22 December 2017

Solomon Amuno
Nunavut Impact Review Board
29 Mitik Street, PO Box 1360
Cambridge Bay,
NU, X0B 0C0
Sent via email: info@nirb.ca

Dear Mr. Amuno,

Re: Response to The Nunavut Impact Review Board's *2016-2017 Annual Monitoring Report for the Mary River Project* and Board's Recommendations

Baffinland Iron Mines Corporation (Baffinland) is pleased to provide a response to the Nunavut Impact Review Board's (NIRB) recommendations based on the review of the 2016 Annual Report and Site Visits performed by NIRB in 2017 for the Mary River Project, issued in in conjunction with the *2016-2017 Annual Monitoring Report for Baffinland Iron Mines Corp.'s Mary River Project*[1] (Monitoring Report). Specifically Baffinland is responding to the NIRB letter dated 27 November 2017[2], which compiles recommendations from the NIRB, Qikiqtani Inuit Association (QIA), Environment and Climate Change Canada (ECCC), Indigenous and Northern Affairs Canada (INAC), Government of Nunavut (GN), and World Wildlife Foundation Canada (WWF).

A total of thirty-four (34) recommendations were received from the various agencies identified above. Responses to the individual recommendations are provided as Attachment No. 1 to this letter. Relevant supporting documentation referenced in Attachment No. 1 are provided as subsequent attachments, where noted.

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[1] NIRB (2017). *The Nunavut Impact Review Board's 2016-2017 Annual Monitoring Report for the Mary River Project (NIRB File No. 08MN053).* Dated 27 November 2017

[2] NIRB (2017). *The Nunavut Impact Review Board's 2016-2017 Annual Monitoring Report for the Mary River Project and Board's Recommendations*. NIRB File No. 08MN053. Dated 27 November 2017

Baffinland

Baffinland looks forward to the opportunity to fully address all recommendations in the 2017 Annual Report. In the interim, should you have any questions or concerns regarding the responses provided, please contact the undersigned at your convenience.

Sincerely,

Megan Lord-Hoyle
Director of Sustainable Development
Baffinland Iron Mines

cc:
Todd Burlingame, Vice-President Sustainability, Baffinland Iron Mines
Christopher Murray, Compliance Manager, Baffinland Iron Mines

Attachment:

Attachment No. 1 – Response to NIRB Recommendations
Attachment No. 2 – 2016 Marine Environmental Effects Monitoring Report
Attachment No. 3 – Summary of Waste Rock Stockpile Facility Corrective Actions

Attachment No. 1

Response to NIRB Recommendations

NO.	NIRB COMMENT	NIRB RECOMMENDATION	BAFFINLAND RESPONSE
I) Recommendations based on the NIRB's Review of the 2016 Annual Report			
1	*Monitoring Sea Levels and Storm Surges at Steensby Port and Milne Inlet* Baffinland is required pursuant to Conditions 1 and 83 of the Project Certificate to undertake monitoring of sea levels and storm surges at Steensby Port, and Milne Inlet area using GPS and tidal gauges. Within its annual reporting to the NIRB, Baffinland reported that it utilized the tidal data collected in 2014 for informing its oceanography and ballast water dispersion modelling for the Project, and that following the completion of the modeling exercise, the tidal gauge was removed and was not re-installed at Milne Port in 2016, and as such no tidal data were collected or available from Milne Port for the current reporting period. The NIRB notes that in its 2016 Board Recommendations to Baffinland, Recommendation #1 specifically requested that the Proponent submit tidal gauge monitoring data for 2014 and 2015 respectively, including information regarding how it intends to address site-specific issues affecting the implementation of sea levels and storm surges monitoring in the Project area. While Baffinland indicated within its response to Board Recommendations that it has engaged its consultant to re-install the tidal gauge, and commence GPS monitoring at Milne Port in the summer of 2017, the NIRB reminds the Proponent that trends related to sea levels and storm surges from the Milne Inlet area cannot be predicted based on the data available for 2014 only. Further, the NIRB also reiterates that the submission of this monitoring data is required to clarify whether implementation of additional mitigation measures are necessary to ensure that the impacts of climate change on Project infrastructure, including Milne port facilities are adequately minimized and mitigated.	The Board requests that Baffinland recommence the monitoring of sea levels and storm surges at Milne Inlet to support trend analysis and that it identifies any site-specific conditions that continue to limit its efforts to retrieve data from the tidal gauge installed at Milne Inlet. It is requested that confirmation of resumption of monitoring is provided to the NIRB following re-installation of the tidal gauges, and that associated monitoring data be submitted to the Nunavut Impact Review Board in the 2017 Annual Monitoring Report.	Baffinland can confirm that the tidal guage was installed at Milne Port during the 2017 open water season. The monitoring data will be submitted to the NIRB in the 2017 annual report as requested.
2	*Greenhouse Gas Emission Reporting* Baffinland is required pursuant to Condition 3 of the Project Certificate to provide interested parties with evidence of continued initiatives undertaken to reduce greenhouse gas (GHG) emissions from the Project area. Within its 2016 Annual Monitoring Report to the NIRB, Baffinland reported that it calculated the annual GHG emissions from the Project site; however, the NIRB notes that the Proponent did not include within its annual reporting information or documents substantiating how it has implemented site-specific initiatives to reduce GHG emissions.	The Board requests that Baffinland provide the Nunavut Impact Review Board with updates regarding its climate change strategy, noting any specific activities it has undertaken or anticipated initiatives to be implemented to specifically reduce greenhouse gas emissions from the Project sites. It is requested that Baffinland provide an update on this within its 2017 Annual Report.	The Climate Change Strategy has been developed in draft as part of the FEIS Addendum for the Phase 2 Proposal, and is currently undergoing internal review. The company is looking to formally implement the strategy in 2018. Details on the implementation will be provided in the 2017 Annual Report.
3	*Air Quality Monitoring* Baffinland is required pursuant to Conditions 7 and 8 of the Project Certificate to update its Air Quality and Noise Abatement Management Plan to support the continuous monitoring of SO2 and NO2 emissions from the Project site, and report on the data collected, in order to ensure that emissions remain within predicted levels across the Project sites, and where applicable, within limits established by all applicable guidelines and regulations. Within its 2016 Annual Monitoring Report to the NIRB, Baffinland reported that it could not collect or measure emissions parameters due to equipment failure, as such no specific updates were made to the Air Quality and Noise Abatement Management plan during the reporting period. In its 2016 Board Recommendations, the NIRB notes that Recommendation #3 to Baffinland requested that the details of any contemplated changes to the ongoing air quality monitoring program, including rationale for the potential suspension of any monitoring parameters (e.g., SO2 and NO2), be provided to the NIRB and other authorizing agencies prior to terminating such monitoring activities. While Baffinland has not indicated its intention to suspend air quality monitoring or discontinue the measurement of these parameters, the NIRB notes that Baffinland has not consistently monitored SO2 and NO2 emissions across the project site or developed an alternative strategy for monitoring emissions in the event of instrumentation malfunction or failure.	The Board requests that Baffinland recommence the monitoring of SO2 and NO2 emissions across the project site and develop an alternative strategy for monitoring such emissions in the event of instrumentation malfunction or failure. The Nunavut Impact Review Board also requests that Baffinland provide information on the ambient concentration of SO2 and NO2 from different project sites, including a timeseries analysis of emission variations across Project sites and that this update be provided within the Proponent's 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland recommenced SO2 and NO2 monitoring in March 2017 at the Port Site, and November 2017 at the Mine Site. Training in operation and maintenance of the air quality analyzers was provided to employees in March and November of 2017. Monthly calibrations have been completed at both sites since the monitoring resumed. An audit of the Port Site air quality monitoring station was completed in November, and it was determined that the equipment was being calibrated properly and operating well. There have been no exceedances of any of the Nunavut Ambient Air Quality Guideline parameters since the start of SO2 and NO2 monitoring. Ambient concentration monitoring results, including a time-series analysis of emissions, will be provided in the 2017 Annual Report.
4	*Dust Management* Baffinland reported that dust management and monitoring was incorporated into the Air Quality and Noise Management Plan and the Road Management Plan prior to the start of construction, and that it further developed a Dust Mitigation Action Plan in response to excessive dust generated onsite. Baffinland also referenced the submission and updates to two (2) key documents (the Air Quality and Noise Management Plan and the Road Management Plan) in substantiating its compliance with Condition 10 of the Project Certificate as pertaining to dust management. Further, the NIRB notes that the web link provided by the Proponent in the 2016 Annual Monitoring Report to enable access to the referenced documents was non-functional; as such the NIRB was unable to confirm whether the Proponent is in full compliance with this term and condition of the Project Certificate. In addition, 2016 Board Recommendation #9 to Baffinland indicated that the 2015 Air Quality and Noise Abatement Management Plan was not updated with information that reflected the specific mitigation measures and adaptive management measures that would be implemented in the event of high threshold level of dust deposition, exceeding levels predicted in the FEIS or FEIS Addendum.	The Board requests that Baffinland substantiate its efforts of undertaking dust management and monitoring activities by submitting the referenced documents (the Air Quality and Noise Management Plan and the Road Management Plan), and provide details of the specific changes or updates made to its existing Dust Monitoring and Mitigation Plan in response to excessive dust emissions generated from the site, with details of how it intends to incorporate adaptive management strategies for increased dust deposition from its operations. It is requested that Baffinland provide updates on its efforts for dust management and monitoring, and also submit all the referenced documentation within the next 30 days to the Nunavut Impact Review Board.	Baffinland continues to investigate how to better mitigate dust on site and plans to update the Air Quality and Noise Management Plan in 2018. Baffinland continues, as scheduled, to evaluate and report on dust emissions through its approved dust monitoring program at the Mine Site, Port Site and Tote Road. Baffinland has worked diligently towards decreasing dust generated by wheel entrainment across the Project Sites, specifically reducing dust generation from ground surfaces by applying water and/or chemical suppressants (CaCl) to road surfaces and site layouts during summer conditions. Measures implemented to mitigate downwind dust of the Ore Pad were implemented in spring 2017 by removing dust impacted snow from areas of accumulation, including snow drifts near water bodies and the beach west of the ship loader; this snow removal program will continue for 2018. The Crushers at the Mine Site were installed with engineered dust shrouds on the main surge bins to reduce windblown dust as well as hoods at the out flow areas. A snow fence trial was conducted at the Ore and Crusher Pads to determine effectiveness of capturing windblown ore dust snow, however varying wind directions confounded results. Research towards various dust control binding agents for crusher pads and roads continue. Copies of the current management plans are available from the Baffinland online document portal, provided below for reference. Updates to these plans will be included with our 2017 Annual Report. **Air Quality and Noise Management Plan** http://www.baffinland.com/downloadocs/baf-ph1-830-p16-0002-r6---air-quality-and-noise-abatement-management-plan_2017-01-09-42.pdf **Roads Management Plan** http://www.baffinland.com/downloadocs/roads-management-plan_2017-11-34-21.pdf
5	*Noise and Vibration Monitoring* Condition 14 of the Project Certificate requires Baffinland to conduct noise and vibration monitoring at Project accommodations during all phases of the Project during the summer and winter seasons. In the 2016 Annual Monitoring Report, Baffinland stated that in July 2016, one (1) room at the Mine Site and two (2) rooms at the Milne Port site were tested for noise and vibration levels. Baffinland further reported that due to equipment malfunction and availability issues that could not be resolved before the end of 2016 it was unable to conduct the scheduled winter noise and vibration monitoring during the 2016 period. The NIRB also notes that Baffinland did not provide any information within its annual reporting regarding what shifts or when exactly in the summer season the tests were done. The NIRB also questions the validity of Baffinland's conclusion regarding the seasonal variation of noise/vibration levels between the two (2) sites due to the relatively low sample size (Mine site=1; Milne Port=2), which is not statistically robust enough and fully representative of the noise/vibration condition levels of the project area.	The Board requests that Baffinland improve its ongoing noise/vibration monitoring program by increasing the overall sample size and frequency of monitoring of noise and vibration levels at the Mine site and Milne Port accommodation facilities, and where possible provide details of the specific time and work shifts when such testing are done, including an analysis of any observed seasonal variation of noise and vibration levels and a discussion of the implication for workers' health and safety onsite. Further, it is requested that Baffinland provide information on how it intends to address future equipment malfunction issues to ensure that noise and vibration levels continue to be adequately monitored across the Project site. It is requested that this be provided within 30 days receipt of the Board's recommendations.	Baffinland recognizes NIRB's recommendation to improve the frequency of noise and vibration testing at Project accommodations and to implement a more robust monitoring program for ensuring noise and vibration testing within accommodations is completed regularly. To-date testing has occurred on an ad hoc basis given the relative distance of the accommodation complexes from blasting activities at the Mine. Testing did continue in 2017, however Baffinland experienced technical issues with monitoring equipment and without a comprehensive program in place the Company is unable to quantify the regular testing of noise and vibration at the accomations complexes at this point. In 2018 Baffinland will develop and execute a program to ensure testing is completed, which will include conducting five (5) samples at the Mine site and five (5) samples at Port site, twice per calendar year (summer and winter). Noise or vibration concerns brought forth by employees are taken seriously and addressed on an as needed basis. During 2017, adaptive management was employed to reduce noise and vibration near accommodation complexes, including implementing quiet work hours, limiting the operation of equipment in the vicinity of accommodation complexes, where practicable, and relocated the Mine Site helicopter landing zone further away from the accommodations complexes during the morning and evening hours of the day. Baffinland additionally respects the precautionary principle when setting thresholds to protect aquatic life and submitted a Milne Ore Dock Construction Noise Verification Program Report to NIRB. Furthermore, our new Mine Site accommodations complex is scheduled to be completed in 2018, which is anticipated to further reduce employee concerns related to noise and vibration. Baffinland is optimistic that by the end of 2018, we will be able to provide the data necessary to demonstrate that noise and vibrations at the accommodations complex is not adversely affecting our employees and contractors. Should the data identify a need for noise or vibration reduction efforts, a plan will be formulated to address these concerns in consultation with stakeholders.

NO.	NIRB COMMENT	NIRB RECOMMENDATION	BAFFINLAND RESPONSE
6	*Aircraft Movements and Flight Levels* In the 2016 Annual Monitoring Report, Baffinland indicated that helicopter flights associated with the Project site have not been compliant with Conditions 59, 71, and 72 of the Project Certificate as pilots are to maintain the minimum cruising altitudes of at least 610 metres during point to point travel when in areas likely to have migratory birds, and 1,000 metres vertical, and 1,500 metres horizontal distance from migratory birds. Baffinland further reported that for the transects flown within the snow goose area during July and August, compliance was 28 percent (%) and 2% respectively. Further, Baffinland indicated that the helicopter flight height compliance outside of the snow goose area in July and August was 37% and 34% respectively, and that all areas flown outside of the sensitive season for waterfowl in June and September, saw 37% and 4% compliance respectively and that in general compliance to minimum cruising altitude was lower in 2016 than it was in 2015.	The Board requests that Baffinland to develop an action plan to mitigate aircraft disturbance to migratory birds, and address the consistent nonconformance with the flight altitude guidelines. It is requested that Baffinland provide information on how it will work with the helicopter contractor on revised protocols, pilot training and monitoring of flight logs to improve performance and compliance with the required flight altitude guidelines. It is also requested that Baffinland provide an update on its conformance within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will provide an update on compliance with Conditions 59, 71 and 72 in the 2017 Annual Report.
7	*Shipboard Observer Program* Baffinland reported to the NIRB that the ship-based surveillance monitoring was conducted in 2013, 2014 and 2015, but was discontinued in 2016 due to safety concerns arising from the on- boarding of the observers, and the general lack of success of observers on ships to observe marine mammals during ship voyages. The NIRB notes that Baffinland provided no updates within its annual reporting on the status of compliance with this condition, nor discussed any alternative programs it was considering for monitoring vessel interactions with marine mammals and seabirds during the year. While Baffinland indicated that it will continue discussions with the Marine Environment Working Group (MEWG) to identify an alternative program that would incorporate an accidental strikes reporting protocol, the NIRB expects the Proponent to remain committed to achieving compliance with this condition. This is particularly important, recognizing Baffinland is currently seeking regulatory approvals associated with its Phase 2 Development proposal which involves increasing the frequency of shipping for the Project; failure to demonstrate adherence to shipboard monitoring may contribute to public concern regarding potentially increasing shipping levels.	The Board requests that Baffinland develop an alternative strategy for monitoring vessel interactions with marine mammals, including seabirds should the ship-board observer program continue to be unfeasible due to safety concerns. It is also requested that Baffinland should notify the Nunavut Impact Review Board of any updates on this condition as pertaining to the design of any alternative programs, including evidence of Marine Environmental Working Group consensus on the agreed alternatives before the implementation of such programs. It is requested that this update be included within the 2017 Annual Report to the Nunavut Impact Review Board.	An update on the current status of the ship-based surveillance program will be provided in the 2017 Annual Report
8	*Marine Environment-Ship Noise* Baffinland is required pursuant to Conditions 110 and 111 to develop a monitoring protocol to prevent impacts to marine mammals from Project shipping activities and expected to work with the Marine Environment Working Group (MEWG) to determine appropriate early warning indicator(s) that will ensure rapid identification of negative impacts along the southern and northern shipping routes. In addressing these conditions, Baffinland indicated within its 2016 Annual Report to the NIRB that the two (2) acoustic sites quantified vessel noise and detected the acoustic presence of marine mammal calls, but that the effects on marine mammals and marine mammal populations were not assessed. In addition, Baffinland also noted that no early warning indicators of negative impacts of vessel noise have been developed.	The Board requests that Baffinland provide information on how it intends to work with the Marine Environmental Working Groups in developing its early warning indicators of negative impacts of vessel noise on marine mammals pursuant to Condition 110 of the Project Certificate. It is also requested that the Proponent report on the specific indicators being developed noting how the Marine Environmental Working Group has been involved in identifying such indicators for use, including a description of how the indicators are to be used to inform marine mammal-vessel interactions. It is requested that this update be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will provide an update on compliance with Conditions 110 and 111, including any updates from the Marine Environmental Working Group in the 2017 Annual Report
9	*Freshwater Aquatic Environment* Baffinland indicated within its 2016 Annual Monitoring Report that there were three (3) exceedances involving effluent discharges to the receiving environment, which constituted non- compliances with Condition 17 of the Project Certificate. In reporting these exceedances, Baffinland further indicated that in 2016, there were other sedimentation events including instances where surface water run-off downstream of Project facilities exceeded the discharge criteria for total suspended solids (TSS) and other parameters, which also constituted non- compliance with the requirement of Condition 46 of the Project Certificate. Baffinland also outlined that as a result of these reported exceedances, it received a Fisheries Act Direction in June of 2016 from Environment and Climate Change Canada under the Fisheries Act, and a letter of non-compliance from Indigenous and Northern Affairs Canada. Although Baffinland clarified that the high number of non-compliant discharges in 2016 was largely as a result of the freshet that occurred in the early spring, the NIRB reminds the Proponent that compliance with Conditions 17 and 46 of the Project Certificate, and implementation of protocols within the Sediment and Dust Mitigation Action Plans continue to be a requirement for the Mary River Project.	The Board request that Baffinland demonstrate how it has complied with the requirement of Conditions 17 and 46 of the Project Certificate, and implemented the protocols for managing sedimentation events during freshet onsite. It is requested that this information be incorporated in the 2017 Annual Monitoring Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
10	*Freshwater Aquatic Environment - Watercourses* Pursuant to Condition 47 of the Project Certificate, Baffinland is required to ensure that all Project infrastructure in watercourses are designed and constructed in such a manner that they do not unduly prevent and limit the movement of water in fish bearing streams and rivers. Within the 2016 Annual Monitoring Report to the NIRB, Baffinland indicated that mild (e.g. CV-106) to severe (e.g. south channel at BG-50) hanging culverts or culvert that are above the water line were noted at a few crossings as described in Table 3.3 of the 2016 Annual Report to the DFO. Baffinland further reported that mild perching of culverts does not appear to have affected fish passage, but indicated that the crossing at BG-50 was sufficiently perched through erosion to prevent all upstream access for fish in the south channel. INAC previously noted in 2015 that 11 of 34 fish-bearing in-water crossings had minor issues that required monitoring and potentially mitigation, and that there is potential for the crossing at BG-01 to become impassable in the future. The NIRB also notes that its 2016 Board Recommendation 15 to Baffinland requested that the Proponent develop an action plan for the improvement of the identified fish-bearing crossings. Further, the NIRB notes that there is a growing number of hanging or perched culverts around the vicinity of fish bearing streams, as such recommends that Baffinland take action to improve fish passage and make upgrades to culverts along the Tote Road.	The Board requests that Baffinland develop an action plan to address the hanging culverts around fish bearing streams, particularly for the crossing at BG-50. It is requested that Baffinland clarify how it has consulted Fisheries and Oceans Canada and modified its fish habitat monitoring program, and that it demonstrate how the Tote Road Earthworks Execution Plan has included an assessment of improvements to fish passage and upgrades to culverts along the Tote Road. It is requested that this update be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
11	*Survey and Monitoring of Arctic Char* Condition 48(a) requires Baffinland to provide plans to conduct additional surveys for the presence of arctic char in freshwater bodies and implement ongoing monitoring of arctic char health in areas affected by the Project. While Baffinland reported that surveys of arctic char were ongoing in the Project area, the NIRB notes that Baffinland's 2016 Annual Monitoring Report did not contain information or data on the general health status of arctic char population in freshwater bodies around the Project site. The NIRB requested in its 2016 Board Recommendation 4 to Baffinland that the Proponent support its conclusions regarding mine-related effects on fish health beyond reliance on morphometric parameters (length, size, weight, and age) and metal bioaccumulation trends in assessing effects. Further, the NIRB also recommended that Baffinland consider improvements to its Core Receiving Environment Monitoring Program (CREMP) to further substantiate its conclusion of no mine-related effects on fish population. In reviewing the 2015 Annual Monitoring Report, the NIRB notes that the Proponent did not provide any follow-up details regarding arctic char health or exposure-related effects due to mining derived contaminants.	The Board request that Baffinland provide information on how it is meeting Condition 48(a) and implementing monitoring of arctic char health in areas affected by the Project, including a discussion of how this monitoring would be informed through consultation with the Mittimatalik Hunters and Trappers Organization. It is also requested that the status of arctic char health sampled from the vicinity of the mine area and reference locations be provided and included within the 2017 Annual Report to the Nunavut Impact Review Board	Baffinland will address this recommendation in the 2017 Annual Report.

NO.	NIRB COMMENT	NIRB RECOMMENDATION	BAFFINLAND RESPONSE
12	*Marine Environment - Vessel Fouling Monitoring* Pursuant to condition 91, Baffinland is required to develop a detailed monitoring plan for Steensby Inlet and Milne Inlet for vessel fouling, and includes sampling areas on ships where antifouling treatment is not applied such as the areas where non-native species are most likely to occur. Within its annual reporting to the NIRB, Baffinland indicated that fouling had been monitored in Milne Port and Ragged Island (located in Eclipse Sound at the mouth of Milne Inlet) using annually collected underwater videos of the habitat offset area adjacent to the ore dock and natural benthic habitat (Milne Port only), and from settlement baskets (filled with native rocks to provide a surface for the settlement of fouling species) deployed in Milne Port and Ragged Island in 2014 and 2016 to detect settlement that would occur over two years. Baffinland further reported that no fouling monitoring has taken place on vessel hulls, and that no trends in fouling in the marine environment of Milne Inlet have been reported to date based on the collected 2014 and 2015 data.	The Board directs Baffinland to implement fouling monitoring on vessel hulls, as required by Condition 91. It is also requested that Baffinland provide the results of its settlement basket monitoring and underwater video surveys, including the proposed SCUBA-based monitoring program for detection of fouling on vessel hulls moored at Milne Port. It is requested that this update be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
13	*Culture, Resources and Land Use - Public Consultation* Baffinland is required pursuant to Condition 162 of the Project Certificate to engage Elders and community members of the North Baffin communities in order to have community level input into its monitoring programs and mitigative measures to ensure that these programs and measures have been informed by traditional activities and cultural resources. Within the 2016 Annual Monitoring Report to the NIRB, Baffinland indicated that in 2016 it completed workshops and community surveys on the Phase 2 Development Project that had been initiated in 2015 and further noted that the feedback it received during the Phase 2 workshops had helped to contribute to its decision-making with respect to the duration of shipping on the Phase 2 Development proposal submitted to the Nunavut Planning Commission. The NIRB notes that Baffinland annual reporting only discussed compliance with Condition 162 within the context of the proposed Phase 2 Development proposal and not for the approved Mary River Project.	The Board requests that Baffinland clarify how its engagement with communities for its Phase 2 Development proposal addressed issues from the monitoring of the approved Mary River project as required by Condition 162. It is requested that this update be included and provided within 30 days to the Nunavut Impact Review Board	Baffinland continues to engage community members to obtain input into its monitoring programs and mitigative measures. For example, Baffinland conducts semi-regular consultation visits with the North Baffin communities to provide Project updates, receive comments, answer questions, and discuss the results of monitoring and mitigation programs. During 2016, meetings and/or workshops were held by Baffinland in May, July, and November. Comments made during community meetings are documented in meeting notes and uploaded to Baffinland's StakeTracker database. During 2015 - 2016, Baffinland also completed a series of community workshops on the Phase 2 Proposal in Pond Inlet and Arctic Bay with 25 local participants (including several Elders). The workshops covered topics such as contemporary Inuit land use in the Eclipse Sound and Navy Board Inlet areas, shipping through ice, open water shipping, and caribou. In addition to 'invited persons' sessions for each of these topics, a series of public open houses were also conducted. While the focus of discussions was on the Phase 2 Proposal, a considerable number of comments were received on the Approved Project. This included comments on existing monitoring programs and mitigation measures, and several recommendations were made in these areas. The results of these workshops have been captured in a report prepared by Jason Prno Consulting Services Ltd. (2017) and uploaded to the StakeTracker database. In addition, Baffinland regularly engages community members on its socio-economic monitoring program through the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC). These committees were established in each region of Nunavut in 2007 to address project certificate requirements for project-specific monitoring programs and to create a discussion forum and information sharing hub that supports impacted communities and interested stakeholders to take part in monitoring efforts (QSEMCs 2017). Baffinland is actively involved in the QSEMC and regularly participates in its meetings. In 2016, Baffinland participated in the QSEMC's July 20-21 meeting in Iqaluit. This meeting had participants from 10 Qikiqtaaluk communities, in addition to participants from Baffinland, QIA, the Government of Nunavut, and Government of Canada. The results of this meeting have been captured by the Government of Nunavut and feedback from this group is considered by Baffinland on an ongoing basis, as appropriate. Further, at least two members of the Mittimatalik Hunters and Trappers Organization participate regularly in both the marine and terrestrial environment working groups. These groups meet four times throughout the year at a minimum. Relevant monitoring results are presented to the group for feedback and input into the monitoring programs and the groups advise on the development of adaptive management strategies if required. As a result of the MHTO participation in the working groups this year as well as concerns voiced in community meetings in Pond Inlet, the marine monitoring program was expanded in 2017 to include sampling around the anchorage locations at Ragged Island.
II) Recommendation from Authorizing Agencies' Comments on 2016 Annual Report			
Qikiqtani Inuit Association (QIA)			
14	*Migration of Inuit and non-Inuit residents and Inuit Employee Turnover Rate* The QIA indicated that Baffinland's 2016 Annual Monitoring Report did not provide sufficient data regarding in-migration and out-migration of Inuit and non-Inuit residents within the North Baffin Local Study Area (LSA). The QIA also noted that information regarding employee residence, housing and migration status were not available for 2016 as required pursuant to Condition 133 of the Project Certificate. The NIRB notes that its 2016 Board Recommendation #13 to Baffinland requested that the Proponent, in consultation with the Qikiqtaaluk Socio- Economic Monitoring Committee, develop robust indicators to measure and survey the in-migration and out-migration of Inuit and non-Inuit residents in the North Baffin Local Study Area. The NIRB reminds Baffinland to continue to work with the QIA and the Qikiqtaaluk Socio-Economic Monitoring Committee to address the expectation for monitoring the migration of Inuit and non-Inuit residents and Inuit employee turnover rate.	The Board requests that Baffinland, in consultation with the Qikiqtaaluk Socio-Economic Monitoring Committee, develop robust indicators to measure and survey the in-migration and out-migration of Inuit and non-Inuit residents in the North Baffin LSA and discuss how this may affect local housing opportunities within the LSA. It is requested that Baffinland conduct a survey of the Inuit employee turnover rate on an annual basis and that the results of the survey be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
15	*Non-Inuit LSA residents and Contractor Employees* The QIA requested that Baffinland provide data for non-Inuit residents and contractors' employees who reside in the local study area, including information regarding Baffinland's Inuit employee payroll. The NIRB notes that its 2016 Board Recommendations 14 to Baffinland requested that the Proponent provide information regarding monitoring of non-Inuit residents and contractor employees in the local study area (LSA), and where applicable, provide information regarding Baffinland's Inuit employee payroll, in order to provide an understanding of the expansion of the local market for consumer goods and services within the LSA. The NIRB has consistently encouraged the Proponent to work with the QIA to address this information gap.	The Board requests that Baffinland consult with the Qikiqtani Inuit Association in discussing priorities regarding monitoring of non-Inuit residents and contractor employees in the local study area, and where applicable, provide information regarding Baffinland's Inuit employee payroll, in order to provide an understanding of the expansion of the local market for consumer goods and services within the local study area. It is requested that this data be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
Environment and Climate Change Canada (ECCC)			
16	*Marine Environmental Effects Monitoring Program* ECCC commented on Section 4.5. 10 and Table 4.18 of the annual report noting that while the focus of the section was on ship ballast water, prop wash effects, and ore dust deposition, the Marine Environmental Effects Monitoring Program (MEEMP) is also designed to detect effects associated with seepage and surface runoff from the Milne Port facility, in fulfilment of Condition 76 of the Project Certificate. ECCC noted that the results of the MEEMP were not included with the NIRB submission.	The Board request that Baffinland submit the results of the Marine Environmental Effects Monitoring Program within 30 days receipt of these recommendations.	The 2016 Marine Environment Effects Monitoring Report (SEM, 2017) can be accessed on Baffinlands web portal, which was available as of March 31, 2017. The report is also provided as Attachment No. 2. **2016 Marine Environmental Effects Monitoring Report** http://www.baffinland.com/downloadocs/bim-2016-marine-eem-final-report_2017-10-01-24.pdf
17	*Aquatic Effects Monitoring Plan* ECCC noted that the results of the Aquatic Effect Monitoring Program (AEMP) submitted in the 2016 Annual Monitoring Report is version 1, while the version available on Baffinland's web portal was an updated version. ECCC recommended that Baffinland provide the current version of the AEMP results to the NIRB for inclusion with the 2016 Annual Report on the NIRB public registry.	The Board request that Baffinland provide the current version of the Aquatic Effect Monitoring Program for inclusion with the 2016 Annual Report on the Nunavut Impact Review Board registry within 30 days receipt of these recommendations. It is also recommended that the next update of the Aquatics Effects Monitoring Plan include maps and figures that are legible and that this information be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Rev 1 of the AEMP is the currently approved version; Rev 2 has not yet been approved by the Nunavut Water Board. For this reason, Baffinland submitted the approved Rev 1 version with the 2016 Annual Report, which is available on the Baffinland Document Portal. Baffinland proposes to provide the Rev 2 version with the 2017 Annual Report, provided it has been approved by the NWB. **Aquatic Effects Monitoring Plan Rev. 1** http://www.baffinland.com/downloadocs/aquatic-effects-monitoring-plan_2017-11-43-17.pdf

NO.	NIRB COMMENT	NIRB RECOMMENDATION	BAFFINLAND RESPONSE
18	*Dustfall Monitoring Program* ECCC noted that a substantial portion of the Dustfall Measuring Program report appears to be missing. ECCC further indicated that the report made the following statement *"annual dust fall results are analyzed against the predicted dust deposition thresholds for the Project to determine if dust fall exceeds the applicable indicator threshold. Results are also reviewed to investigate dust fall on a temporal and spatial scale relative to background with focus on seasonal differences in dust fall data."* and then proceeded immediately to references without a discussion of the analysis described.	The Board requests that Baffinland provide the missing sections of the Dustfall Monitoring Program report as well as a discussion of the information as relevant to dustfall monitoring. It is requested that this information be provided within 30 days receipt of these recommendations.	As noted in Baffinland's response to reviewer comments (submitted to NIRB July 28, 2017), it is unclear which report ECCC is referring to. All dustfall reporting is in the 2016 Terrestrial Monitoring Report and includes all data and discussion of the dustfall monitoring program. The report can be accessed on the Baffinland web portal. **2016 Terrestrial Monitoring Report** http://www.baffinland.com/downloadocs/2016annualmonitoringreport20170404_2017-10-33-17.pdf
19	*Groundwater & Surface Water* ECCC noted that Table 4.11 of the 2016 Annual Report states that "groundwater is not monitored; surface seepage is monitored in accordance with the Water License". ECCC further indicated that groundwater around the mine waste rock piles should be monitored for metal leaching which could drain during the freeze-thaw cycle, and that Baffinland should provide its justification for not monitoring groundwater around the mine waste rock piles.	The Board requests that Baffinland monitor groundwater drainage around the mine waste piles and in other Project locations pursuant to Condition 23 of the Project Certificate or clarify/justify why groundwater is not currently being monitored. It is requested that data regarding groundwater monitoring be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will provide an update on ground water monitoring in the 2017 Annual Report.
20	*Air quality* ECCC noted that no incinerator stack testing has been conducted since the initial testing in 2013. ECCC specifically noted that potential problems with incineration may have arisen since the initial testing, resulting in the potential release of contaminants, such as dioxins, furans, and mercury at levels exceeding allowable standards into the environment. ECCC further indicated that Baffinland has not included any commitments to conduct a follow-up incinerator stack testing in the Project's Waste Management Plan and recommended that Baffinland perform stack testing of the incinerators every three (3) years.	The Board requests that Baffinland perform stack testing of incinerators at regular three (3) year intervals, and to report the results of such testing in future Annual Reports to the Nunavut Impact Review Board.	Baffinland is in compliance with Project Certificate Condition No. 12, which states: "*Prior to commencing any incineration of on-site Project wastes, the Proponent shall conduct at least one stack test immediately following the commissioning of each temporary and permanent incinerator."* Baffinland is currently reviewing industry standards and best practices, and will develop a more detailed response to be included in the 2017 Annual Report.
Indigenous and Northern Affairs Canada (INAC)			
21	*Effluent Discharge Criteria, including Ground water/surface water monitoring* INAC reported that Baffinland's annual reporting did not include detailed information of water volume and analytical data associated with effluent discharges from the Crusher Pad Sedimentation Pond (MS-06) and Waste Rock Sedimentation Pond (MS-08) pursuant to Conditions 17 and 24 of the Project Certificate. INAC also commented on Baffinland's compliance status with Conditions 20 through 30 of the Project Certificate noting that on page 79 of Baffinland's 2016 Annual Monitoring Report the Proponent was not clear on how many instances or one-time exceedances of effluent discharges from the project site have occurred. In addition, Baffinland reported that surface water runoff downstream of active quarries and mining areas showed elevated ammonia and nitrate levels in comparison to baseline concentrations during the 2016 period. INAC indicated that Baffinland did not include any detailed data of the chemical parameters in the report or identified where such data could be found and accessed.	The Board requests that Baffinland include detailed data of water volume and analytical data associated with the surface water runoff from active mining/quarries areas and effluent discharges from the Crusher Pad Sedimentation Pond (MS-06) and Waste Rock Sedimentation Pond (MS-08) and other project facilities in order to verify its compliance with terms and conditions 17 and 24 of the Project Certificate. It is requested that this update be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland compiles this data and presents it in the Annual QIA and NWB Report For Operations. The 2016 report can be found on the Baffinland Document Portal. An update on compliance with conditions 17 and 24 will be provided in the 2017 NIRB Annual report. **2016 QIA and NWB Annual Report For Operations** http://www.baffinland.com/downloadocs/17-03-31---2016-qia-nwb-annual-report-for-operations_2017-10-32-04.pdf
22	*Hydrodynamic Modelling* INAC commented on page 183 of the Annual Monitoring Report noting that the report lacked detailed measurement data for the hydrodynamic modelling sampling program conducted in Milne Inlet pursuant to condition 83(a) of the Project Certificate. Although Baffinland reported that the results of the sampling showed a well-defined vertical gradient in salinity, increasing from the surface the bottom of the marine water, INAC requested that the Proponent clarify when or in which season the above-noted salinity profile was taken and also indicate whether it would be different in different seasons. Further, INAC also commented that the results of physical and chemical parameters, such as conductivity, total suspended solids, turbidity, nutrients, metals and other chemical species in the water column and in the sediment collected from Milne Inlet area were only presented in descriptive terms without any quantitative data description being provided within the report.	The Board requests that Baffinland improve upon its reporting of results associated with the hydrodynamic modeling program by incorporating both descriptive and quantitative data of all relevant parameters in future annual reports. It is requested that this update be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
23	*Ballast Water Management* INAC commented on the erroneous data presented on Table 4.8 on page 194 of the annual report, and questioned the validity of Baffinland's quality assurance (QA)/ quality control (QC) procedures and practices for ballast water monitoring, as well as its conclusion regarding its compliance with Condition 89 of the Project Certificate.	The Board requests that Baffinland improve Quality Assurance and Quality Control protocols for its ballast water sampling program in order to prevent erroneous data and to ensure that ballast water meet the salinity requirements of the applicable regulations prior to discharge at the Milne Port. It is also requested that the Proponent provide corrected results of its ballast water sampling, including details of how Quality Assurance/Quality Control methods would be improved upon and validated for subsequent sampling within 30 days receipt of the Board's recommendations.	The higher than expected salinity results collected in 2016 are attributed to the measuring technique or equipment applied in the field, and the lack of a robust Quality Assurance Quality Control (QA/QC) system integrated into the overall ballast water sampling program that would have been effective at identifying anomalous results in the field within an adequate time frame to allow for expedited corrective measures. In order to resolve this issue in future ship-based ballast water sampling efforts, Baffinland will be purchasing new water quality instrumentation for the 2018 season that will meet industry-standard requirements for reliably measuring temperature and salinity/conductivity (plus purchase of a second identical unit for redundancy purposes). Further to this, Baffinland has retained Golder Associates Ltd. to develop a comprehensive, stand-alone Standard Operating Procedures (SOP) manual for Baffinland's ship-based ballast water sampling program. The SOP will include information on applicable legislation, program objectives, monitoring responsibilities, sampling equipment specifications, detailed technical procedures for sampling and sampling planning, comprehensive QA/QC procedures, and adaptive management measures for implementation during non-compliance events.
Government of Nunavut (GN)			
24	*Nunavut Annual Net Migration* The GN noted that some surveyed Baffinland employees indicated that they intend to relocate to a different community in the next 12 months and with housing inventories not available in many communities, the GN further expressed concerns that such move may place additional stress on housing-related issues. The GN recommended that further questions be developed and incorporated into the pre-existing voluntary employee survey to better define the effects of project-related influences on housing in the north Baffin LSA.	The Board requests that Baffinland assess Project-related influences on housing in the north Baffin local study area, as well as to continue developing employee surveys to properly address all socio-economic indicators likely to arise due to migration. It is requested that the results of the survey be provided and incorporated within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
25	*Community Survey Results* The GN commented that the 2016 North Baffin community survey reported on in the 2016 Annual Report did not report examples of negative changes expressed in the community surveys. The GN further noted that the availability of such information would lead to opportunities to review impacts reported on behalf of communities, and where impacts are found to be valid, the Proponent can then investigate whether mitigation measures have been or can be successfully implemented.	The Board requests that Baffinland adhere to the recommendation of the Government of Nunavut to provide examples of negative changes or concerns reported in the community surveys and a description of how Baffinland intends to address these impacts and confirm that proper mitigation measures have been implemented. The positive and negative results associated with the community surveys should be provided and included within the 2017 Annual Report to the NIRB.	Baffinland will address this recommendation in the 2017 Annual Report.
26	*Childcare availability and Cost* The GN commented that the lack of child care in communities may result in the increase in Inuit turnover rates at the Project and recommended that the Proponent investigate the feasibility of using the Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat (INPK) to provide additional supports to community daycares or child care services over and above what is available through the GN's Start-up Contribution program.	The Board requests that Baffinland follow the recommendation of the Government of Nunavut to address the increase in Inuit turnover rates at the Project by exploring the feasibility of using the Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat fund to provide additional supports to community daycares or child care services over and above what is available through the Government of Nunavut's Start-up Contribution program. It is requested that updates with respect to providing additional supports to community daycares or child care services for employees or through Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat fund be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.

