community types will be removed, with 11 of these community types expected to experience displacements of less than 10 ha.

The principal mitigation measure to limit adverse effects to terrestrial systems and to SAR is to develop as small an overall project footprint as practicable, and to avoid disturbance to Threatened Species at Risk (SAR) territories, such as known whip-poor-will territories, where reasonably feasible. Where it is not reasonably feasible to avoid displacement or disturbance to known Threatened SAR territories, compensation through an *Endangered Species Act* (ESA) permit will be provided.

It is recognized that the NLSA supports a variety of wildlife species including species that are of particular interest, such as species that are hunted and trapped, as well as breeding populations

of nine SAR and three Provincially rare species (Sections 7.9 to 7.16). These species of interest are herein referred to as targeted species; a complete list of which is being developed for monitoring purposes, in consultation with RRP stakeholders through the EA process. Species of greatest concern include two SAR: Eastern Whip-poor-will and Bobolink, which are both designated Federally and Provincially as Threatened. These species are the SAR likely to be most impacted by directly and indirectly by the RRP, as discussed in Section 7.15.

A wildlife monitoring plan will be implemented to ensure that effects on wildlife are properly mitigated. FMP monitoring will be based where possible, on standard survey protocols used during baseline studies so that any changes in local mammal, area-sensitive breeding bird or amphibian populations may be detected.

The objectives of the FMP are to determine / confirm:

- The direct loss of habitat resulting from RRP activities for targeted species including SAR;
- Unanticipated reductions in habitat suitability for various targeted species resulting from disturbances caused by the RRP such as from sound and artificial lighting;
- Use of alternate habitat within the NLSA or natural environment regional study area (NRSA) by SAR and other area-sensitive species;
- Whether or not changes in vegetation structure, such as the construction of wetlands promote new colonization by SAR or provide alternate habitat for displaced individuals;
- Whether or not compensatory habitat established under the ESA, provides suitable habitat for the intended SAR; and
- Indirect effects on SAR and Provincially rare species which are dependent on existing agricultural practices in the NLSA, such as Barn Swallow and Black-billed Magpie, which feed on insects attracted to the NLSA by livestock.

Except as defined otherwise below, post construction monitoring surveys will be carried out in the first year following the completion of construction and at three year intervals thereafter until completion of the active reclamation phase. Post closure monitoring will be defined in the Closure Plan and in any applicable ESA permits.

13.7.2 Methods for Measuring Effects - Mammals

Methods for determining adverse RRP-induced effects on mammals following the implementation of proposed mitigation measures will include:

- Bat acoustic monitoring at representative locations;
- Aerial helicopter survey in late winter to document numbers and distributions of White-tailed Deer, Moose and Wolves at locations representing suitable habitat directly adjacent to the RRP site; and control sites. Such surveys to be conducted during the first winter of the construction phase, the winter following the completion of construction, and at three year intervals thereafter until the end of the active mine reclamation phase;
- Working with any Aboriginal hunters to document White-tailed Deer, Moose, Wolf and Black Bear harvesting activities in the RRP site area;
- Implementation of a wildlife log (including collisions) of general mammal observations made by employees on the RRP site including White-tailed Deer, Moose, Black Bear and any other larger furbearers; and
- Monitoring of Black Bear activity related to waste disposal (if applicable) and general site activities.

13.7.3 Methods for Measuring Effects - Breeding Birds

Methods for determining adverse effects to breeding birds following the implementation of proposed mitigation measures will include:

- Targeted point count surveys for diurnal SAR including Golden-winged Warbler, Barn Swallow and Bobolink and for woodland area-sensitive breeding birds in suitable habitat. Point counts will be based on standardized survey protocols described for the Ontario Breeding Bird Atlas Guide for Participants (OBBA 2001) so as to be consistent with baselines study methodology (Section 5.2.12);
- Incidental data collection for SAR and Provincially rare species which are currently present at lower abundance including: Canada Warbler, Olive-sided Flycatcher, Short-eared Owl, American Pelican, Bald Eagle and Black-billed Magpie;
- Targeted twilight surveys for Eastern Whip-poor-will in suitable habitat. Whip-poor-will monitoring efforts will follow standardized survey protocols as outlined in the whip-poor-will Roadside Survey Participant's Guide (BSC 2012);
- Concurrent data collection for Common Nighthawk to be undertaken during targeted Eastern Whip-poor-will surveys as described above as no standardized survey protocols have been developed specifically for this species;
- Annual monitoring of active Bald Eagle nests which occur in close proximity the RRP site. Monitoring will attempt to establish fledging success;

- Implementation of a wildlife log of general breeding bird observations at the RRP site by employees (focused on raptors and raptor nests, and SAR species); and
- Any additional monitoring defined in ESA permits.

13.7.4 Methods for Measuring Effects - Amphibians

Effects on amphibians after implementation of proposed mitigation measures will include:

- Implementation of a wildlife log of general amphibian observations by employees.

13.7.5 Adaptive Management Measures

Adaptive management methods will be developed in consultation with Ministry of Natural Resources (MNR) staff and Aboriginal group representatives, as required. Mitigation will take the form of adaptive management, whereby data analysis of potential stressors and observed wildlife behaviour will be used to determine whether or not further corrective actions beyond those already planned, are required to lessen impacts.

13.7.6 Reporting

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results will be provided to the parties of the FMP annually during the construction, operation and active reclamation phases of the RRP.

Additional reporting may be prescribed in Federal and Provincial environmental approvals including SAR permits.

13.8 Public Health and Safety FMP

13.8.1 Context and Objectives

This section considers the potential for traffic accidents on public roads related to the construction and operation of the RRP. Roads of specific interest are:

- Highways 71 and 11, west of Fort Frances and south of Kenora;
- Highway 600;
- Teeple Road west of Highway 71; and
- East Access Road.

Workplace health and safety issues are subject to provisions of the Ontario *Occupational Health and Safety Act* and are not addressed herein.

Monitoring relating to the potential release of contaminants to local surface water bodies and groundwater are addressed in Sections 13.1.4 and 13.1.5, respectively.

The EA Report predicts that increases in traffic volumes due to RRP operations are expected to be well within the road design parameters, but that some traffic accidents will still occur consistent with all traffic use of regional roads.

13.8.2 Methods for Measuring Effects

Methods for assessing traffic accidents along public roads will include:

- Monitoring road surface conditions for the identified roads of interest during the winter months and working with the Ministry of Transportation (MTO) and the local municipalities, to ensure that roads are properly cleared, salted and sanded, as appropriate to maintain safe driving conditions;
- Maintaining a record of any accidents involving RRR employees and contractors related to the RRP; and
- Maintaining a record of any near misses related to potential traffic accidents along the roads of interest involving RRR employees and contractors related to the RRP.

13.8.3 Adaptive Management Measures

Adaptive management measures will be developed by RRR in consultation with MTO and the local municipalities to respond to any developing concerns or trends in traffic or traffic accidents, should they arise.

13.8.4 Reporting

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results pertinent to Section 13.1.7 of this assessment will be provided to the parties of the FMP annually basis during the construction and operation phases.

13.9 Traditional Land Use FMP

13.9.1 Context and Objectives

Traditional land use (TLU) discussions and study to date indicated that TLU in the general vicinity of the RRP site area is limited to modest (Section 5.11). The potential for RRP effects to TLU would therefore also appear to be limited to modest. Nevertheless, and subject to the support of the involved Aboriginal peoples, a FMP is provisionally proposed.

The objective of the TLU FMP would be to monitor the effects of the RRP on the traditional pursuits of local Aboriginal peoples within areas potentially affected by the RRP development, as well as to document the effects of employment at the RRP on Aboriginal employee traditional activities.

13.9.2 Methods for Measuring Effects

To assess potential changes to TLU that could potentially derive from implementation of the RRP, RRR will carry out, or provide financial support for, the following activities:

- Subject to any terms of agreement with the local First Nations and Métis, periodically update Traditional Knowledge (TK) studies conducted for the RRP beginning five years after mine operations initiate, to determine if there have been any changes to resource harvesting patterns by local Aboriginal peoples as a result of the RRP, and the reasons for any such changes;
- Conduct reviews at five year intervals, of the activities of a subset of RRR Aboriginal employees (representative cross section) to determine the effects of employment on their traditional activities; and
- Confirm any expected changes in the availability of fisheries and wildlife resources to local harvesters, based on data derived from biological monitoring programs.