NO.	NIRB COMMENT	NIRB RECOMMENDATION	BAFFINLAND RESPONSE
27	*Food Security* The GN noted that Baffinland's annual reporting did not make any conclusion regarding food security for affected community members and that the majority of discussion in the 2016 Annual Monitoring Report tended to focus on income, including food access and affordability of food in the local communities. The GN specifically commented that the access to hunting grounds continues to be identified as an ongoing issue for residents of Pond Inlet but that Baffinland has yet to measure or report this impact.	The Board requests that Baffinland consider working with appropriate stakeholders to develop a measurement tool/indicator for food security and provide information on the impact of the Project on food security, including access to hunting grounds. It is requested that this update be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
28	*Pressures on Existing Health and Social Services* The GN reported that the Project has had impacts on the health care service provisions and recommended that service requests and interactions be tracked to monitor the degree of impact and determine if improvements can be made to the system and process currently in place for health and social services.	The Board requests that Baffinland engage with the Government of Nunavut to discuss possible Project implications on existing health and social services, including strategies for tracking health and social service requests. The Proponent should also consider providing information regarding outbreak investigations of communicable diseases, medical assessment or return to work as a requirement of insurance or workplace policies, and treatment of workplace injuries upon returning to the community. It is requested that an update on this engagement and related outcomes be included within the 2017 Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
World Wildlife Fund (WWF)			
29	*Collection of Marine baseline data* The WWF noted that Condition 99 of the Project Certificate requires Baffinland collect baseline data on marine wildlife, including shore-based observations of pre-Project narwhal and beluga behaviour at Milne Inlet at an appropriate frequency for not less than three consecutive years. In reviewing the 2016 Annual Report to the NIRB, the WWF noted that Condition 101 requires that Baffinland incorporate a schedule for periodic aerial surveys as recommended by the Marine Environmental Working Group. The WWF further noted that the results of the 2016 aerial survey were not included within Baffinland annual reporting to the NIRB, and as a result questioned the validity of Baffinland's conclusions regarding narwhal abundance and behaviour. In addition, WWF recommended that Baffinland incorporate more monitoring data such as DFO- led aerial surveys prior to interpreting results and providing conclusive statements within its annual report.	The Board requests that Baffinland strengthen its marine monitoring program by including data from acoustic monitoring and aerial surveying, and where possible integrate results from Fisheries and Oceans Canada led surveys, prior to the interpretation of results and provision of conclusions within its annual reporting. It is further recommended that Baffinland comment on its ability to undertake more direct studies on disturbance, including for instance, acoustic monitoring before, during, and after ship transits, drone monitoring before, during, and after ship transits and possibly photo surveys before, during and after transits. In addition, it is also requested that Baffinland submit documentation of the results of the shore-based observations of narwhal behavior that took place in 2016 within 30 days' receipt of the Board's recommendations	During the 2017 season, Baffinland incorporated acoustic monitoring into its marine monitoring program by means of deploying passive acoustic monitoring tags on live-captured narwhal that also included integrated dive and accelerometer sensors to measure the tagged animal's acoustic environment and vocal activity in tandem with dive and foraging behavior. The deployment of high-resolution movement and acoustic tags on individual narwhal over an extended time series provides a means to evaluate potential changes in animal behavior related to shipping events along the Northern Shipping Route. This study was part of an ongoing research collaboration with Fisheries and Oceans Canada (DFO) (Arctic Research Division). Data analysis from this program is currently undergoing analysis and will be presented in a technical report available for review by the Board and MEWG members and observer parties later in 2018. 2018 Monitoring programs are also in development and will be presented to the Marine Environment Working Group for comment. The Board requests that Baffinland 'strengthen its marine monitoring program by including data from aerial surveying, and where possible, integrating results from Fisheries and Oceans Canada led surveys, prior to the interpretation of results and provision of conclusions within its annual reporting'. In 2016 Baffinland and DFO entered into a data sharing agreement regarding aerial imagery data collected by DFO in the Project area during the open-water season of 2016. Baffinland retained Golder to analyze the 2016 aerial photographic survey data collected by DFO for the purpose of calculating narwhal abundance and density estimates in Milne Inlet, Tremblay Sound and Eclipse Sound during the 2016 open-water season, based on conventional distance sampling methods. The results of this analysis are presented in a technical data report (Golder 2017) that is presently under review by DFO for their approval before being shared with other parties; a condition of the existing data sharing agreement. Baffinland anticipates that this report will be available for review by NIRB and MEWG members in Q1 of 2018. Please note that the results from the 2016 Bruce Head Shore-based Monitoring Program were released in a technical report prepared by LGL (Smith et al. 2017) that was provided to MEWG members in April 2017, and can be found on the Baffinland Online Document portal at the link below. **Shore-Based Monitoring of Narwhals and Vessels at Bruce Head, Milne Inlet, 2016** http://www.baffinland.com/downloadocs/fa0089---bruce-head-narwhal-2016-final-reportopt_2017-10-08-33.pdf
III) Recommendations Based on NIRB's 2017 Site Visits			
30	*Used Tires* During the 2017 site visits, used tires continue to be a significant waste stream across the Project sites, particularly around the mine site and Mile Port, and as noted in the 2016 site visit. While the NIRB Project Certificate does not have any specific terms and conditions for addressing this particular waste stream, the management measures committed to by Baffinland in both the Final Environmental Impact Statement and the Environmental Protection Plan stated used tires were expected to be stockpiled for shipment offsite (e.g., re-treading, reuse, or disposal). During the August 2017 site visit, Baffinland indicated that used tires were being stored in seacans for shipping and disposal offsite in the south, and that plans were underway to repurpose some of the historical tires for other site use. The NIRB's 2016 Board Recommendation #17 to Baffinland requested that the Proponent provide an explanation as to why the used tire management measures committed to in the Final Environmental Impact Statement (FEIS) and FEIS Addendum for the Mary River Project and Early Revenue Phase, which stated that used tires would be stockpiled for shipment offsite (e.g., re-treading, reuse, or disposal), were not in place onsite.	The Board requests that Baffinland provide an update regarding how it has implemented measures within its Tire Management Plan for re-treading, reuse, or offsite disposal of tires generated from the site. It is further recommended that a more organized method of storing the tires be implemented. It is requested that a response to this recommendation be provided within 30 days' receipt of these recommendations.	Baffinland devised and implemented a tire storage, reuse and disposal Tire Standard Operating Proceedure (SOP) in 2017, in response to concerns identified by NIRB. The majority of all new tires are stored in sea cans. Used Tires that have been produced since the implementation of storage protocols in 2017 are segregated by size and stored in sea cans or placed outside in a designated orderly manner due to sea can storage capacity limits on site. During the 2017 sea lift back haul, there were 6 – 40 foot sea cans (average 80 tires each) and 20 – 20 foot sea cans (average 40 tires each) backhauled to southern disposal facilities. Historically deposited tires continue to be an issue on site. In efforts to address this issue Baffinland will allocate budget in 2018 to: - install used tires as safety barriers where appropriate; and, - action a contractor run disposal program in efforts to reduce the amount of used tires on site through backhaul.
31	*Waste Landfill* At the time of the March and August 2017 NIRB site visits, it was noted that all of the protective mesh around the landfill area were completely removed from the supporting poles similar to previous site visit observations in 2014, 2015, and 2016, and the wooden fence around the facility was insufficient to contain wind-blown debris originating from the landfill. The NIRB further notes that the condition of the fencing around the landfill during the 2017 site visits have not significantly improved compared to previous years as Baffinland has yet to install a more durable fencing materials consistent with best practices, and as recommended by the NIRB in 2014, 2015, and 2016 respectively. Further, the NIRB's 2016 Board Recommendation #18 requested that Baffinland continue to evaluate its need for an upgraded litter fence around the active areas of the landfill in the light of changing environmental conditions at site.	The Board directs Baffinland to adhere to industry best practices for landfill operations, including through the installation and continued maintenance of landfill litter fences to ensure waste materials are not dispersed offsite. It is requested that an update regarding this recommendation be provided within the next 30 days to the Nunavut Impact Review Board.	Baffinland will install and maintain two lengths of 8 foot high steel mesh fencing on the leeward side of the prevailing winds to capture and contain potential landfill debris from exiting the containment area to compliment the existing damaged plastic landfill fence and sea can barriers. The effectiveness of the containment will be monitored and appropriate enhancements will be made if the fencing does not adequately control release of debris beyond the fenceline.

NO.	NIRB COMMENT	NIRB RECOMMENDATION	BAFFINLAND RESPONSE
32	*Uncontrolled Seepages from Waste Rocks* During the tour of the waste rock dump that occurred as part of the NIRB's 2016 site visit, NIRB staff noted uncontrolled seepage of site contact water into the adjacent tundra from the piles of potentially acid generating waste rocks. It was observed that the waste rock storage area lacked appropriate water management structures required to properly divert or intercept overland runoff from waste rock dump to the nearby sediment pond. Subsequent to the 2016 visit, Baffinland constructed the MS-08 facility (sedimentation pond and ditching) to address the issue. The NIRB's 2016 Board Recommendation 19 to Baffinland specifically requested that the Proponent provide an explanation for the uncontrolled seepage of site contact water from the piles of potentially acid generating waste rock into the adjacent tundra and provide an action plan for addressing the environmental issue. During the March 2017 site visit NIRB staff noted that MS-08 had been constructed, but as a result of the snow and freezing conditions onsite it was not possible to assess the effectiveness of the facility. Prior to the August 2017 site visit, it was noted by the QIA and ECCC that the MS-08 facility was not effective in containing the runoff from the waste rock pile during the freshet. During the August 2017 site visit, the NIRB staff further noted that MS-08 had overflowed, with the site contact water/ runoff flowing into the adjacent tundra. Baffinland indicated its intent to re-ditch the western portion of MS-08 and re-engineer the sedimentation pond and interception ditch as necessary to prevent further seepage and overflow from the facility.	The Board requests that Baffinland provide an action plan showing how the MS-08 facility will be improved to ensure that site contact water is properly managed around the waste rock piles, and that discharge from the waste rock dump meets criteria and is properly contained and channeled, and not allowed to flow into the adjacent tundra. It is requested that this information be provided within 30 days receipt of these recommendations.	Baffinland is in the process of finalizing a strategy to address outstanding concerns regarding the Waste Rock Stockpile Facility (Facility). Once finalized, an Action Plan will be provided to NIRB, as well as INAC, ECCC and the QIA. A brief description of the 2017 events and corrective actions taken to date were summarized in an update sent from Baffinland to ECCC on November 21, 2017 (Attachment No. 3). Further discussion will be provided in the 2017 Annual Report.
33	*Landform - Contaminated Snow, Soil and Synthetic Liners* During the March and August 2017 site visits, the NIRB staff noted significant improvement to the landfarm facility due to the ongoing removal of entrenched synthetic liners and the control of windblown debris from the site consistent with the request of the NIRB's 2016 Recommendation #20 to Baffinland. However, the NIRB staff observed that some liner scraps continue to be visible within the contaminated soils located in the facility. In addition, waste barrels, plastic buckets and other non-soil debris were also observed in the landfarm.	The Board requests that Baffinland adhere to industry best practices for landfarm operations, including for management of contaminated snow and waste synthetic liners. It is requested that an update regarding this recommendation be provided within the next Annual Report to the Nunavut Impact Review Board.	Baffinland will address this recommendation in the 2017 Annual Report.
34	*Terrain Stability at Sewage Outfall Area* As noted during the 2016 site visit, some areas within the vicinity of the sewage outfall area showed signs of terrain instability, and could pose a fall risk to workers unfamiliar with the site. The NIRB's 2016 Board Recommendation 22 to Baffinland requested that the Proponent address the terrain stability issues noted at the sewage outfall area in relation to impacts resulting from freshet events or spring thaw. Although Baffinland responded to the NIRB that the location will be included as part of the bi-annual geotechnical inspection of the Mary River Project infrastructure as required under the Type "A" Water Licence; the August 2017 NIRB site visit noted that the terrain situation around the sewage outfall area continues to remain unstable due to significant erosion and permafrost thawing.	The Board requests that Baffinland provide an action plan for addressing the terrain stability issues consistently noted at the sewage outfall area in relation to impacts caused by freshet events or spring thaw. It is requested that this information be provided within 30 days receipt of these recommendations.	A field level geotechnical inspection was performed in 2017, but was not documented in the annual Geotechnical Report. Preliminary assessment of the permafrost degradation attributed the erosion and permafrost degradation to naturally occuring processes. Baffinland will address stability concerns by depositing aggregate (e.g 3/4" fill, rip-rap) as needed to provide the necessary reinforcement and environmental protection to mitigate the risk of future sluffing of terrain in the area of concern. Subsequent geotechnical investigations in 2018 will specifically assess and provide further recommendation on mitigation measures, if needed.

Attachment No. 2

2016 Marine Environmental Effects Monitoring Report

Final Report

2016 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species Monitoring Milne Inlet Marine Ecosystem

Prepared For:

Baffinland Iron Mines Corporation
2275 Upper Middle Road East,
Suite 300
Oakville, ON
L6H 0C3

Prepared By:

Sikumiut Environmental Management Ltd.
SEM
2nd Floor, 79 Mews Place
St. John's, NL
A1B 4N2
March 30, 2017

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EXECUTIVE SUMMARY

In 2016, the second year of monitoring of marine ecology under the Marine Environmental Effects Monitoring Program (MEEMP) for the Mary River Project was undertaken. Marine data continued to be collected to complete species inventories for Milne Port to support monitoring related to aquatic invasive species (AIS).

The MEEMP was developed to address regulatory requirements for the implementation of the Mary River Project as documented in the Nunavut Impact Review Board (NIRB) Project Certificate No. 005 Terms and Conditions. The MEEMP includes monitoring of marine ecology (this report), and monitoring of marine mammals and shipboard observer monitoring, both of which are addressed in separate documents. Sampling design for marine ecological monitoring was based on repeated measures (RM) regression analyses where replicates (stations) are re-sampled at specific time intervals (years). The spatial structure was based on a radial gradient design for monitoring effects with distance from a point source, the Milne ore dock. Sampling design included data collection along four transects, three of which radiated from Milne Port: West Transect (WT); East Transect (ET); and North Transect (NT). A fourth transect, Coastal Transect (CT), extended from the end of the East Transect northeastward terminating outside of the predicted zone of influence (ZOI) of Project activities. Three transects (WT, ET, CT) followed the same depth contour (15-18 m) to control for depth stratified environmental and biological conditions. The North Transect included both distance and depth gradients.

Monitoring targets were identified during Project environmental assessment and in consideration of the NIRB Project Certificate Terms and Conditions and included: (i) physical sediment quality (particle size); (ii) marine sediment chemistry (iron, hydrocarbons); (iii) epibenthic community (benthic epifauna abundance, % macroflora cover); (iv) fish community (contaminants in flesh of incidental mortalities of sculpin and Arctic char); and (v) AIS (species inventory pre- and post-Project implementation). In 2015, water quality was added to the MEEMP in relation to site drainage discharge and this monitoring had a more restricted spatial and temporal sampling design, emanating from the point of discharge. For 2016 sampling occurred on three more occasions.

Water Quality

Conductivity, temperature and depth profiles were collected throughout Milne Inlet as part of opportunistic data collection for possible oceanographic modeling. The profiles indicated a consistent pattern with a well-defined vertical gradient in salinity increasing from the surface to the bottom, with the increase greatest in the near surface layers (10-15 m). There was similarly a consistent gradient in temperature, declining from the surface layer to 65-85 m in depth.

Surface water samples were collected during five sampling events in August and September in an attempt to assess the temporal variability in water quality. Samples were comparable between stations, with most variability occurring between events. Water was clear with low total suspended solids, low turbidity, low colour and was circumneutral to slightly alkaline. Nutrients were either very low or non-detected. Most metals were un-detectable excepting aluminum, barium, boron, cadmium, molybdenum, strontium, titanium, uranium and zinc. Mercury exceeded Canadian Council of Ministers of the Environment (CCME 2016) guidelines for the protection of aquatic life during one sampling event in 2015 but was undetected in 2016. Hydrocarbons were not detected in any water samples collected in 2016.

Sediment Quality

In 2016, sediment samples were collected at five sampling stations from each transect (n=19 stations), with each station at increasing distance from the ore dock. Replicates (n=3) from each station were further used to assess the variability between samples. Sediment quality assessment included chemical analyses (conventional metals and petroleum hydrocarbons) and physical characterization (particle size analysis and total organic carbon). There was considerable spatial variability in particle size characteristics within and among sampling sites. The highest variability occurred within the East Transect while the highest overall variability was in relation to the sand component. The North Transect demonstrated increasing fines (clay and silt) with increasing depth, as expected, while the Coastal Transect overall had highest percentages of clay. The sand component was highest in the West and East Transects, likely related to the proximity of the stream and river mouths, particularly Phillips Creek. Consistent with higher clay and silt fractions, the Coastal and North Transects had highest concentrations of organic carbon.

Project activities considered to potentially alter the physical composition of sediment included dust dispersion from loading of ore and sediment redistribution as a result of propeller wash from shipping activity. Project activities are more likely to cause deposition and/or redistribution of lighter weight materials, consequently the relationship between percent fines and distance from the ore dock was monitored. In 2014, the West and East Transects demonstrated a weak positive relationship between percent fines and distance from the ore dock while the North and

Coastal Transects demonstrated no distinct relationship. High variability between samples resulted in weak regression relationships for each transect with from 6% to 50% of the variation in data explained by the regressions. Similar weak relationships were evident in the 2015 data, and analysis of covariance (ANCOVA) indicated there were no significant differences in the regression relationships between baseline (2014) and the first year of operations (2015) for all transects. In 2016, relationships between particle size and distance were again weak showing no significant differences in the regressions between years with the exception of the West Transect. The West Transect showed a significant decrease in slope loosely indicating an increase in the percent fines near the ore dock and a slight decrease in the percent fines at distance.

Conventional metals in sediment were in low concentrations with the exception of aluminum and iron which were found in relatively high concentrations. Aluminum and iron concentrations were highest from the North and Coastal Transects, likely related to the high clay, silt and organic carbon content of these samples. Overall, two stations exceeded CCME Interim Sediment Quality Guidelines (ISQG) for arsenic for the protection of aquatic life and one station for zinc. Hydrocarbons were for the most part below detection with only trace amounts of petroleum hydrocarbons in the lube oil ranges (C_{16}-C_{32}) detected and generally in lower concentrations than 2015.

High volumes of iron ore will continue to be stockpiled and loaded onto ships at the Milne ore dock during Project operations; consequently, iron concentration in sediment was identified as a monitoring target. In 2014, the West Transect showed a slight decrease in iron concentrations with distance from the ore dock while the East, North and Coastal Transects showed a slight increase with distance, with from 1% to 50% of the variation in data explained by the regression models. In 2015, the same trends were apparent with the West Transect iron concentrations showing a slight decrease with distance from the ore dock, while the other three transects (East, North and Coastal) demonstrated slight increases with distance, with from 4% (East) to 70% (North) of the variation in data explained by the regression models. Analysis of covariance indicated there was no significant difference between years in the relationship between iron concentration and distance from the ore dock for all transects. Similar results were found in 2016 for the West, North and Coastal Transects with no significant differences between years, however, the East transect had a significant difference from baseline values, which was likely driven by a reduction in iron content in proximity to the ore dock.

Benthic Epifauna and Macroflora

Habitat surveys were completed by underwater video on the four transects and habitat features assessed included: substrate (type and distribution); macroflora (class and distribution); and epifauna (presence and abundance). The potential influence of the Project on marine habitat will be primarily reflected in physical and chemical alteration of sediments. It was necessary to link these possible effects to the biological community and benthic epifauna (as total abundance) and the proportion (%) of macrofloral cover were identified as indicators of biological response to Project related effects.

A comparison of regression slopes for epifauna abundance and % macroflora coverage with distance from the Milne Port have indicated significant differences between baseline (2014) and year one (2015) for the West and East Transects, but not for the Coastal Transect or the North Transect (which was not sampled in 2014). In 2016, there were significant differences in % macroflora for the West, East and Coastal Transects generally related to slight decreases however, these decreases in macroflora may be related to the significant increases in epifauna at the West, East and North Transects. These differences must be interpreted cautiously given the high variability within the system coupled with the difficulty in collecting data over the exact same area from year to year. Transects will continue to be re-sampled in future years to increase the power of analysis.

Fish and Mobile Epifauna

Gill nets and baited Fukui traps were deployed to capture finfish and mobile epifauna associated with Milne Port and adjacent areas. Fishing locations were not based on the radial gradient study design and targeted the Milne ore dock (Fukui traps) and Eastern Shore (Gill nets; traditional Inuit fishing areas). Opportunistic sampling of incidental mortalities during fishing activities was conducted to collect flesh for contaminant analyses and 13 Arctic char were sampled. Char ranged between nine and 19 years in age and had relatively low body burden contamination. Arsenic, copper, mercury and zinc were present in all five fish, while chromium (n=1) and iron (n=1) were also present. None of the fish exceeded Health Canada's guideline for mercury and fish consumption (0.5 mg/kg). The use of char to monitor body burden has limited value due to the short and transient exposure to contaminants at Milne Port.

Resident fish in the vicinity of Milne Port were dominated by sculpin species and a mark-recapture survey has been conducted with limited success since inception of the program in

2014 in order to estimate relative population size. Thirty-eight sculpin were captured in 2016, representing three species, with no recaptures of marked fish and therefore, it was not possible to estimate population size. The lack of recaptures and low catch-per-unit-effort since 2014 indicated resident sculpin of any one species are not present in numbers adequate to support sampling requirements that would require sacrificing fish (i.e., body burden analyses). Opportunistic sampling of fish at the surveillance level will be continued and tissue samples from incidental mortalities from fishing efforts will be analyzed for contaminants.

Aquatic Invasive Species

Monitoring for aquatic invasive species is based on annual surveys of zooplankton, benthic infauna, epibenthos, macroflora, fish, and encrusting epifauna. Each survey is used to update the taxa list for each level of biota, with the updated listings examined for new taxa to determine if new taxa are potentially invasive. Surveys in 2016 were the third year under an aquatic invasive species monitoring program and the first year after operational shipping of iron, which was initiated in July 2015.

Zooplankton samples were collected at Milne Inlet using a combination of vertical and oblique tows. Zooplankton, representing 29 and 22 taxa, were identified from vertical and oblique samples, respectively. Nine of 38 taxa (24%) identified in 2016 were not previously recorded, while a total of 63 taxa have been identified in three years of monitoring (2014, 2015, and 2016). The taxa accumulation curve for all years approached an asymptote at 63 species, suggesting sampling effort may be sufficient for characterizing zooplankton biodiversity.

Benthic invertebrate samples were collected at Milne Inlet along four transects at three depth strata. Samples contained from 13 to 53 taxa with the total number of taxa in 2016 at least 209. In 2016, 49 (26%) of the taxa identified were not previously found at Milne Port with a total of 332 taxa identified in all years combined. The combined taxa accumulation curve indicated the relationship approached an asymptote at 347 species suggesting the combined sampling effort may be sufficient for characterizing benthic biodiversity.

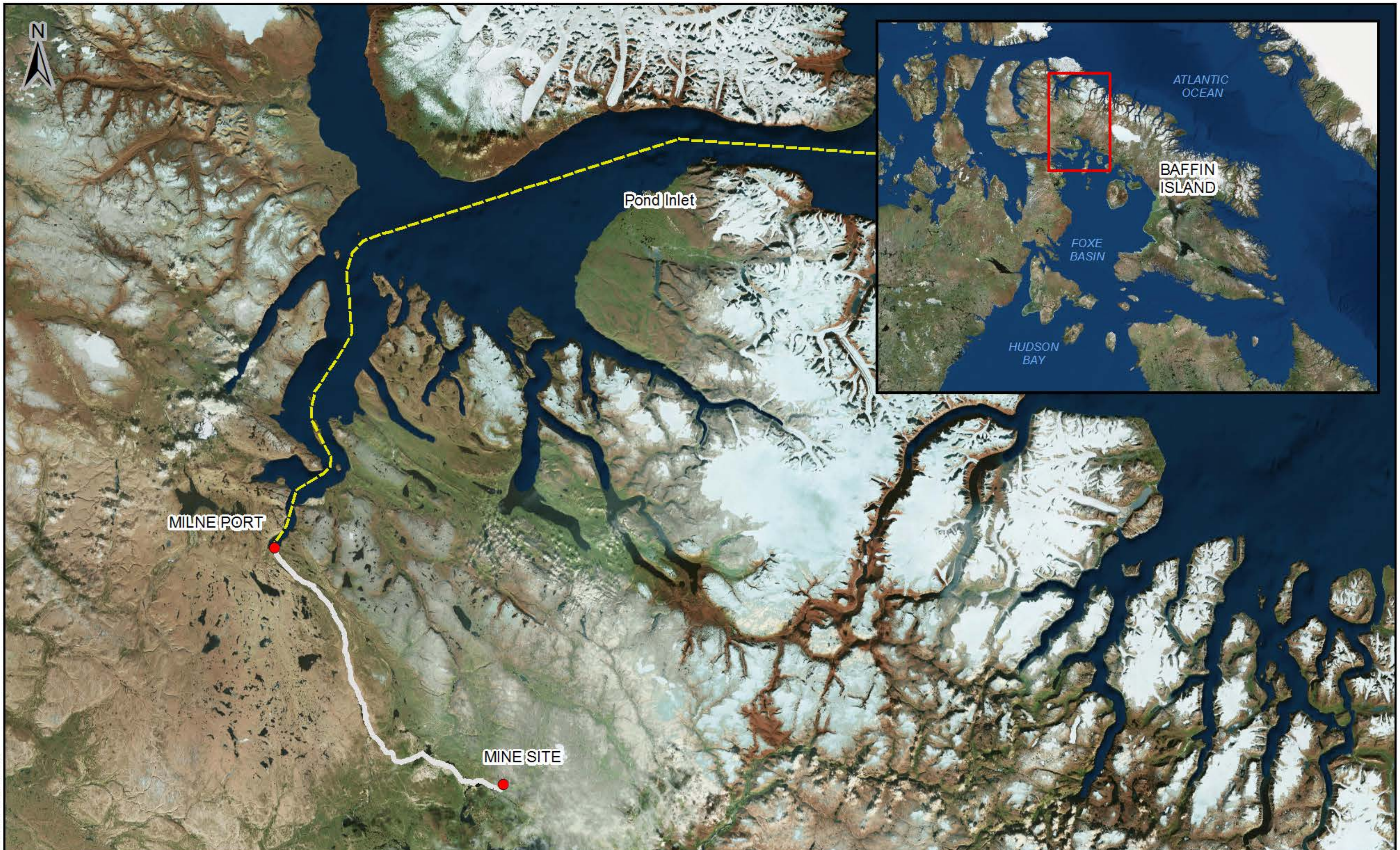
Benthic epifauna were captured in Fukui traps and observed in underwater video in 2016. A total of 25 taxa were identified in 2016 including five taxa not previously observed; Ocean quahog, Sea lily, Northern propellerclam, Feather duster worm, and Razor clam. A total of six macroflora taxa were identified in underwater video in 2016 representing a similar level of diversity in all three monitoring years. Gill nets and baited Fukui traps were used to capture finfish and mobile epifauna in 2016. A total of 13 finfish species were recorded from sampling efforts from 2010 through 2016. In 2016, three species were captured with gill nets while four species were captured in Fukui traps. Arctic cod, not previously captured, were observed in large schools associated with the ore dock coarse rock substrate in 2016. Settlement baskets for sampling encrusting epifauna were deployed in 2014 and unfortunately could not be located in 2016, and traps were redeployed with recovery planned for 2018.

1.0 INTRODUCTION

Baffinland Iron Mines Ltd. (Baffinland) is the proponent for the Mary River Project (“the Project”), an approved iron ore mine, with associated facilities located on north Baffin Island, in the Qikiqtaaluk Region of Nunavut (Figure 1.1). The Project involves construction, operation, closure and reclamation of an 18 million tonne-per-annum (Mt/a) open pit mine that will operate for an estimated 21 years. An Early Revenue Phase (ERP) was proposed as an addendum to the approved Project and involved truck transport of ore via an existing Tote Road with ore being stockpiled at Milne Port for shipment. Loading ore onto ships at Milne Inlet occurs during the open water shipping season (approximately 90-100 days from July to October). The development of the Milne Port (freight dock, laydown areas, expanded camp and sewage treatment facilities, maintenance shops and warehouses) and the upgrade of the Tote Road (limited realignment, replacement of culverts, addition of bridges) were integral to the approved Project and were included in the scope of the Final Environmental Impact Assessment (FEIS) approved within the Nunavut Impact Review Board (NIRB) Project Certificate No. 005. As part of the ERP, additional proposed infrastructure at Milne Inlet included an ore dock that would serve as the loading area for shipment of ore and ore shipments were increased to 4.2 Mtpa (million tonnes per annum). The Addendum to the FEIS to address the ERP was approved by NIRB (May 2014) and the Project Certificate amended accordingly.

Baffinland has developed a plan for a second phase of development for its Mary River Project (“Phase 2”) which will seek to optimize the infrastructure constructed for the ERP, and enable Baffinland to increase shipments of iron ore from Milne Port to 12.0 Mtpa. Phase 2 includes construction of a railway following the Northern Transportation Corridor (existing Tote Road) to eventually replace truck transportation of ore; increased utilization of Milne Port for shipping including the addition of a second dock at Milne Port; optimization of ore shipments during ice free/open water periods (mid-July to mid-October) with the option to undertake shipping activity between July 01 and December 31; and a variety of market vessels will be used for ore shipment including Supramax vessels (55,000 dwt), Panamax vessels (75,000 dwt), Post Panamax vessels (90,000 dwt), and Cape size vessels (250,000 dwt). The proposed Phase 2 of the project is currently undergoing environmental assessment.

As part of the early planning for the Project, a range of marine baseline surveys have been conducted in Milne Inlet in 2008 and 2010 by both Coastal and Ocean Resources Inc. (CORI) and North/South Consultants Inc. (NSC) and results are provided in the FEIS (BIM 2012).



Legend

- Site Locations
- Tote Road
- Milne Shipping Route

NOTES
1. BASE MAP: ESRI CANADA, DIGITAL CHART OF THE WORLD.

0 20 40 60 km

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Overview Map of the Mary River Project

SEM

REF NO. **070-025-1-011**

FIGURE 1.1

REV 0

FIGURE ID: 070-025-1-011 Overview Map of the Mary River Project

Data on water and sediment quality, zooplankton and phytoplankton biomass were collected in 2008 and 2010 by NSC. Drop camera surveys were completed in 2008 and 2010 to classify seabed habitat (bathymetry and substrate) and associated macroflora and epifauna (CORI). Benthic invertebrates, zooplankton and marine and anadromous fish were sampled in 2010 (NSC).

In 2013, Sikumiut Environmental Management Ltd. (SEM) was retained by Baffinland to undertake an expanded baseline program in Milne Inlet in consideration of the changes to the Project as a result of the ERP. The intent of this program was to verify the previous results at the Milne Port area and to augment the existing pre-Project baseline. A focus of work in 2013 included establishing reference sites in anticipation of future environmental effects monitoring (EEM). Two reference sites including a 'near' field location (4.5 km from the port site) and a 'far' field location (9.0 km from the port site) were studied. Sampling and data collection activities at the port and reference sites included:

- Sediment quality (particle size and chemistry);
- Benthic infaunal community;
- Fish community and mobile epifauna; and
- Mapping and classification of nearshore fish habitat which included information on substrate, macroflora and benthic epifauna.

The results of the 2013 efforts were documented in the 2013 Marine Baseline report (SEM 2014).

In 2014, SEM undertook additional baseline studies prior to commencement of Project operations. SEM completed a 'gap analysis' to evaluate the existing (pre-2014) baseline data to determine what data gaps needed to be addressed in 2014. This analysis addressed requirements identified in the Project Terms and Conditions as specified by NIRB and any specific data requirements to support future environmental effects monitoring. This included identification of data collection requirements specific to completion of an inventory of marine flora and fauna for future monitoring for aquatic invasive species (AIS; NIRB requirement #87).

An important element of the 2014 program at Milne Inlet was the development and implementation of a Marine Environmental Effects Monitoring Program (MEEMP). The MEEMP (Baffinland 2016) was developed in consideration of the anticipated and possible Project related impacts to the marine environment as identified in the FEIS (BIM 2012) and ERP Addendum

(BIM 2014). The MEEMP design also considered monitoring requirements outlined in the NIRB Terms and Conditions. Baffinland's Marine Environmental Effects Monitoring Plan (MEEMP) has integrated two major components: marine ecology (MEEMP – Ecosystem) and marine mammals (MEEMP – Mammals). While the design document has integrated the marine ecology and marine mammal concepts, the EEM studies have been completed and reported as separate components. It is also noteworthy that the final design for studies for the marine ecology component of the MEEMP was based on a radial gradient design and not on the basis of a control (reference)/impact study design. The radial gradient design has included the 'near' and 'far' locations established in 2013, while the study design and data analyses are based on the distance from the point source, the ore dock.

Marine ecology studies in 2014 were intended to collect baseline data specific to the MEEMP design (e.g., spatial distribution of data collection, sample sizes, replication requirements). Studies in 2014 were also completed in consideration that some elements of the MEEMP required further discrimination and refinement and that data collection was required to inform further development. Additionally, some MEEMP related data gathering in 2014 was completed to determine if biological populations could be affected by monitoring activities (e.g., lethal sampling for fish tissue collection).

In 2015, SEM was retained to complete the first year of the MEEMP (marine ecology). The sampling program for 2015 was based on protocols developed in 2014. Additions to the sampling program in 2015 included water sampling around a discharge point to the marine environment, which addressed feedback from Environment Canada concerning contaminants and suspended solids in site runoff. An under ice sampling component for zooplankton was also conducted to address seasonal variability in plankton species as additional baseline to the aquatic invasive species monitoring. The sampling program in 2016 mirrored the work completed in 2015 with the exception of a temporally expanded water quality sampling program to further capture the seasonal variability. Similarly, the under ice zooplankton sampling component was not completed due to the relative similarities in taxa encountered in the previous sampling year.

This report documents the 2016 Milne Inlet MEEMP field program from August 2016, including analysis and presentation of results. Data from 2014 and 2015 are compared where possible to identify any statistically significant changes from baseline. All data have been compared to applicable guidelines. In addition to the MEEMP, the aquatic invasive species monitoring component has been integrated into this report to avoid any redundancy in reporting.

2.0 MATERIALS AND METHODS

Prior to the commencement of field studies all appropriate approvals and permits were obtained from the Federal and Nunavut governments, as required. A copy of the Fisheries and Oceans Canada (DFO) experimental fishing license is presented in Appendix A. Approvals from DFO also included an Animal Use Protocol (AUP) which defined how experimental animals were to be handled during the survey program (Appendix A). All field activities completed by SEM were conducted between August 4 and August 23, 2016, with the Milne Inlet camp facilities used as the headquarters for all field studies. Additional water sampling was completed by BIM staff outside of the August 4-23 timeline and will be further discussed under Section 2.7.

2.1 Study Area

Milne Inlet is a narrow fjord originating to the south of Eclipse Sound and is characterized by deep water (generally >100 m) with steep surrounding headlands. The study sites for the 2016 MEEMP program centered on the Milne ore dock which is located at the southern tip of Milne Inlet on the fjord-head delta. Construction of the main ore dock began in the summer of 2014 with shipping operations commencing in July 2015.

2.2 Objectives and Work Scope

The objectives of the 2016 program were:

- Implement year three of the Mary River Project MEEMP (Marine Ecology) studies;
- Collect AIS monitoring data during Project Operations; and
- Continue to refine field sampling methods and protocols.

2.3 Study Team

The Study Team was led by D. Scruton, Project Manager, with senior advice, QA/QC and report review provided by L. Metcalfe. The SEM field team for MEEMP studies was led by C. Moore-Gibbons with support from G. Vivian, and J. Pennell. Studies in August were supported by vessel charter out of Pond Inlet with Inuarak Outfitting Inc. The vessel crew included L. Inuarak and R. Komangapik. Underwater video analysis was completed by C. Kehoe and L. Muggeridge. Report preparation was completed by D. Scruton, C. Moore-Gibbons, C. Kehoe and B. Martin, with geomatics assistance from G. Vivian. The study team and their respective roles are identified in Table 2.1.

Table 2.1 Study Team.

Team Member	Affiliation	Position	Area of Responsibility
Dave Scruton	SEM	Senior Scientist	Project management, client liaison, report preparation
Leroy Metcalfe	SEM	President	Project QA/QC
Grant Vivian	SEM	Vice President	Senior advisor, geomatics support
Claire-Moore Gibbons	SEM	Biologist	Field lead, report preparation
Josh Pennell	SEM	Biological Technician	Field support
Crystal Kehoe	SEM	Biological Technician	Video data analyses, report preparation
LeeAnn Muggeridge	SEM	Biological Technician	Video data analyses
Bryan Martin	SEM	Director, Field Programs	Report preparation
Lee Inuarak	Inuarak Outfitting	Boat Capitan	Lead, platform support
Ronnie Komangapik	Inuarak Outfitting	Boat Crew	Technical assistance

Sub-contractors

In addition to the SEM study team, selected analyses were sub-contracted to companies and individuals with specialized expertise.

Analytical laboratory services for water, sediment and tissue samples were sub-contracted to Maxxam Analytics (Maxxam) laboratory in Bedford, NS, a SCC accredited laboratory. Maxxam laboratories in Montreal, QC facilitated the shipping of samples from the study area to the laboratories in Bedford.

Maxxam laboratory services involved a rigorous internal QA/QC program, including:

- laboratory duplicates (10%);
- laboratory internal spikes; and
- analyses of method blanks.

The results of Maxxam's internal QA/QC procedures for water quality, sediment quality, and fish tissue analysis were reported with analytical results (included in Appendix B).

The taxonomic identification and enumeration of zooplankton samples was sub-contracted to SpryTech Biological Services (SpryTech) in Halifax, NS. SpryTech provides environmental and research expertise to government, industry and universities, with specialization in plankton ecology and taxonomy. The QA/QC procedures followed by SpryTech included:

- re-analyzing 10% of the total number of samples;
- determining the precision of analysis (how accurate was the total count);
- determining reliability of identifications (how accurate was the count of each species);
- use of appropriate standard internationally accepted references (including websites);
- reference of species names through the World Registry of Marine Species and Integrated Taxonomic Information System;
- preparation of a reference collection; and
- archiving of samples.

The benthic taxonomic identification and enumeration was sub-contracted to Envirosphere Consultants Limited, Windsor, Nova Scotia who sorted and conducted analyses of biological species composition and abundance/biomass of the benthic samples. This company has considerable experience with marine benthic sample analyses for the Davis Strait and has completed most of the benthic identifications for the offshore oil production EEM programs in Atlantic Canada. The QA/QC followed by Envirosphere for processing of benthic invertebrate samples in the laboratory included:

- 10 % replication of any sub-sampling procedures;
- re-sorting of randomly selected samples;
- use of appropriate regional and recent identification keys;
- preparation of a reference collection;
- archiving of samples; and
- maintaining detailed notes of sample processing.

2.4 Platform Support

Two vessels were used during the field studies, including an 8.0 m Silver Dolphin powered by two 115 HP two-stroke outboard motors (charter) and a 4.6 m Zodiac with a 20 HP Yamaha four-stroke outboard motor (provided by Baffinland).

2.5 Health and Safety

SEM has a well-developed Safety Management Plan and associated Standard Operating Procedures (SOPs) which were used to assess hazards associated with implementation of the MEEMP. Prior to the implementation of field activities, SEM developed a Project Safety Management Plan specific to the activities, location, logistical requirements and other considerations of the MEEMP. All SEM staff were fully briefed and trained in all aspects of the

Safety Management Plan and team members were tasked with various levels of responsibility within the plan.

Prior to commencing field work, a site survey and orientation of the vessels, including the location of PFDs and fire extinguishers, were completed. All staff attended a Health and Safety Briefing presented by Baffinland. On a daily basis, prior to field crew departing the dock, a 'tool box' meeting was held to discuss daily activities, potential safety hazards and mitigations. An emergency response and communications plan was developed by SEM and submitted to Baffinland's on-site environment department. This plan included communications by radio prior to departure and following the return to shore daily. In addition, an InReach satellite communicator was available for emergency use during the entire field program.

2.6 MEEMP Design

2.6.1 Marine Ecology

Baffinland is committed to implementing the MEEMP associated with its Mary River Project as one of the components of the Baffinland Environment Health and Safety Management System, described in Volume 10 of the Environmental Impact Statement (EIS) (BIM 2012). SEM developed the MEEMP design (Baffinland 2016) to address regulatory requirements for the implementation of the Mary River Project, specifically as they relate to Project activities at the Milne Port on the marine ecosystem and marine mammals. The MEEMP design however did not include compliance monitoring. Additional consideration was given to public concerns and issues. Scientific issues related to study design; sampling strategy and analyses of results for significance of effects were also important elements of the MEEMP design. The MEEMP design addressed selected NIRB Project Certificate Terms and Conditions, specifically as they related to requirements for environmental effects monitoring and collection of additional baseline data prior to Project operations. The MEEMP describes in detail all aspects of the design and implementation of the plan, including the three categories of study: research level, surveillance level and EEM level.

Goals and objectives of the marine ecology monitoring components have been clearly stated in the MEEMP Design to ensure results are scientifically defensible and relevant. The objectives of the MEEMP studies address the need to confirm predictions made during environmental assessment of the Project and to confirm the effectiveness of mitigation measures that have been implemented. Most importantly, various monitoring programs serve as early warning indicators (EWIs) to identify exceedances of environmental guidelines and/or thresholds; for identifying unanticipated effects/ EWIs which could trigger additional and/or expanded monitoring studies; implementation of additional mitigation measures; or potential modification to Project activities.