13.9.3 Adaptive Management Measures

Adaptive management measures, if required, would be developed by RRR in consultation with the affected Aboriginal peoples, to respond to legitimate concerns arising out of the monitoring of traditional use patterns related to RRP development and activities.

13.9.4 Reporting

The reporting of any results relating to traditional pursuits would be subject to confidentiality and other considerations expressed by the involved Aboriginal peoples, and if deemed appropriate would be reported in summary form as part of the FMP annual report.

13.10 Archaeology FMP

13.10.1 Context and Objectives

Avoidance has been possible for several of the archaeological sites identified through past studies but is not expected to be practical for the remainder. Regarding the listed sites (Section 7.22), eight (four pre-contact and four historic) are either located outside of the project

development area or do not meet the standards required for Stage 3 assessment. Six sites do meet the standards and require additional assessment work, as required by the MTCS 2011 Standards and Guidelines. It is recommended that Stage 3 and if required, Stage 4 work at these sites be undertaken. As the project work is on-going, additional sites may be located and will be assessed in a similar manner as the sites listed.

Where heritage resources or areas that might require protection have been identified, specific measures, as required, will be taken to protect these resources. This will include informing contractor supervisory staff on a need to know basis of site-specific sensitivities.

In addition to known sites identified through archaeological studies, there is also the potential to uncover additional as yet unknown, culturally significant features during mine site construction activities.

The objective of the cultural heritage features FMP is therefore to ensure that known and unknown heritage resources are not inadvertently intruded upon or damaged during Project construction or operation phases.

13.10.2 Methods for Measuring Effects

RRR will carry out the following monitoring program to ensure the protection of cultural heritage resources:

- Maintain a record of all cultural heritage resources known to occur in the vicinity of planned RRP developments, such that intrusion or damage to such resources can be avoided during construction, recognizing and respecting confidentiality limitations;
- Maintain an active dialogue with local residents and Aboriginal group representatives, having knowledge of specific areas prior to and during major construction activities, to provide guidance to supervisory staff on the likely or possible occurrence of as yet undocumented cultural heritage sites;
- Enlist the services of a trained archaeologist during the conduct of major construction works to support RRR as needed, where there is a reasonable potential for encountering as yet undocumented cultural heritage sites;
- Enlist the services of Elders or other cultural advisors in the event that cultural heritage resources are encountered (in addition to meeting all Regulatory requirements); and
- Conduct a post-construction assessment of the state of known cultural heritage sites in the vicinity of RRP activities / structures to confirm the integrity of such resources.

13.10.3 Adaptive Management Measures

Adaptive management measures will be developed by RRR in consultation with local residents, the Ministry of Culture, Tourism and Sport and the local Aboriginal groups, to respond to any deficiencies in methods and procedures for protecting cultural heritage resources, if such a need is identified.

13.10.4 Reporting

Any notable cultural heritage finds will be reported according to Regulatory requirements at the time, with reporting as required when and if further information becomes available.

Otherwise, and subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results pertinent to Section 13.1.9 of this assessment will be provided to the parties of the FMP on an annual basis during the construction, operation and active reclamation phases of the Project respecting confidentiality requirements.

Additional reporting mechanisms may be prescribed in Provincial and Federal environmental approvals.

13.11 Cultural Heritage Landscapes and Built Heritage Resources FMP

13.11.1 Context and Objectives

Cultural heritage landscapes and built heritage studies have identified a number of cultural heritage landscapes and built heritage resources in the vicinity of the RRP that will be unavoidably affected by the development of the RRP (Appendix M-3). None of the identified resources are protected under the *Ontario Heritage Act* or other regulatory instruments (Unterman McPhail 2013).

The introduction of the mining operations will alter the character of the existing agricultural landscape that has been identified as a cultural heritage landscape of potential heritage value. Certain built heritage resources may be removed during the development of the RRP or subsequently, such as if they pose a public safety concern.

Mitigation measures and best management practices will be implemented to address potential impacts. Rainy River Resources has proposed to undertake a mitigation program consisting of an illustrated history of the study area.

13.11.2 Methods for Measuring Effects

RRR will carry out the following monitoring program to ensure the documentation of cultural heritage landscapes and built heritage resources as appropriate:

- Develop an initial record of all cultural heritage landscapes and built heritage resources known to occur near the planned RRP developments, such that intrusion or damage to such resources can be documented; and
- Conduct a post-construction assessment of the state of known cultural heritage landscapes and built heritage resources in the vicinity of RRP activities / structures to confirm the status of such resources.

13.11.3 Adaptive Management Measures

Adaptive management measures will be developed by RRR in consultation with local residents, the Ministry of Culture, Tourism and Sport, to respond to any deficiencies in methods and procedures for documenting existing cultural heritage landscapes and built heritage resources, if such a need is identified.

13.11.4 Reporting

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results pertinent to Section 13.11 of this assessment will be provided to the parties of the FMP on an annual basis during the construction, operation and active reclamation phases of the Project respecting confidentiality requirements.

13.12 Traffic Volume FMP

13.12.1 Context and Objectives

The EA Report concluded that road systems that will be used to service the RRP have sufficient existing capacity to handle the projected increases in traffic loads. The principal consideration for traffic is to manage traffic flows so as to remain within the capacity of existing road systems, and not to interfere with other local traffic. As Highway 71 (and Highway 11) has considerable excess capacity, there are no plans to monitor traffic flow on major highways.

Traffic flow on local roads with more limited capacity is of greater interest, notably:

- Highway 600;
- Teeple Road west of Highway 71; and
- The East Access Road.

The intent is to document that these local roads are able to continue to function adequately, and within safe limits for both project and local traffic.

13.12.2 Methods for Measuring Effects

Methods for measuring traffic use along local roads will include:

- Periodic traffic count surveys using automated traffic counters;
- Employee surveys to determine transport routes to and from the mine site; and
- Ongoing discussions with MTO and the Township of Chapple to support additional traffic volume monitoring studies if appropriate.

13.12.3 Adaptive Management Measures

Adaptive management measures to better manage traffic on local roads would be developed if needed. Potential adaptive management measures could include adjustments to speed limits and improved signage on local roads under RRR control and employee bussing.

13.12.4 Reporting

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results will be provided to the parties of the FMP annually during the construction and operation phases.

13.13 Accommodations FMP

13.13.1 Context and Objectives

The environmental effects analysis relating to accommodations concluded that there is sufficient capacity within the surrounding communities to accommodate the RRP construction and operations workforces, and that dedicated site construction and operations accommodations complexes were not needed. Development of the RRP is therefore expected to provide a modest stimulus to the local housing market, reversing the current trend of weak demand and surplus inventory.

It is expected that employees and contractors will find accommodation in the local area. The principal objectives of the accommodations monitoring program will therefore be to:

- Document the locations and types of residences used by RRP employees and contractors; and
- Provide generalized employment data to the local municipalities to assist them with their planning programs.

13.13.2 Methods for Measuring Effects

Methods for documenting accommodations use in association with the RRP will include conducting contractor and employee surveys to determine:

- Community or nearest community of local residence;
- Type of residence (rental or ownership);
- Type of accommodation (existing or new);
- Type of occupancy (single, shared or family); and
- Whether or not the employee / contractor is an existing local resident, or new to the area.

13.13.3 Adaptive Management Measures

No specific adaptive management measures are proposed in relation to accommodations monitoring. The information will be used inform local municipalities, and to provide information to RRR that might assist with improved traffic management, if appropriate.

13.13.4 Reporting

Subject to acceptance in writing of the FMP by the Federal and Provincial governments, monitoring results will be provided to the parties of the FMP annually during the construction and operation phases.

13.14 Environmental Management Plans

Environmental management plans are specifically mentioned in the EIS Guidelines as an example of a:

... tool that can be used to ensure that proper measures and controls are in place in order to decrease the potential for environmental degradation during all phases of project development, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety.