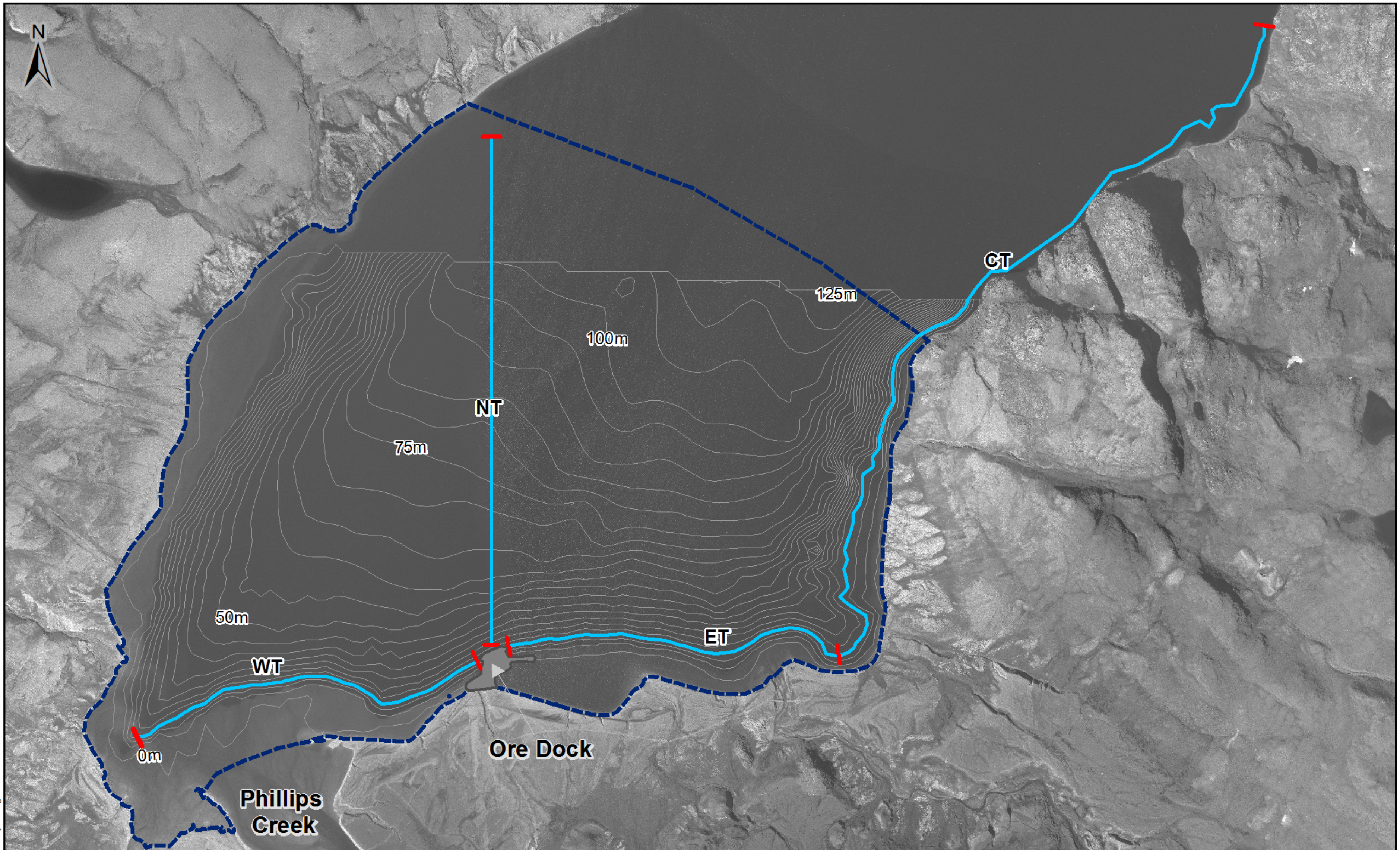
The sampling design was based on a radial gradient pattern originating at the ore dock, which represents the potential point source of contaminants (e.g., ore dust, hydrocarbon deposition) and physical perturbations (sediment re-suspension and transportation; Figure 2.1). The current discharge location of treated effluent to the marine environment is also in close proximity to the ore dock.

The statistical design was based on repeated measures (RM) distance regression analyses where the same replicates (stations) will be re-sampled at specific time intervals (years). Stations are established along a distance gradient from a potential point source of environmental perturbation (e.g., chemical contamination or physical disturbance). The RM regression design is an alternative to the Before:After Control:Impact (BACI) analyses of variance (ANOVA) design and is considered more sensitive to change and therefore more powerful than the simple comparison of parameters between control and impact locations. The gradient design enables physical, chemical and biological changes to be assessed as a function of distance from a point source. Radial gradient designs are also effective at addressing threshold of effects as a function of distance and/or quantification (e.g., contaminant level) of effect.

Regression analysis (i.e., 'line of best fit') was used to examine the pre-operations dataset. The slope, or gradient, of the regression line can be negative or positive and indicates the rate of change in the dependent variable (e.g., iron concentration), with respect to the increase in the explanatory variable, distance from ore dock. Confidence intervals were 95% (alpha = 0.05), such that $P<0.05$ resulted in the rejection of the null hypothesis and acceptance of the alternate hypothesis.

The null and alternate hypotheses for <u>baseline</u> linear regression analysis were:

H_{01} - Baseline: The slope of the line (i.e., gradient) will not be significantly different than zero.
H_{A1} - Baseline: The slope of the line will be significantly different than zero.



Legend

- Transect
- Bathymetric Contours
- Ore Dock
- Zone of Influence

0 500 1,000 1,500 Meters

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY
2. BATHYMETRIC CONTOUR INTERVAL: 5m
3. BATHYMETRIC DATA REDUCED TO CHART DATUM.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Radial Gradient Study Design

SEM

REF NO. **070-025-1-001**

FIGURE 2.1

REV 0

FIGURE ID: 070-025-01-001 Radial Gradient Study Design

In monitoring years 2015 and onward, data gradients were/will be compared to the baseline gradients, as per a RM design, using an analysis of covariance (ANCOVA). Changes to the gradient are generally indicated when the slope of the regression line is significantly different from the slope of the baseline, resulting in the rejection of the null hypothesis and acceptance of an alternate hypothesis. The null and alternate hypotheses for the comparison of the slopes during monitoring years are:

H_{02} - EEM: The slope of the line will not be significantly different from baseline gradients.

H_{A2} - EEM: The slope of the line will be significantly different from baseline gradients.

In the event that a linear regression does not adequately describe the data, an equation with an additional parameter may be used to better describe the gradient (e.g. a quadratic or logarithmic equation). In this case, changes to a gradient over time would also be indicated when the curve of the regression line is significantly different from the baseline, resulting in the rejection of the null hypothesis and acceptance of an alternate hypothesis. The equation for a quadratic regression model is: $y = ax^2+bx+y_0$, where a is the curve of the line, b is the slope of the line and y_0 is the y-intercept. A comparison of slopes can be conducted with a quadratic regression model, similar to the comparison of linear regressions. In addition to comparison of slopes, the curve of the line can also be used for comparison between years. If both the slope and curve are found to be equal, the y-intercepts can then be compared, as with the linear regression model.

If warranted, the potential null and alternate hypotheses for the comparison of the quadratic curves during monitoring years would be:

H_{03} - EEM: The curve of the line will not be significantly different from baseline gradients.

H_{A3} - EEM: The curve of the line will be significantly different from baseline gradients.

If present, changes in the slope or curve of the gradient could be linked to Project activities. If slopes and/or curves are found to be equal, and the null hypotheses (H_{02} and/or H_{03}) is accepted, a comparison of y-intercepts can be conducted to further compare the datasets.

The statistical power of this RM analysis is expected to increase with increasing number of datasets (i.e., increasing number of years of monitoring). Initial calculations of the 2014 data were conducted in SigmaPlot (Version 11.0) while analyses of covariance were completed in 2015 and 2016 using SigmaPlot (Version 13.0) and are provided in Appendix C.

2.6.2 Aquatic Invasive Species

The Aquatic Invasive Species (AIS) monitoring is an integral part of the larger Marine Environmental Effects Monitoring Program (MEEMP, Baffinland 2016). The AIS monitoring component does not follow the radial gradient design but rather is based on a Before/After experimental design, focussing on the areas with the highest likelihood of marine invasions, particularly the port infrastructure where the majority of ballast water exchange will occur. Baseline data collection was therefore focused on the future location of the Milne Port infrastructure.

Objectives for conducting the AIS EEM include:

- To verify impact predictions in the Project Environmental Impact Statement (EIS, Baffinland 2012);
- To evaluate the effectiveness of mitigations to be put in place (i.e., ballast water exchange protocols, ballast water management and treatment);
- To identify unforeseen effects (i.e., invasion of non-indigenous species);
- To provide early warning of undesirable change in the environment (i.e., establishment of non-indigenous species, impacts on native species); and
- To improve understanding of cause-and-effect relationships (e.g., ballast water as the vector for AIS introductions).

In developing the AIS EEM program, it was important to ensure that all relevant issues were addressed, while avoiding a broad spectrum, poorly focused program. For AIS monitoring, it is expected there will be a clear cause-and-effect relationship between Project activities (shipping, ballast water exchange) and impact (introduction of AIS). EEM design was therefore focused on the ore dock and the point source of environmental perturbation and with the detection of fauna and flora that were not identified in baseline species inventories as the primary indicator.

EEM programs commonly establish protocols for evaluating monitoring data to determine if there is need to modify monitoring plans or develop and implement corrective action. Thresholds are commonly established such that when thresholds are exceeded, monitoring programs may be altered or mitigation measures and/or corrective actions implemented. For AIS monitoring, the threshold could be a single occurrence of a non-indigenous species or alternatively more evidence to determine that the species has become established, is reproducing and is expanding its range.

The primary purpose of the AIS EEM program at Milne Inlet is for early warning/early detection of AIS invasion, therefore the program was based on monitoring studies at the surveillance level with a threshold of detection of a single occurrence of a non-indigenous species. Early detection of an invasive species could trigger expanded effort to determine the established range of the invader, whether successful reproduction has occurred, and if resident species have been affected. Early detection could trigger adaptive management (e.g., improve ballast water management/treatment) and/or corrective actions (measures to eradicate the AIS), if corrective actions are deemed feasible.

An important consideration in the AIS EEM was the temporal pattern and scheduling of monitoring activities as the frequency of monitoring needed to be balanced between survey costs and the likelihood of new invasions. As AIS monitoring at Milne Inlet is intended to provide early detection of invasive species, it was recommended that, initially, all monitoring components be assessed annually and the frequency of sampling be determined through discussion with regulators as the Project progresses and as ballast water management and monitoring programs are implemented. It is likely as the EEM program progresses, and results from monitoring of ballast water become available, the frequency of monitoring for AIS in the receiving environment will be reduced from the initial annual program.

The conceptual design of an AIS EEM program, including the various study components to be addressed are identified in Table 2.2. The focus is on fauna and lower trophic levels, which is consistent with the CAISN II program and many other AIS programs globally. Fish have been included as part of the AIS monitoring, as fish sampling will be completed as part of the overall MEEMP, and the fishing methods can also be used to collect mobile epifauna.

Table 2.2 Study Components for the AIS Environmental Effects Monitoring Program.

Component	Sampling Frequency	Spatial Extent	Monitoring Specific to AIS	Meets Other MEEMP Objectives	Sampling Approach
Zooplankton	Annually	Sampling from deep water at port location	Yes	No	Zooplankton tows during open water
Benthic Infauna	Annually	Sampling from four depth strata/habitats	Yes	No	Grab samples or quadrats from soft sediments
Epifauna	Annually	Sampling from four depth strata/habitats	No	Yes	Data collected from baited Fukui traps and underwater video

Table 2.2 Study Components for the AIS Environmental Effects Monitoring Program. (Cont'd)

Component	Sampling Frequency	Spatial Extent	Monitoring Specific to AIS	Meets Other MEEMP Objectives	Sampling Approach
Encrusting Epifauna	Annually	Project infrastructure and settlement baskets	Yes	No	Scrapings from infrastructure and deployed settlement baskets
Fish	Annually	Sampling from four depth strata/habitats	No	Yes	Sampling from Fukui traps and tended gill net sets

A map showing the conceptual spatial sampling design for the AIS EEM is provided in Figure 2.2. The sampling design included four transects perpendicular to shore to water deeper than 25 m. Video data will be collected along these transects and benthic invertebrate grabs will be collected from various depth strata also along the transects. Zooplankton samples will be collected from deep water (>25 m) at the end of each transect using both vertical and oblique tows. Although zooplankton were collected under the ice (June) during the baseline program, annual resampling has not been warranted. Fukui traps and tended gill nets will be set in the vicinity of Milne port for other aspects the MEEMP, and some sets will be made in association with the AIS transects. Settlement baskets for encrusting epifauna will be deployed in proximity to the ore dock. Scrapings from infrastructure at the ore dock and also possibly from navigation buoys will be collected after sufficient colonisation has occured.

FIGURE ID: 070-025-1-004 Aquatic Invasive Species Monitoring Study Design.mxd

Legend

- Benthic Infauna Sample
- Settlement Basket
- Zooplankton Sample
- Fukui Trap
- Video Transect

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 75 150 225 Meters

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Aquatic Invasive Species Monitoring Study Design

SEM

REF NO. **070-025-01-004**

Figure 2.2

REV 0

2.7 Marine Ecology EEM Sampling

2.7.1 Sampling Sites

Sampling design was based on a radial pattern extending out from the Milne ore dock with sampling stations established along four transects at increasing distance from the point source (Figure 2.3). Three of the transects (East, West and Coastal) were established along the 15 m depth contour. The 15 m depth contour was selected as it was considered to be below any potential influence of ice scour and was associated with relatively large abundances and diversity of marine flora and fauna (SEM 2014). Using one depth contour for three transects (East, West, Coastal) controls for potentially confounding influences such as the depth stratified distribution of sediment/substrate and associated biota. The fourth transect (North) included both a distance and depth gradient which will permit consideration of depth as a contributing or co-variable to any observed gradients in effects. Descriptions of the four transects are as follows:

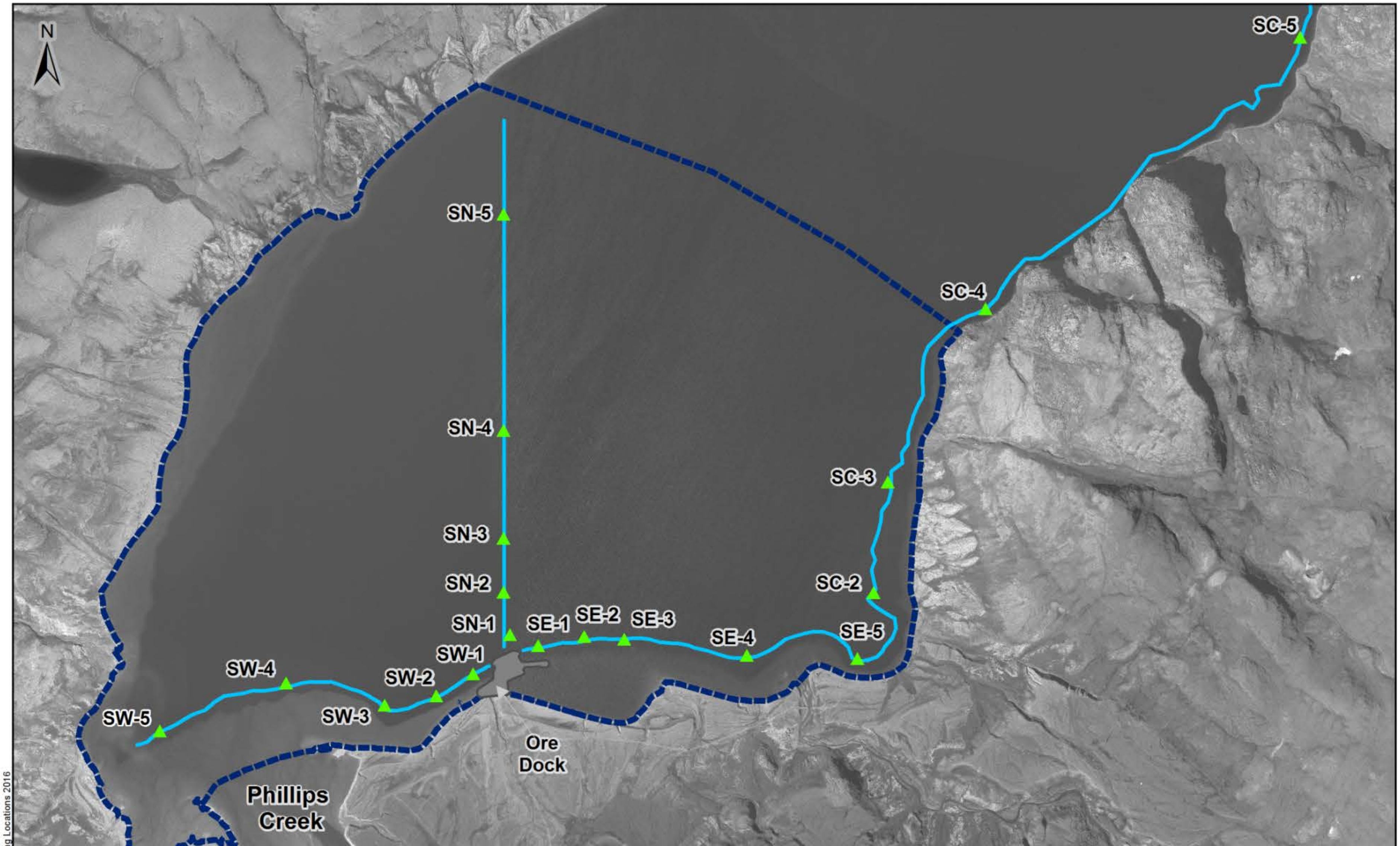
1) West Transect (~1.5 km): Transect runs west from Ore Dock along the 15 m depth contour line with five sampling stations at approximately 0 m, 250 m, 500 m, 1,000 m and 1,500 m.

2) East Transect (~1.5 km): Transect runs east from Ore Dock along the 15 m depth contour line with five sampling stations at approximately 0 m, 250 m, 500 m, 1,000 m and 1,500 m.

3) Coastal Transect (~4 km): Transect runs northeast along the 15 m depth contour line around the eastern shore of Milne Inlet with five sampling stations at approximately 0 m (identical to station 1,500 m of East Transect), 500 m, 1,000 m, 2,000 m and 4,000 m.

North Transect (~2km): Transect runs north from Ore Dock with five sampling stations at approximately 0 m, 250 m, 500 m, 1,000 m and 2,000 m.

The Coastal Transect captured a gradient beyond the zone of influence (ZOI) which was not provided by the other transects given the configuration of lower Milne Inlet. Data collected along this transect will be important in determining if the identified ZOI was predicted correctly and in delineating the spatial scale of Project effects. Additionally, the Coastal Transect



Legend

- ▲ 2016 Sampling Station
- Transect
- Zone of Influence

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 500 1,000 1,500 Meters

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Sediment Sampling Locations, 2016

SEM

REF NO. **070-025-1-002**

FIGURE 2.3

REV 0

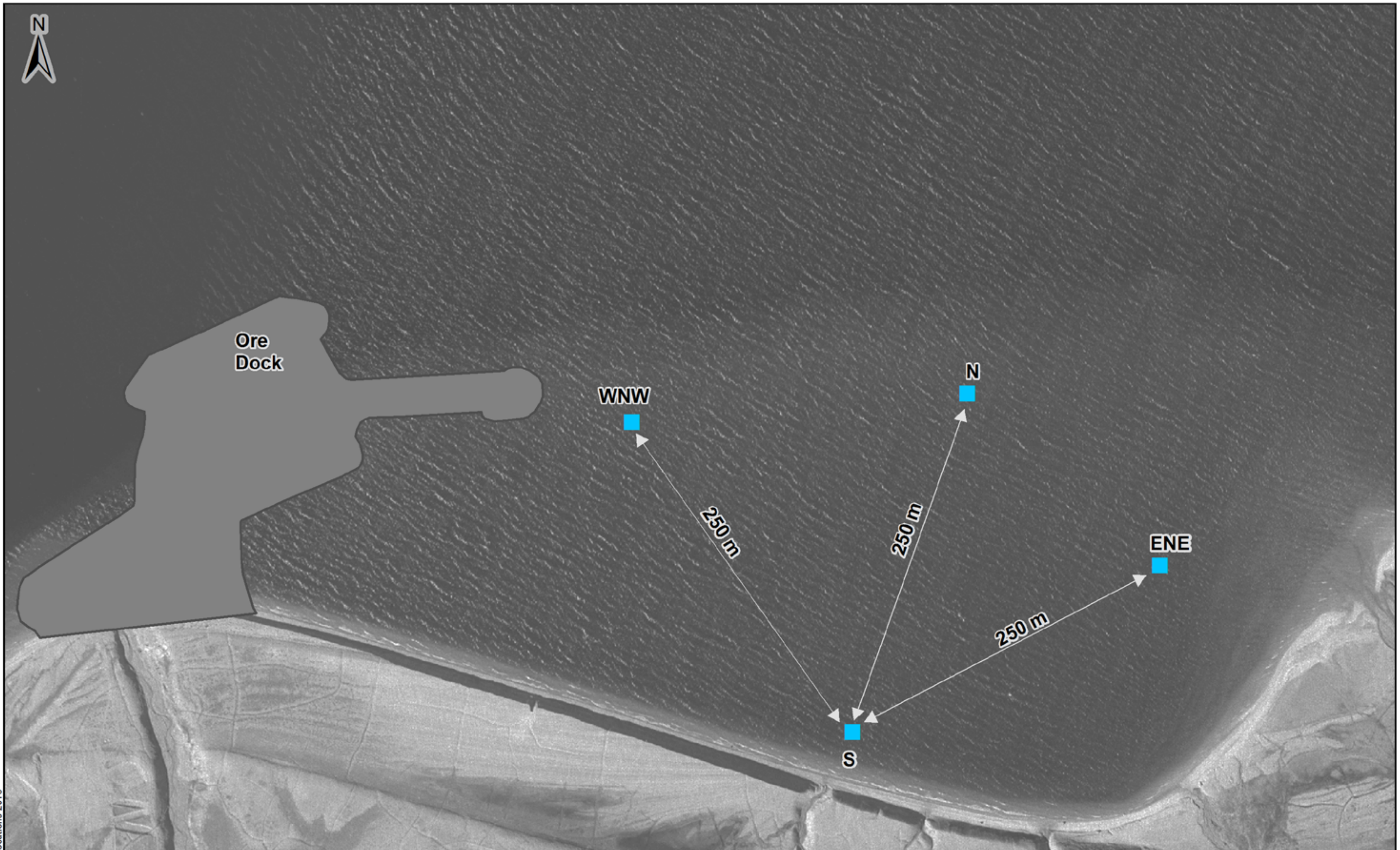
FIGURE ID: 070-025-1-002 Sediment Sampling Locations 2016 encompasses Reference Site 1 established in 2013 (SEM 2014), thereby maximizing use of existing baseline data

Water quality sampling was completed near the site surface drainage outflow point (Figure 2.4). Due to the nature of water quality variables, sampling stations were established on a smaller scale radial design, situated at shorter distances from the discharge point. Conductivity/temperature/depth (CTD) profiles were collected by Moran-CORI throughout Milne Inlet as part of oceanographic data collection and are reported in this document (Figure 2.5). Moran-CORI also completed an extensive observational oceanography program in Milne Inlet which included ocean current data and water property conductivity-temperature-depth (CT/CTD) data. An Acoustic Doppler Current Profiler (ADCP) mooring and CT logger was deployed in August 2015 and retrieved in August 2016. A separate report has been prepared containing data collected as part of the Moran-CORI observational oceanography program (CORI 2016).

2.7.2 Water Quality

2.7.2.1 CTD - Conductivity/Temperature/Depth

Conductivity, temperature and depth (CTD) profiles were collected by Moran-CORI throughout Milne Inlet to potentially support future oceanographic assessment of ballast water dispersal (Figure 2.5). A Ruskin RBC Concerto CTD meter was initially used to profile the conductivity, temperature and depth (pressure) at selected sites. At each station, the vessel operator stabilized the boat and provided depth using an Eagle CUDA 168 depth sounder to the study team. The CTD meter was pre-programmed for data collection and storage, and collected vertical profile data every 0.167 seconds as the instrument was lowered to the bottom. The unit recorded a header, containing unit information along with parameters measured with timestamps. At each station the CTD meter was placed in the water and held at the surface for 60 seconds to allow the unit sensors to fully initialize. The instrument was then lowered through the water column at an approximate rate of one meter per second. Following retrieval, the data record was downloaded onto a laptop computer and visualized using Ruskin V1.8.18 software to ensure the suitability of the collected data prior to moving to the next station.



Legend

Water Sampling Site

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 50 100 150 Meters

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Water Sampling Locations, 2016

SEM

REF NO. 070-025-1-003

FIGURE 2.4

REV 0

FIGURE ID: 070-025-1-003 Water Sampling Locations 2016

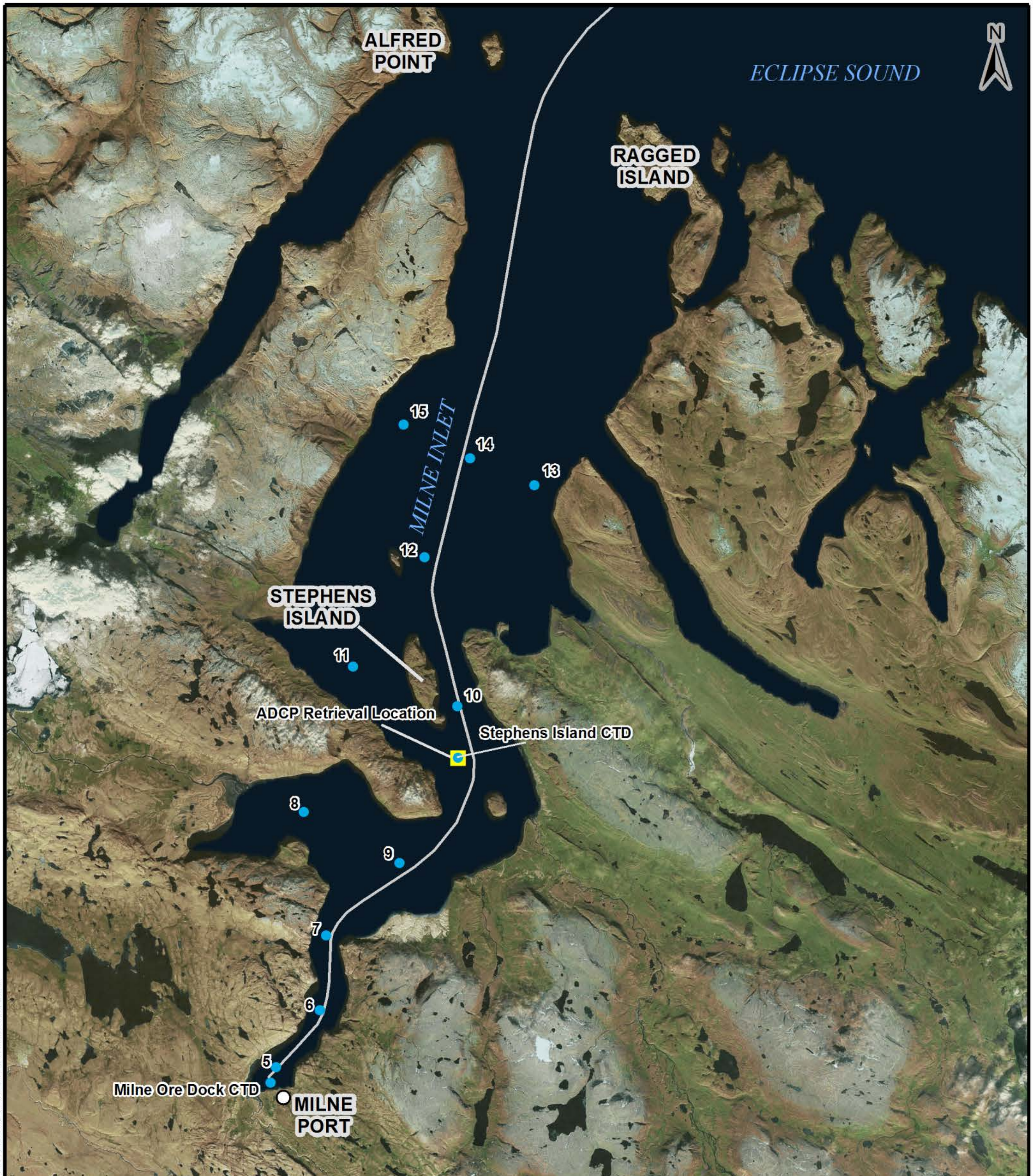


FIGURE ID:070-025-1-012 Locations of CTD Profiles and ADCP Retrieval in Milne Inlet 2016

Legend

- ADCP Retrieval Location
- CTD Site
- Shipping Route

NOTES:
1. BASE MAP DATA PROVIDED BY ArcGIS ONLINE DATABASE.
2. CTD = CONDUCTIVITY TEMPERATURE DEPTH

0 5 10 15 Kilometers

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Locations of CTD Profiles and ADCP Retrieval in Milne Inlet, 2016

SEM

REF NO. **070-021-1-024**

FIGURE 2.5

REV 0

2.7.2.2 Water Sample Collection

Water quality stations were established surrounding the marine discharge point in a radial gradient design at varying distances and directions from the discharge point (Figure 2.4). Water samples were collected using a 2.5 L horizontally-oriented Niskin Sampler bottle. Due to the shallow water and absence of stratification at the sampling locations, samples were only collected from the near-surface. The Niskin was lowered into the water and a messenger dropped to trigger closure of the bottle. After retrieval, ten sub-samples were drawn off into pre-labelled sample bottles for the selected chemical analysis. Fixatives or preservatives, where required, were pre-dosed within the sample bottles provided by Maxxam. Water samples were held in coolers in the field until transferred to refrigeration at shore-based accommodations and shipped to the Maxxam analytical laboratory within 48 hours of collection. The Maxxam laboratory in Montreal, QC, facilitated the timely shipping of samples to Maxxam in Bedford, NS. Water samples were collected on five separate occasions in an attempt to capture any temporal variation displayed across the open water season, an increase from two sampling events in 2015.

2.7.2.3 Analysis and Interpretation

Laboratory analyses of water samples by Maxxam included general chemistry, major ions, nutrients, metals and hydrocarbons. Water samples were analyzed for various parameters as summarized in Table 2.3. Methods of analyses, units of reporting, reportable detection limits (RDL) and Canadian Council of Ministers of the Environment (CCME) values for Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME 2016), where applicable, are included. Major ions were determined using Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES), while trace elements were determined using Inductively Coupled Plasma – Mass Spectrometry (ICP-MS), with the exception of mercury which was analyzed using Cold-Vapor Atomic Absorption Spectrometry (CVAA) methods. Samples were analyzed for Total Petroleum Hydrocarbons (TPH) and included Benzene, Toluene, Ethylbenzene and Xylene(s) (BTEX), gasoline range organics (C_6 to C_{10}) and analysis of extractable hydrocarbons – diesel (>C_{10} to C_{16}), diesel (>C_{16} to C_{21}) and lube (>C_{21} to C_{32}) range organics. BTEX and gasoline range organics were analyzed by purge and trap-gas chromatography/mass spectrometry or headspace – gas chromatography (MS/flame ionization detectors). Extractable hydrocarbons, including diesel and lube range organics were analyzed using capillary column gas chromatography (flame ionization detector).

Table 2.3 Water Quality Parameters Measured at Milne Port, 2016.

	Units	RDL	CCME Guideline	Analysis Method
Conventional Parameters				
pH	pH	N/A	7.0 - 8.7	meter
Total Alkalinity	$mg \cdot L^{-1}$	5		colourimetry
Hardness	$mg \cdot L^{-1}$	1		calculation
Turbidity	NTU	0.1		nephelometer
Conductivity	$\mu S \cdot cm^{-1}$	1		meter
Colour	TCU	5		colourimetry
Total Suspended Solids (TSS)	$mg \cdot L^{-1}$	1		dry weight
Calculated TDS	$mg \cdot L^{-1}$	1		gravimetric
Total Organic Carbon (C)	$mg \cdot L^{-1}$	0.5		spectrophotometry
Reactive Silica (SiO_2)	$mg \cdot L^{-1}$	0.5		spectrophotometry
Nutrients				
Nitrate + Nitrite	$mg \cdot L^{-1}$	0.05		chromatography
Nitrite (N)	$mg \cdot L^{-1}$	0.01		chromatography
Nitrate (N)	$mg \cdot L^{-1}$	0.05	16[a]	chromatography
Nitrogen (Ammonia)	$mg \cdot L^{-1}$	0.05		colourimetry
Total Phosphorous (P)	$mg \cdot L^{-1}$	0.1		OES
Orthophosphate (P)	$mg \cdot L^{-1}$	0.01		spectrophotometry
Major Ions				
Total Calcium (Ca)	$\mu g \cdot L^{-1}$	100		OES
Total Magnesium (Mg)	$\mu g \cdot L^{-1}$	100		OES
Total Sodium (Na)	$\mu g \cdot L^{-1}$	100		OES
Total Potassium (K)	$\mu g \cdot L^{-1}$	100		OES
Dissolved Chloride (Cl)	$mg \cdot L^{-1}$	1.0		colourimetry
Dissolved Sulphate (SO_4)	$mg \cdot L^{-1}$	2.0		spectrophotometry
Trace Elements				
Total Mercury (Hg)	$\mu g \cdot L^{-1}$	0.013	0.016[b]	CVAA
Total Aluminum (Al)	$\mu g \cdot L^{-1}$	50		ICP-MS
Total Antimony (Sb)	$\mu g \cdot L^{-1}$	10		ICP-MS
Total Arsenic (As)	$\mu g \cdot L^{-1}$	10	12.5	ICP-MS
Total Barium (Ba)	$\mu g \cdot L^{-1}$	10		ICP-MS
Total Beryllium (Be)	$\mu g \cdot L^{-1}$	10		ICP-MS
Total Bismuth (Bi)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Boron (B)	$\mu g \cdot L^{-1}$	500		ICP-MS
Total Cadmium (Cd)	$\mu g \cdot L^{-1}$	0.1	0.12	ICP-MS
Total Chromium (Cr)	$\mu g \cdot L^{-1}$	10	56, 1.5[c]	ICP-MS
Total Cobalt (Co)	$\mu g \cdot L^{-1}$	4.0		ICP-MS

Table 2.3 Water Quality Parameters Measured at Milne Port, 2016. (Cont'd)

	Units	RDL	CCME Guideline	Analysis Method
Trace Elements				
Total Copper (Cu)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Iron (Fe)	$\mu g \cdot L^{-1}$	500		ICP-MS
Total Lead (Pb)	$\mu g \cdot L^{-1}$	5.0		ICP-MS
Total Manganese (Mn)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Molybdenum (Mo)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Nickel (Ni)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Selenium (Se)	$\mu g \cdot L^{-1}$	10		ICP-MS
Total Silver (Ag)	$\mu g \cdot L^{-1}$	1.0		ICP-MS
Total Strontium (Sr)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Thallium (Tl)	$\mu g \cdot L^{-1}$	1.0		ICP-MS
Total Tin (Sn)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Titanium (Ti)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Uranium (U)	$\mu g \cdot L^{-1}$	1.0		ICP-MS
Total Vanadium (V)	$\mu g \cdot L^{-1}$	20		ICP-MS
Total Zinc (Zn)	$\mu g \cdot L^{-1}$	50		ICP-MS
Hydrocarbons				
Benzene	$mg \cdot L^{-1}$	0.001	0.11	gas chromatography/MS
Toluene	$mg \cdot L^{-1}$	0.001	0.215	gas chromatography/MS
Ethylbenzene	$mg \cdot L^{-1}$	0.001	0.025	gas chromatography/MS
Xylene (Total)	$mg \cdot L^{-1}$	0.002		gas chromatography/MS
C_6 - C_{10} (less BTEX)	$mg \cdot L^{-1}$	0.010		gas chromatography/MS
$>C_{10}$-C_{16} Hydrocarbons	$mg \cdot L^{-1}$	0.060		gas chromatography
$>C_{16}$-C_{21} Hydrocarbons	$mg \cdot L^{-1}$	0.060		gas chromatography
$>C_{21}$-$<C_{32}$ Hydrocarbons	$mg \cdot L^{-1}$	0.12		gas chromatography
Modified TPH (Tier1)	$mg \cdot L^{-1}$	0.12		gas chromatography
Reached Baseline at C_{32}	$mg \cdot L^{-1}$	N/A		gas chromatography
Surrogate Recovery (%)				
Isobutylbenzene - Extractable	%			N/A
n-Dotriacontane - Extractable	%			N/A
Isobutylbenzene - Volatile	%			N/A

Notes:
RDL = Reportable Detection Limit
Results relate only to the items tested.
[a] - CCME Guideline is for direct effects only and does not consider indirect effects from eutrophication
[b] - CCME Guideline is for inorganic mercury only, whereas the concentration reported is for total mercury
[c] - CCME Guideline values are for hexavalent and trivalent chromium, whereas the concentration reported is for total chromium

The water quality sampling program was intended to characterize spatial patterns in marine water quality within the study area associated with the site runoff discharge point. Appropriate descriptive and summary statistics (minimums, maximums, means and standard deviations) were determined and presented, as appropriate. For parameters with at least one station having a measurable value, non-detectable values (values below the RDL) were set to half of the RDL and used in statistical analyses. Water samples were a representation of a single point in time and it is important to consider that there can be considerable temporal and seasonal variability in some water quality parameters.

Results were compared with the CCME marine water quality guidelines; Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME 2016).

CTD data were used to document the baseline physical characteristics of the water column at selected sites throughout Milne Inlet. Data were examined for any evidence of stratification in the water column, either by temperature or salinity, and are presented graphically.

2.7.3 Sediment Quality

2.7.3.1 Sediment Sample Collection

Sediment sampling stations were identified along each of the four transects, at increasing distance from the point source. Marine sediment samples were collected from each station using an 11.3 kg, stainless steel, Petite Ponar sediment grab. Prior to deployment, the sampling platform held position at the sampling station. The Petite Ponar was then primed for release and lowered over the side of the vessel in a vertical position to approximately 2 m above the ocean bottom, as determined from the vessel's depth sounder. The grab was then maneuvered into a fully vertical position and allowed to freefall into the ocean bottom. Upon contact with the bottom, a spring-loaded trigger on the grab caused the sample compartment to close and encapsulate the seabed sediment sample. The sample was retrieved to the surface and examined by the Study Team to determine sample integrity. Assessing sample integrity included ensuring the grab was not open during retrieval, thereby losing sediment, and determining that the sediment-water interface had not been disturbed. Upon retrieval, each grab was emptied into a 20 L bucket, with each sample composed of multiple grabs. Multiple grabs were generally required in order to have sufficient sample volume for the required analyses. At each sampling site the date, time, Site ID, GPS coordinates, collection device and any particular sample properties (i.e., colour, texture, consistency, odour and presence of biota) were recorded. All samples were photographed. Each sample was identified by transect, station number and sample number and labelled accordingly (e.g., SW-1-1). The same sampling scheme was followed for all of the sediment sampling stations in the radial transect design. Following sample collection, sediment was transferred to labeled jars as provided by Maxxam. Sediment destined for hydrocarbon analysis (BTEX) were separated using specialized plungers provided by the laboratory (approximately 5 g of sediment) and added to pre-measured vials containing 10 ml of methanol.

All sampling gear was thoroughly rinsed in saltwater between collections. New nitrile gloves were worn when preparing the samples and were disposed of after each set of samples were collected. All samples were kept in coolers with ice packs until stored at refrigeration facilities at the Milne Camp and subsequently shipped to the selected laboratory within 48 hours of collection. Maxxam in Montreal, QC, facilitated the timely forwarding of samples to Maxxam in Bedford, NS.

2.7.3.2 Physical Analyses

Physical characterization of sediment samples was completed by Maxxam at their Bedford, NS laboratory and included two levels of sizing of particles based on the Wentworth and Phi scales.

Analyses based on sieving included determining the proportion (percent) of sample as gravel, sand, silt and clay. Organic matter and carbonates in the sample were first destroyed by treatment with hydrogen peroxide. Wet sieving (63 micron mesh sieve) was then used to separate the gravel and sand fractions. These were subsequently passed through a series of nested sieves to separate the fractions based on particle diameter.

A detailed Particle Size Analysis (PSA) was determined by pipette analysis. Sample aliquots were extracted by pipette from the sample and dried to constant weight. Stoke's Law was used to determine the diameter of each fraction and quantify it as a particle size in mm (expressed as % passing through an equivalent sized sieve). These results were converted to the Phi scale for ease of presentation. The Phi scale is a logarithmic representation of the Wentworth scale and is computed as follows:

$$\Phi = -\log 2 \text{ (grain size, mm)}$$ (Krumbein 1936).

2.7.3.3 Chemical Analyses

Parameters analyzed in sediment samples included trace metals (including mercury), petroleum hydrocarbons and total organic and inorganic carbon (TOC-TIC). For analytical quantification of metals in sediments, the choice of digestion method (i.e., total or available metals) is dependent on the intended use of the results. The 'available' metal extraction method, also known as 'extractable', is generally used when evaluating potential biological effects (i.e., as in environmental effects monitoring programs for mining development). The approach reports the biologically available fraction of metals and not residual metals (i.e., those metals held within the lattice framework of the sediment). Total metal analysis unbinds the metals from the sediment framework over-representing the concentration that is available for uptake by organisms. Baseline samples collected in 2007, 2008 and 2010 were analyzed for total metals, while samples collected between 2013, 2015 and 2016 were analyzed for available metals and therefore meaningful comparisons to results prior to 2013 have not been possible.

Trace metals concentrations were analyzed by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) with the exception of mercury, which was determined using both ICP-MS and Cold-Vapor Atomic Absorption Spectrometry (CVAAS). Sediment samples were analyzed for Total Petroleum Hydrocarbons (TPH) and included Benzene, Toluene, Ethylbenzene and Xylene(s) (BTEX), by Gas Chromatography – Mass Spectrometry (GC-MS), while the extractable hydrocarbons, including gasoline range organics (C_6 to C_{10}), diesel (>C_{10} to C_{16}), diesel (>C_{16} to C_{21}) and lube (>C_{21} to >C_{32}) range organics, were analyzed by Gas Chromatography – Flame Ionization Detector (GC-FID).

Methods of analyses, units of reporting, RDLs and CCME Interim Sediment Quality Guidelines (ISQGs) (CCME 2016) limits and Probable Effect Level (PEL) guidelines for the Protection of Aquatic Life, where applicable/available, are provided in Tables 2.4 and 2.5.

Table 2.4 Conventional Metals Measured in Sediment.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	Analysis Methods
Metals					
Extractable Aluminum (Al)	$mg \cdot kg^{-1}$	10			ICP-MS
Extractable Antimony (Sb)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Arsenic (As)	$mg \cdot kg^{-1}$	2.0	7.24	41.6	ICP-MS
Extractable Barium (Ba)	$mg \cdot kg^{-1}$	5.0			ICP-MS
Extractable Beryllium (Be)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Bismuth (Bi)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Boron (B)	$mg \cdot kg^{-1}$	5.0			ICP-MS
Extractable Cadmium (Cd)	$mg \cdot kg^{-1}$	0.30	0.7	4.2	ICP-MS
Extractable Chromium (Cr)	$mg \cdot kg^{-1}$	2.0	52.3	160	ICP-MS
Extractable Cobalt (Co)	$mg \cdot kg^{-1}$	1.0			ICP-MS
Extractable Copper (Cu)	$mg \cdot kg^{-1}$	2.0	18.7	108	ICP-MS
Extractable Iron (Fe)	$mg \cdot kg^{-1}$	50			ICP-MS
Extractable Lead (Pb)	$mg \cdot kg^{-1}$	0.50	30.2	112	ICP-MS
Extractable Lithium (Li)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Manganese (Mn)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Mercury (Hg)	$mg \cdot kg^{-1}$	0.010	0.13	0.7	CVVAS

Table 2.4 Conventional Metals Measured in Sediment. (Cont'd)

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	Analysis Methods
Metals					
Extractable Molybdenum (Mo)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Nickel (Ni)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Rubidium (Rb)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Selenium (Se)	$mg \cdot kg^{-1}$	1.0			ICP-MS
Extractable Silver (Ag)	$mg \cdot kg^{-1}$	0.50			ICP-MS
Extractable Strontium (Sr)	$mg \cdot kg^{-1}$	5.0			ICP-MS
Extractable Thallium (Tl)	$mg \cdot kg^{-1}$	0.10			ICP-MS
Extractable Tin (Sn)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Uranium (U)	$mg \cdot kg^{-1}$	0.10			ICP-MS
Extractable Vanadium (V)	$mg \cdot kg^{-1}$	2.0			ICP-MS
Extractable Zinc (Zn)	$mg \cdot kg^{-1}$	5.0	124	271	ICP-MS

[1]RDL = Reportable Detection Limit
[2]CCME (2002) Interim Sediment Quality Guideline
[3]CCME (2002) Probable Effect Level

Table 2.5 Hydrocarbons Measured in Sediment.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	Analysis Method
Petroleum Hydrocarbons					
Benzene	$mg \cdot kg^{-1}$	0.025			GC-MS
Toluene	$mg \cdot kg^{-1}$	0.025			GC-MS
Ethylbenzene	$mg \cdot kg^{-1}$	0.025			GC-MS
Xylene (Total)	$mg \cdot kg^{-1}$	0.050			GC-MS
C_6 - C_{10} (less BTEX)	$mg \cdot kg^{-1}$	2.5			GC-MS
>C_{10}-C_{16} Hydrocarbons	$mg \cdot kg^{-1}$	10			GC-FID
>C_{16}-C_{21} Hydrocarbons	$mg \cdot kg^{-1}$	10			GC-FID
>C_{21}-<C_{32} Hydrocarbons	$mg \cdot kg^{-1}$	15			GC-FID
Modified TPH (Tier1)	$mg \cdot kg^{-1}$	15			-
Reached Baseline at C_{32}	$mg \cdot kg^{-1}$	N/A			-
Hydrocarbon Resemblance	$mg \cdot kg^{-1}$	N/A			-
Surrogate Recovery (%)					
Isobutylbenzene - Extractable	%				GC-MS
n-Dotriacontane - Extractable	%				GC-MS
Isobutylbenzene - Volatile	%				GC-FID

[1]RDL = Reportable Detection Limit
[2]CCME (2002) Interim Sediment Quality Guideline
[3]CCME (2002) Probable Effect Level

2.7.3.4 Analysis and Interpretation

The purpose of the sediment sampling program was to characterize spatial patterns in marine sediment quality within the study area and to compare with baseline data. Appropriate descriptive and summary statistics (minimums, maximums, means and standard deviations) were calculated and presented for each parameter analyzed for each location, where appropriate. Non-detectable (ND) values were represented as half the RDL value for statistical purposes (i.e., for determination of means if more than one value was above non-detectable levels). If all values were non-detectable for a particular parameter, they were represented as ND in the data tables.

The data from this study have been compared with two sets of marine sediment quality guidelines, specifically: (i) CCME Interim Sediment Quality Guideline (ISQGs); and (ii) Probable Effect Level (PELs) for the protection of aquatic life in the marine environment (CCME 2016). Exceedances of the ISQG guideline are underlined and shaded. No exceedances of the PEL guideline were present.

Several sediment quality monitoring targets have been considered and will continue to be evaluated on an ongoing basis in the MEEMP. These targets include changes over time in: particle size (specifically percent fines), iron concentrations, and hydrocarbon concentrations (reduced effort until triggered). Changes in these variables over time can be expected and could be linked to Project activities.

2.7.3.4.1 Particle Size

Project shipping activities will likely contribute to sediment redistribution in Milne Inlet and over time is expected to result in a coarsening of sediment due to bottom scouring from propeller wash. Conversely, Project activities such as stockpiling and loading of iron ore at the Milne ore dock are expected to result in an increase in fines in the sediment. In both cases, the Milne ore dock serves as a point source of sedimentation and redistribution.

The relationship between particle size, particularly percent fines, and distance from the ore dock point source was explored using linear regression analysis. The gradient of percent fines prior to Project operations was used to compare against gradients measured in 2015 and 2016 in order to identify significant changes within two standard deviations of the mean (as per Environmental Canada's [2012] technical guidance for EEM). Since Project activities such as shipping may have confounding effects on the distribution of percent fines (i.e., loading of ore resulting in dust deposition vs. propeller wash redistributing fines), correlations with other environmental variables, such as iron concentrations, will be useful in exploring the extent of possible Project-induced change.

2.7.3.4.2 Iron Concentrations in Sediments

Project activities, such as stockpiling of iron ore near the Milne ore dock (discharge of stockpile run-off) and loading of iron ore on shipping vessels, may result in iron dust deposition in the marine environment. This deposition is expected to be concentrated at the Milne ore dock and as such, it has been identified as a potential point source of contamination. Baseline information on the natural variability of iron concentrations in the marine environment at Milne Inlet provide a method of predicting how iron concentrations will change during Project operations. Gradients of iron in sediments will continue to be evaluated using regression analysis against monitoring gradients to determine the magnitude and extent of potential effects of Project activities on the marine environment.

Comparisons are intended to be sensitive enough to detect significant changes within two standard deviations of the mean as per Environmental Canada's (2012) technical guidance for EEM. As the MEEMP progresses, other factors that may confound or contribute to this relationship between iron concentration and distance from the point source will be considered.

2.7.3.4.3 Hydrocarbon Concentrations in Sediments

Increased shipping associated with Project operations has the potential of increasing the concentration of petroleum hydrocarbons in the marine environment and sediment. Similarly, increases in the level of activity on land increases the potential for petroleum hydrocarbons to enter the marine environment at the site runoff area. This potential Project-induced change centres around the Milne ore dock as a point source of potential hydrocarbon contamination. Linear regression analysis of the relationship between hydrocarbons in sediment and distance from the ore dock has not been possible due to the low levels reported (i.e., generally non-detectable). Given the minimal presence of hydrocarbons in sediment at Milne Port during baseline surveys and the first two years of operations, hydrocarbon sampling effort has decreased and could potentially be further decreased to a surveillance level in the following years of monitoring unless hydrocarbon results trigger a return to an EEM level of sampling.

2.7.4 Substrate, Macroflora and Benthic Epifauna

Habitat surveys were conducted using underwater video along the North, West, East and Coastal Transects. Underwater video was collected at these study areas to characterize the habitat and associated biota based on a classification of substrate, marine flora and marine fauna. Underwater video surveys were completed along the 15 m depth contour line extending away from the ore dock for the West, East and Coastal Transects. Video data was collected along an increasing depth gradient (from the port) for the North Transect. Methods employed during these surveys are described in the following sections.

For the purposes of describing the marine habitat, general depth categories were delineated as described in Kelly *et al*. (2009 Draft) and provided in Table 2.6. Video footage was collected from the Shallow Subtidal Zone (~15 m depth) and, for the North Transect, between the Shallow Subtidal Zone extending to the Deep Subtidal Zone (90-120 m).

Table 2.6 Depth Categories Described by Kelly *et al* (2009 Draft).

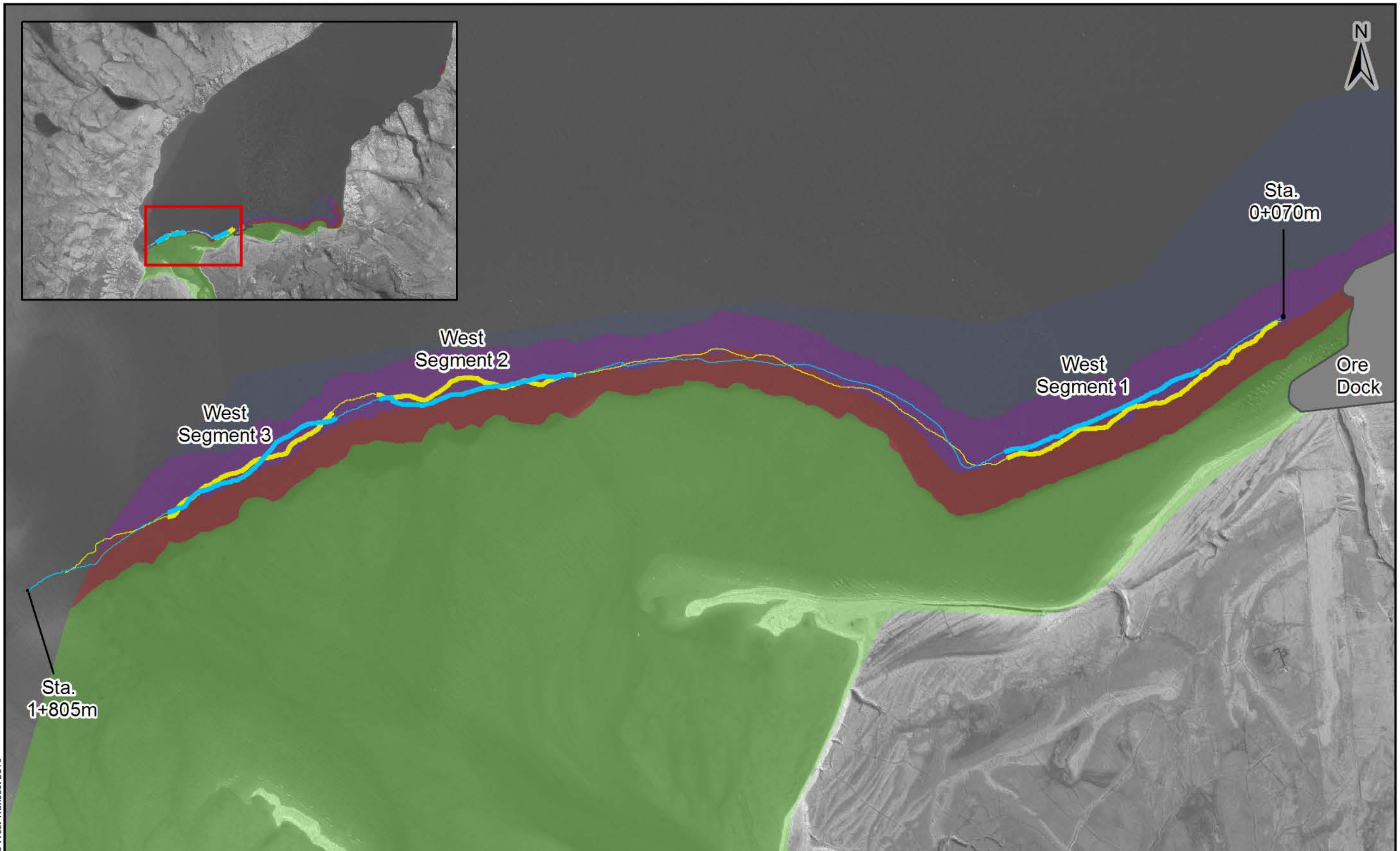
Depth Category	Description
Intertidal Zone	Between high and low tide
Shallow Subtidal Zone	Mean low tide to 30 m
Deep Subtidal Zone, 30-60 m	30-60 m
Deep Subtidal Zone, 60-90 m	60-90 m
Deep Subtidal Zone, 90-120 m	90-120 m

2.7.4.1 Data Collection

Two replicate video surveys were conducted along each of the four transects described above and identified as replicate 1 (R1) and replicate 2 (R2). The video data from each transect was collected adjacent to the other, within the limits imposed by the field sampling methods. The intended purpose of replication was to describe the natural variability of the data within a small area and to improve the statistical power of data analyses. The sample design provided a gradient of substrate, macroflora and benthic epifauna with respect to increasing distance from a point source of Project activity (Milne ore dock). Video data from 2016 followed the replicates from 2015 and 2014 as closely as possible within constraints imposed by the field sampling methods. Transects of 2016 video data are illustrated in Figures 2.6 through 2.9.

The video survey involved the use of an underwater drop video camera system (Deep Blue Pro) with a high powered LED light, laser scaler, fins, weights and an umbilical cord connecting the camera assembly to the surface. The communication cable connected the camera to an onboard laptop computer and permitted data to be viewed and logged in real time. In addition to the underwater video array, the field team used a fish finder transducer with external power supply and GPS to provide positional information to the boat operator in order to stay on course. The multi–channel GPS unit was connected to the serial port of the laptop computer in order for the vessel position to be compared in real time against the 15 m contour the field crew was following. The system allowed the user to review real time data such as depth, GPS coordinates, magnetic heading, speed and temperature information.

Video was collected as one continuous transect. In order to maintain a slow constant speed (between 1 to 2 $km \cdot hr^{-1}$), the boat operator had to carefully maneuver the boat against the



Legend

- Replicate 1 - Detailed Analysis
- Replicate 2 - Detailed Analysis
- Replicate 1 - Video Extent
- Replicate 2 - Video Extent
- Upper Subtidal/Intertidal (<3m depth)
- Shallow Subtidal (~3-15m depth)
- Moderate Subtidal (~15-25m depth)
- Deep Subtidal (>25m depth)

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 100 200 300 Meters

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

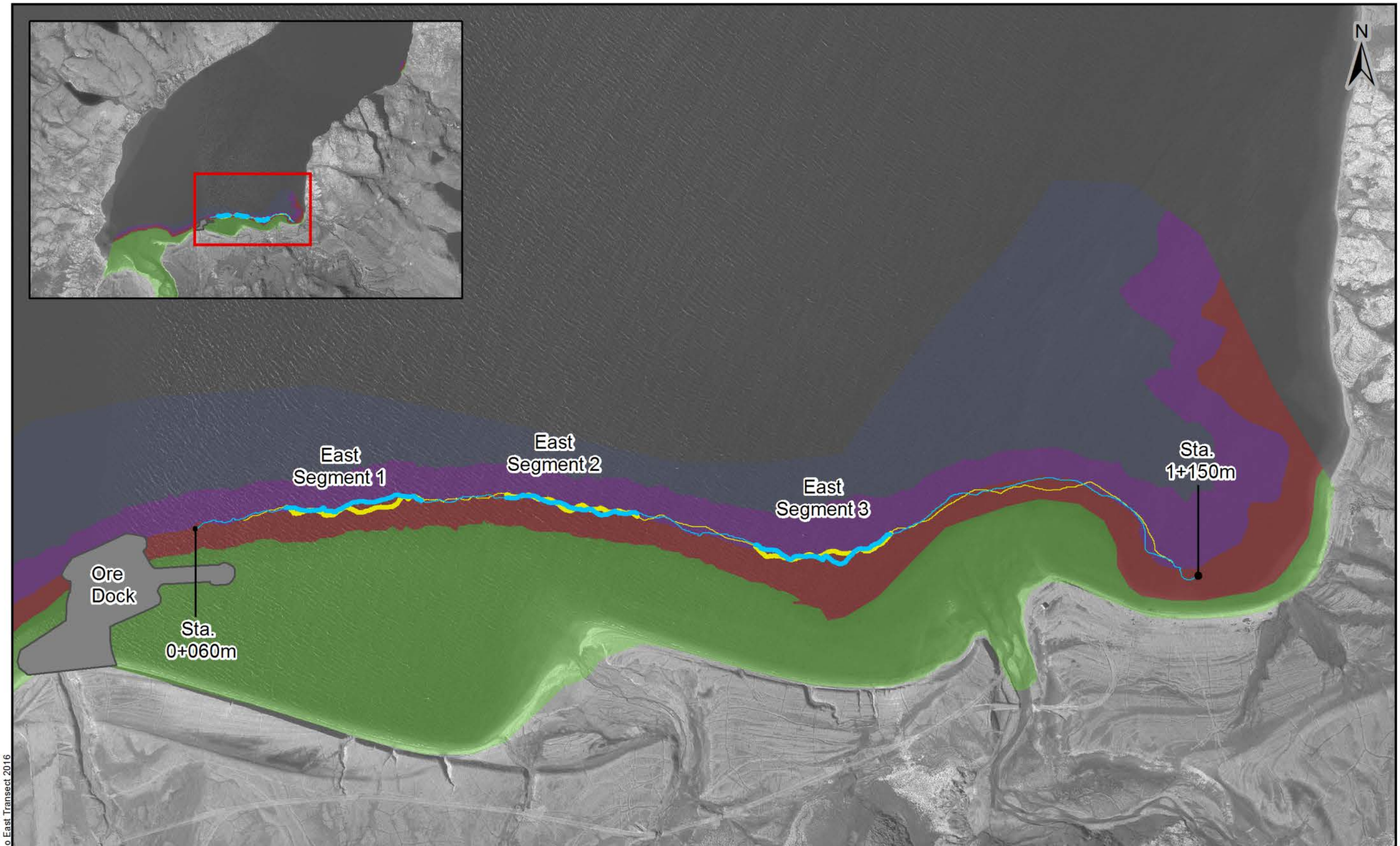
Underwater Video West Transect 2016

SEM

REF NO. **070-025-01-021**

FIGURE 2.6 REV 0

FIGURE ID: 070-025-01-021 Underwater Video West Transect 2016



Legend

	Replicate 1 - Detailed Analysis		Upper Subtidal/Intertidal (<3m depth)
	Replicate 2 - Detailed Analysis		Shallow Subtidal (~3-15m depth)
	Replicate 1 - Video Extent		Moderate Subtidal (~15-25m depth)
	Replicate 2 - Video Extent		Deep Subtidal (>25m depth)

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 100 200 300 Meters

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Underwater Video East Transect 2016

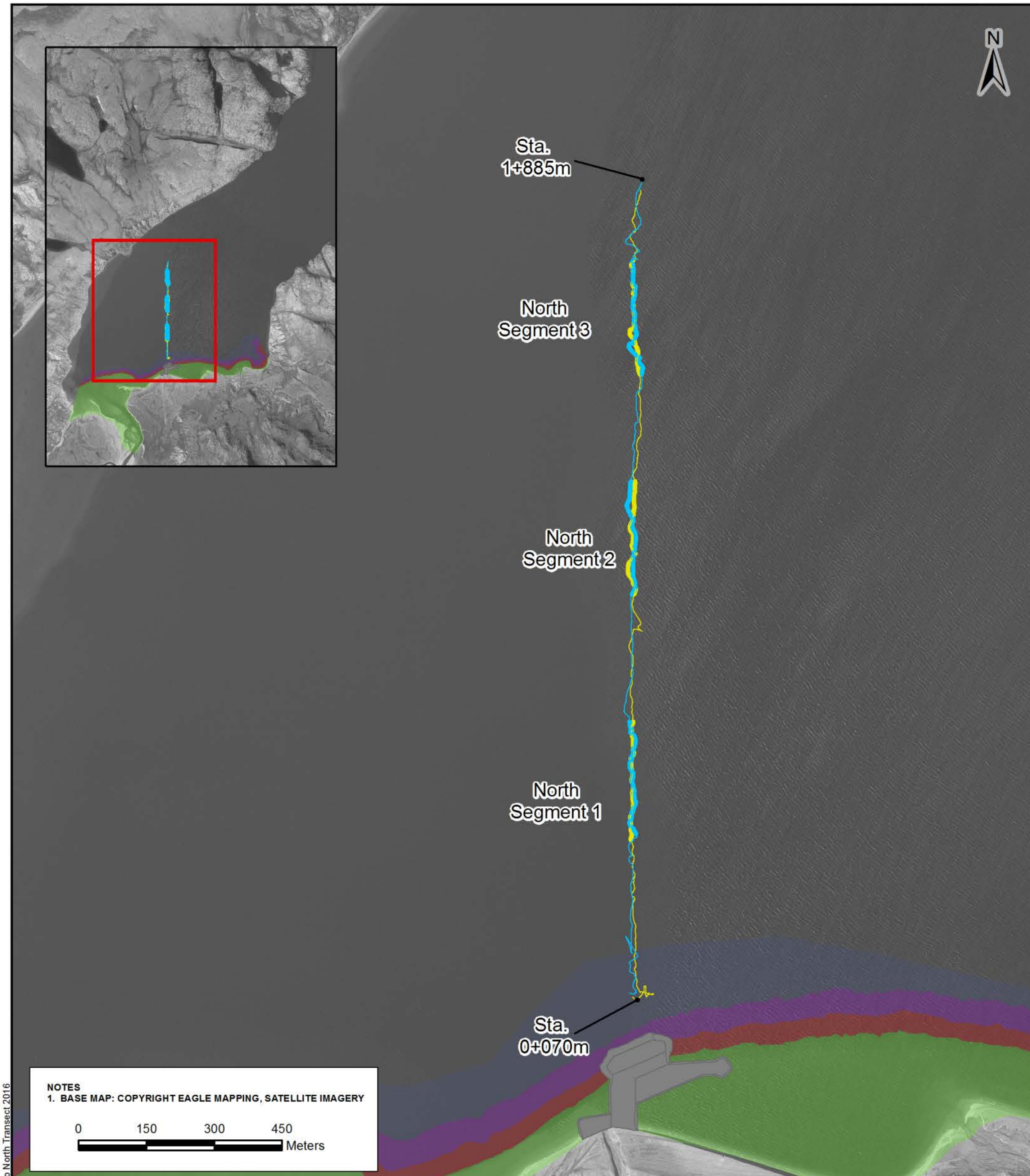
SEM

REF NO. **070-025-01-025**

FIGURE 2.7

REV 0

FIGURE ID: 070-025-01-022 Underwater Video East Transect 2016



Legend

- Replicate 1 - Detailed Analysis
- Replicate 2 - Detailed Analysis
- Replicate 1 - Video Extent
- Replicate 2 - Video Extent
- Upper Subtial/Intertidal (<3m depth)
- Shallow Subtidal (~3-15m depth)
- Moderate Subtidal (~15-25m depth)
- Deep Subtidal (>25m depth)

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MARY RIVER PROJECT

Underwater Video
NorthTransect 2016

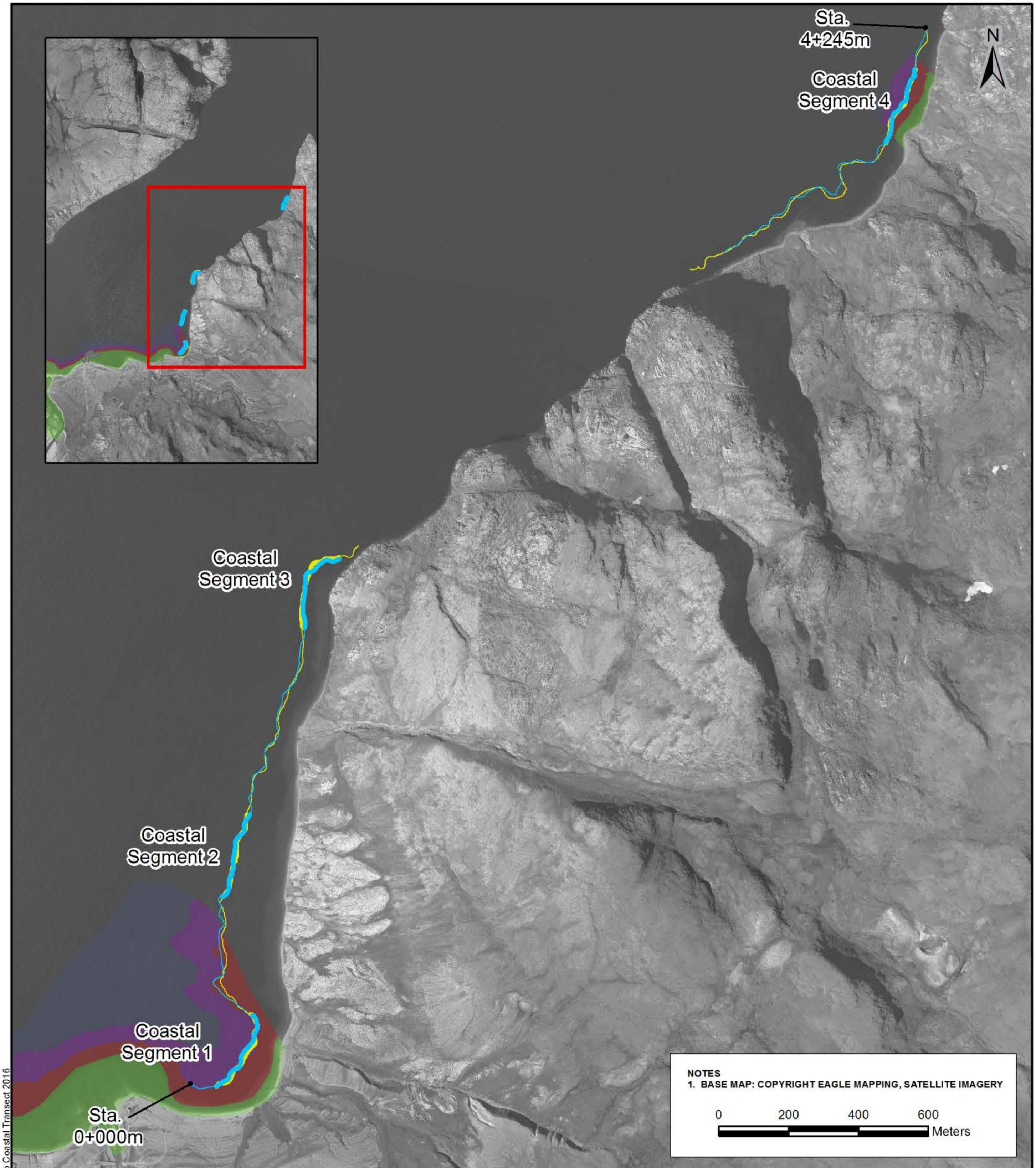
SEM

REF NO.
070-025-01-024

FIGURE 2.8

REV
0

FIGURE ID: 070-025-01-024 Underwater Video North Transect 2016



Legend

- Replicate 1 - Detailed Analysis
- Replicate 2 - Detailed Analysis
- Replicate 1 - Video Extent
- Replicate 2 - Video Extent
- Upper Subtial/Intertidal (<3m depth)
- Shallow Subtidal (~3-15m depth)
- Moderate Subtidal (~15-25m depth)
- Deep Subtidal (>25m depth)

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Underwater Video Coastal Transect 2016

SEM

REF NO. **070-025-01-023**

FIGURE 2.9

REV 0

FIGURE ID: 070-025-01-023 Underwater Video Coastal Transect 2016 current in reverse. Based on camera orientation (lens facing towards the bottom) and height above the bottom, an average field of view of approximately 4 m width was recorded. A scale bar was displayed in the field of view to provide a size reference for video interpretation (e.g., substrate). The scale bar was composed of two green laser lights mounted a fixed distance apart that shone down at the seafloor during video recordings. As the vessel approached the survey location the drop camera was lowered in the water column to a depth of 1 – 1.5 m above the seafloor. The camera was lowered and raised as needed to maintain clear view of the seafloor. The towed video was recorded and displayed in real time and the digital video data was stored on hard drives. The video was reviewed by the field team in real time to ensure the data collected was acceptable for subsequent analyses. In addition, an inline GPS overlay was utilized to embed live GPS information onto the raw video footage and was subsequently used to geo-reference the video track. The embedded GPS information provided a quality control check when plotting the camera lines during post-processing. At the completion of each survey, the video data was backed up and archived on separate portable hard drives. All data were digitally logged with the necessary metadata information.

2.7.4.2 Analysis of Video

The video was viewed by a biological technician experienced in the assessment and interpretation of substrate, marine flora and marine fauna. The technician recorded, on a frame by frame basis, the distribution of substrate types, distribution of macroflora and the distribution and number of individual faunal species (invertebrates and fish) observed in each frame. All interpretation and classification was consistent with schemes previously used by SEM (SEM 2012; 2014; 2015b; 2016).

Video was analyzed in 5m increments along each transect and were summarized on a per-transect basis, as well as on a per-segment basis within each transect, and presented as per Kelly *et al*. (2009, draft). Parameters included surveyed length and area, video time, macrofauna (abundance and relative abundance of each taxon where possible), substrate type (% coverage, predominant substrate group) and macroflora (% coverage, predominant taxon and/or predominant macrofloral class). The relative abundance of macroflora for each identifiable taxon was assessed and described on a percent (%) coverage basis, in 5% increments.

Due to the quantity of video data collected and extensive effort required for analysis of the video footage, an adaptive analysis technique was used. Rather than analyzing every second of footage, three segments (referred to as S1, S2 and S3) along each transect replicate (R1 and R2) of collected video were analyzed amounting to approximately 25% of the total video. If, in future years, the variability of the data is too great to detect small changes when comparing data with baseline, remaining segments of archived video data can be analyzed and included in the comparison. This approach of adaptive analysis minimizes the cost of increasing the size of the dataset while maximizing the benefit of each datum that is added. This type of approach is especially useful with video analysis since the storage time is indefinite.

2.7.4.2.1 Benthic Epifauna

All benthic epifauna encountered in the video footage were identified to the lowest practical taxonomic level which included species, genus or faunal class. In 2014, 2015, and 2016 epifauna was enumerated, providing quantitative results of abundance. In previous years, the relative abundance of macrofauna for each identifiable taxon was assessed and described, on a relative ranking scale (AMEC 2010) including 'abundant', 'common', 'occasional' and 'uncommon'.

The ranking scale is not quantitative and the divisions between each rank are relative, as assigned by the video interpreter. The enumeration of benthic epifauna completed since 2014 will allow for more robust statistics to be conducted for the purposes of detecting changes over time.

2.7.4.2.2 Substrate

Video data was initially reviewed and characterized by detailed substrate type with combinations of up to five substrate types based on the Wentworth-Udden (Wentworth 1922) classification (Table 2.7). The detailed substrate types were subsequently aggregated into broad substrate types as per Kelly *et al*. (2009, draft, Table 2.7).

Table 2.7 Classification of Marine Substrates.

Broad Substrate Category[1]	Detailed Substrate Category[1]	Definition
Bedrock	Bedrock	Continuous solid rock exposed by scouring forces.
Coarse	Boulder	Rocks greater than 250 mm in diameter.
	Rubble	Large rocks ranging from 130 mm – 250 mm in diameter.
Medium	Cobble	Rocks ranging from 30 mm – 130 mm.
	Gravel	Granule size or coarser, 2 mm – 30 mm.
Fine	Sand	Fine deposits ranging from 0.06 mm – 2 mm.
	Mud	Material encompassing both silt and clay <0.06 mm.
Organic	Organic/Detritus	Soft material 85% or more organic materials.
Shell	Shells	Calcareous remains of shellfish and other invertebrates.

Note [1]: Marine substrates as adapted from Wentworth-Udden and aggregated into broad substrate categories after Kelly *et al*. 2009, draft.

2.7.4.2.3 Macroflora

The macroflora observed on the video were identified to the lowest practical taxonomic level which included species, genus or vegetation class (Table 2.8). Owing to the speed of the survey in some sections, contact with the ocean bottom, water clarity, distance off the bottom or other reasons, identification to species and/or genus was not always possible.

Table 2.8 Classification of Marine Vegetation.

Vegetation Class[1]	Definition
Red Algae	Common name or Rhodophyta (e.g., *Chondrus crispus* – Irish moss, *Lithothamium* – coralline algae, *Ptilota, Porphyra, Rhodymenia* – dulse, etc.)
Brown Algae	Common name for the seaweeds of the Laminariales (Phaeophyta), brown alga with a large broad-bladed thallus attached to the substrate by a tough stalk and holdfast (e.g., *Laminaria longicruris* – cabbage kelp, *L. digitata* – finger kelp, *Alaria esculenta* – winged kelp, *Chorda filum* – Mermaid's trusses, *Agarium clathratum, Saccorhiza deratodea*, etc.)
Green Algae	Common name for Chlorophyta (e.g., *Chlamydomonas, Spirogyra, Ulva lactuca* – sea lettuce, *Urospora,* etc.)
Rockweed	Fucus sp. – rock weed, *Ascophyllum nodosum* – knotted wrack
Eelgrass	*Zostera marina* is a green flowering plant (Anthophyta) and is primarily a subtidal species that penetrates to some extent into the intertidal zone. It is common on mud flats that are exposed at low tide, in estuaries and shallow, protected bays.

Table 2.8 Classification of Marine Vegetation. (Cont'd)

Vegetation Class[1]	Definition
Salt Marsh	Aquatic plants developing on wet soil (e.g., tidal or salt marshes)
Other	Any other type of flora not identified in the above categories

Note [1]: Classification of marine vegetation after Kelly *et al*. (2009, draft)

2.7.4.3 Analysis and Interpretation

Linear regression analysis was used to elucidate the baseline relationships of benthic epifaunal and macrofloral abundance, with respect to increasing distance from the Milne ore dock. Each year, the slope of the regression line, which represents the gradient, can be compared to the baseline slope and slopes of previous monitoring years in order to identify significant differences over time.

While the substrate data is not explicitly used in the MEEMP analyses, the substrate information can be used to assist with interpreting changes in the faunal or floral community.

2.7.5 Fish Sampling

Fish sampling was undertaken to provide a general characterization of the fish community in association with the Milne Port and ore dock. A mark-recapture study design has been used since inception of the program in an attempt to gather information on the relative population sizes of the different species. The intent of the mark-recapture program was to determine relative population sizes of fish (e.g., sculpin) species in order to determine potential use of one or more species as a biological indicator of Project-induced change. For example, in order to utilize sculpin body burden for an ongoing monitoring program, the resident population must be large enough to support lethal sampling of fish, at the required sample size, for tissue analysis. Unfortunately, sculpin catch rates, including re-capture, have been very low and reliable population estimates have not been possible.

Sampling locations were established in the immediate vicinity of the ore dock and along the eastern shore of Milne Inlet. Fukui traps were primarily set in the vicinity of the ore dock for the entire sampling period in order to maximize the chances of recapture of marked fish. Conversely, given the low catch rate experienced in previous years using gill nets in the vicinity of the ore dock, effort was focused on traditional fishing areas used by local Inuit (eastern shore). The locations of the fish sampling efforts are provided in Figures 2.10 and 2.11. Detailed methods for the collection and analysis of fish samples are described in the following sections.

2.7.5.1 Fish Collection

Fish were surveyed by various sampling gear to determine presence/absence, relative abundance and for collecting the appropriate metrics to characterize and describe the fish communities. All sampling was conducted in accordance with conditions outlined in Experimental License S-16/17-1014-NU and Animal Use Protocol (AUP) FWI-ACC-2016-013 Letter of Approval, as issued by DFO (Appendix A). Gear was deployed in the same general areas as in previous years. At all sampling sites the date, time, Site ID, UTM coordinates, depth and fishing gear type were recorded. The focus was on using non-lethal methods to the extent possible. The fishing gear included the following:

- Experimental, multi-panel, multi-mesh size monofilament gill nets set in a sinking (bottom set) and tended fashion; and
- Fukui traps (baited).

Two sets of six-panel, multi-mesh size monofilament experimental gill nets, each panel measuring 15.2 m x 2.4 m deep, consisting of 2.5, 3.8, 5.1, 6.4, 7.6 and 10.2 cm mesh sizes, were used to collect marine fish. Gill nets were set along the shoreline of the Local Study Area (LSA) with emphasis placed on known Inuit fishing sites for Arctic char (Figure 2.10). Gill nets were tended every two hours on a regular basis and were removed on a daily basis consistent with the conditions contained in the DFO experimental license.

Fukui traps measured 61 cm x 46 cm x 20 cm, with 1.25 cm stretch mesh and were baited with salted herring and mackerel placed in a plastic bait container. The bait containers were checked after each haul with bait replaced as necessary. Traps were set in strings of ten traps each and locations of deployment are presented in Figure 2.11. Locations of Fukui traps and experimental gill nets (i.e., each end of the nets or trap lines) were recorded on a Garmin 76Cx GPS. In addition, depths were documented and

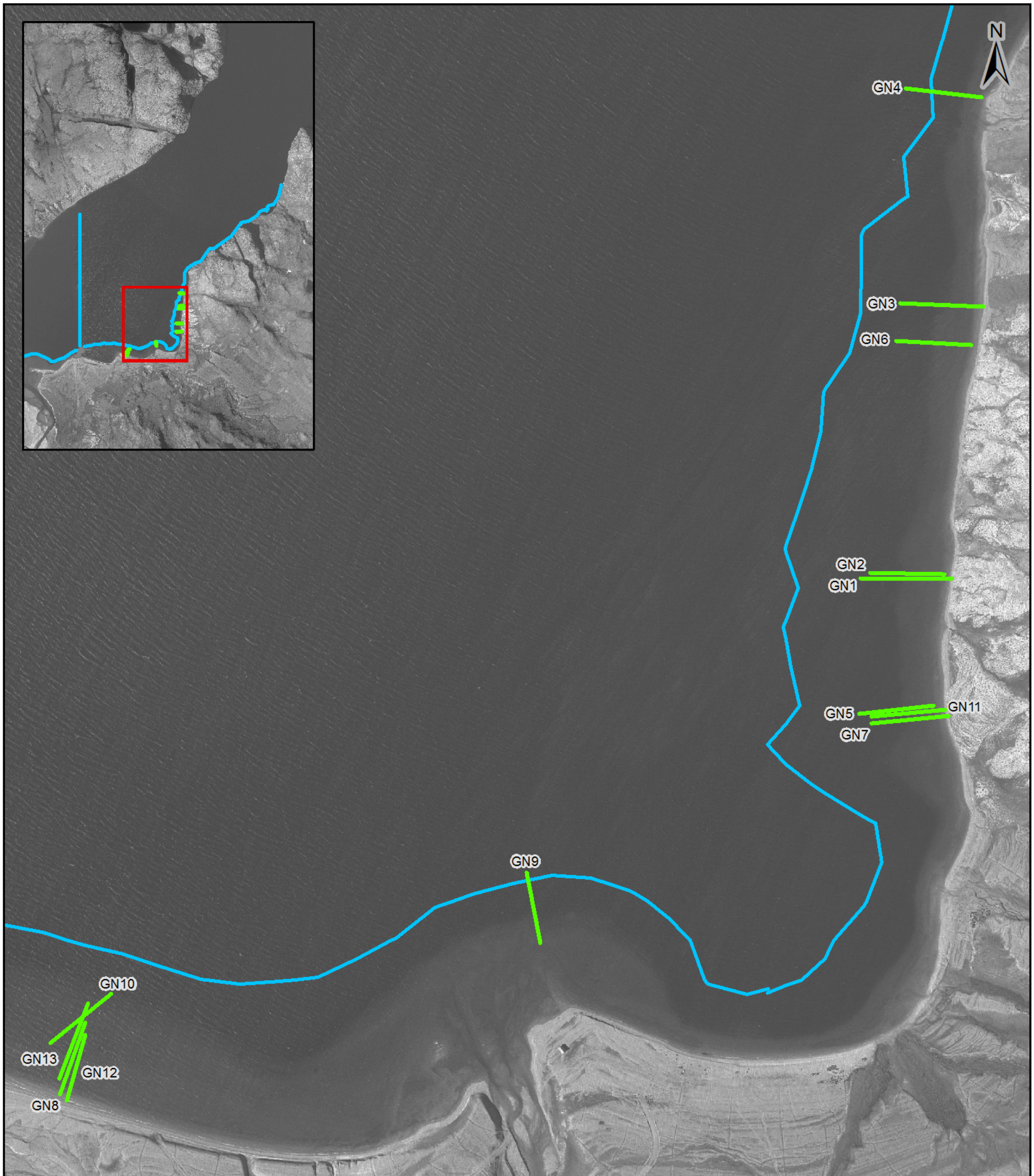


FIGURE ID: 070-025-1-007 Gill Net Locations 2016.mxd

Legend

- Gill Net
- Transect

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 80 160 240 Meters

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Gill Net Locations, 2016

SEM

REF NO. 070-025-1-007

FIGURE 2.10

REV 0

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Fukui Trap Locations, 2016

SEM

REF NO. 070-025-1-006

FIGURE 2.11

REV 0

FIGURE ID: 070-025-1-006 Fukui Trap Locations 2016.mxd date and time of both deployment and recovery were recorded. All fish collected were identified to species, measured for length and weight and, whenever possible, released alive.

2.7.5.2 Analyses and Interpretation

All fishing data from the field program was subsequently analyzed to include the following:

- Relative abundance, including relative population size, and distribution of species;
- Catch per unit of effort (CPUE), measured as the total number of fish captured per hour of effort (including effort from empty nets);
- Length/weight distribution of each species; and
- Age distribution, body burden and diet of incidental fish mortalities.

2.8 Aquatic Invasive Species Sampling

2.8.1 Sampling Sites

Sampling sites for 2016 AIS video data and plankton tows were in the vicinity of those previously collected and are provided in Figure 2.12. Video data was collected along four transects perpendicular to shore partially surrounding the ore dock. Benthic invertebrate grabs were collected along the same transects from three depth strata while the zooplankton samples were collected from deeper water (>25 m) at the end of each transect using both vertical and oblique tows. Fukui traps and tended gill nets were set as part of the regular MEEMP program with various sets positioned in close proximity to the AIS transects (Figures 2.10 and 2.11). Settlement baskets for encrusting epifauna were deployed on the west side of the ore dock in very close proximity.

2.8.2 Zooplankton

In 2016, zooplankton were collected at four sample locations by vertical tows, using a 80 µm mesh plankton net and by oblique tows, using a 243 µm mesh plankton net. Both nets had diameters of 30 cm. Vertical samples (n=4) were collected by lowering the plankton net to 1 m above the bottom and retrieving the net to the surface at a rate of approximately 1 m/second. Samples from each station were composed of a composite of three replicate tows.