Environmental aspects and potential impacts of the project will be managed within an environmental management system which integrates environmental performance with overall project management. The environmental management system provides the framework for

demonstrating environmental due diligence and performance results to stakeholders and Aboriginal groups.

Environmental areas of concern as identified within the EA Report or from other sources are assessed through a risk evaluation process to understand and determine appropriate control levels. Legal and other environmental commitments are considered during these reviews.

It is anticipated the environmental management system will consider the following areas as significant environmental aspects of the RRP (although they may not be represented by individual management plans depending on the final environmental management system framework):

- Recycling and waste reduction program;
- Mine rock (PAG / NPAG) management;
- Water management;
- General waste management;
- Hazardous materials management;
- Fuel handling and storage;
- Fugitive dust management;
- Sound management;
- Wildlife management;
- Traffic management;
- Cultural awareness;
- Heritage management;
- Emergency response; and
- Response to malfunctions and accidents.

Aspects that may have an increased potential environmental effect will generally have greater operational controls or monitoring. The type of controls to be applied to other environmental aspects will vary but will consider the following elements:

- Documented management plans, procedures or instructions;
- Defined responsibilities and authorities;
- Required competencies or training for associated tasks;
- Specified equipment and maintenance;
- Stipulated operating criteria;
- Monitoring and measurement activities;
- Preparedness for incidents / non-conformance; and
- Formal communication channels.

Implementation and maintenance of the environmental management system will be driven by the RRR commitment to the principles of continuous improvement, a do no harm culture as well as ongoing compliance with the environmental requirements. Worker awareness of this commitment and requirements related to their work will be communicated through formal programs such as project orientation, job training or contractor packages.

Environmental management system maintenance and effectiveness will be monitored through a variety of programs, such as:

- Formal and informal audits;
- Environmental monitoring;
- Non-conformance incidents, status of corrective actions; and
- Stakeholder feedback.

Periodic management reviews will be completed to consider changing circumstances which could affect the continued suitability and adequacy of the plans, and to support continual improvement in overall effectiveness.

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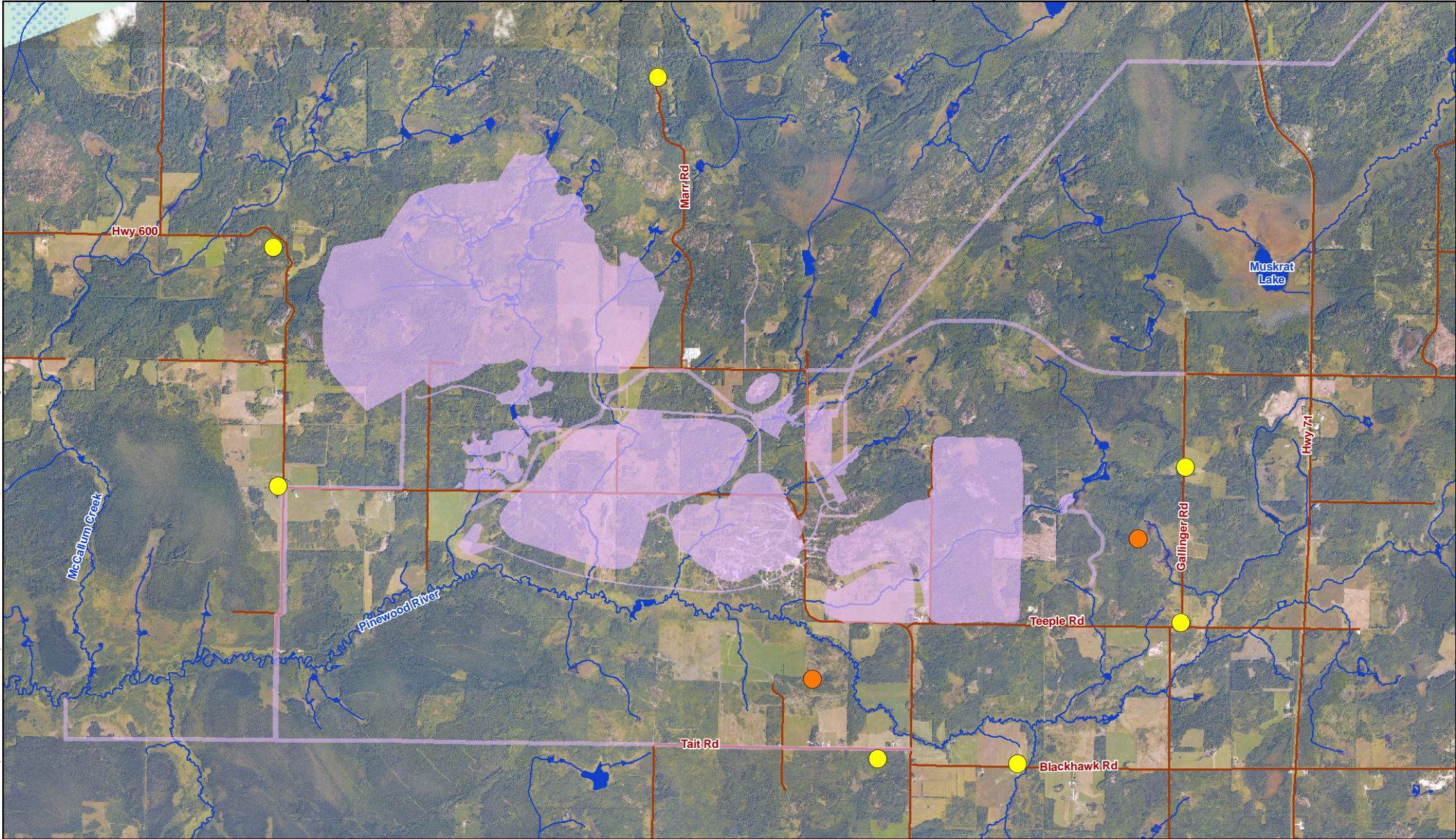
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LEGEND