Legend

- Settlement Basket (Encrusting epifauna)
- Vertical Zooplankton Tow
- Horizontal Zooplankton Tow
- Underwater Video Transect

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY.
2. BATHYMETRIC CONTOUR INTERVAL: 5m

0 50 100 150 Meters

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Invasive Species Sampling Locations, 2016

SEM

REF NO. 070-025-1-005

FIGURE 2.12

REV 0

FIGURE ID: 070-025-1-005 Invasive Species Sampling Locations 2016.mxd

Oblique samples (n=4) were collected by towing the plankton net just below the water surface for a period of ten minutes at an average velocity of approximately 2.5 km/h. Plankton samples were transferred to 250 ml glass jars and fixed with 95% ethanol prior to packaging, labelling and storage as per protocols provided by the taxonomic laboratory.

Samples were subsequently sent to SpryTech Biological Services in Bedford, NS, for taxonomic analysis. The list of zooplankton species collected has been used to update the species inventory list and to determine presence of any new species not previously identified. New species collected in 2016 were further investigated to determine if any newly identified species were possibly invasive (non-native).

Zooplankton samples containing ichthyoplankton (eggs and larvae) were retained for further taxonomic analysis where required.

2.8.3 Benthic Invertebrate Infauna

In 2016, benthic infauna samples were collected at three depth strata (3-15 m, 15-25 m, and 25-35 m) along four transects, consistent with the AIS monitoring study design. Benthic samples were collected using a Petite Ponar sediment grab as detailed in Section 2.7.3 – Sediment Quality. Following sample retrieval, sample volumes were estimated for quantitative analyses. Any benthic epifauna present were included in the samples (e.g., urchins) for later sieving. All samples were sieved within a few hours of collection through a 500 µm mesh screen by gently elutriating sample with seawater and manually removing any organisms using fine tined forceps. All organisms were placed in 250 ml wide mouth HDPE sample bottles and preserved in 95% ethanol.

Samples were shipped to Envirosphere Consulting in Windsor, NS, for enumeration and identification to the lowest practical taxonomic level (LPL). The benthic infauna species list was updated and examined for presence of any new species not previously identified. New species collected in 2016 were evaluated to determine if new species were possibly invasive (non-native).

2.8.4 Benthic Epifauna and Macroflora

Underwater video surveys were conducted along four transects, perpendicular to the shoreline, from the shoreline to beyond the 25 m depth contour and were conducted consistent with Kelly *et al*. (2009, draft. The video survey involved the use of an underwater drop video camera system as detailed in Section 2.7.4 – Substrate, Macroflora and Benthic Epifauna.

The video data was examined to identify flora and fauna taxa to the LPL by a qualified biological technician. For aquatic invasive species monitoring, only the presence of taxa was recorded as abundance was not important for determination of AIS.

The list of epifauna and macroflora identified in the video was used to update the species inventory list and to determine the presence of new species not previously identified. New species were further assessed to determine if these species could be possibly invasive (non-native).

2.8.5 Fish and Mobile Epifauna

As previously noted, baited Fukui traps and experimental gill nets were used to collect finfish and mobile epifauna. Fukui traps and nets were set as previously indicated in Section 2.7.5.

Finfish and mobile epifauna identified were used to update the species inventory and to determine the presence of any new species not previously identified. Any new species were further assessed to determine if these species could be possibly invasive (non-native).

2.8.6 Encrusting Epifauna

Encrusting epifauna were to be collected by settlement baskets. Settlement baskets, measuring 16.5 cm in diameter and 28 cm in length and filled with cobble ranging in size from 8 cm to 12 cm, were deployed in August 2014. Baskets were deployed in relatively shallow water below the ice scour level. The baskets, acting as anchors, were placed in pairs joined by nylon rope with a highly visible, yellow, `hard ball` float attached to the end at a length allowing the float to remain visible for subsequent location and recovery at approximately 2-3 m below the surface at low tide. Settlement baskets were initially retrieved in 2015, one year after deployment, but due to the low rate of colonization, baskets were redeployed for an additional year. Settlement baskets at the Milne Port were unfortunately not retrieved in 2016 and it was speculated the baskets may have been disturbed/removed by boat traffic at the port site. Baskets were redeployed in 2016 and were tethered to the port infrastructure so as to avoid possible disturbance and removal by marine traffic.

2.9 Quality Management

The following quality assurance/quality control procedures were implemented by SEM personnel during field sample collection in 2016:

- SOPs, developed for key study components, were present with field crews at all times and samples were collected accordingly;
- All major study components had key personnel designated as lead responsibility and these individuals ensured that SOPs were being followed;
- Regular meetings of field team members were held to review study progress, assess methodologies and sample collection efforts, discuss any health and safety issues and to set and revise priorities in relation to accomplishments and field conditions;
- All personnel involved in field procedures had appropriate education, training and experience;
- Sampling methodologies were consistently applied among sites throughout the study area;
- Sampling equipment was appropriate for the habitat/study component and was properly cleaned and calibrated;
- All samples were collected in the proper container with the appropriate preservative and/or fixative added;
- Field personnel maintained detailed notes in appropriate field notebooks and/or customized field data sheets;
- SEM utilized a data tracker so that the Study Team could reconcile, on a nightly basis, all sample and data collection with the required sampling levels associated with the study design;
- All data were transcribed from field notebooks and field datasheets into a digital format (e.g., MS Excel spreadsheet) and backed up onto a USB drive on a frequent basis (nightly when possible). Study component leads were responsible to ensure data integrity; and
- All sample movements/shipments were recorded on detailed Chain of Custody forms.

Data collected in the field and reported by the analytical laboratories were maintained in central databases and were checked for accuracy, completeness and reasonableness of data. Databases were routinely backed up on an internal network and backup hard drive. The draft and final reports were reviewed by senior staff within SEM prior to submission to Baffinland.

3.0 RESULTS

The results of the biological and environment surveys completed in 2016, including those supporting the MEEMP, are presented in the following sections. Oceanography data collected by Moran-CORI is beyond the scope of this report and is reported under separate cover, although CTD data is presented and discussed herein to assist in describing and interpreting water quality.

3.1 Water Quality

Water samples were collected from four sampling stations on five occasions; August 1, August 9, August 14, August 21, and September 16, 2016, for a total of 20 samples. One station was situated near the site drainage discharge with three additional stations extending radially out from the water source as depicted in Figure 2.4 and displayed in Table 3.1. Samples were analyzed for general chemistry and nutrients, total suspended solids, metals and mercury, and petroleum hydrocarbons. CTD measurements were collected by Moran-CORI at an additional 13 locations throughout Milne Inlet (Table 3.2 and Figure 2.5).

Table 3.1 Location and Depth of Water Samples Collected at Milne Inlet, 2016.

Station	Sample Date	Sample ID	Sample location		Water Depth (m)
			Easting	Northing	
Point Source (PS)	August 1	W-5	503662	7976403	1.2 – 2.0
	August 9	W-21			
	August 14	W-38, W-32			
	August 21	W-33			
	September 16	W-34			
West North West (WNW)	August 1	W-3, W-4	503540	7976599	1.2 – 2.0
	August 9	W-14, W-28			
	August 14	W-16			
	August 21	W-12			
	September 16	W-17, W-13			
North (N)	August 1	W-2	503725	7976612	1.2 – 2.0
	August 9	W-20			
	August 14	W-37			
	August 21	W-36, W-18			
	September 16	W-22			
East North East (ENE)	August 1	W-1	503874	7976517	1.2 – 2.0
	August 9	W-8			
	August 14	W-27			
	August 21	W-26			
	September 16	W-24			

Table 3.1 Location and Depth of Water Samples Collected at Milne Inlet, 2016. (Cont'd)

Station	Sample Date	Sample ID	Sample location		Water Depth (m)
			Easting	Northing	
Field Blanks	August 1	W-6	N/A	N/A	N/A
	August 14	W-11	N/A	N/A	N/A
	September 16	W-7	N/A	N/A	N/A
Note: Location data is provided in UTM NAD 83, Zone 17 coordinates.					

Table 3.2 Location of CTD Profiles Collected Throughout Milne Inlet, 2016.

CTD Station	Date (2016)	Sampling Locations	
		Easting	Northing
Milne Ore Dock CTD	August 17	503379	7976909
Stephens Island CTD	August 17	517231	8000982
CTD site 5	August 17	503784	7978046
CTD site 6	August 17	507040	7982289
CTD site 7	August 17	507505	7987797
CTD site 8	August 17	505830	7996957
CTD site 9	August 17	512922	7993184
CTD site 10	August 17	517229	8004793
CTD site 11	August 17	509487	8007716
CTD site 12	August 17	514799	8015793
CTD site 13	August 17	522910	8021152
CTD site 14	August 17	518155	8023129
CTD site 15	August 17	513240	8025627
Note: Location data is provided in UTM NAD 83, Zone 17 coordinates.			

The CTD profiles conducted by Moran-CORI were depicted as salinity and temperature gradients with depth (Figures 3.1 through 3.3) and showed relative similarities at all stations with similar depths. It is noteworthy that depth, on the Y axis, is highly variable between stations. Surface temperatures varied between 5.8 and 9.4°C with no particular trend between the inner and outer portions of the inlet. Temperatures generally declined with depth in a relatively linear fashion in the top 20 to 60 m and either remained consistent or increased with increasing depth below 60 m. The lowest temperatures (min. -1.43°C) were generally recorded between 65 and 90 m in depth. Salinity increased rapidly with increasing depth in the top 20 m and either remained relatively stable with increasing depth below 20 m or increased slightly. The lowest salinity (17.8 PSU) was recorded near the inner portion of Milne Inlet while the highest salinity (33.9 PSU) was recorded at depth slightly farther out the inlet.

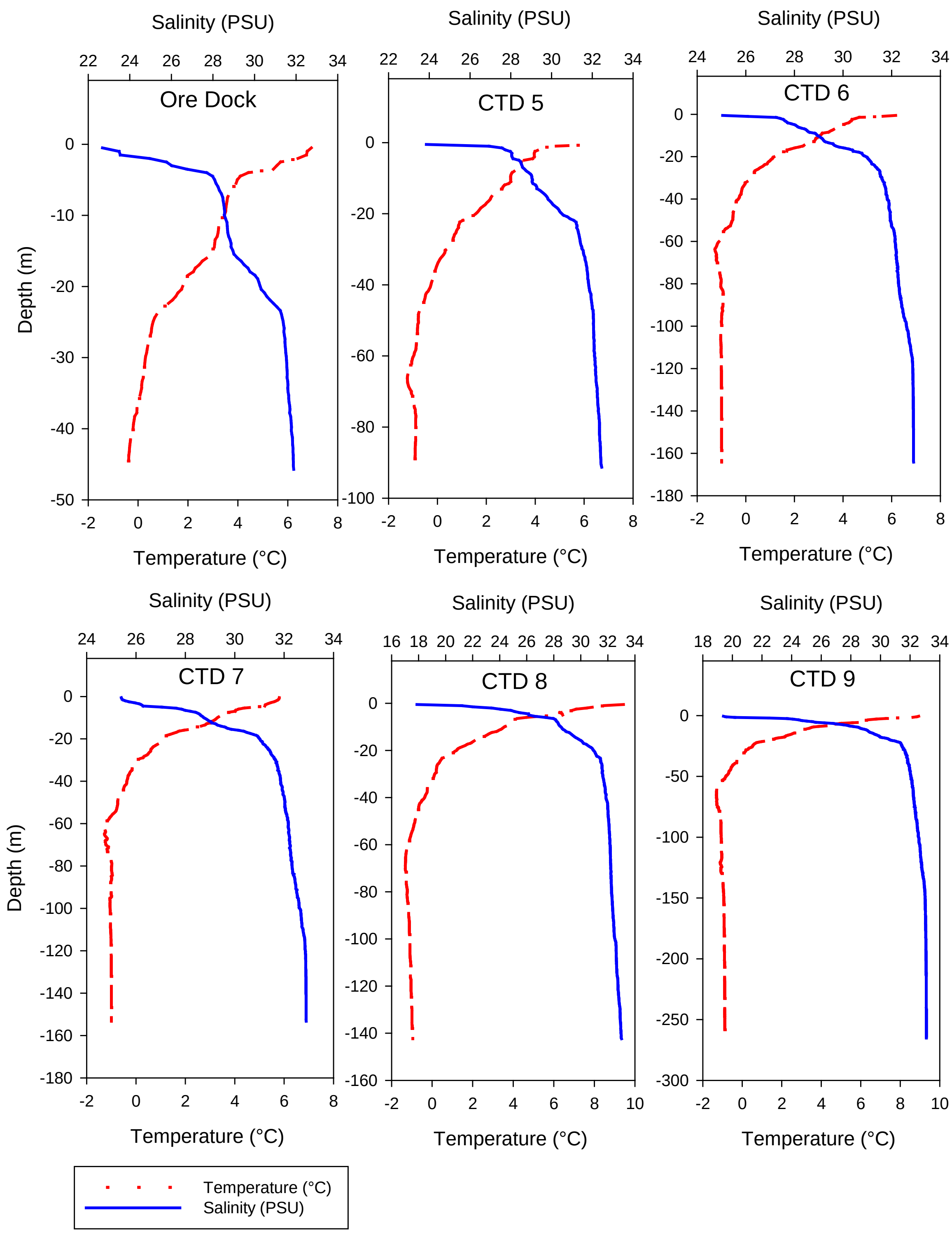


Figure 3.1 CTD Data from Milne Port and the Inner Portion of Milne Inlet, 2016.

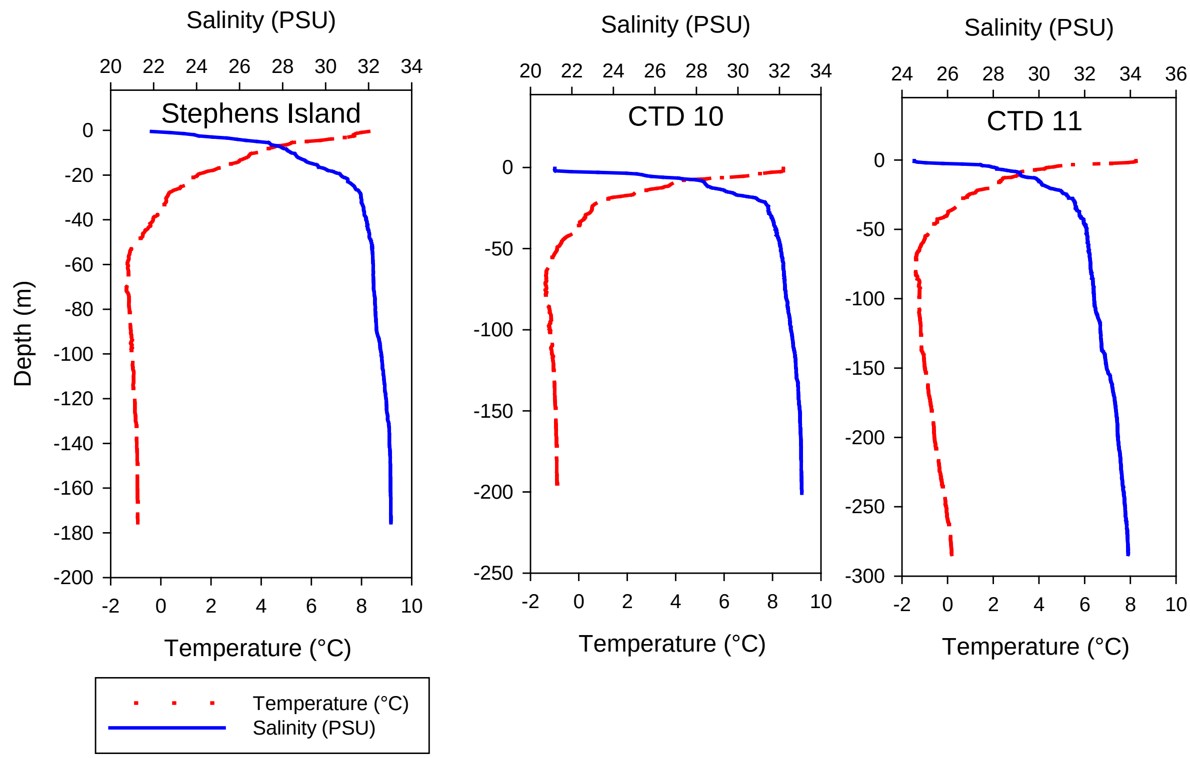


Figure 3.2 CTD Data from the Mid Portion of Milne Inlet Incl. Stephens Island, 2016.

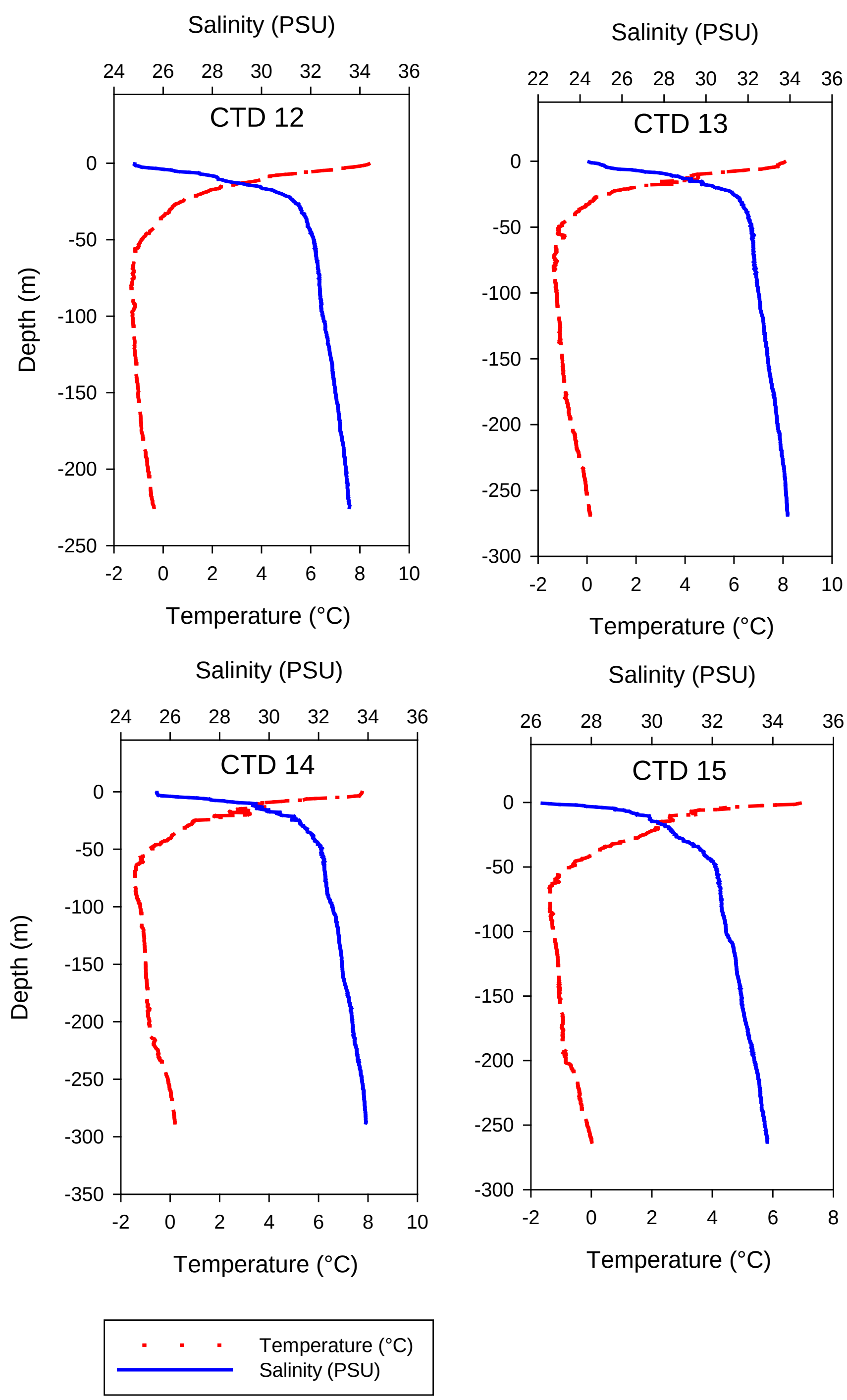


Figure 3.3 CTD Data from the Near Outer Portion of Milne Inlet, 2016.

3.1.1 Water Sampling

Results of water samples collected from the port area of Milne Inlet are presented in the following section by sampling event. A summary and comparison between sampling events is provided in the summary section.

3.1.1.1 Sampling Event - 1

Table 3.3 presents the summary of the laboratory analysis samples collected on August 1 for conventional parameters, nutrients and major ions, and Table 3.4 presents the results for metals. Hydrocarbons were non detectable during the first sampling event and are not presented. Samples were comparable between stations with little variability. Values of pH were alkaline as expected in the marine environment and ranged between 7.88 and 7.94 (mean 7.92) and were all within the CCME guidelines. Water samples were generally clear with low total suspended solids (all non-detectable), low turbidity (0.32 to 0.78 NTU, mean 0.48 NTU) and low colour (all non-detectable). Conductivity varied from 46,000 to 47,000 µS·cm^{-1}.

Nutrients were low with nitrate only detected at the Point Source. Ammonia was low and varied between 0.082 and 0.21 mg·L^{-1} (mean 0.14 mg·L^{-1}). Similarly, orthophosphate was low ranging between 0.016 and 0.020 mg·L^{-1} (mean 0.018 mg·L^{-1}). Major ions were comparable between stations and generally in the ranges expected for Arctic marine water.

Table 3.3 Conventional Water Quality Data from Milne Port, August 1, 2016.

Parameter	Units	RDL[1]	CCME[2]	ENE W-1	N W-2	WNW W-3	PS W-5	Mean
pH	pH	N/A	7.0-8.7	7.92	7.94	7.88	7.94	7.92
Total Alkalinity	mg·L^{-1}	5.0		100	99	99	99	99
Bicarb. Alkalinity	mg·L^{-1}	1.0		99	98	98	99	99
Carb. Alkalinity	mg·L^{-1}	1.0		ND	ND	ND	ND	ND
Calculated TDS	mg·L^{-1}	1.0		29,000	30,000	29,000	29,000	29,250
Conductivity	uS·cm^{-1}	1.0		47,000	47,000	47,000	46,000	46,750
Hardness	mg·L^{-1}	1.0		5,500	5,500	5,500	5,500	5,500
Turbidity	NTU	0.10		0.49	0.78	0.32	0.32	0.48
TSS	mg·L^{-1}	2.0		ND	ND	ND	ND	ND
Colour	TCU	5.0		ND	ND	ND	ND	ND
Total Organic Carbon	mg·L^{-1}	5.0		ND	ND	ND	ND	ND
Reactive Silica	mg·L^{-1}	0.50		ND	ND	ND	ND	ND
Nutrients								
Nitrate + Nitrite	mg·L^{-1}	0.050		ND	ND	ND	0.58	0.16*
Nitrite	mg·L^{-1}	0.010		ND	ND	ND	ND	ND

Table 3.3 Conventional Water Quality Data from Milne Port, August 1, 2016. (Cont'd)

Parameter	Units	RDL[1]	CCME[2]	ENE W-1	N W-2	WNW W-3	PS W-5	Mean
Nutrients								
Nitrate	mg·L^{-1}	0.050		ND	ND	ND	0.58	0.16*
Nitrogen (Ammonia)	mg·L^{-1}	0.050		0.082	0.11	0.21	0.16	0.14
Orthophosphate	mg·L^{-1}	0.010		0.020	0.018	0.016	0.018	0.018
Major Ions								
Total Calcium	µg·L^{-1}	1,000		370,000	370,000	380,000	380,000	373,333
Total Magnesium	µg·L^{-1}	1,000		1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
Total Potassium	µg·L^{-1}	1,000		350,000	350,000	350,000	350,000	350,000
Total Sodium	µg·L^{-1}	1,000		9,000,000	9,100,000	9,100,000	9,100,000	9,066,667
Dissolved Chloride	mg·L^{-1}	120		17,000	17,000	17,000	16,000	16,750
Dissolved Sulphate	mg·L^{-1}	240		1,500	1,900	1,800	1,800	1,750
Ion Balance								
Anion Sum	me·L^{-1}	N/A		52	519	508	486	391
Cation Sum	me·L^{-1}	N/A		512	517	514	514	514
Ion Balance (% Difference)	%	N/A		1.00	1.15	0.58	2.83	1.39

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
*Mean value was determined using half the RDL

Trace metals were, for the most part, non-detectable with only boron (4,300 to 4,400 µg·L^{-1}, mean 4,325 µg·L^{-1}), strontium (6,900 to 7,000 µg·L^{-1}, mean 6,950 µg·L^{-1}) and uranium 2.9 to 3.2 µg·L^{-1}, mean 3.1 µg·L^{-1}) detected. Sample values were in the ranges experienced in previous years with no exceedances of the CCME guidelines for the protection of aquatic life.

Hydrocarbons were not detected in water samples collected at Milne Inlet on August 1, 2016 and therefore no data are presented.

Table 3.4 Trace Metals in Water from Milne Port, August 1, 2016.

Parameter	Units	RDL[1]	CCME[2]	ENE W-1	N W-2	WNW W-3	PS W-5	Mean
Metals								
Total Aluminum	µg·L^{-1}	50		ND	ND	ND	ND	ND
Total Antimony	µg·L^{-1}	10		ND	ND	ND	ND	ND
Total Arsenic	µg·L^{-1}	10	12.5	ND	ND	ND	ND	ND
Total Barium	µg·L^{-1}	10		ND	ND	ND	ND	ND
Total Beryllium	µg·L^{-1}	10		ND	ND	ND	ND	ND
Total Bismuth	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Boron	µg·L^{-1}	500		4,300	4,300	4,300	4,400	4,325
Total Cadmium	µg·L^{-1}	0.10	0.12	ND	ND	ND	ND	ND
Total Chromium	µg·L^{-1}	10	[3]1.5, 56	ND	ND	ND	ND	ND
Total Cobalt	µg·L^{-1}	4.0		ND	ND	ND	ND	ND

Table 3.4 Trace Metals in Water from Milne Port, August 1, 2016. (Cont'd)

Parameter	Units	RDL[1]	CCME[2]	ENE W-1	N W-2	WNW W-3	PS W-5	Mean
Metals								
Total Copper	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Iron	$\mu g \cdot L^{-1}$	500		ND	ND	ND	ND	ND
Total Lead	$\mu g \cdot L^{-1}$	5.0		ND	ND	ND	ND	ND
Total Manganese	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Mercury	$\mu g \cdot L^{-1}$	0.013	0.016	ND	ND	ND	ND	ND
Total Molybdenum	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Nickel	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Phosphorus	$\mu g \cdot L^{-1}$	1,000		ND	ND	ND	ND	ND
Total Selenium	$\mu g \cdot L^{-1}$	10		ND	ND	ND	ND	ND
Total Silver	$\mu g \cdot L^{-1}$	1.0	7.5	ND	ND	ND	ND	ND
Total Strontium	$\mu g \cdot L^{-1}$	20		7,000	7,000	6,900	6,900	6,950
Total Thallium	$\mu g \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Total Tin	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Titanium	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Uranium	$\mu g \cdot L^{-1}$	1.0		2.9	3.2	3.0	3.2	3.1
Total Vanadium	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Zinc	$\mu g \cdot L^{-1}$	50		ND	ND	ND	ND	ND

[1]RDL = Reportable Detection Limit
[2]CCME (2015)Water Quality Guideline
[3]Chromium is dependant on whether in the trivalent or hexavalent form
ND=not detected

3.1.1.2 Sampling Event - 2

Table 3.5 presents the summary of the laboratory analysis samples collected on August 9 for conventional parameters, nutrients and major ions. Hydrocarbons were not detected during the second sampling event. Samples were comparable between stations with minor variability. Values for pH were alkaline and ranged between 7.80 and 7.94 (mean 7.89) and were all within the CCME guidelines. Water samples were generally clear with low total suspended solids (TSS; ND to 1.2 $mg \cdot L^{-1}$, mean 1.0 $mg \cdot L^{-1}$), low turbidity (0.64 to 0.99 NTU, mean 0.83 NTU) and low colour (all non-detectable). Conductivity varied between 14,000 and 17,000 $\mu S \cdot cm^{-1}$ (mean 15,500 $\mu S \cdot cm^{-1}$), which was considerably lower than the first sampling trip (mean 46,750 $\mu S \cdot cm^{-1}$).

Nutrients were relatively low with only nitrite not present. Ammonia was detected in low concentrations and varied between 0.11 $mg \cdot L^{-1}$ and 0.19 $mg \cdot L^{-1}$ (mean 0.16 $mg \cdot L^{-1}$). Major ions were comparable between stations and in the ranges expected for Arctic marine water.

Table 3.5 Conventional Water Quality Data from Milne Port, August 9, 2016.

Parameter	Units	RDL[1]	CCME[2]	ENE W-8	WNW W-14	N W-20	PS W-21	Mean
pH	pH	N/A	7.0-8.7	7.91	7.94	7.80	7.89	7.89
Total Alkalinity	$mg \cdot L^{-1}$	5.0		85	86	87	85	86
Bicarb. Alkalinity	$mg \cdot L^{-1}$	1.0		84	85	86	85	85
Carb. Alkalinity	$mg \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Calculated TDS	$mg \cdot L^{-1}$	1.0		9,000	8,200	9,100	9,700	9,000
Conductivity	$uS \cdot cm^{-1}$	1.0		15,000	14,000	16,000	17,000	15,500
Hardness	$mg \cdot L^{-1}$	1.0		1,700	1,600	1,800	1,900	1,750
Turbidity	NTU	0.10		0.99	0.86	0.64	0.82	0.83
TSS	$mg \cdot L^{-1}$	1.0		ND	1.2	1.2	1.2	1.0
Colour	TCU	5.0		ND	ND	ND	ND	ND
Total Organic Carbon	$mg \cdot L^{-1}$	0.50/5.0		0.92	0.74	ND	ND	1.67*
Reactive Silica	$mg \cdot L^{-1}$	0.50		0.70	0.70	0.67	0.60	0.67
Nutrients								
Nitrate + Nitrite	$mg \cdot L^{-1}$	0.050		0.053	0.052	0.052	0.052	0.052
Nitrite	$mg \cdot L^{-1}$	0.010		ND	ND	ND	ND	ND
Nitrate	$mg \cdot L^{-1}$	0.050		0.053	0.052	0.052	0.052	0.052
Nitrogen (Ammonia)	$mg \cdot L^{-1}$	0.050		0.11	0.18	0.16	0.19	0.16
Orthophosphate	$mg \cdot L^{-1}$	0.010		0.011	0.011	ND	0.012	0.010*
Major Ions								
Total Calcium	$\mu g \cdot L^{-1}$	100		120,000	110,000	130,000	140,000	125,000
Total Magnesium	$\mu g \cdot L^{-1}$	1,000		330,000	320,000	360,000	390,000	350,000
Total Potassium	$\mu g \cdot L^{-1}$	100		97,000	90,000	100,000	120,000	101,750
Total Sodium	$\mu g \cdot L^{-1}$	1,000		2,700,000	2,600,000	3,000,000	3,200,000	2,875,000
Dissolved Chloride	$mg \cdot L^{-1}$	100		5,000	4,400	4,700	5,100	4,800
Dissolved Sulphate	$mg \cdot L^{-1}$	40		720	650	760	810	735
Ion Balance								
Anion Sum	$me \cdot L^{-1}$	N/A		157	138	151	161	152
Cation Sum	$me \cdot L^{-1}$	N/A		153	149	169	180	163
Ion Balance (% Difference)	%	N/A		1.27	3.65	5.82	5.55	4.07

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
*Mean value was determined using half the RDL
ND=not detected
N/A=not applicable

Table 3.6 presents a summary of the laboratory analysis for trace metals. Results were, for the most part, non-detectable with only aluminum (21 to 25 $\mu g \cdot L^{-1}$, mean 23 $\mu g \cdot L^{-1}$), barium (5.9 to 6.7 $\mu g \cdot L^{-1}$, mean 6.2 $\mu g \cdot L^{-1}$), boron (1,100 to 1,400 $\mu g \cdot L^{-1}$, mean 1,225 $\mu g \cdot L^{-1}$), cadmium (non-detected to 0.018 $\mu g \cdot L^{-1}$, mean 0.013 $\mu g \cdot L^{-1}$), molybdenum (3.1 to 3.6 $\mu g \cdot L^{-1}$, mean 3.3 $\mu g \cdot L^{-1}$), strontium (1,800 to 2,400 $\mu g \cdot L^{-1}$, mean 2,075 $\mu g \cdot L^{-1}$), titanium (non-detected to 2.6 $\mu g \cdot L^{-1}$, mean 1.4 $\mu g \cdot L^{-1}$), uranium (1.60 to 1.9 $\mu g \cdot L^{-1}$, mean 1.8 $\mu g \cdot L^{-1}$) and zinc (non-detected to 25 $\mu g \cdot L^{-1}$, mean 8.8 $\mu g \cdot L^{-1}$) detected. There were more trace metals detected in the second sampling event, however none of the samples exceeded CCME guidelines for the protection of aquatic life. Hydrocarbons were not detected in water samples collected at Milne Inlet on August 9, 2016.

Table 3.6 Trace Metals in Water from Milne Port, August 9, 2016.

Parameter	Units	RDL[1]	CCME[2]	ENE W-8	WNW W-14	N W-20	PS W-21	Mean
Metals								
Total Aluminum	$\mu g \cdot L^{-1}$	5.0		21	24	25	22	23
Total Antimony	$\mu g \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Total Arsenic	$\mu g \cdot L^{-1}$	1.0	12.5	ND	ND	ND	ND	ND
Total Barium	$\mu g \cdot L^{-1}$	1.0		6.0	5.9	6.7	6.1	6.2
Total Beryllium	$\mu g \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Total Bismuth	$\mu g \cdot L^{-1}$	2.0		ND	ND	ND	ND	ND
Total Boron	$\mu g \cdot L^{-1}$	50		1,200	1,100	1,200	1,400	1,225
Total Cadmium	$\mu g \cdot L^{-1}$	0.010	0.12	ND	0.017	0.018	0.013	0.013*
Total Chromium	$\mu g \cdot L^{-1}$	1.0	[3]1.5, 56	ND	ND	ND	ND	ND
Total Cobalt	$\mu g \cdot L^{-1}$	0.40		ND	ND	ND	ND	ND
Total Copper	$\mu g \cdot L^{-1}$	2.0		ND	ND	ND	ND	ND
Total Iron	$\mu g \cdot L^{-1}$	50		ND	ND	ND	ND	ND
Total Lead	$\mu g \cdot L^{-1}$	0.50		ND	ND	ND	ND	ND
Total Manganese	$\mu g \cdot L^{-1}$	2.0		ND	ND	ND	ND	ND
Total Mercury	$\mu g \cdot L^{-1}$	0.013	0.016	ND	ND	ND	ND	ND
Total Molybdenum	$\mu g \cdot L^{-1}$	2.0		3.1	3.1	3.3	3.6	3.3
Total Nickel	$\mu g \cdot L^{-1}$	2.0		ND	ND	ND	ND	ND
Total Phosphorus	$\mu g \cdot L^{-1}$	100		ND	ND	ND	ND	ND
Total Selenium	$\mu g \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Total Silver	$\mu g \cdot L^{-1}$	0.10	7.5	ND	ND	ND	ND	ND
Total Strontium	$\mu g \cdot L^{-1}$	2.0		2000	1800	2100	2400	2075
Total Thallium	$\mu g \cdot L^{-1}$	0.10		ND	ND	ND	ND	ND
Total Tin	$\mu g \cdot L^{-1}$	2.0		ND	ND	ND	ND	ND
Total Titanium	$\mu g \cdot L^{-1}$	2.0		ND	ND	ND	2.6	1.4*
Total Uranium	$\mu g \cdot L^{-1}$	0.10		1.9	1.6	1.7	1.8	1.8
Total Vanadium	$\mu g \cdot L^{-1}$	2.0		ND	ND	ND	ND	ND
Total Zinc	$\mu g \cdot L^{-1}$	5.0		ND	5.3	25	ND	8.8*

Notes:
[1]RDL = Reportable Detection Limit
[2]CCME (2015)Water Quality Guideline
[3]Chromium is dependent on whether in the trivalent or hexavalent form
*Mean value was determined using half the RDL
ND=not detected

3.1.1.3 Sampling Event - 3

Table 3.7 presents the summary of the laboratory analysis samples collected on August 14 for conventional parameters, nutrients and major ions. Hydrocarbons were not detected and therefore are not presented. Samples were generally comparable between stations with minor variability with the calculated TDS, conductivity, hardness and major ions (all related parameters). Values of pH were alkaline and ranged between 7.80 and 7.87 (mean 7.83) and were all within the CCME guidelines. Water samples were generally clear with low TSS (all non-detectable), low turbidity (0.28 to 0.35 NTU, mean 0.33 NTU) and low colour (non-detectable to 5.3 TCU, mean 3.2 TCU). Conductivity varied from 8,800 to 12,000 $\mu S \cdot cm^{-1}$, which continues the trend of a downward decline from the first two sampling events.

Nutrients were low with nitrite, nitrate and orthophosphate all non-detected. Ammonia was low and varied between 0.099 and 0.20 $mg \cdot L^{-1}$ (mean 0.15 $mg \cdot L^{-1}$). Major ions had slight differences between stations, and, although relatively low, generally remained in ranges expected for Arctic marine water.

Table 3.7 Conventional Water Quality Data from Milne Port, August 14, 2016.

Parameter	Units	RDL[1]	CCME[2]	WNW W-16	ENE W-27	N W-37	PS W-38	Mean
pH	pH	N/A	7.0-8.7	7.80	7.83	7.87	7.82	7.83
Total Alkalinity	$mg \cdot L^{-1}$	5.0		86	85	83	83	84
Bicarb. Alkalinity	$mg \cdot L^{-1}$	1.0		85	84	82	83	84
Carb. Alkalinity	$mg \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Calculated TDS	$mg \cdot L^{-1}$	1.0		5,800	6,300	5,700	4,900	5,675
Conductivity	$uS \cdot cm^{-1}$	1.0		10,000	12,000	10,000	8,800	10,200
Hardness	$mg \cdot L^{-1}$	1.0		1,100	1,200	1,100	930	1,083
Turbidity	NTU	0.10		0.28	0.35	0.34	0.34	0.33
TSS	$mg \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Colour	TCU	5.0		ND	5.3	ND	ND	3.2*
Total Organic Carbon	$mg \cdot L^{-1}$	0.50		0.55	0.66	0.65	0.71	0.64
Reactive Silica	$mg \cdot L^{-1}$	0.50		0.67	0.59	0.64	0.67	0.64
Nutrients								
Nitrate + Nitrite	$mg \cdot L^{-1}$	0.10		ND	ND	ND	ND	ND
Nitrite	$mg \cdot L^{-1}$	0.010		ND	ND	ND	ND	ND
Nitrate	$mg \cdot L^{-1}$	0.10		ND	ND	ND	ND	ND
Nitrogen (Ammonia)	$mg \cdot L^{-1}$	0.050		0.14	0.099	0.20	0.18	0.15
Orthophosphate	$mg \cdot L^{-1}$	0.010		ND	ND	ND	ND	ND

Table 3.7 Conventional Water Quality Data from Milne Port, August 14, 2016. (Cont'd)

Parameter	Units	RDL[1]	CCME[2]	WNW W-16	ENE W-27	N W-37	PS W-38	Mean
Major Ions								
Total Calcium	µg·L^{-1}	100		84,000	91,000	85,000	76,000	84,000
Total Magnesium	µg·L^{-1}	1,000		210,000	230,000	210,000	180,000	207,500
Total Potassium	µg·L^{-1}	100		62,000	68,000	63,000	54,000	61,750
Total Sodium	µg·L^{-1}	1,000		1,700,000	1,900,000	1,700,000	1,500,000	1,700,000
Dissolved Chloride	mg·L^{-1}	25/40		3,300	3,500	3,200	2,800	3,200
Dissolved Sulphate	mg·L^{-1}	2.0/5.0		410	470	410	340	408
Ion Balance								
Anion Sum	me·L^{-1}	N/A		102	110	99.7	86.5	100
Cation Sum	me·L^{-1}	N/A		97.7	108	98	83	97
Ion Balance (% Difference)	%	N/A		2.40	0.89	0.88	2.06	1.56

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
*Mean value was determined using half the RDL
ND = not detected
N/A = not applicable

Table 3.8 presents a summary of the laboratory analysis for trace metals. Results were, for the most part, non-detectable with only aluminum (8.9 to 10 µg·L^{-1}, mean 9.7 µg·L^{-1}), barium (5.2 to 5.7 µg·L^{-1}, mean 5.4 µg·L^{-1}), boron (660 to 830 µg·L^{-1}, mean 753 µg·L^{-1}), molybdenum (2.1 to 2.4 µg·L^{-1}, mean 1.6 µg·L^{-1}), strontium (1,200 to 1,400 µg·L^{-1}, mean 1,300 µg·L^{-1}) and uranium 1.4 to 1.6 µg·L^{-1}, mean 1.5 µg·L^{-1}) detected. Hydrocarbons were not detected in water samples collected at Milne Inlet on August 14, 2016.

Table 3.8 Trace Metals in Water from Milne Port, August 14, 2016.