Approximate Principal RRP Facilities

Proposed Monitoring Locations

- Air Quality Monitoring Location
- Sound Monitoring Location

NOTES:



RAINY RIVER PROJECT

Proposed Air Quality and Sound Monitoring Locations

Datum: NAD83
Projection: UTM Zone 15N



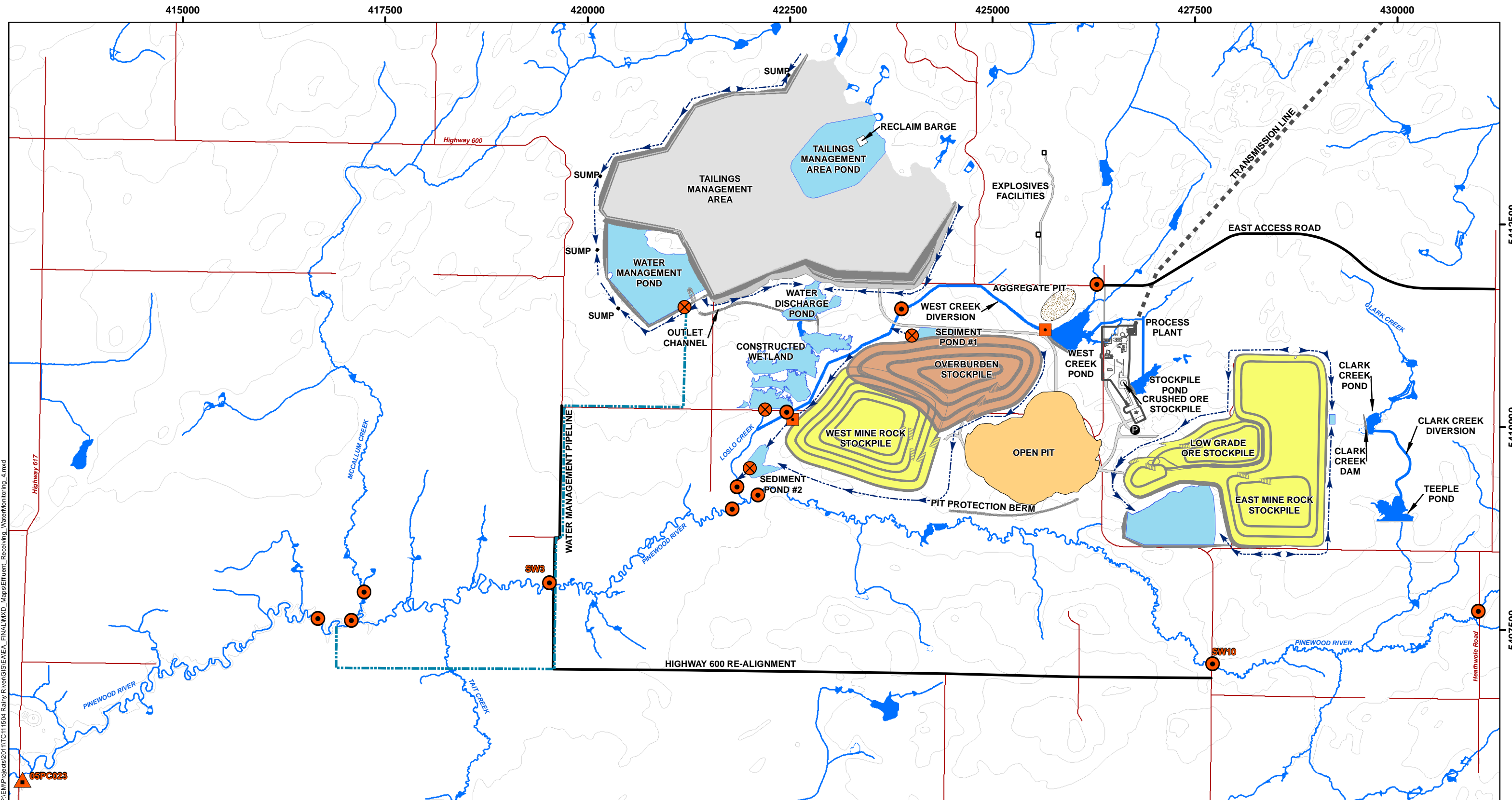
PROJECT N^o: TC111504

FIGURE: 13-1



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DATE: October 2013



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LEGEND

- Proposed Monitoring Locations**
- Water Survey of Canada Flow Monitoring Station
 - Receiver Water Quality Monitoring Location
 - Receiver Flow Monitoring Location
 - Final Effluent Monitoring Location (Water Quality and Flow Monitoring)

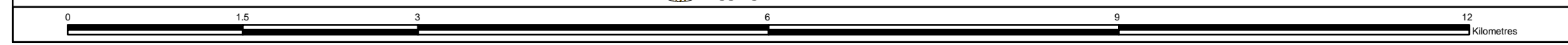
Proposed Site Features

- Underground Portal
- Open Pit
- Process Plant
- Water Management Pipelines
- Site Roads
- Pond
- Aggregate Pit
- 230 kV Transmission Line
- Deposited Tailings
- Overburden Stockpile
- Mine Rock Stockpile
- Ditch

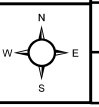
NOTES:
 - Site Plan from AMEC CAD drawing May 3, 2013, derived from BBA drawing 3098003-003000-41-D20-0001, April 29, 2013