Parameter	Units	RDL[1]	CCME[2]	WNW W-16	ENE W-27	N W-37	PS W-38	Mean
Metals								
Total Aluminum	µg·L^{-1}	5.0		10	10	8.9	10	9.7
Total Antimony	µg·L^{-1}	1.0		ND	ND	ND	ND	ND
Total Arsenic	µg·L^{-1}	1.0	12.5	ND	ND	ND	ND	ND
Total Barium	µg·L^{-1}	1.0		5.2	5.7	5.3	5.5	5.4
Total Beryllium	µg·L^{-1}	1.0		ND	ND	ND	ND	ND
Total Bismuth	µg·L^{-1}	2.0		ND	ND	ND	ND	ND
Total Boron	µg·L^{-1}	500		740	830	780	660	753
Total Cadmium	µg·L^{-1}	0.010	0.12	ND	ND	ND	ND	ND
Total Chromium	µg·L^{-1}	1.0	[3]1.5, 56	ND	ND	ND	ND	ND
Total Cobalt	µg·L^{-1}	0.40		ND	ND	ND	ND	ND
Total Copper	µg·L^{-1}	2.0		ND	ND	ND	ND	ND
Total Iron	µg·L^{-1}	50.0		ND	ND	ND	ND	ND
Total Lead	µg·L^{-1}	0.50		ND	ND	ND	ND	ND
Total Manganese	µg·L^{-1}	2.0		ND	ND	ND	ND	ND

Table 3.8 Trace Metals in Water from Milne Port, August 14, 2016. (Cont'd)

Parameter	Units	RDL[1]	CCME[2]	WNW W-16	ENE W-27	N W-37	PS W-38	Mean
Metals								
Total Mercury	µg·L^{-1}	0.013	0.016	ND	ND	ND	ND	ND
Total Molybdenum	µg·L^{-1}	2.0		ND	2.4	2.1	ND	1.6*
Total Nickel	µg·L^{-1}	2.0		ND	ND	ND	ND	ND
Total Phosphorus	µg·L^{-1}	100		ND	ND	ND	ND	ND
Total Selenium	µg·L^{-1}	1.0		ND	ND	ND	ND	ND
Total Silver	µg·L^{-1}	0.10	7.5	ND	ND	ND	ND	ND
Total Strontium	µg·L^{-1}	2.0		1300	1400	1300	1200	1300
Total Thallium	µg·L^{-1}	0.10		ND	ND	ND	ND	ND
Total Tin	µg·L^{-1}	2.0		ND	ND	ND	ND	ND
Total Titanium	µg·L^{-1}	2.0		ND	ND	ND	ND	ND
Total Uranium	µg·L^{-1}	0.10		1.4	1.5	1.4	1.6	1.5
Total Vanadium	µg·L^{-1}	2.0		ND	ND	ND	ND	ND
Total Zinc	µg·L^{-1}	5.0		ND	ND	ND	ND	ND

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
[3]Chromium is dependent on whether in the trivalent or hexavalent form
*Mean value was determined using half the RDL
ND=not detected

3.1.1.4 Sampling Event - 4

Table 3.9 presents the summary of the laboratory analysis samples collected during August 21 for conventional parameters, nutrients and major ions. Hydrocarbons were not detected on the August 21 sampling trip. Samples were generally comparable between stations with a small amount of variability with the calculated TDS, conductivity, hardness and major ions (all related parameters). Values of pH were alkaline and ranged between 7.67 and 7.86 (mean 7.75) and were all within the CCME guidelines. Water samples were generally clear with low TSS (non-detectable to 1.0 mg·L^{-1}, mean 0.6 mg·L^{-1}), low turbidity (0.11 to 0.33 NTU, mean 0.21 NTU) and low colour (all non-detectable). Conductivity increased from the previous two sampling trips and varied between 29,000 and 32,000 µS·cm^{-1}.

Nutrients were low with nitrite, nitrate and orthophosphate all non-detected. Ammonia remained low and varied between 0.064 and 0.16 mg·L^{-1} (mean 0.13 mg·L^{-1}). Major ions had slight differences between stations, with the lowest values occurring at the Point Source, but generally all values remained in the ranges expected for Arctic marine water.

Table 3.9 Conventional Water Quality Data from Milne Port, August 21, 2016.

Parameter	Units	RDL[1]	CCME[2]	WNW W-12	ENE W-26	PS W-33	N W-36	Mean
pH	pH	N/A	7.0-8.7	7.67	7.69	7.86	7.78	7.75
Total Alkalinity	mg·L^{-1}	5.0		90	88	89	88	89
Bicarb. Alkalinity	mg·L^{-1}	1.0		89	87	89	87	88
Carb. Alkalinity	mg·L^{-1}	1.0		ND	ND	ND	ND	ND
Calculated TDS	mg·L^{-1}	1.0		19,000	20,000	16,000	21,000	19,000
Conductivity	uS·cm^{-1}	1.0		31,000	32,000	29,000	32,000	31,000
Hardness	mg·L^{-1}	1.0		3,600	3,700	2,400	3,900	3,400
Turbidity	NTU	0.10		0.21	0.17	0.33	0.11	0.21
TSS	mg·L^{-1}	1.0		1.0	ND	ND	ND	0.6*
Colour	TCU	5.0		ND	ND	ND	ND	ND
Total Organic Carbon	mg·L^{-1}	5.0		ND	ND	ND	ND	ND
Reactive Silica	mg·L^{-1}	0.50		ND	ND	ND	ND	ND
Nutrients								
Nitrate + Nitrite	mg·L^{-1}	0.050		ND	ND	ND	ND	ND
Nitrite	mg·L^{-1}	0.010		ND	ND	ND	ND	ND
Nitrate	mg·L^{-1}	0.050		ND	ND	ND	ND	ND
Nitrogen (Ammonia)	mg·L^{-1}	0.050		0.064	0.16	0.16	0.15	0.13
Orthophosphate	mg·L^{-1}	0.010		0.011	0.010	0.012	0.017	0.013
Major Ions								
Total Calcium	µg·L^{-1}	1,000		240,000	250,000	170,000	250,000	227,500
Total Magnesium	µg·L^{-1}	1,000		730,000	740,000	480,000	790,000	685,000
Total Potassium	µg·L^{-1}	1,000		220,000	230,000	150,000	230,000	207,500
Total Sodium	µg·L^{-1}	1,000		6,000,000	6,000,000	3,900,000	6,500,000	5,600,000
Dissolved Chloride	mg·L^{-1}	120		11,000	11,000	10,000	12,000	11,000
Dissolved Sulphate	mg·L^{-1}	200		1,500	1,500	1,300	1,500	1,450
Ion Balance								
Anion Sum	me·L^{-1}	N/A		332	350	321	358	340
Cation Sum	me·L^{-1}	N/A		341	342	220	365	317
Ion Balance (% Difference)	%	N/A		1.35	1.23	18.7	0.91	5.5

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
*Mean value was determined using half the RDL
ND = not detected
N/A = not applicable

Table 3.10 presents a summary of the laboratory analysis for trace metals. Results were, for the most part, non-detectable with only boron (1,700 to 2,800 µg·L^{-1}, mean 2,425 µg·L^{-1}), strontium (3,000 to 4,600 µg·L^{-1}, mean 4,125 µg·L^{-1}) and uranium (2.2 to 2.7 µg·L^{-1}, mean 2.4 µg·L^{-1}) detected.

Table 3.10 Trace Metals in Water from Milne Port, August 21, 2016.

Parameter	Units	RDL[1]	CCME[2]	WNW W-12	ENE W-26	PS W-33	N W-36	Mean
Metals								
Total Aluminum	$\mu g \cdot L^{-1}$	50		ND	ND	ND	ND	ND
Total Antimony	$\mu g \cdot L^{-1}$	10		ND	ND	ND	ND	ND
Total Arsenic	$\mu g \cdot L^{-1}$	10	12.5	ND	ND	ND	ND	ND
Total Barium	$\mu g \cdot L^{-1}$	10		ND	ND	ND	ND	ND
Total Beryllium	$\mu g \cdot L^{-1}$	10		ND	ND	ND	ND	ND
Total Bismuth	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Boron	$\mu g \cdot L^{-1}$	500		2,600	2,600	1,700	2,800	2,425
Total Cadmium	$\mu g \cdot L^{-1}$	0.10	0.12	ND	ND	ND	ND	ND
Total Chromium	$\mu g \cdot L^{-1}$	10	[3]1.5, 56	ND	ND	ND	ND	ND
Total Cobalt	$\mu g \cdot L^{-1}$	4.0		ND	ND	ND	ND	ND
Total Copper	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Iron	$\mu g \cdot L^{-1}$	500		ND	ND	ND	ND	ND
Total Lead	$\mu g \cdot L^{-1}$	5.0		ND	ND	ND	ND	ND
Total Manganese	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Mercury	$\mu g \cdot L^{-1}$	0.013	0.016	ND	ND	ND	ND	ND
Total Molybdenum	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Nickel	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Phosphorus	$\mu g \cdot L^{-1}$	1000		ND	ND	ND	ND	ND
Total Selenium	$\mu g \cdot L^{-1}$	10		ND	ND	ND	ND	ND
Total Silver	$\mu g \cdot L^{-1}$	1.0	7.5	ND	ND	ND	ND	ND
Total Strontium	$\mu g \cdot L^{-1}$	20		4,400	4,600	3,000	4,500	4,125
Total Thallium	$\mu g \cdot L^{-1}$	1.0		ND	ND	ND	ND	ND
Total Tin	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Titanium	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Uranium	$\mu g \cdot L^{-1}$	1.0		2.5	2.2	2.7	2.2	2.4
Total Vanadium	$\mu g \cdot L^{-1}$	20		ND	ND	ND	ND	ND
Total Zinc	$\mu g \cdot L^{-1}$	50		ND	ND	ND	ND	ND

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
[3]Chromium is dependent on whether in the trivalent or hexavalent form
ND=not detected

3.1.1.5 Sampling Event - 5

Table 3.11 presents the summary of the laboratory analysis samples collected on September 12 for conventional parameters, nutrients and major ions. Hydrocarbons were not detected on the September 12 sampling event. Samples were generally comparable with minor variability. Values of pH were alkaline and ranged between 7.80 and 7.84 (mean 7.85) and were all within the CCME guidelines. Water samples were generally clear with relatively low TSS (1.2 to 3.0 $mg \cdot L^{-1}$, mean 2.1 $mg \cdot L^{-1}$), low turbidity (0.10 to 0.43 NTU, mean 0.29 NTU) and low colour (all non-detectable). Conductivity varied from 43,000 to 44,000 µS·cm^{-1} approaching the early August values.

Nutrients were low with nitrite non-detected and nitrate detected in only one sample (0.34 mg·L^{-1}). Ammonia and orthophosphate were low and varied between 0.08 and 0.23 mg·L^{-1} (mean 0.15 mg·L^{-1}) and 0.015 to 0.036 mg·L^{-1}, (mean 0.020 mg·L^{-1}), respectively. Major ions had minor differences between stations and were in ranges expected for Arctic marine water.

Table 3.11 Conventional Water Quality Data from Milne Port, September 12, 2016.

Parameter	Units	RDL[1]	CCME[2]	WNW W-17	N W-22	ENE W-24	PS W-34	Mean
pH	pH	N/A	7.0-8.7	7.86	7.84	7.80	7.91	7.85
Total Alkalinity	mg·L^{-1}	5.0		94	93	95	94	94
Bicarb. Alkalinity	mg·L^{-1}	1.0		94	93	95	93	94
Carb. Alkalinity	mg·L^{-1}	1.0		ND	ND	ND	ND	ND
Calculated TDS	mg·L^{-1}	1.0		27,000	27,000	27,000	26,000	26,750
Conductivity	uS·cm^{-1}	1.0		44,000	44,000	43,000	43,000	43,500
Hardness	mg·L^{-1}	1.0		5,300	5,100	5,200	5,100	5,175
Turbidity	NTU	0.10		0.23	0.41	0.43	0.10	0.29
TSS	mg·L^{-1}	1.0		1.2	2.3	1.8	3.0	2.1
Colour	TCU	5.0		ND	ND	ND	ND	ND
Total Organic Carbon	mg·L^{-1}	5.0		ND	ND	ND	ND	ND
Reactive Silica	mg·L^{-1}	0.50		ND	ND	ND	ND	ND
Nutrients								
Nitrate + Nitrite	mg·L^{-1}	0.050		ND	ND	ND	0.34	0.03*
Nitrite	mg·L^{-1}	0.010		ND	ND	ND	ND	ND
Nitrate	mg·L^{-1}	0.050		ND	ND	ND	0.34	0.03*
Nitrogen (Ammonia)	mg·L^{-1}	0.050		0.09	0.08	0.23	0.21	0.15
Orthophosphate	mg·L^{-1}	0.010		0.015	0.015	0.015	0.036	0.020
Major Ions								
Total Calcium	µg·L^{-1}	1,000		350,000	330,000	340,000	340,000	340,000
Total Magnesium	µg·L^{-1}	1,000		1,100,000	1,000,000	1,000,000	1,000,000	1,025,000
Total Potassium	µg·L^{-1}	1,000		310,000	310,000	320,000	310,000	312,500
Total Sodium	µg·L^{-1}	1,000		8,900,000	8,500,000	8,800,000	8,700,000	8,725,000
Dissolved Chloride	mg·L^{-1}	120		15,000	15,000	15,000	14,000	14,750
Dissolved Sulphate	mg·L^{-1}	240		1,200	1,400	1,200	1,200	1,250
Ion Balance								
Anion Sum	me·L^{-1}	N/A		449	462	444	428	446
Cation Sum	me·L^{-1}	N/A		501	481	496	488	492
Ion Balance (% Difference)	%	N/A		5.51	2.03	5.50	6.53	4.89

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
*Mean value was determined using half the RDL
ND = not detected
N/A = not applicable

Table 3.12 presents a summary of the laboratory analysis for trace metals. Results were, for the most part, non-detectable with only boron (3,600 to 4,200 µg·L^{-1}, mean 3,775 µg·L^{-1}), strontium (6,200 to 6,400 µg·L^{-1}, mean 6,325 µg·L^{-1}) and uranium 2.7 to 3.2 µg·L^{-1}, mean 2.9 µg·L^{-1}) detected.

Table 3.12 Trace Metals in Water from Milne Port, September 12, 2016.

Parameter	Units	RDL[1]	CCME[2]	WNW W-17	N W-22	ENE W-24	PS W-34	Mean
Metals								
Total Aluminum	µg·L^{-1}	50		ND	ND	ND	ND	ND
Total Antimony	µg·L^{-1}	10		ND	ND	ND	ND	ND
Total Arsenic	µg·L^{-1}	10	12.5	ND	ND	ND	ND	ND
Total Barium	µg·L^{-1}	10		ND	ND	ND	ND	ND
Total Beryllium	µg·L^{-1}	10		ND	ND	ND	ND	ND
Total Bismuth	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Boron	µg·L^{-1}	500		3,600	3,600	4,200	3,700	3,775
Total Cadmium	µg·L^{-1}	0.10	0.12	ND	ND	ND	ND	ND
Total Chromium	µg·L^{-1}	10	[3]1.5, 56	ND	ND	ND	ND	ND
Total Cobalt	µg·L^{-1}	4.0		ND	ND	ND	ND	ND
Total Copper	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Iron	µg·L^{-1}	500		ND	ND	ND	ND	ND
Total Lead	µg·L^{-1}	5.0		ND	ND	ND	ND	ND
Total Manganese	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Mercury	µg·L^{-1}	0.013	0.016	ND	ND	ND	ND	ND
Total Molybdenum	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Nickel	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Phosphorus	µg·L^{-1}	1,000		ND	ND	ND	ND	ND
Total Selenium	µg·L^{-1}	10		ND	ND	ND	ND	ND
Total Silver	µg·L^{-1}	1.0	7.5	ND	ND	ND	ND	ND
Total Strontium	µg·L^{-1}	20		6,400	6,200	6,300	6,400	6,325
Total Thallium	µg·L^{-1}	1.0		ND	ND	ND	ND	ND
Total Tin	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Titanium	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Uranium	µg·L^{-1}	1.0		2.9	2.7	2.9	3.2	2.9
Total Vanadium	µg·L^{-1}	20		ND	ND	ND	ND	ND
Total Zinc	µg·L^{-1}	50		ND	ND	ND	ND	ND

[1]RDL = Reportable Detection Limit
[2]CCME (2015) Water Quality Guideline
[3]Chromium is dependent on whether in the trivalent or hexavalent form
ND=not detected

3.1.2 Summary and QA/QC

Given the similarities between stations, means from each sampling period are compared with overall minimum and maximum values from all 20 samples. Tables 3.13 and 3.14 present summaries for conventional parameters and trace metals, respectively. Due to the high variability in major ions and conductivity over the course of the sampling events, the reportable detection limits (RDL) were also slightly variable creating difficulties with comparisons. For this reason, non detected values were not represented as half the RDL as usual when calculating the means but rather were omitted from the calculations. The number of values above non detect was therefore added for each row.

With the exception of the major ions and associated parameters, primarily conductivity, mean values were for the most part comparable between sampling periods with low standard deviations. Metals were similarly comparable between sampling periods with large standard deviations occurring primarily with boron and strontium. Hydrocarbons were not detected in any water samples collected in 2016.

Duplicate samples were collected during each sampling event for quality assurance/quality control purposes and results are presented in Tables 3.15 and 3.16. For the most part, duplicates were within the acceptable 10% range with notable exceptions, primarily related to TSS and turbidity. There can be high variability between samples for these related parameters when levels are very low, as in this circumstance. Other parameters, including organic carbon, ammonia and various metals also demonstrated slightly elevated % differences (i.e., greater than 10%) however measured values were generally within one RDL value of each other with others approaching near non detectable values.

Table 3.13 Statistical Summary of Conventional Parameters in Water from the Milne Inlet Sampling Locations, August 2016.

Parameter	Units	RDL[1]	Mean Trip 1	Mean Trip 2	Mean Trip 3	Mean Trip 4	Mean Trip 5	# above ND	Overall Mean	Overall Min	Overall Max	Overall Std. Dev.
Conventional Parameters												
pH	pH	N/A	7.92	7.89	7.83	7.75	7.85	20	7.85	7.67	7.94	0.08
Total Alkalinity	$mg \cdot L^{-1}$	5.0	99	86	84	89	94	20	90	83	100	6
Bicarb. Alkalinity	$mg \cdot L^{-1}$	1.0	99	85	84	88	94	20	90	82	99	6
Carb. Alkalinity	$mg \cdot L^{-1}$	1.0	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Calculated TDS	$mg \cdot L^{-1}$	1.0	29,250	9,000	5,675	19,000	26,750	20	17,935	4,900	30,000	9,640
Conductivity	$uS \cdot cm^{-1}$	1.0	46,750	15,500	10,200	31,000	43,500	20	29,390	8,800	47,000	15,000
Hardness	$mg \cdot L^{-1}$	1.0	5,500	1,750	1,083	3,400	5,175	20	3,382	930	5,500	1,837
Turbidity	NTU	0.10	0.48	0.83	0.33	0.21	0.29	20	0.43	0.10	0.99	0.26
TSS	$mg \cdot L^{-1}$	2.0	ND	1.0	ND	0.6	2.1	8	1.61	1.00	3.00	0.71
Colour	TCU	5.0	ND	ND	3.2	ND	ND	1	5.30	5.30	5.30	NA
Total Organic Carbon	$mg \cdot L^{-1}$	0.50	ND	1.67	0.64	ND	ND	6	0.71	0.55	0.92	0.12
Reactive Silica	$mg \cdot L^{-1}$	0.50	ND	0.67	0.64	ND	ND	8	0.66	0.59	0.70	0.04
Nutrients												
Nitrate + Nitrite	$mg \cdot L^{-1}$	0.050	ND	0.052	ND	ND	0.03	6	0.34	0.05	0.58	0.22
Nitrite	$mg \cdot L^{-1}$	0.010	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Nitrate	$mg \cdot L^{-1}$	0.050	ND	0.052	ND	ND	0.03	6	0.16	0.05	0.58	0.24
Nitrogen (Ammonia Nitrogen)	$mg \cdot L^{-1}$	0.050	0.14	0.160	0.15	0.13	0.15	20	0.15	0.06	0.23	0.05
Orthophosphate	$mg \cdot L^{-1}$	0.010	0.02	0.010	ND	0.013	0.020	19	0.016	0.010	0.036	0.006
Major Ions												
Total Calcium	$\mu g \cdot L^{-1}$	1,000	375,000	125,000	84,000	227,500	340,000	20	230,300	76,000	380,000	118,605
Total Magnesium	$\mu g \cdot L^{-1}$	1,000	1,100,000	350,000	207,500	685,000	1,025,000	20	673,500	180,000	1,100,000	368,457
Total Potassium	$\mu g \cdot L^{-1}$	1,000	350,000	101,750	61,750	207,500	312,500	20	206,700	54,000	350,000	117,016
Total Sodium	$\mu g \cdot L^{-1}$	3,000	9,075,000	2,875,000	1,700,000	5,600,000	8,725,000	20	5,595,000	1,500,000	9,100,000	3,097,788
Dissolved Chloride	$mg \cdot L^{-1}$	120	16,750	4,800	3,200	11,000	14,750	20	10,100	2,800	17,000	5,494
Dissolved Sulphate	$mg \cdot L^{-1}$	100	1,750	735	408	1,450	1,250	20	1,119	340	1,900	507
Ion Balance												
Anion Sum	$me \cdot L^{-1}$	N/A	391	152	100	340	446	20	286	52	519	166
Cation Sum	$me \cdot L^{-1}$	N/A	514	163	97	317	492	20	316	83	517	175
Ion Balance (% Difference)	%	N/A	1.39	4.07	1.56	5.50	4.89	20	3.49	0.58	18.70	4.10

[1]RDL = Reportable Detection Limit
ND = non detected

Table 3.14 Statistical Summary for Trace Metals in Water from the Milne Sampling Locations, August, 2016.

Parameter	Units	RDL[1]	Mean Trip 1	Mean Trip 2	Mean Trip 3	Mean Trip 4	Mean Trip 5	# Above RDL	Overall mean	Overall Min	Overall Max	Overall Std. Dev.
Metals												
Total Aluminum	$\mu g \cdot L^{-1}$	50	ND	23	10	ND	ND	8	16	9	25	7
Total Antimony	$\mu g \cdot L^{-1}$	10	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Arsenic	$\mu g \cdot L^{-1}$	10	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Barium	$\mu g \cdot L^{-1}$	10	ND	6.2	5.4	ND	ND	8	5.8	5.2	6.7	0.5
Total Beryllium	$\mu g \cdot L^{-1}$	10	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Bismuth	$\mu g \cdot L^{-1}$	20	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Boron	$\mu g \cdot L^{-1}$	500	4,325	1,225	753	2,425	3,775	20	2,501	660	4,400	1,444
Total Cadmium	$\mu g \cdot L^{-1}$	0.01	ND	0.013	ND	ND	ND	3	0.016	0.013	0.018	0.003
Total Chromium	$\mu g \cdot L^{-1}$	10	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Cobalt	$\mu g \cdot L^{-1}$	4.0	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Copper	$\mu g \cdot L^{-1}$	20	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Iron	$\mu g \cdot L^{-1}$	500	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Lead	$\mu g \cdot L^{-1}$	5.0	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Manganese	$\mu g \cdot L^{-1}$	20	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Mercury	$\mu g \cdot L^{-1}$	0.013	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Molybdenum	$\mu g \cdot L^{-1}$	20	ND	3.3	1.6	ND	ND	6	2.9	2.1	3.6	0.6
Total Nickel	$\mu g \cdot L^{-1}$	20	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Phosphorus	$\mu g \cdot L^{-1}$	1,000	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Selenium	$\mu g \cdot L^{-1}$	10	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Silver	$\mu g \cdot L^{-1}$	1.0	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Strontium	$\mu g \cdot L^{-1}$	20	6,950	2,075	1300	4,125	6,325	20	4,155	1,200	7,000	2,316
Total Thallium	$\mu g \cdot L^{-1}$	1.0	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Tin	$\mu g \cdot L^{-1}$	20	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Titanium	$\mu g \cdot L^{-1}$	20	ND	1.4	ND	ND	ND	1	2.60	2.60	2.60	NA
Total Uranium	$\mu g \cdot L^{-1}$	1.0	3.1	1.8	1.5	2.4	2.9	20	2.3	1.4	3.2	0.7
Total Vanadium	$\mu g \cdot L^{-1}$	20	ND	ND	ND	ND	ND	0	ND	ND	ND	ND
Total Zinc	$\mu g \cdot L^{-1}$	50	ND	8.8	ND	ND	ND	2	15	5	25	14

[1]RDL = Reportable Detection Limit
ND=not detected

Table 3.15 QA/QC Duplicates for Conventional Parameters in Water from the Milne Inlet Sampling Locations, 2016.

Parameter	Units	RDL[1]	August 1			August 9			August 14			August 21			September 12		
			W-3	W-4	% Difference	W-14	W-28	% Difference	W-38	W-32	% Difference	W-36	W-18	% Difference	W-17	W-13	% Difference
Conventional Parameters																	
pH	pH	N/A	7.88	7.96	-1.01	7.94	7.80	1.78	7.82	7.83	-0.13	7.78	7.87	-1.15	7.86	7.95	-1.14
Total Alkalinity	mg·L^{-1}	5.0	99	100	-1	86	87	-1	83	86	-4	88	91	-3	94	93	1
Bicarb. Alkalinity	mg·L^{-1}	1.0	98	99	-1	85	87	-2	83	85	-2	87	90	-3	94	92	2
Carb. Alkalinity	mg·L^{-1}	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calculated TDS	mg·L^{-1}	1.0	29,000	29,000	0	8,200	8,000	2	4,900	5,000	-2	21,000	16,000	27	27,000	27,000	0
Conductivity	uS·cm^{-1}	1.0	47,000	47,000	0	14,000	13,000	7	8,800	9,400	-7	32,000	26,000	21	44,000	44,000	0
Hardness	mg·L^{-1}	1.0	5,500	5,600	-2	1,600	1,500	6	930	900	3	3,900	3,100	23	5,300	52,00	2
Turbidity	NTU	0.10	0.32	0.17	61.22	0.86	0.59	37.24	0.34	0.18	61.54	0.11	0.15	-30.77	0.23	0.17	30.00
TSS	mg·L^{-1}	2.0	ND	ND	ND	1.2	1.2	0	ND	ND	ND	ND	ND	ND	1.2	1.2	0.0
Colour	TCU	5.0	ND	ND	ND	ND	ND	ND	ND	5.1	-68.4	ND	ND	ND	ND	ND	ND
Total Organic Carbon	mg·L^{-1}	0.50	ND	ND	ND	0.74	0.25	99.0	0.71	0.88	-21.38	ND	ND	ND	ND	ND	ND
Reactive Silica	mg·L^{-1}	0.50	ND	ND	ND	0.70	0.73	-4.20	0.67	0.68	-1.48	ND	ND	ND	ND	ND	ND
Nutrients																	
Nitrate + Nitrite	mg·L^{-1}	0.050	ND	ND	ND	0.052	0.055	-5.607	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrite	mg·L^{-1}	0.010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrate	mg·L^{-1}	0.050	ND	ND	ND	0.052	0.055	-5.607	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrogen (Ammonia Nitrogen)	mg·L^{-1}	0.050	0.21	0.19	10.00	0.18	0.10	61.82	0.18	0.13	32.26	0.15	0.15	0.00	0.09	0.16	-56.00
Orthophosphate	mg·L^{-1}	0.010	0.016	0.017	-6.061	0.011	ND	ND	ND	ND	ND	0.017	0.012	34.483	0.015	0.015	0.000
Major Ions																	
Total Calcium	µg·L^{-1}	1,000	380,000	380,000	0	110,000	110,000	0	76,000	73,000	4	250,000	210,000	17	350,000	34,0000	3
Total Magnesium	µg·L^{-1}	1,000	1,100,000	1,100,000	0	320,000	290,000	10	180,000	170,000	6	790,000	630,000	23	1,100,000	1,100,000	0
Total Potassium	µg·L^{-1}	1,000	350,000	360,000	-3	90,000	86,000	5	5,4000	51,000	6	230,000	180,000	24	310,000	310,000	0
Total Sodium	µg·L^{-1}	3,000	9,100,000	9,200,000	-1	2,600,000	2,400,000	8	1,500,000	1,400,000	7	6,500,000	5,100,000	24	8,900,000	8,900,000	0
Dissolved Chloride	mg·L^{-1}	120	17,000	17,000	0	4,400	4,400	0	2,800	2,900	-4	12,000	8,800	31	15,000	15,000	0
Dissolved Sulphate	mg·L^{-1}	100	1,800	1,800	0	650	610	6	340	370	-8	1,500	1,200	22	1,200	1,400	-15

[1]RDL = Reportable Detection Limit
ND=not detected

Table 3.16 QA/QC Duplicates for Trace Metals in Water for the Milne Sampling Locations, 2016.

Parameter	Units	RDL[1]	August 1			August 9			August 14			August 21			September 12		
			W-3	W-4	% Diff	W-14	W-28	% Dif	W-38	W-32	% Dif	W-36	W-18	% Dif	W-17	W-13	% Dif
Metals																	
Total Aluminum	µg·L^{-1}	50	ND	ND	ND	24	26	-8	10	10	0	ND	ND	ND	ND	ND	ND
Total Antimony	µg·L^{-1}	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Arsenic	µg·L^{-1}	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Barium	µg·L^{-1}	10	ND	10	-67	5.9	6.1	-3.3	5.5	4.9	11.5	ND	ND	ND	ND	ND	ND
Total Beryllium	µg·L^{-1}	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Bismuth	µg·L^{-1}	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Boron	µg·L^{-1}	500	4,300	4,400	-2	1,100	1,000	10	660	600	10	2,800	2,200	24	3,600	3,600	0
Total Cadmium	µg·L^{-1}	0.1	ND	0.14	-87.18	0.02	0.01	42.85	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Chromium	µg·L^{-1}	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Cobalt	µg·L^{-1}	4.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Copper	µg·L^{-1}	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Iron	µg·L^{-1}	500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Lead	µg·L^{-1}	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Manganese	µg·L^{-1}	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Mercury	µg·L^{-1}	0.013	ND	ND	ND	1.2	1.2	0	ND	ND	ND	ND	ND	ND	0.013	0.013	0
Total Molybdenum	µg·L^{-1}	20	ND	ND	ND	3.1	2.8	10.2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Nickel	µg·L^{-1}	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Phosphorus	µg·L^{-1}	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Selenium	µg·L^{-1}	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Silver	µg·L^{-1}	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Strontium	µg·L^{-1}	20	6,900	7,000	-1	1,800	1,700	6	1,200	1,000	18	4,500	3,600	22	6,400	6,400	0
Total Thallium	µg·L^{-1}	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Tin	µg·L^{-1}	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Titanium	µg·L^{-1}	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Uranium	µg·L^{-1}	1.0	3	3.1	-3.3	1.6	1.7	-6.1	1.6	1.7	-6.1	2.2	2.3	-4.4	2.9	2.8	3.5
Total Vanadium	µg·L^{-1}	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Zinc	µg·L^{-1}	50	ND	ND	ND	5.3	ND	71.8	ND	ND	ND	ND	ND	ND	ND	ND	ND

[1]RDL = Reportable Detection Limit
ND=not detected

3.2 Sediment Quality

A total of 57 sediment samples as well as an additional five samples as QA/QC duplicates total n=62) were collected along the four transects radiating from the ore dock. Due to the large sample size required for physical/chemical analysis, multiple grabs were generally composited to obtain the required volume for each sample. Three samples were collected from each of five stations per transect in order to increase the statistical power for the EEM analysis. Only one sample for hydrocarbon analysis was collected from each station due to minimal presence of hydrocarbons collected in sediment during previous sampling years negating the need/opportunity for statistical analyses.

An overview of the sampling locations and number of samples collected is provided in Table 3.17. As the Coastal Transect is an extension of the East Transect, there were no additional samples collected from SC-1 (i.e., same as SE-5, see Figure 2.3). Distance from the transect origin in Table 3.17 indicates where sampling took place along the theoretical transect established during design of the MEEMP (Baffinland 2016). The results from each transect are described in the following sections and are compared in the Summary and EEM Analyses sections. Sediment quality assessment included chemical analyses (trace metals, petroleum hydrocarbons, total organic/inorganic carbon) and physical characterization (particle size analysis).

Table 3.17 Locations and Numbers of Sediment Samples Collected, Milne Inlet, 2016.

Date (2016)	Station	Sample ID	Depth (m)	Number of Grabs	Distance from Transect Origin (m)	Location	
						Easting	Northing
August 8	SW-1	SW-1-1	16	3	215	503419	7976660
August 8	SW-1	SW-1-2	16	2	215	503419	7976660
August 8	SW-1	SW-1-3	16	2	215	503419	7976660
August 8	SW-2	SW-2-1	18	3	600	503147	7976572
August 8	SW-2	SW-2-2	18	2	600	503147	7976572
August 8	SW-2	SW-2-3	18	3	600	503147	7976572
August 8	SW-3	SW-3-1	16	2	820	502961	7976467
August 8	SW-3	SW-3-2	16	3	820	502961	7976467
August 8	SW-3	SW-3-3	16	2	820	502961	7976467
August 8	SW-4	SW-4-1	19	4	1,225	502721	7976424
August 8	SW-4	SW-4-2	18	3	1,225	502721	7976424
August 8	SW-4	SW-4-3	18	2	1,225	502721	7976424
August 8	SW-5	SW-5-1	15	3	1,735	502264	7976526
August 8	SW-5	SW-5-2	17	3	1,735	502264	7976526

Table 3.17 Locations and Numbers of Sediment Samples Collected, Milne Inlet, 2016. (Cont'd)

Date (2016)	Station	Sample ID	Depth (m)	Number of Grabs	Distance from Transect Origin (m)	Location	
						Easting	Northing
August 8	SW-5	SW-5-3	15	4	1,735	502264	7976526
August 9	SE-1	SE-1-1	16	4	120	503433	7976699
August 9	SE-1	SE-1-2	17	3	120	503433	7976699
August 9	SE-1	SE-1-3	18	3	120	503433	7976699
August 9	SE-2	SE-2-1	16-19	8	325	503646	7976741
August 9	SE-2	SE-2-2	16-19	5	325	503646	7976741
August 9	SE-2	SE-2-3	16-19	4	325	503646	7976741
August 14	SE-3	SE-3-1	15-18	5	560	503832	7976728
August 14	SE-3	SE-3-2	15-18	6	560	503832	7976728
August 14	SE-3	SE-3-3	15-18	5	560	503832	7976728
August 14	SE-4	SE-4-1	15-16	1	1,070	504415	7976650
August 14	SE-4	SE-4-2	15-16	1	1,070	504414	7976650
August 14	SE-4	SE-4-3	15-16	1	1,070	504416	7976648
August 14	SE-5	SE-5-1/ SC-1-1	18	1	1,650 / -55	504914	7976685
August 14	SE-5	SE-5-2/ SC-1-2	18	1	1,650 / -55	504915	7976686
August 14	SE-5	SE-5-3/ SC-1-3	18	1	1,650 / -55	504915	7976686
August 14	SC-2	SC-2-1	15-16	2	449	504983	7976947
August 14	SC-2	SC-2-2	15-16	1	445	504983	7976943
August 14	SC-2	SC-2-3	15-16	1	451	504985	7976949
August 14	SC-3	SC-3-1	15	1	987	505065	7977455
August 14	SC-3	SC-3-2	15	1	987	505065	7977456
August 14	SC-3	SC-3-3	15	1	987	505064	7977456
August 14	SC-4	SC-4-1	15-17	4	1,994	505506	7978253
August 14	SC-4	SC-4-2	15-17	5	1,994	505506	7978253
August 14	SC-4	SC-4-3	15-17	2	1,994	505506	7978253
August 14	SC-5	SC-5-1	16-18	4	4,078	506978	7979507
August 14	SC-5	SC-5-2	16-18	1	4,078	506978	7979508
August 14	SC-5	SC-5-3	16-18	2	4,078	506977	7979508
August 9	SN-1	SN-1-1	37	3	160	503273	7976858
August 9	SN-1	SN-1-2	37	1	160	503273	7976856
August 9	SN-1	SN-1-3	37	1	160	503273	7976856
August 9	SN-2	SN-2-1	57	1	235	503283	7976930
August 9	SN-2	SN-2-2	57	1	235	503285	7976932
August 9	SN-2	SN-2-3	57	1	235	503285	7976932
August 9	SN-3	SN-3-1	67	2	775	503288	7977468
August 9	SN-3	SN-3-2	67	1	775	503288	7977468
August 9	SN-3	SN-3-3	67	1	775	503288	7977471
August 9	SN-4	SN-4-1	80	2	1,185	503269	7977882
August 9	SN-4	SN-4-2	80	2	1,185	503269	7977882
August 9	SN-4	SN-4-3	80	1	1,185	503269	7977882
August 9	SN-5	SN-5-1	100	2	1,890	503295	7978586
August 9	SN-5	SN-5-2	100	1	1,890	503295	7978586
August 9	SN-5	SN-5-3	100	1	1,890	503295	7978586
UTM NAD 83, Zone 17							

3.2.1 West Transect

Fifteen sediment samples (Table 3.17) were collected along the West Transect. Results and summary statistics are presented in Table 3.18 (particle size and organic carbon content) and Table 3.19 (trace metals). Hydrocarbons were not detected in sediment along the West Transect.

Substrate composition (particle size) on the Wentworth scale (i.e., gravel, sand, silt or clay) for each station is presented in Table 3.18 and Figure 3.4, while a more detailed analysis of sediment composition (i.e., the Phi scale) is presented in Figure 3.5. The physical analysis demonstrated relative similarity in particle size among and between stations. Samples from all stations were mainly composed of sand or sand and silt. Fines, as clay and silt, were present in moderately large amounts in all samples. Organic carbon content was slightly higher than measured in the previous sampling effort along the West Transect with means of between 28 and 42 $g \cdot kg^{-1}$.

Table 3.18 Mean Particle Size Distribution (Wentworth Scale) and Carbon Content for the West Transect.

	Units	RDL	SW-1		SW-2		SW-3		SW-4		SW-5	
			Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gravel	%	0.10	9	5	7	5	13	8	8	9	6	6
Sand	%	0.10	57	5	58	0	51	15	71	4	59	6
Silt	%	0.10	24	5	26	4	32	6	18	6	29	1
Clay	%	0.10	10	2	9.2	1.9	4.2	0.8	3.2	0.1	5.7	0.7
Carbon												
Organic Carbon	$mg \cdot kg^{-1}$	500	28,667	4,509	32,000	1,414	40,500	2,121	32,333	2,517	42,333	2,517
Loss on Ignition	%	0.30	10	1	9	1	11	1	10	2	11	1

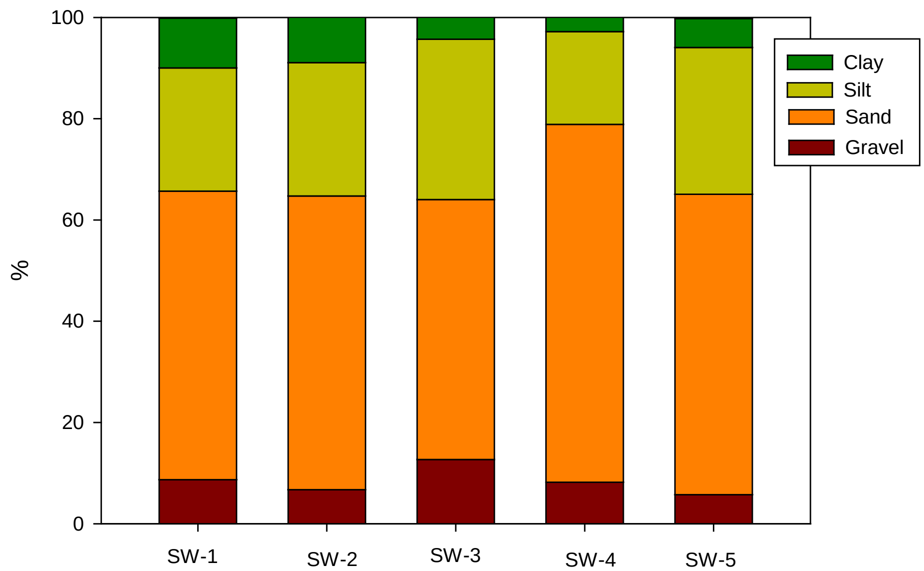


Figure 3.4 Wentworth Particle Size Distribution for the West Transect.

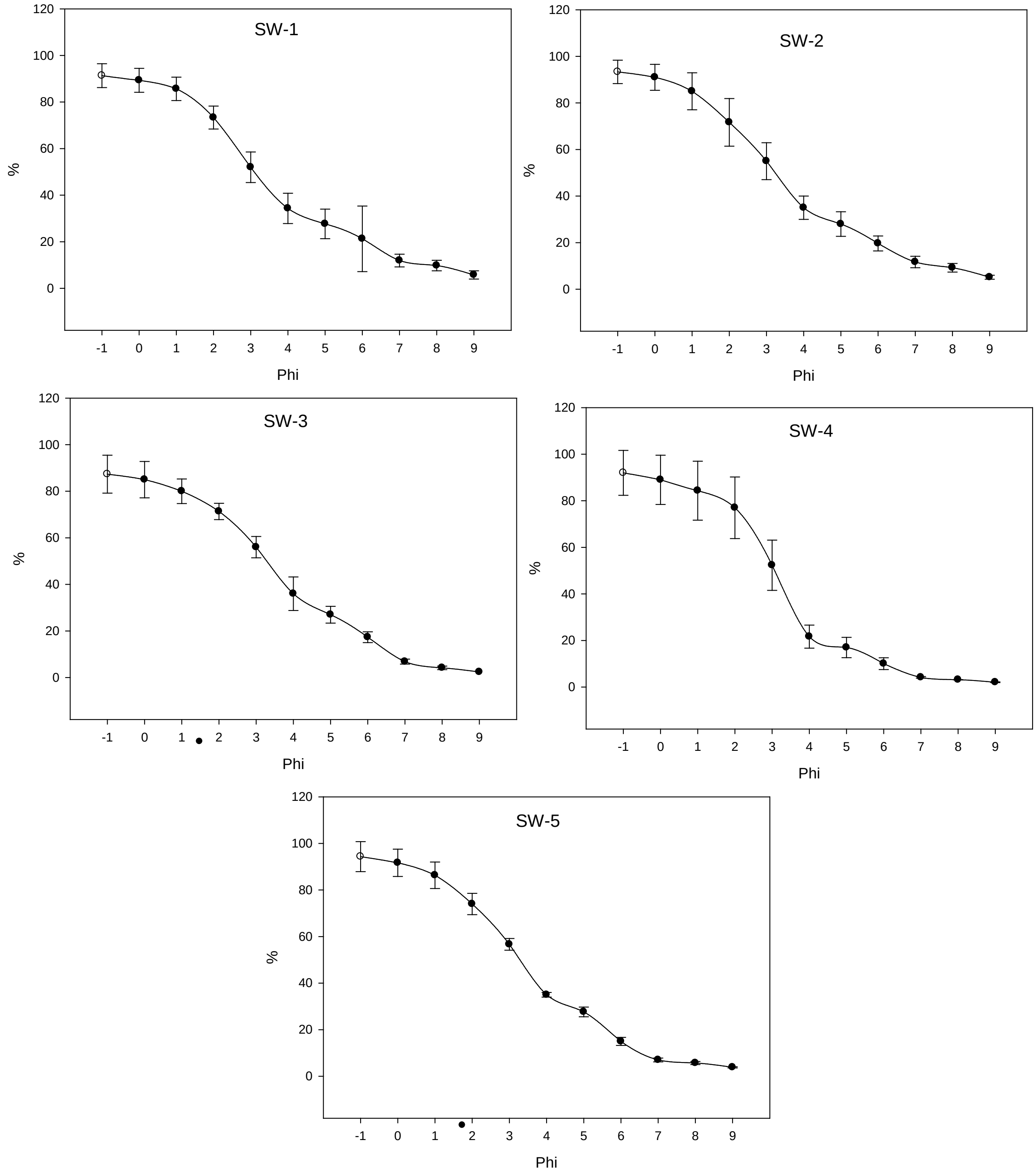


Figure 3.5 Phi Scale Particle Size Distribution for the West Transect (with standard deviation).

Trace metal concentrations in sediment samples from the West Transect (Table 3.19) were generally comparable between stations with SW-3 having a slightly higher concentration of arsenic and iron, including two exceedances of CCME's ISQG for arsenic. Aluminum and iron, as in previous years, had the highest variability based on the magnitude, with mean values between 3,633 and 4,733 $mg \cdot kg^{-1}$ for aluminum and 8,900 to 12,333 $mg \cdot kg^{-1}$ for iron, all of which were in comparable ranges to previous sampling efforts. Interstation variability (standard deviation) was also highest in aluminum and iron samples largely related to the magnitude of the concentration. Two samples, SW-3-1, SW-3-2, exceeded the CCME ISQG guidelines for arsenic (mean of 7.3 $mg \cdot kg^{-1}$, max 7.8 $mg \cdot kg^{-1}$). Arsenic did not exceed the CCME ISQG guideline in 2013, with maximum reported concentration at Milne Inlet of 6.6 $mg \cdot kg^{-1}$ but did in three samples in 2014, with a maximum reported concentration of 7.9 $mg \cdot kg^{-1}$. One sample, SW-2-1, exceeded the CCME ISQG guideline for zinc (mean 79 $mg \cdot kg^{-1}$, max 210 $mg \cdot kg^{-1}$). No samples were exceeded CCME's PEL guideline. Although petroleum hydrocarbons were detected in both 2014 and 2015 at the West Transect, hydrocarbons were not detected in 2016.

Table 3.19 Trace Metals in Sediments for the West Transect.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	SW-1		SW-2		SW-3		SW-4		SW-5	
					Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Metals														
Extractable Aluminum (Al)	mg·kg^{-1}	10			4,667	451	4,233	153	4,733	569	3,633	306	4,167	153
Extractable Antimony (Sb)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Arsenic (As)	mg·kg^{-1}	2.0	7.24	41.6	4.1	0.0	3.1	0.8	7.3	0.5	3.5	0.4	2.2	0.1
Extractable Barium (Ba)	mg·kg^{-1}	5.0			16	3	15	1	18	6	13	2	13	1
Extractable Beryllium (Be)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Bismuth (Bi)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Boron (B)	mg·kg^{-1}	50.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Cadmium (Cd)	mg·kg^{-1}	0.30	0.7	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Chromium (Cr)	mg·kg^{-1}	2.0	52.3	160	17	2	15	1	18	2	15	0	15	1
Extractable Cobalt (Co)	mg·kg^{-1}	1.0			3.0	0.1	2.8	0.2	3.2	0.3	2.8	0.2	3.2	0.3
Extractable Copper (Cu)	mg·kg^{-1}	2.0	18.7	108	5.7	0.4	6.2	1.2	6.3	0.9	5.4	0.3	6.8	0.7
Extractable Iron (Fe)	mg·kg^{-1}	50			10,667	577	8,900	819	12,333	1,528	9,667	577	9,500	346
Extractable Lead (Pb)	mg·kg^{-1}	0.50	30.2	112	4.9	0.5	4.6	0.1	4.6	0.5	3.5	0.3	4.2	0.3
Extractable Lithium (Li)	mg·kg^{-1}	2.0			22	2	20	1	23	3	19	2	22	1
Extractable Manganese (Mn)	mg·kg^{-1}	2.0			117	6	110	10	137	15	130	10	150	10
Mercury (Hg)	mg·kg^{-1}	0.010	0.13	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Molybdenum (Mo)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Nickel (Ni)	mg·kg^{-1}	2.0			9.3	0.8	9.2	0.3	10	1	8.7	0.3	8.7	0.2
Extractable Rubidium (Rb)	mg·kg^{-1}	2.0			19	2	17	2	18	2	14	1	14	1
Extractable Selenium (Se)	mg·kg^{-1}	1.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Silver (Ag)	mg·kg^{-1}	0.50			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Strontium (Sr)	mg·kg^{-1}	5.0			43	3	41	3	52	6	39	3	42	2
Extractable Thallium (Tl)	mg·kg^{-1}	0.10			0.09	0.03	ND	ND	0.07	0.03	ND	ND	ND	ND
Extractable Tin (Sn)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Uranium (U)	mg·kg^{-1}	0.10			0.80	0.05	0.65	0.02	0.69	0.07	0.64	0.03	0.82	0.05
Extractable Vanadium (V)	mg·kg^{-1}	2.0			19	2	17	2	19	1	13	1	15	1
Extractable Zinc (Zn)	mg·kg^{-1}	5.0	124	271	15	1	79	113	14	2	15	7	12	1
Moisture	%	1			23	N/A	20	N/A	22	N/A	17	N/A	19	N/A

[1] RDL = Reportable Detection Limit
[2] CCME (2002) Interim Sediment Quality Guideline
[3] CCME (2002) Probable Effect Level
ND = non detected, and are assumed to be half the RDL for statistical purposes

3.2.2 East Transect

Fifteen sediment samples (Table 3.17) were collected along the East Transect. Results and summary statistics are presented in Table 3.20 and Figure 3.6 (particle size and organic carbon content) and Table 3.21 (trace metals). Hydrocarbons were not detected in sediment along the East Transect.

Substrate composition (i.e., gravel, sand, silt or clay) for each station along the East Transect is presented in Table 3.20 and Figure 3.6, while a more detailed analysis of sediment composition (i.e., the Phi scale) is presented in Figure 3.7. Physical analysis demonstrated relative similarity in particle size among stations however silt and clay increased considerably with increasing distance from the ore dock. There was a much higher sand content in SE-1 in 2016 in comparison to 2015, where a gradient had not previously been noted. Gravel content remained relatively similar between years. Organic carbon content was relatively low varying between 1 and 19 $g \cdot kg^{-1}$.

Table 3.20 Mean Particle Size Distribution (Wentworth Scale) and Carbon Content for the East Transect.

	Units	RDL[1]	SE-1		SE-2		SE-3		SE-4		SE-5 / SC-1	
			Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gravel	%	0.10	4	6	20	3	10	6	7.0	3.4	1.9	0.8
Sand	%	0.10	93	5	58	0	67	5	64	6	49	11
Silt	%	0.10	1	1	18	1	14	1	19	2	34	5
Clay	%	0.10	1.7	0.3	4.3	0.5	8.7	0.7	10	1	15	7
Carbon												
Organic Carbon	$mg \cdot kg^{-1}$	500	1,267	473	7,000	3466	18,000	1,732	15,667	3,512	19,667	4,726
Loss on Ignition	%	0.30	4	0	11	0	10	1	10	1	14	3

[1]RDL = Reportable Detection Limit
ND = non detected

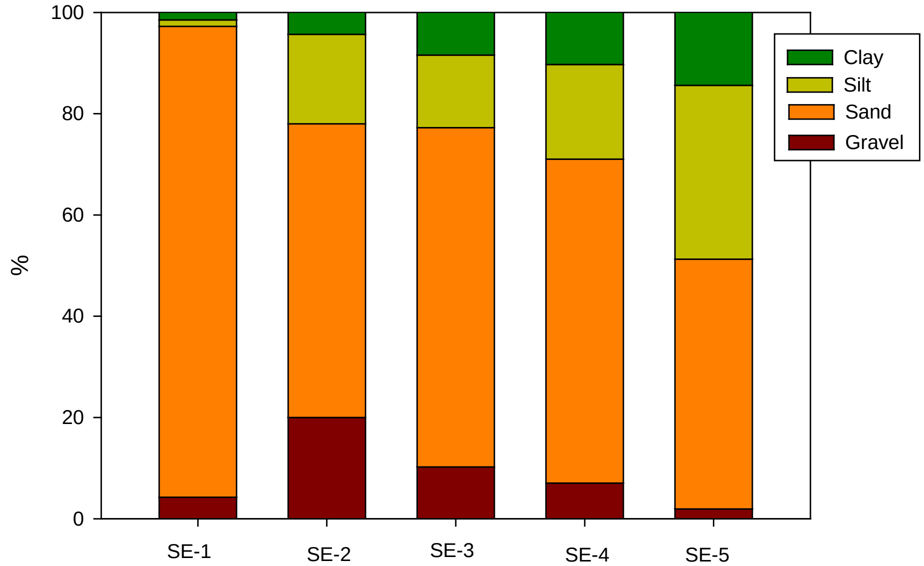


Figure 3.6 Wentworth Particle Size Distribution for the East Transect.

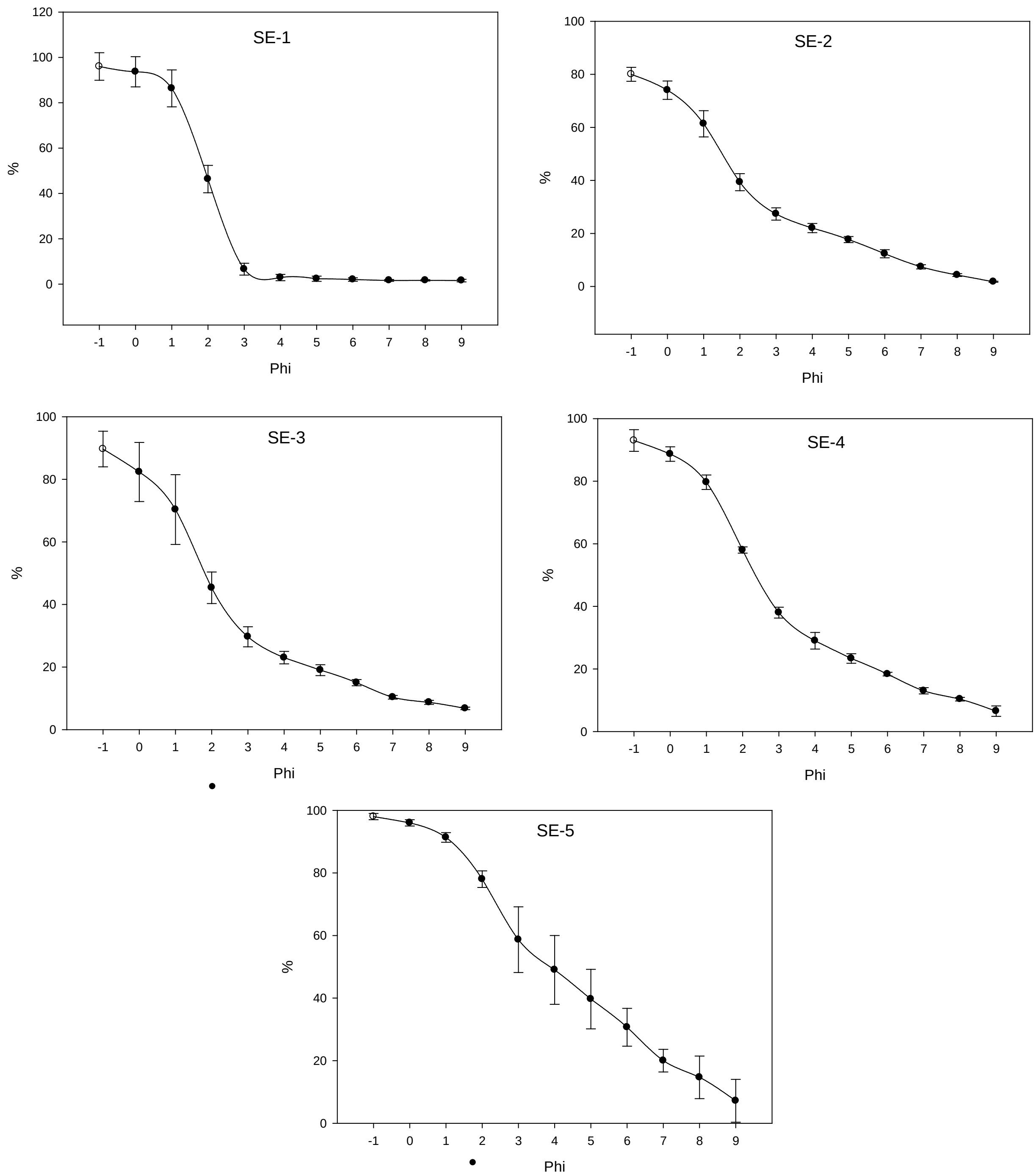


Figure 3.7 Phi Scale Particle Size Distribution for the East Transect (with standard deviation).

Trace metal concentrations in sediment samples from the East Transect were generally comparable between stations as was interstation variability with the exception of station SE-1 which had generally lower concentrations of all trace metals, likely related to the higher sand content and lower concentration of silt and clay. As in previous years, aluminum and iron had the highest variability, with mean values between 923 and 5,500 mg·kg^{-1} for aluminum and 2,300 to 9,833 mg·kg^{-1} for iron, values of which were in comparable ranges (high end) detected in 2014 from the East Transect. None of the samples exceeded the CCME ISQG or PEL guidelines for the protection of aquatic life. Hydrocarbons were not detected in 2016 however they had been detected in all samples in both 2014 and 2015.

Table 3.21 Trace Metals in Sediment for the East Transect.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	SE-1		SE-2		SE-3		SE-4		SE-5/SC-1	
					Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Metals														
Extractable Aluminum (Al)	mg·kg^{-1}	10			923	21	3,133	153	3,400	173	3,600	265	5,500	854
Extractable Antimony (Sb)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Arsenic (As)	mg·kg^{-1}	2.0	7.24	41.6	ND	ND	2.7	0.5	3.1	0.5	2.7	0.2	3.6	0.6
Extractable Barium (Ba)	mg·kg^{-1}	5.0			ND	ND	10	1	11	1	11	1	14	3
Extractable Beryllium (Be)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Bismuth (Bi)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Boron (B)	mg·kg^{-1}	50.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Cadmium (Cd)	mg·kg^{-1}	0.30	0.7	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Chromium (Cr)	mg·kg^{-1}	2.0	52.3	160	3.6	0.2	11	0	11	1	12	0	18	4
Extractable Cobalt (Co)	mg·kg^{-1}	1.0			ND	ND	2	0	2.0	0.1	2.1	0.2	3.2	0.8
Extractable Copper (Cu)	mg·kg^{-1}	2.0	18.7	108	ND	ND	4	0	4.2	0.2	4.4	0.4	6.6	1.6
Extractable Iron (Fe)	mg·kg^{-1}	50			2,300	100	6,900	500	7,100	458	7,133	252	9,833	1258
Extractable Lead (Pb)	mg·kg^{-1}	0.50	30.2	112	1.2	0.1	3.8	0.3	3.9	0.3	4.1	0.3	5.9	0.8
Extractable Lithium (Li)	mg·kg^{-1}	2.0			4.1	0.3	14	1	16	1	16	1	25	5
Extractable Manganese (Mn)	mg·kg^{-1}	2.0			29	3	80	3	82	6	85	4	115	18
Mercury (Hg)	mg·kg^{-1}	0.010	0.13	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Molybdenum (Mo)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Nickel (Ni)	mg·kg^{-1}	2.0			ND	ND	7	1	6.1	0.6	6.3	0.3	10	2
Extractable Rubidium (Rb)	mg·kg^{-1}	2.0			4.0	0.5	11	1	12	1	12	0	19	4
Extractable Selenium (Se)	mg·kg^{-1}	1.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Silver (Ag)	mg·kg^{-1}	0.50			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Strontium (Sr)	mg·kg^{-1}	5.0			11	0	34	7	36	3	32	4	40	6
Extractable Thallium (Tl)	mg·kg^{-1}	0.10			ND	ND	ND	ND	ND	ND	ND	ND	0.09	0.04
Extractable Tin (Sn)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Uranium (U)	mg·kg^{-1}	0.10			0.24	0.03	0.57	0.05	0.58	0.04	0.62	0.08	0.84	0.17
Extractable Vanadium (V)	mg·kg^{-1}	2.0			4.3	0.3	13	1	14	1	15	1	21	4
Extractable Zinc (Zn)	mg·kg^{-1}	5.0	124	271	ND	ND	11	1	11	1	11	1	17	3
Moisture	%	1			16	N/A	18	N/A	20	N/A	22	N/A	28	N/A

[1] RDL = Reportable Detection Limit
[2] CCME (2002) Interim Sediment Quality Guideline
[3] CCME (2002) Probable Effect Level
ND = non detected, are assumed to be half the RDL for statistical purpose

3.2.3 North Transect

Fifteen sediment samples (Table 3.17) were collected along the North Transect. Results and summary statistics are presented in Table 3.22 (particle size and organic carbon content), Table 3.23 (trace metals) and Table 3.24 (hydrocarbons).

Substrate composition (i.e., gravel, sand, silt or clay) for each station along the North Transect is presented in Table 3.22 and Figure 3.8, while a more detailed analysis of sediment composition (i.e., the Phi scale) is presented in Figure 3.9. The physical analysis demonstrated relative similarity in particle size among stations with an increase in fines (silt and clay) with increasing depth between stations 1 and 3, and tapering beyond. Interstation samples were relatively comparable with the highest variation occurring at station 3. Samples were primarily composed of sand and silt with appreciable amounts of both gravel and clay. The organic carbon content was moderate varying between approximately 8 and 15 g·kg^{-1}.

Table 3.22 Mean Particle Size Distribution (Wentworth Scale) and Carbon Content in the North Transect.

	Units	RDL[1]	SN-1		SN-2		SN-3		SN-4		SN-5	
			Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gravel	%	0.10	19	9	12	5	6.1	6.9	12	11	11	6
Sand	%	0.10	40	2	44	6	36	20	31	5	33	1
Silt	%	0.10	31	7	34	3	47	18	45	6	50	5
Clay	%	0.10	11	2	10	1	12	9	11	3	6.7	0.5
Carbon												
Organic Carbon	mg·kg^{-1}	500	8,800	1,997	15,233	5,680	11,000	1,000	10,400	2,307	9,700	2,022
Loss on Ignition	%	16	1	16	1	17	4	18	0	18	1	16

[1]RDL = Reportable Detection Limit
ND = non detected, are assumed to be half the RDL for statistical purpose

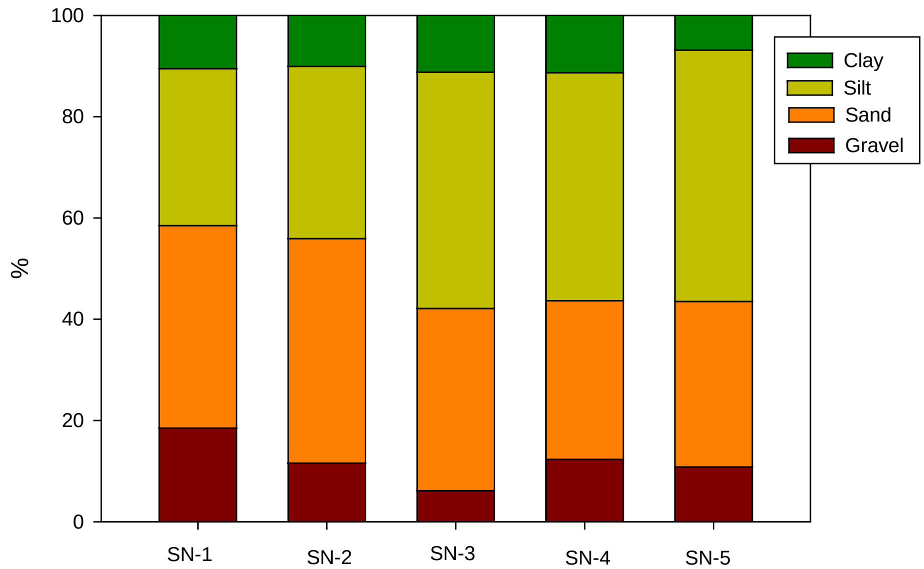


Figure 3.8 Wentworth Particle Size Distribution for the North Transect.

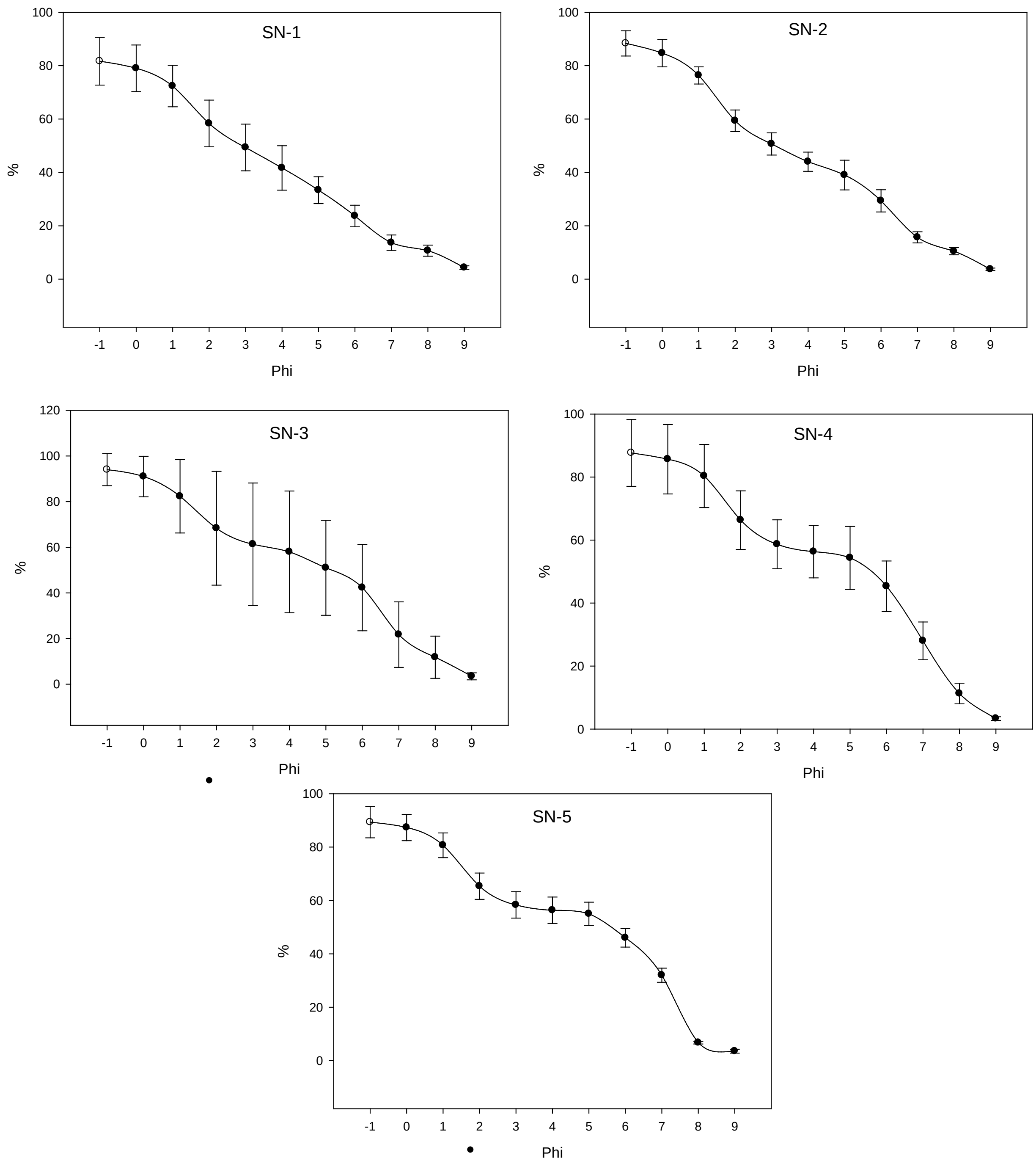


Figure 3.9 Phi Scale Particle Size Distribution for the North Transect (with standard deviation).

Trace metal concentrations in sediment samples from the North Transect were generally comparable between stations but, for the most part, metal concentrations trended upwards with increasing depth which can generally be attributed to the increasing proportion of fine particles (silt and clay) with increasing depth. Aluminum and iron had the highest variability, with mean values between 5,300 and 7,733 mg·kg^{-1} for aluminum and 10,233 to 14,667 mg·kg^{-1} for iron. Interstation variability (standard deviation) was also highest in aluminum and iron, primarily related to the magnitude in concentration. Both parameters had concentrations that were slightly higher than values obtained in 2013 but similar to 2014 and 2015. Mercury was detected in the four deepest stations at the North Transect with mean values ranging between 0.007 and 0.013 mg·kg^{-1}. Only one sample (SN-4-1; 7.4 mg·kg^{-1}) exceeded the CCME ISQG guidelines for arsenic (7.2 mg·kg^{-1}), up from no detections in 2015 but down from three in 2014 (maximum concentration of 9.0 mg·kg^{-1} for 2014 up from 6.6 mg·kg^{-1} in 2013). No samples exceeded CCME's PEL guidelines. Petroleum hydrocarbons in the C_{21}-C_{32} range (28 mg·kg^{-1}; lube oil range) was detected from one sample and was within ranges previously measured at the North Transect.

Table 3.23 Trace Metals in Sediment from the North Transect.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	SN-1		SN-2		SN-3		SN-4		SN-5	
					Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Metals														
Extractable Aluminum (Al)	mg·kg^{-1}	10			5,300	173	5,400	500	6,967	2574	7,200	265	7,733	153
Extractable Antimony (Sb)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Arsenic (As)	mg·kg^{-1}	2.0	7.24	41.6	4.1	0.7	4.4	1.9	4.5	1.0	6.4	1.0	5.9	1.0
Extractable Barium (Ba)	mg·kg^{-1}	5.0			16	1	17	3	19	6	21	1	23	0
Extractable Beryllium (Be)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Bismuth (Bi)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Boron (B)	mg·kg^{-1}	50.0			ND	ND	ND	ND	53	2	ND	ND	33	14
Extractable Cadmium (Cd)	mg·kg^{-1}	0.30	0.7	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Chromium (Cr)	mg·kg^{-1}	2.0	52.3	160	18	1	17	2	21	7	22	1	23	1
Extractable Cobalt (Co)	mg·kg^{-1}	1.0			3.3	0.1	3.2	0.5	4.0	1.2	4.4	0.2	4.7	0.1
Extractable Copper (Cu)	mg·kg^{-1}	2.0	18.7	108	6.7	0.3	7.1	0.8	10	3	10	1	11	0
Extractable Iron (Fe)	mg·kg^{-1}	50			10,333	577	10,233	1,662	12,233	3,060	14,000	0	14,667	577
Extractable Lead (Pb)	mg·kg^{-1}	0.50	30.2	112	5.4	0.2	5.6	0.5	7.5	2.2	9.2	1.6	8.9	0.1
Extractable Lithium (Li)	mg·kg^{-1}	2.0			24	1	25	3	32	12	31	2	33	0
Extractable Manganese (Mn)	mg·kg^{-1}	2.0			133	6	130	17	137	39	157	6	160	10
Mercury (Hg)	mg·kg^{-1}	0.010	0.13	0.7	ND	ND	0.007	0.003	0.009	0.004	0.011	0.001	0.013	0.001
Extractable Molybdenum (Mo)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Nickel (Ni)	mg·kg^{-1}	2.0			10	0	10	1	13	4	13	1	14	1
Extractable Rubidium (Rb)	mg·kg^{-1}	2.0			18	1	18	3	22	7	23	1	24	0
Extractable Selenium (Se)	mg·kg^{-1}	1.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Silver (Ag)	mg·kg^{-1}	0.50			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Strontium (Sr)	mg·kg^{-1}	5.0			50	3	50	6	52	13	58	3	61	3
Extractable Thallium (Tl)	mg·kg^{-1}	0.10			0.09	0.03	0.09	0.03	0.12	0.06	0.14	0.01	0.15	0.01
Extractable Tin (Sn)	mg·kg^{-1}	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Uranium (U)	mg·kg^{-1}	0.10			0.85	0.06	0.78	0.08	1.12	0.40	1.01	0.08	1.17	0.06
Extractable Vanadium (V)	mg·kg^{-1}	2.0			20	1	20	3	27	8	31	0	33	1
Extractable Zinc (Zn)	mg·kg^{-1}	5.0	124	271	16	1	16	2	21	5	22	1	25	1
Moisture	%	1			25	N/A	26	N/A	30	N/A	29	N/A	30	N/A

[1] RDL = Reportable Detection Limit
[2] CCME (2002) Interim Sediment Quality Guideline
[3] CCME (2002) Probable Effect Level
ND = non detected, are assumed to be half the RDL for statistical purpose

Table 3.24 Hydrocarbons in Sediment from the North Transect.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	SN-1	SN-2	SN-3	SN-4	SN-5
Petroleum Hydrocarbons									
Benzene	$mg{\cdot}kg^{-1}$	0.025			ND	ND	ND	ND	ND
Toluene	$mg{\cdot}kg^{-1}$	0.025			ND	ND	ND	ND	ND
Ethylbenzene	$mg{\cdot}kg^{-1}$	0.025			ND	ND	ND	ND	ND
Xylene (Total)	$mg{\cdot}kg^{-1}$	0.050			ND	ND	ND	ND	ND
C_6 - C_{10} (less BTEX)	$mg{\cdot}kg^{-1}$	2.5			ND	ND	ND	ND	ND
$>C_{10}$-C_{16} Hydrocarbons	$mg{\cdot}kg^{-1}$	10			ND	ND	ND	ND	ND
$>C_{16}$-C_{21} Hydrocarbons	$mg{\cdot}kg^{-1}$	10			ND	ND	ND	ND	ND
$>C_{21}$-$<C_{32}$ Hydrocarbons	$mg{\cdot}kg^{-1}$	15			ND	28	ND	ND	ND
Modified TPH (Tier1)	$mg{\cdot}kg^{-1}$	15			ND	28	ND	ND	ND
Reached Baseline at C_{32}	$mg{\cdot}kg^{-1}$	N/A			N/A	YES	NA	NA	N/A
Hydrocarbon Resemblance	$mg{\cdot}kg^{-1}$	N/A			N/A	*	NA	NA	N/A
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%				98	94	92	94	94
n-Dotriacontane - Extractable	%				103	86	105	103	101
Isobutylbenzene - Volatile	%				112	98	103	108	109

[1]RDL = Reportable Detection Limit
[2]CCME (2002) Interim Sediment Quality Guideline
[3]CCME (2002) Probable Effect Level
*Possible lube oil fraction
N/A = not applicable
ND = non detected, are assumed to be half the RDL for statistical purpose

3.2.4 Coastal Transect

Fifteen sediment samples (Table 3.17) were collected along the Coastal Transect including the three from the most distant point of the East Transect [SE-5]. Results and summary statistics are presented in Tables 3.25 (particle size and organic carbon content), Table 3.26 (trace metals) and Table 3.27 (hydrocarbons).

Substrate composition (i.e., gravel, sand, silt or clay) for each station along the Coastal Transect is presented in Table 3.25 and Figure 3.10, while a more detailed analysis of sediment composition (i.e., the Phi scale) is presented in Figure 3.11. The physical analysis demonstrated similarities in particle size among stations despite the distance between stations. Particle size distribution has remained very similar between years. Interstation samples were similarly comparable with the largest variation in clay content. Samples were relatively well distributed over the particle size classes, primarily within the sand, silt and clay size classes. Organic carbon content was moderate showing a considerable increase from previous years at most stations (means of 19 to 35 $g \cdot kg^{-1}$ vs 9 to 17 $g \cdot kg^{-1}$ in 2015).

Table 3.25 Mean Particle Size Distribution (Wentworth Scale) and Carbon Content for the Coastal Transect.

	Units	RDL	SC-1		SC-2		SC-3		SC-4		SC-5	
			Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gravel	%	0.10	2.1	1.3	5.2	3.3	8.0	5.8	7.9	4.5	2.1	1.3
Sand	%	0.10	23	1	19	2	32	8	39	3	23	1
Silt	%	0.10	47	9	45	4	38	16	33	5	47	9
Clay	%	0.10	28	10	31	2	22	3	20	1	28	10
Carbon												
Organic Carbon	$mg \cdot kg^{-1}$	500	19,667	4,726	31,667	577	35,000	2,646	26,000	2,000	19,000	1,000
Loss on Ignition	%	0.30	14	3	18	1	20	0	17	2	12	1

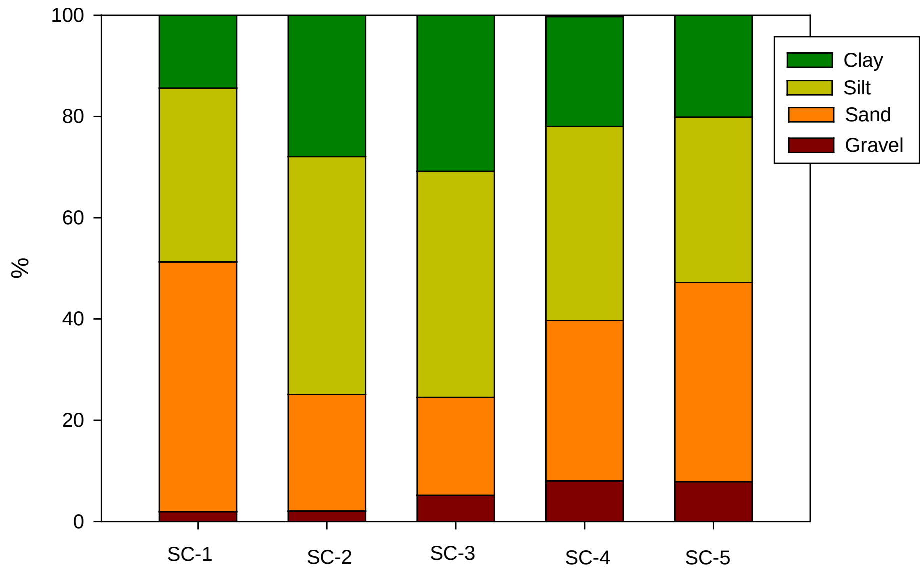


Figure 3.10 Wentworth Particle Size Distribution for the Coastal Transect.

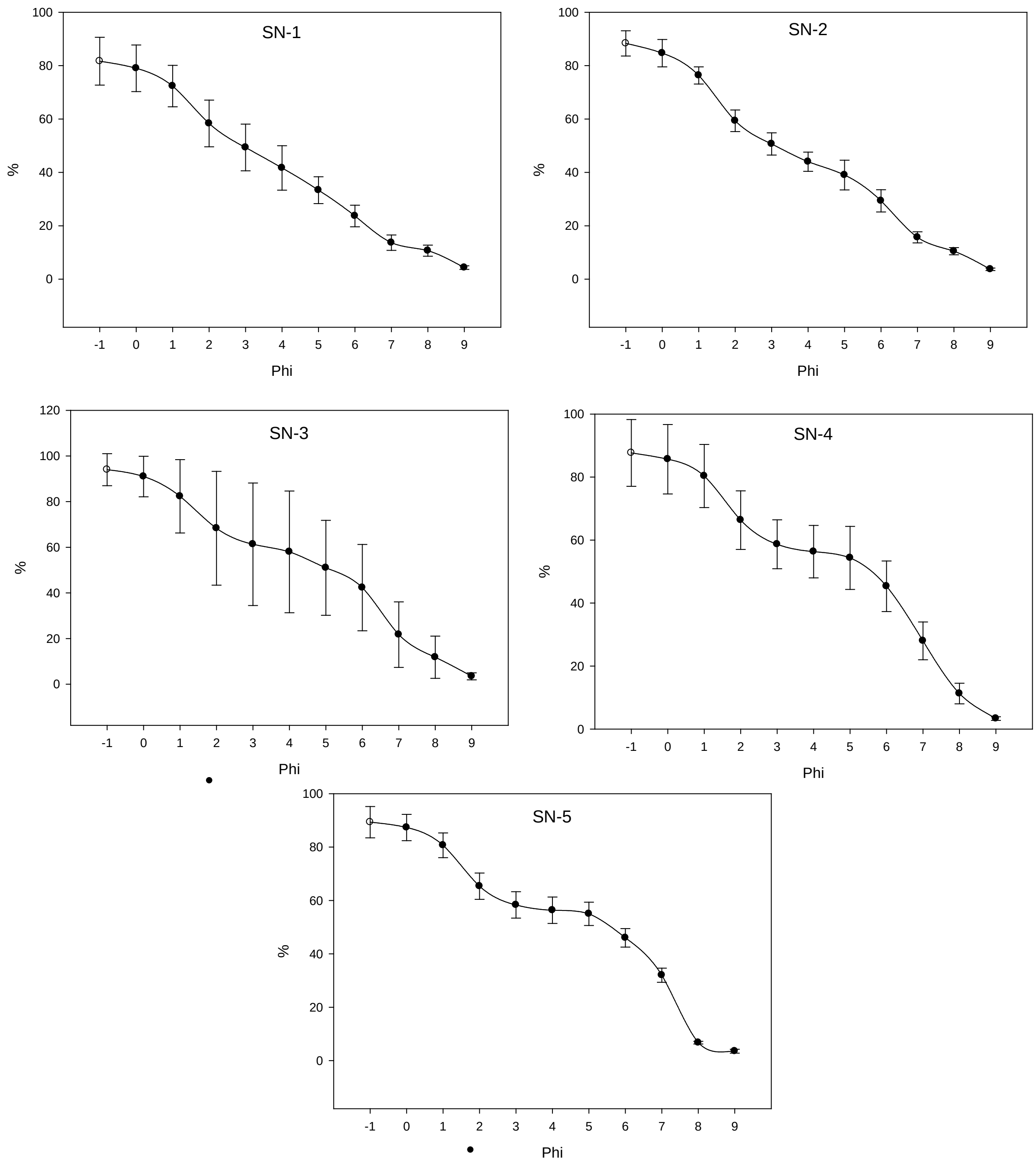


Figure 3.11 Phi Scale Particle Size Distribution for the Coastal Transect (with standard deviation).

Trace metal concentrations in sediment samples from the Coastal Transect were generally comparable between stations with the exception of SC-1 having generally lower concentrations (as in 2014 and 2015), likely related to the lower clay content. Aluminum and iron had the highest variability, with mean values between 5,500 and 9,600 $mg \cdot kg^{-1}$ for aluminum and 9,833 to 14,333 mg·kg^{-1} for iron. Interstation variability (standard deviation) was also highest in the aluminum and iron samples primarily due to the magnitude. None of the parameters analyzed exceeded CCME ISQG or PEL guidelines.

Petroleum hydrocarbons were detected from one sample in the C_{16}-C_{21} and C_{21}-C_{32} ranges with 46 and 60 mg·kg^{-1}, respectively which was slightly higher than in 2014 (4 to 42 mg·kg^{-1}) but similar to 2015 (29 to 65 mg·kg^{-1}).