RAINY RIVER PROJECT
Proposed Discharge and Receiving Water Monitoring Locations



Datum: NAD83
 Projection: UTM Zone 15N



PROJECT N^o: TC111504

FIGURE: 13-2

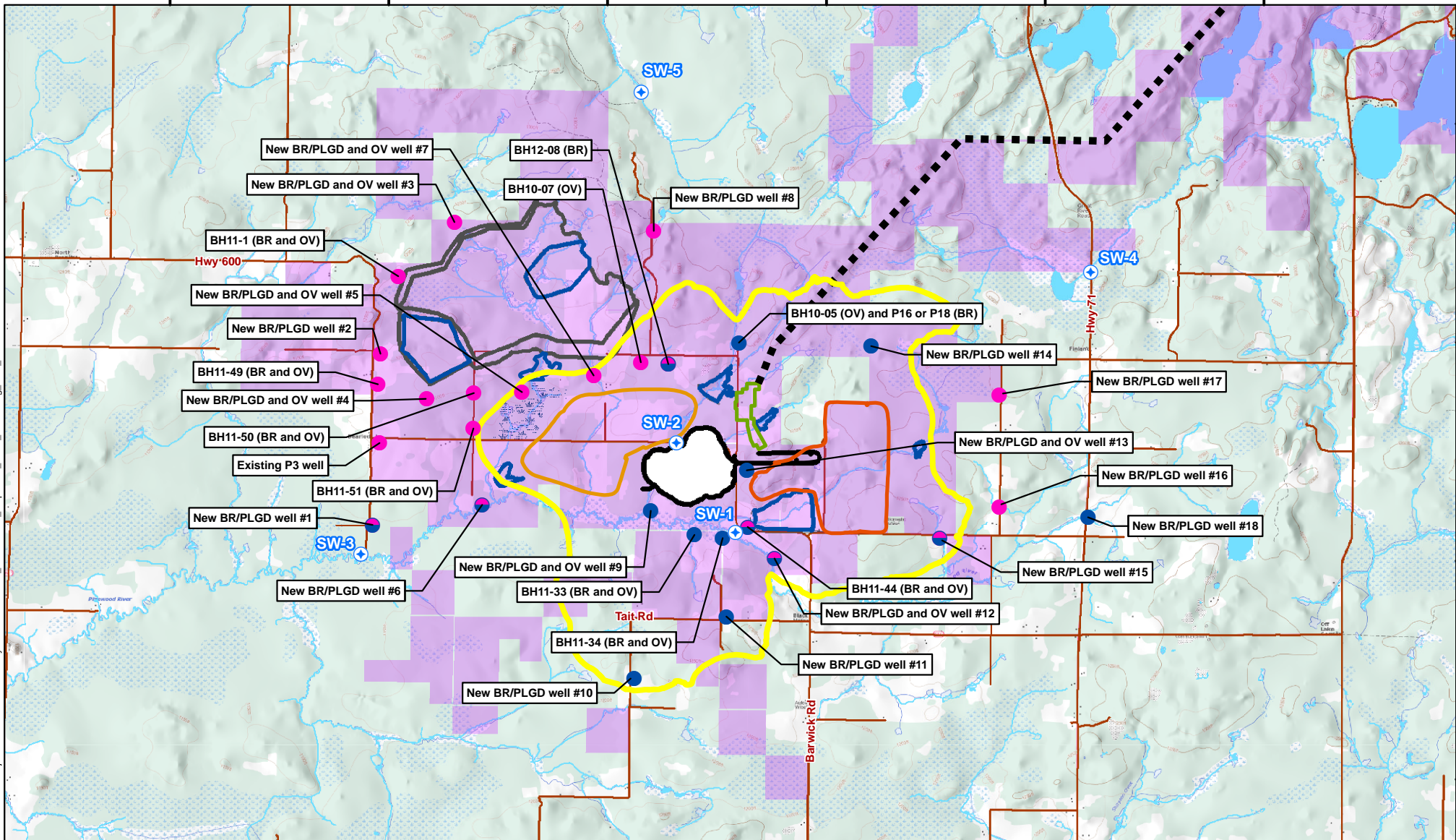
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LEGEND

- Approximate Open Pit Outline and Underground Ramp
- RRR Active Dispositions/Unpatented Claims
- 1 m Drawdown Envelope of all Sensitivity Runs
- Surface Water Level Monitoring Stations (labelled on map)
- Proposed Monitoring Wells (labelled on map)**
- Groundwater level monitoring location
- Groundwater quality monitoring location
- Groundwater level and quality monitoring location

Proposed Site Features

- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

NOTES:

- Land tenure information derived from MNDM Claimap service, data extracted on May 8, 2012
- RRR land current as of Sept. 2013
- Background topographic map extracted from Topogram, Geogratis, NRCan 1:50k DRG



RAINY RIVER PROJECT

Proposed Groundwater Monitoring Well Network

Datum: NAD83
Projection: UTM Zone 15N



PROJECT N^o: TC111504

FIGURE: 13-3

SCALE: 1:100,000

DATE: October 2013