Table 3.26 Trace Metals in Sediment for the Coastal Transect.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	SC-1/SE-5		SC-2		SC-3		SC-4		SC-5	
					Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Metals														
Extractable Aluminum (Al)	$mg \cdot kg^{-1}$	10			5,500	854	7,833	907	9,600	1,229	8,800	1,082	7,200	346
Extractable Antimony (Sb)	$mg \cdot kg^{-1}$	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Arsenic (As)	$mg \cdot kg^{-1}$	2.0	7.24	41.6	3.6	0.6	4.6	0.4	5.1	0.4	4.8	1.6	2.7	0.1
Extractable Barium (Ba)	$mg \cdot kg^{-1}$	5.0			14	3	23	4	25	2	31	6	18	0
Extractable Beryllium (Be)	$mg \cdot kg^{-1}$	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Bismuth (Bi)	$mg \cdot kg^{-1}$	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Boron (B)	$mg \cdot kg^{-1}$	50.0			ND	ND	59	6	64	5	38	22	ND	ND
Extractable Cadmium (Cd)	$mg \cdot kg^{-1}$	0.30	0.7	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Chromium (Cr)	$mg \cdot kg^{-1}$	2.0	52.3	160	18	4	25	2	28	2	26	2	23	1
Extractable Cobalt (Co)	$mg \cdot kg^{-1}$	1.0			3.2	0.8	4.1	0.3	4.6	0.3	4.6	0.4	3.7	0.2
Extractable Copper (Cu)	$mg \cdot kg^{-1}$	2.0	18.7	108	6.6	1.6	10	1	11	1	9.3	1.5	7.4	0.6
Extractable Iron (Fe)	$mg \cdot kg^{-1}$	50			9,833	1,258	13,000	1,000	14,333	577	13,000	1,732	10,667	577
Extractable Lead (Pb)	$mg \cdot kg^{-1}$	0.50	30.2	112	5.9	0.8	8.7	0.9	9.8	0.2	8.7	1.1	7.2	0.4
Extractable Lithium (Li)	$mg \cdot kg^{-1}$	2.0			25	5	36	4	41	3	36	5	27	2
Extractable Manganese (Mn)	$mg \cdot kg^{-1}$	2.0			115	18	143	12	163	6	143	15	123	6
Mercury (Hg)	$mg \cdot kg^{-1}$	0.010	0.13	0.7	ND	ND	0.012	0.000	0.010	0.004	0.013	0.002	0.009	0.003
Extractable Molybdenum (Mo)	$mg \cdot kg^{-1}$	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Nickel (Ni)	$mg \cdot kg^{-1}$	2.0			10	2	14	1	16	1	14	2	14	1
Extractable Rubidium (Rb)	$mg \cdot kg^{-1}$	2.0			19	4	25	3	29	3	25	3	25	2
Extractable Selenium (Se)	$mg \cdot kg^{-1}$	1.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Silver (Ag)	$mg \cdot kg^{-1}$	0.50			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Strontium (Sr)	$mg \cdot kg^{-1}$	5.0			40	6	52	3	75	14	75	11	51	7
Extractable Thallium (Tl)	$mg \cdot kg^{-1}$	0.10			0.09	0.04	0.15	0.02	0.17	0.02	0.16	0.01	0.13	0.00
Extractable Tin (Sn)	$mg \cdot kg^{-1}$	2.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Extractable Uranium (U)	$mg \cdot kg^{-1}$	0.10			0.84	0.17	1.27	0.15	1.57	0.15	1.30	0.17	1.30	0.17
Extractable Vanadium (V)	$mg \cdot kg^{-1}$	2.0			21	4	30	4	35	4	28	4	22	1
Extractable Zinc (Zn)	$mg \cdot kg^{-1}$	5.0	124	271	17	3	23	2	28	1	25	3	24	2
Moisture	%	1			28	N/A	39	N/A	43	N/A	45	N/A	36	N/A

[1] RDL = Reportable Detection Limit
[2] CCME (2002) Interim Sediment Quality Guideline
[3] CCME (2002) Probable Effect Level
ND = non detected, are assumed to be half the RDL for statistical purpose

Table 3.27 Hydrocarbons in Sediment for the Coastal Transect.

	Units	RDL[1]	CCME ISQG[2]	CCME PEL[3]	SC-1	SC-2	SC-3	SC-4	SC-5
Petroleum Hydrocarbons									
Benzene	mg·kg^{-1}	0.025			ND	ND	ND	ND	ND
Toluene	mg·kg^{-1}	0.025			ND	ND	ND	ND	ND
Ethylbenzene	mg·kg^{-1}	0.025			ND	ND	ND	ND	ND
Xylene (Total)	mg·kg^{-1}	0.050			ND	ND	ND	ND	ND
C_6 - C_{10} (less BTEX)	mg·kg^{-1}	2.5			ND	ND	ND	ND	ND
>C_{10}-C_{16} Hydrocarbons	mg·kg^{-1}	10			ND	ND	ND	ND	ND
>C_{16}-C_{21} Hydrocarbons	mg·kg^{-1}	10			ND	ND	ND	46	ND
>C_{21}-<C_{32} Hydrocarbons	mg·kg^{-1}	15			ND	ND	ND	60	ND
Modified TPH (Tier1)	mg·kg^{-1}	15			ND	ND	ND	100	ND
Reached Baseline at C_{32}	mg·kg^{-1}	N/A			NA	NA	NA	YES	NA
Hydrocarbon Resemblance	mg·kg^{-1}	N/A			NA	NA	NA	*	NA
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%				97	93	97	92	97
n-Dotriacontane - Extractable	%				102	127	127	127	102
Isobutylbenzene - Volatile	%				76	87	85	96	76

[1]RDL = Reportable Detection Limit
[2]CCME (2002) Interim Sediment Quality Guideline
[3]CCME (2002) Probable Effect Level
*Possible lube oil fraction
NA = not applicable
ND = non detected, are assumed to be half the RDL for statistical purpose

3.2.5 Summary and QA/QC

There was considerable spatial variability in the particle size characteristics and metal concentrations both within and among sampling sites (Tables 3.28 through 3.30). Differences in particle size were mainly related to depth but were also variable between transects and these differences could be related to wave energy, along shore sediment transport, proximity to river mouths and other factors. Overall, particle size was mainly composed of sand and silt with some stations having higher proportions of gravel while others contained equivalent amounts of the four size classes. The slight increase in metal concentrations with increasing depth as demonstrated for the North Transect was not consistent as shallower areas (i.e., 15 m) in other transects had similar concentrations in metals as compared with deeper sites. Mean metal concentrations from the 2016 sediment samples were generally low, with the exception of aluminum (n=57 samples from 19 stations, mean, 4,287; 3,311; 6,520 and 7,787 mg·kg^{-1}) and iron (n=57 samples from 19 stations, mean, 10,213; 6,653; 12,293 and 12,167 mg·kg^{-1}) at the West, East, North and Coastal Transects, respectively. For comparison, 2015 mean aluminum and iron concentrations were 3,906; 3,780; 6,133 and 7,850 mg·kg^{-1} and 9,267; 7,847; 12,167 and 13,000 mg·kg^{-1} whereas 2014 mean aluminum and iron concentrations were 4,273; 3,504;

6,187 and 6,613 mg·kg^{-1} and 10,030; 7,227; 12,243 and 11,243 mg·kg^{-1} at the West, East, North and Coastal Transects, respectively.

Petroleum hydrocarbons in the fuel oil and lube oil ranges were detected in lower concentrations and fewer samples than in 2015.

There were no exceedances of the CCME PEL guidelines for metals or hydrocarbons from any of the study areas sampled in 2016, however, arsenic concentrations exceeded the CCME ISQG guideline of 7.24 mg·kg^{-1} at two stations (same as 2015, down from three stations in 2014) at the same stations as in previous years. Similarly, zinc concentrations exceeded the CCME ISQG guideline of 124 mg·kg^{-1} from one sample from one station on the West Transect (210 mg·kg^{-1}).

Six duplicate samples were collected for QA/QC purposes and sent blind to the laboratory. As expected QA/QC values were returned with varying results. In contrast to water samples, sediment samples are generally considered to be less homogeneous due to varying sizes of particles within samples, especially related to the largest and smallest particle sizes (i.e., gravel and clay). The relatively large differences in particle size between duplicates displayed in Table 3.30 demonstrate the relatively non-homogeneous nature of the subsamples with % differences varying between 2 and 176%. Despite the relative non-homogeneity between duplicate samples, % differences were largely within the acceptable 10% range with minor exceptions. The high percent difference in hydrocarbon concentrations is related to the results of one sample returned as non detectable and thus half the RDL was used for the calculation. The high percent difference is not assumed to be related to techniques used by the analytical laboratory, rather is likely related to the heterogeneity of the particular samples.

Table 3.28 Mean Particle Size Distribution (Wentworth Scale) and Carbon Content for QA/QC Duplicates.

	Units	RDL[1]	SW-1-1Q	SW-1-1	% Diff	SW-2-1Q	SW-2-1	% Diff	SC-2-1Q	SC-2-1	% Diff	SN-1-1Q	SN-1-1	% Diff	SE-1-1Q	SE-1-1	% Diff	SE-2-1Q	SE-2-1	% Diff
Gravel	%	0.10	8	10	22	19	12	45	5	3	56	17	9	67	1	11	176	17	22	26
Sand	%	0.10	64	62	3	51	58	13	21	22	5	38	41	8	97	88	10	62	58	7
Silt	%	0.10	23	20	14	24	23	4	46	45	2	41	38	8	1	0	51	18	17	6
Clay	%	0.10	4	8	56	6	7	15	28	30	7	5	13	97	1	1	7	4	4	11

[1]RDL = Reportable Detection Limit

Table 3.29 Trace Metals in Sediment for QA/QC Duplicates.

	Units	RDL[1]	SW-1-1Q	SW-1-1	%Diff	SW-2-1Q	SW-2-1	%Diff	SN-1-1Q	SN-1-1	%Diff	SE-1-1Q	SE-1-1	%Diff	SE-2-1Q	SE-2-1	%Diff	SC-2-1Q	SC-2-1	%Diff
Metals																				
(Al)	mg·kg^{-1}	10		4200	0	4600	4100	11.49	5300	5400	1.87	810	900	10.53	3000	3300	-9.52	9500	7700	20.93
(Sb)	mg·kg^{-1}	2.0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(As)	mg·kg^{-1}	2.0	4.4	4.1	7.06	2.8	2.3	19.61	3.9	3.7	5.26	ND	ND	0	3.5	3.2	8.96	4.6	4.8	4.26
(Ba)	mg·kg^{-1}	5.0	15	14	6.90	15	14	6.90	16	16	0	ND	ND	0	10	11	9.52	25	24	4.08
(Be)	mg·kg^{-1}	2.0	ND	ND	0	ND	4200	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(Bi)	mg·kg^{-1}	2.0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(B)	mg·kg^{-1}	50.0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	60	54	10.53
(Cd)	mg·kg^{-1}	0.30	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(Cr)	mg·kg^{-1}	2.0	15	15	0	16	14	13.33	18	18	0	3.4	3.6	5.71	11	11	0	27	26	3.77
(Co)	mg·kg^{-1}	1.0	2.8	3	6.90	2.8	2.6	7.41	3.5	3.3	5.88	ND	ND	0	2	2.2	9.52	4.5	4.2	6.90
(Cu)	mg·kg^{-1}	2.0	5.3	5.3	0	6.3	7.6	18.71	7.6	7	8.22	ND	ND	0	4.4	4.6	4.44	9.9	9.5	4.12
(Fe)	mg·kg^{-1}	50	10000	10000	0	9100	8000	12.87	11000	10000	9.52	1900	2200	14.63	7100	7400	4.14	14000	13000	7.41
(Pb)	mg·kg^{-1}	0.50	4.3	4.5	4.5	4.6	4.6	0	5.7	5.5	3.57	1.1	1.1	0	3.7	4	7.79	9.5	8.6	9.94
(Li)	mg·kg^{-1}	2.0	19	21	10	22	19	14.63	24	24	0	4.1	3.9	5.00	14	15	6.90	41	36	12.99

Table 3.29 Trace Metals in Sediment for QA/QC Duplicates. (Cont'd)

	Units	RDL[1]	SW-1-1Q	SW-1-1	%Diff	SW-2-1Q	SW-2-1	%Diff	SN-1-1Q	SN-1-1	%Diff	SE-1-1Q	SE-1-1	%Diff	SE-2-1Q	SE-2-1	%Diff	SC-2-1Q	SC-2-1	%Diff
Metals																				
(Mn)	mg·kg^{-1}	2.0	120	110	8.70	110	100	9.52	130	130	0	25	26	3.92	80	83	3.68	160	150	6.45
(Hg)	mg·kg^{-1}	0.010	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(Mo)	mg·kg^{-1}	2.0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(Ni)	mg·kg^{-1}	2.0	8.6	8.5	1.17	9.4	8.9	5.46	11	10	9.52	ND	ND	0	6.1	6.9	12.31	15	14	6.90
(Rb)	mg·kg^{-1}	2.0	18	17	5.71	17	15	12.50	19	19	0	3.2	3.6	11.76	11	12	8.70	28	25	11.32
(Se)	mg·kg^{-1}	1.0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(Ag)	mg·kg^{-1}	0.50	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(Sr)	mg·kg^{-1}	5.0	36	39	8.00	42	39	7.41	47	54	13.86	9.6	11	13.59	31	42	30.14	56	54	3.64
(Tl)	mg·kg^{-1}	0.10	ND	ND	0	ND	ND	0	0.12	0.11	8.70	ND	ND	0	ND	ND	0	0.2	0.14	35.29
(Sn)	mg·kg^{-1}	2.0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0
(U)	mg·kg^{-1}	0.10	0.75	0.76	1.32	0.68	0.63	7.63	0.94	0.92	2.15	0.19	0.23	19.05	0.58	0.62	6.67	1.5	1.3	14.29
(V)	mg·kg^{-1}	2.0	17	17	0	18	15	18.18	21	20	4.88	3.7	4.5	19.51	14	14	0	33	30	9.52
(Zn)	mg·kg^{-1}	5.0	15	14	6.90	16	210	171.68	18	17	5.71	ND	ND	0	9.8	11	11.54	26	24	8.00

[1]RDL = Reportable Detection Limit
ND = non detected, are assumed to be half the RDL for statistical purpose

Table 3.30 Hydrocarbons in Sediment for QA/QC Duplicates.

	Units	RDL[1]	SW-3-1	SW-3-1Q	% Diff
Petroleum Hydrocarbons					
Benzene	$mg \cdot kg^{-1}$	0.025	ND	ND	-
Toluene	$mg \cdot kg^{-1}$	0.025	ND	ND	-
Ethylbenzene	$mg \cdot kg^{-1}$	0.025	ND	ND	-
Xylene (Total)	$mg \cdot kg^{-1}$	0.050	ND	ND	-
C_6 - C_{10} (less BTEX)	$mg \cdot kg^{-1}$	2.5	ND	ND	-
$>C_{10}$-C_{16} Hydrocarbons	$mg \cdot kg^{-1}$	10	ND	ND	-
$>C_{16}$-C_{21} Hydrocarbons	$mg \cdot kg^{-1}$	10	ND	ND	-
$>C_{21}$-$<C_{32}$ Hydrocarbons	$mg \cdot kg^{-1}$	15	ND	36	134.88
Modified TPH	$mg \cdot kg^{-1}$	15	ND	36	134.88
Surrogate Recovery (%)					
Isobutylbenzene - Extractable	%		97	96	1.04
n-Dotriacontane - Extractable	%		102	105	-2.90
Isobutylbenzene - Volatile	%		76	86	-12.35

3.2.6 EEM Analysis – Sediment Quality

Two EEM Level candidates (iron concentration and particle size) and one Surveillance Level candidate (hydrocarbon concentration), with reduced sampling effort, were identified as monitoring targets for sediment (see MEEMP design document, Baffinland 2016). Due to the low hydrocarbon content in sediment at this time, only iron concentration and particle size have been analyzed in relationship to distance from the ore dock.

3.2.6.1 Particle Size

In order to measure the potential for Project-induced change to marine habitat, particle size was selected as a candidate for the MEEMP. Redistribution of lighter weight materials that have a smaller diameter is a potential result from Project activities. Therefore a regression analysis was conducted to examine the relationship between percent fines (%) and distances along each transect to establish a baseline for existing particle size gradients in the vicinity of the ore dock. Gradients present during the baseline studies were generally considered to be related to non-Project related natural conditions such as depth, sediment transport patterns, and proximity to Phillips Creek and were reflective of the natural variability within the system under baseline conditions. Potential Project induced changes affecting marine sediment particle sizes over time included winnowing of fine particles due to prop wash (i.e., decrease in percent fines) or an increase in percent fines due to dust dispersal. Percent fines, for the purposes of this analysis, were considered particles of diameter < 0.25 mm (<+2 Phi), which represents fine sand and smaller. In 2016, an analysis of covariance (ANCOVA) was used to compare linear regression slopes between each year. The results of the regression analyses and analysis of covariance from the four transects are described below.

West Transect

Analysis of covariance indicated there was a significant difference between the factor year and the covariate distance along the West Transect (P=0.005) shown in Figure 3.12, therefore the EEM null hypothesis can be rejected. Slopes appear to decrease over time, with the slope of the line in 2016 an order of magnitude smaller than the slope in 2014.

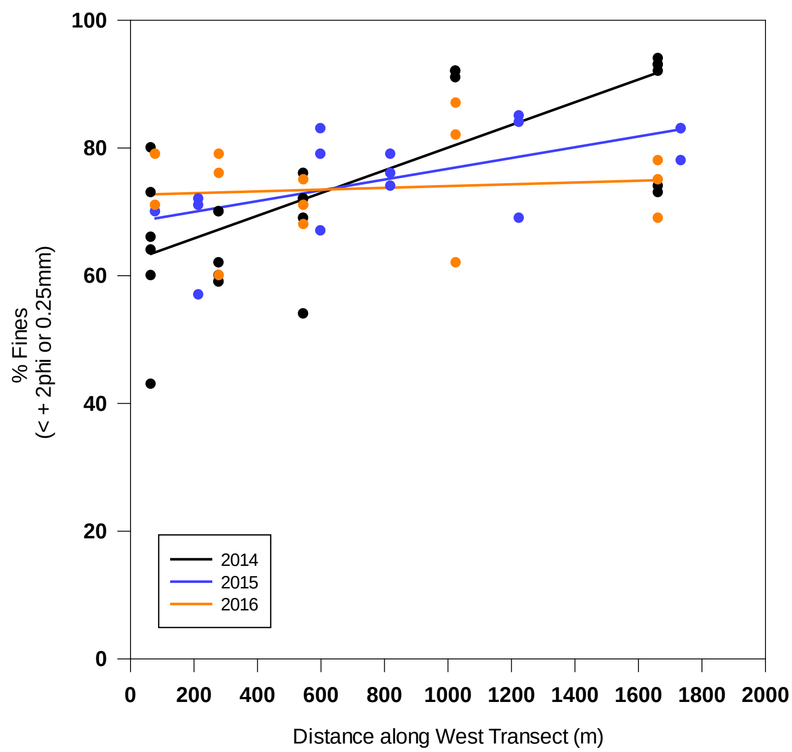


Figure 3.12 Percent Fines in Relation to Distance Along the West Transect.

East Transect

Analysis of covariance indicated there was not a significant difference between the factor year and the covariate distance along East Transect (P=0.815) shown in Figure 3.13, therefore the EEM null hypothesis could not be rejected. There were no significant interactions between year and the covariates % fines and distance along the East Transect. The equal slopes assumption passed and the differences among the adjusted means of the treatment groups were not great enough to exclude the possibility that the differences were only due to random sample variability (P=0.079), therefore the y-intercepts of the slopes were not significantly different.

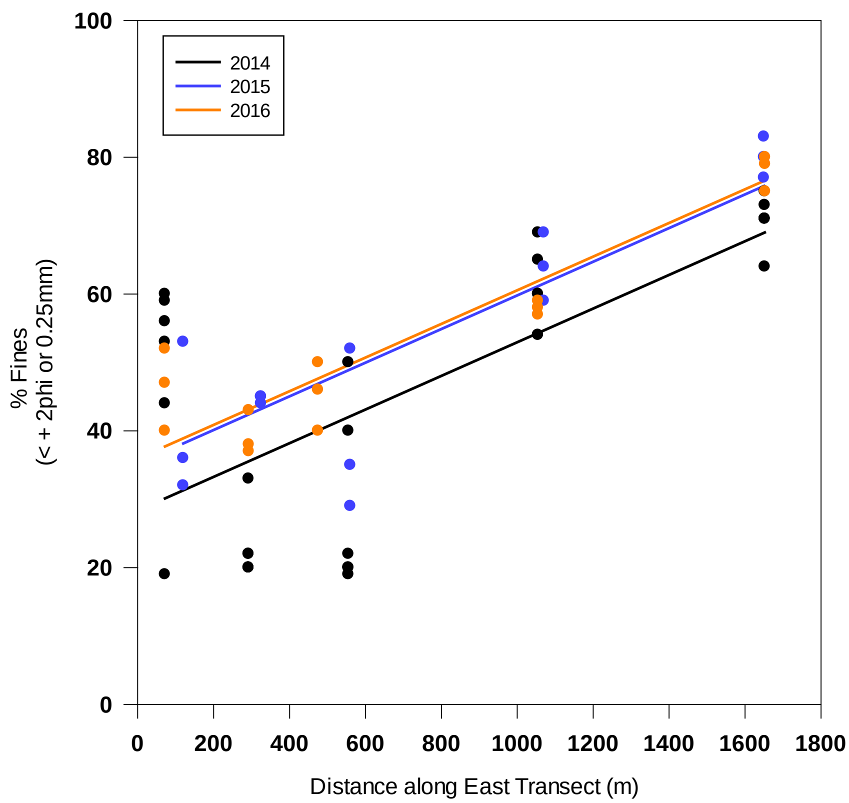


Figure 3.13 Percent Fines in Relation to Distance Along the East Transect.

North Transect

Analysis of covariance indicated there was not a significant difference between the factor year and the covariate distance along North Transect (P=0.788) shown in Figure 3.14, therefore the EEM null hypothesis could not be rejected. The differences among the adjusted means of the treatment groups were not great enough to exclude the possibility that the differences are only due to random sample variability (P=0.233), therefore the y-intercepts of the slopes were not significantly different.

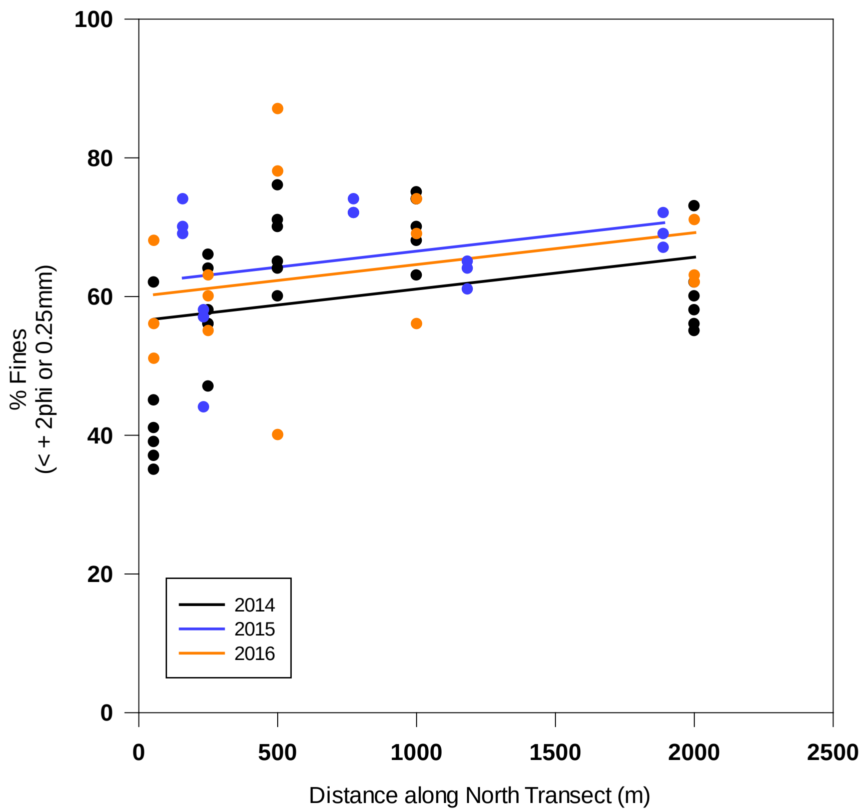


Figure 3.14 Percent Fines in Relation to Distance Along the North Transect.

Coastal Transect

Analysis of covariance indicated there was not a significant difference between the factor year and the covariate distance along the Coastal Transect (P=0.878) shown in Figure 3.15, therefore the EEM null hypothesis could not be rejected. The difference in the adjusted means of the treatment groups was statistically significant (P=0.006), therefore the y-intercepts of the equal slopes were found to be significantly different. This suggests that, while the gradient of percent fines along the Coastal Transect was the same in 2015 and 2016, percent fines increased uniformly along the transect by approximately 6.8 % in 2015 and increased again by 1.2 % in 2016.

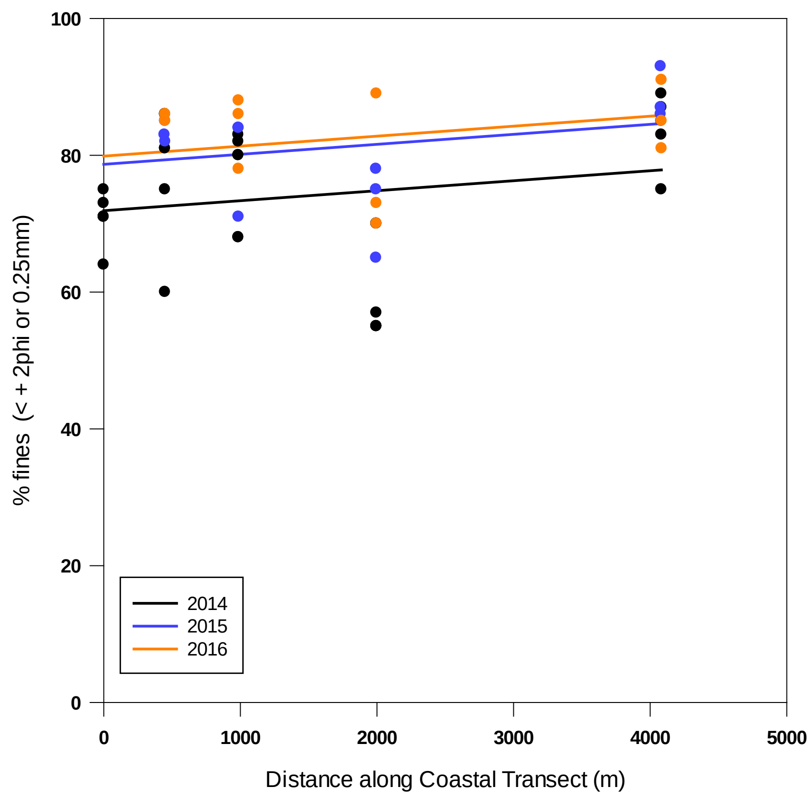


Figure 3.15 Percent Fines in Relation to Distance Along the Coastal Transect.

3.2.6.2 Iron Concentrations in Sediment

High volumes of iron ore will be stockpiled and loaded onto ships at the Milne ore dock during Project operations. Consequently, iron concentration in sediment was identified as a monitoring target for the MEEMP. In 2014, linear regressions of iron concentrations versus distance from the ore dock for each transect were conducted in order to establish the baseline for existing gradients at Milne Port.

Beginning in 2015, an analysis of covariance (ANCOVA) was utilized to compare between year slopes in order to determine whether a significant change within slopes has occurred. Each subsequent year will add another dataset for use in the ANCOVA.

West Transect

Analysis of covariance indicated there was not a significant difference between the factor year and the covariate distance along the West Transect (P=0.680) shown in Figure 3.16, and therefore the EEM null hypothesis could not be rejected. The differences among the adjusted means of the treatment groups were not great enough to exclude the possibility that the differences are only due to random sample variability (P=0.511), therefore the y-intercepts of the slopes were not significantly different.

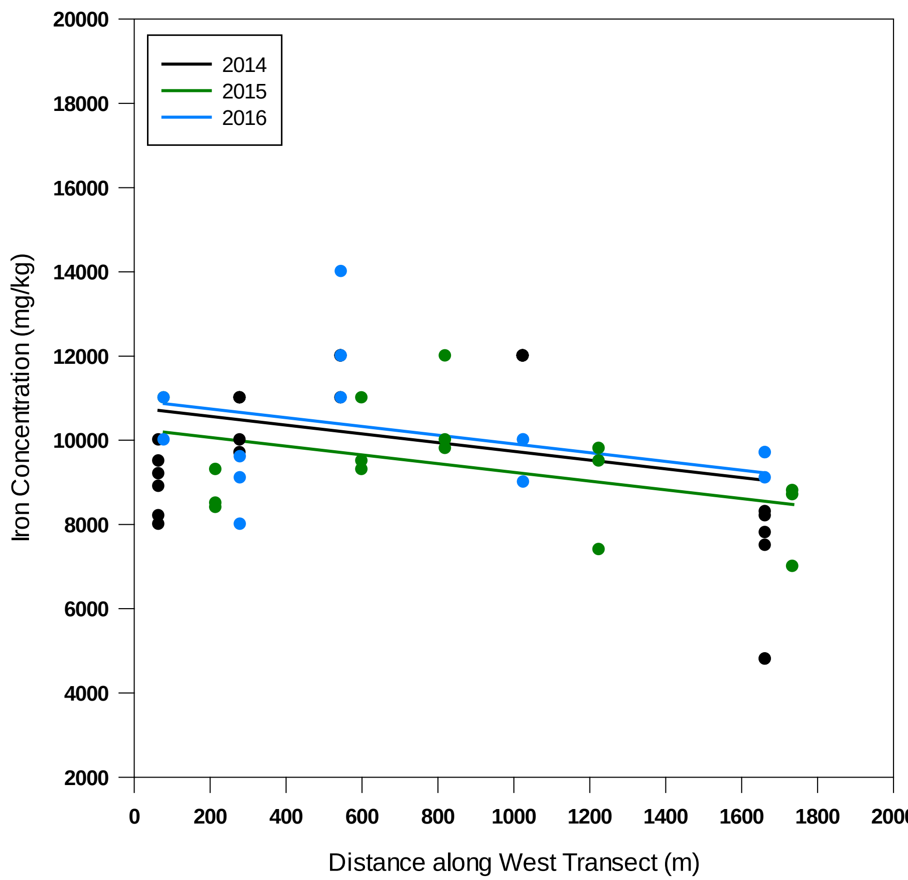


Figure 3.16 Iron Concentrations in Relation to Distance Along the West Transect.

East Transect

Analysis of covariance indicated there was a significant difference between the factor year and the covariate distance along East Transect (P=<0.001) shown in Figure 3.17, therefore the EEM null hypothesis could be rejected. There was a significant increase in the slope of the 2016 linear regression, which could be, in part, related to low iron concentrations found at the start of the transect close to the ore dock.

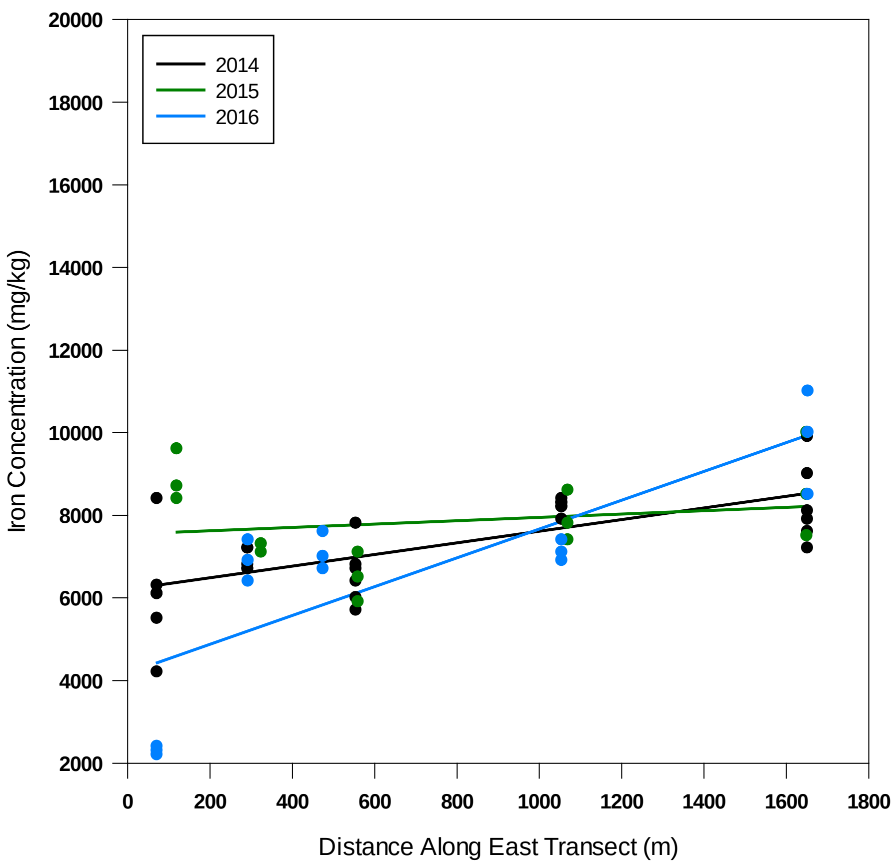


Figure 3.17 Iron Concentrations in Relation to Distance Along the East Transect.

North Transect

Analysis of covariance indicated there was not a significant difference between the factor year and the covariate distance along the North Transect (P=0.698) shown in Figure 3.18, therefore the EEM null hypothesis could not be rejected. The differences among the adjusted means of the treatment groups were not great enough to exclude the possibility that the differences were only due to random sample variability (P=0.776), therefore the y-intercepts of the slopes were not significantly different.

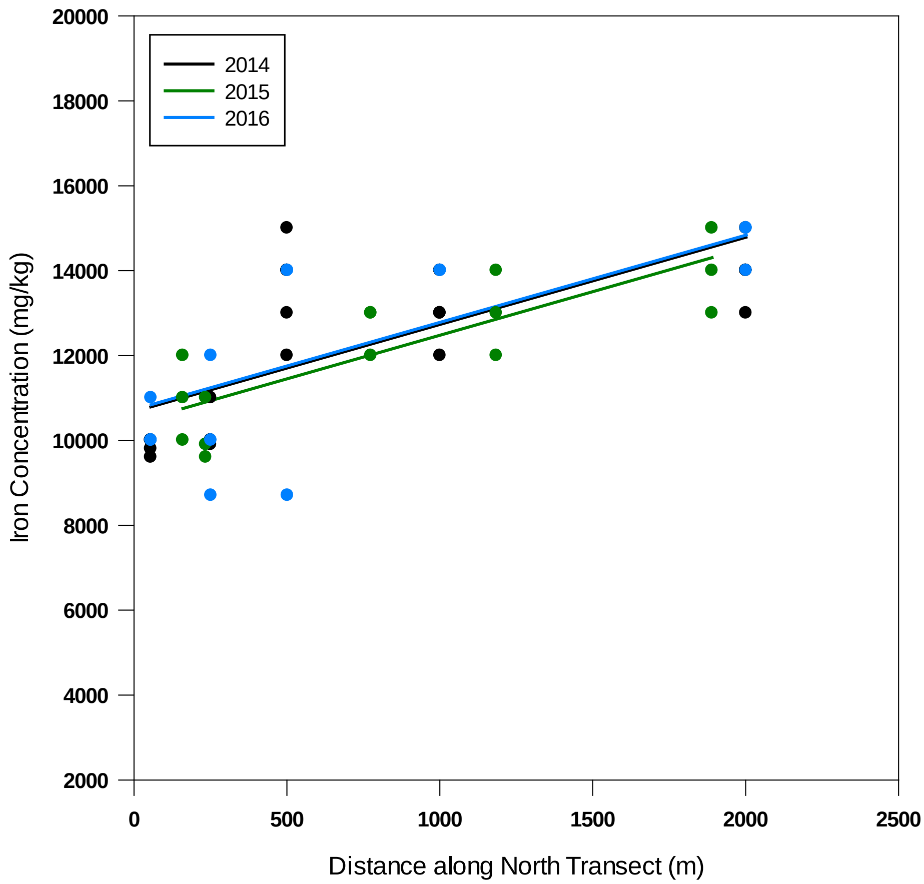


Figure 3.18 Iron Concentrations in Relation to Distance Along the North Transect.

Coastal Transect

Analysis of covariance indicated there was not a significant difference between the factor year and the covariate distance along the Coastal Transect (P=0.640) shown in Figure 3.19, therefore the EEM null hypothesis could not be rejected. The differences among the adjusted means of the treatment groups were not great enough to exclude the possibility that the differences are only due to random sample variability (P=0.365), therefore the y-intercepts of the slopes were not significantly different. As noted, the iron concentration analysis from the Coastal Transect may in the future benefit from a quadratic or exponential type regression.

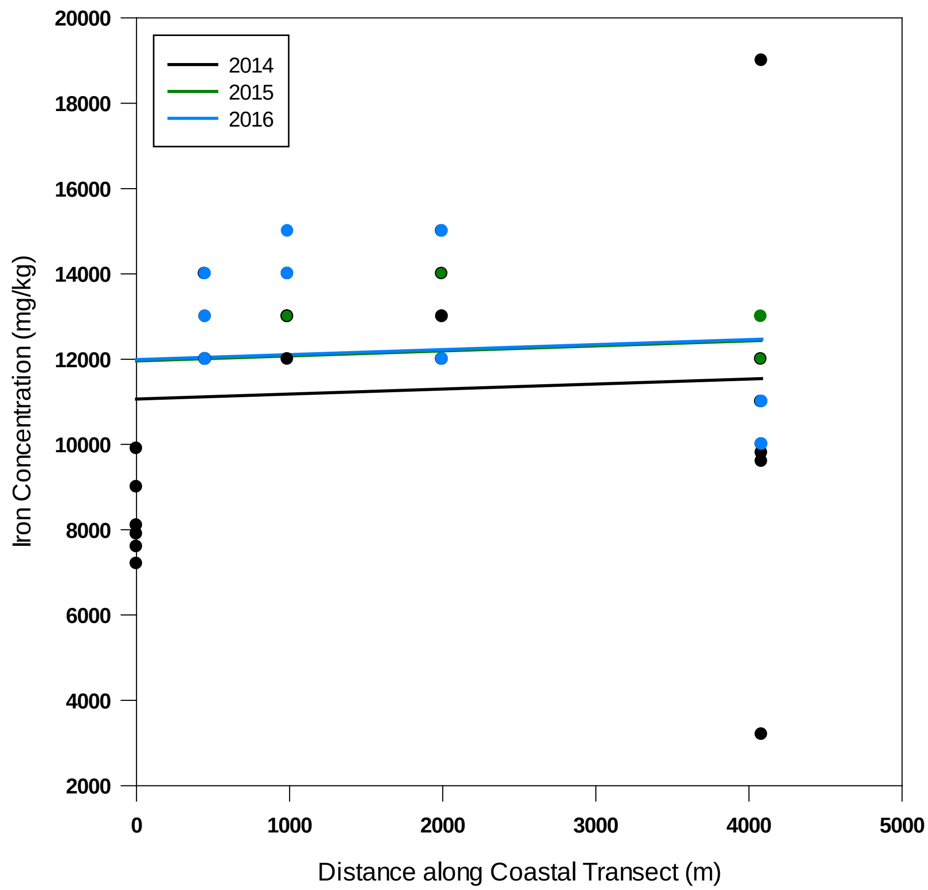


Figure 3.19 Iron Concentrations in Relation to Distance Along the Coastal Transect.

3.2.6.3 Hydrocarbon Concentrations in Sediment

Sediment concentrations of petroleum hydrocarbons in lube oil ranges were detected at low levels and generally to a lesser extent (number and concentration) than detected in previous years. Within the MEEMP design, initial monitoring of hydrocarbon concentrations in sediment will continue to be at a Surveillance Level in relation to compliance with CCME ISQGs (Table 2.4). If the levels of hydrocarbons increase as monitoring progresses then consideration will be given to treat hydrocarbons at the full EEM level which would include having hydrocarbons in the regression based radial gradient analyses. A regression was not completed in 2016 due to low hydrocarbon levels.

3.2.7 Summary of EEM Analysis – Sediment Quality

The relationship between particle size and iron concentration in sediments, and the distance from the ore dock, has been explored along each transect. In order to examine the MEEMP at a more comprehensive level, and further elucidate patterns in these sediment quality variables, sediment sampling stations were grouped based on their distance from the ore dock, regardless of the transect on which they were found. Table 3.31 provides a summary of % fines and iron concentrations based on distance from the Milne ore dock while Figures 3.20 and 3.21 illustrate how % fines and iron concentrations vary with distance from the ore dock, respectively. The upper panels of Figures 3.20 and 3.21 display means and standards deviations, while the lower panels of each Figure display the individual samples that generate those means.

In 2016, percent fines had a considerable variation between transects and within distance groupings as in previous years. In comparison to 2014 and 2015 values, it appears as though percent fines have increased slightly near the ore dock and decreased slightly at distance and thus altering the trendline from a positive to a negative slope. Similarly, the iron concentrations measured from sediment samples had a high inter-station variability shown by the relatively large standard deviations and also had a relatively high variably between stations and groupings. As with the percent fines, the iron concentration appears to have increased slightly near the ore dock and decreased slightly at distance thus altering the trendline from a positive to a negative slope, although much of the variation is related to the high standard deviation.

Table 3.31 Mean Values for % Fines and Iron Concentration in Sediment Based on Distance from the Milne Ore Dock.

Approximate Distance Along Transects from Ore Dock[1] (m)	Sampling Stations	% Fines (<+2 Phi (0.25 mm))						Iron Concentration (mg kg^{-1})					
		2014		2015		2016		2014		2015		2016	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
55 - 215	SN-1	43	10	71	2	58	9	9,900	153	11,000	816	10333	577
	SW-1	61	11	67	7	73	5	8,967	699	8,733	403	10667	577
	SE-1	47	17	40	9	46	6	6,100	1,245	8,900	510	2300	100
236 - 600	SN-2	58	6	53	6	59	4	10,483	518	10,167	602	10233	1662
	SW-2	63	5	76	7	72	10	10,617	549	9,933	759	8900	819
	SE-2	23	5	45	0	39	3	6,967	236	7,233	94	6900	500
501 - 820	SN-3	68	5	73	1	68	25	13,667	943	12,667	471	12233	3060
	SW-3	69	9	76	2	71	4	11,667	471	10,600	993	12333	1528
	SE-3	30	14	39	10	45	5	6,567	670	6,500	490	7100	458
1,001 - 1,225	SN-4	71	4	63	2	66	9	13,167	687	13,000	816	14000	0
	SW-4	92	1	79	7	77	13	12,000	0	8,900	1,068	9667	577
	SE-4	60	6	64	4	58	1	8,217	157	7,933	499	7133	252
1,600 - 2,101	SN-5	61	6	69	2	65	5	14,000	577	14,000	816	14667	577
	SW-5	89	9	81	2	74	5	6,900	1,508	8,167	826	9500	346
	SE-5/SC-1	70	3	80	2	78	3	8,283	908	8,667	1,027	9833	1258
	SC-2	78	10	83	1	85	1	12,167	373	12,667	943	13000	1000
2,637 - 2,638	SC-3	78	10	80	6	84	5	12,833	373	13,667	471	14333	577
3,648 - 3,644	SC-4	60	8	73	6	77	10	12,500	500	13,667	1,247	13000	1732
5,728 - 5,734	SC-5	84	6	89	3	77	10	10,433	4,606	12,000	816	10667	577

[1] Milne ore dock represents the origin of West, East and North Transects. For the sake of comparison, distance of the Coastal Transect sampling stations is measured from the origin of the East Transect

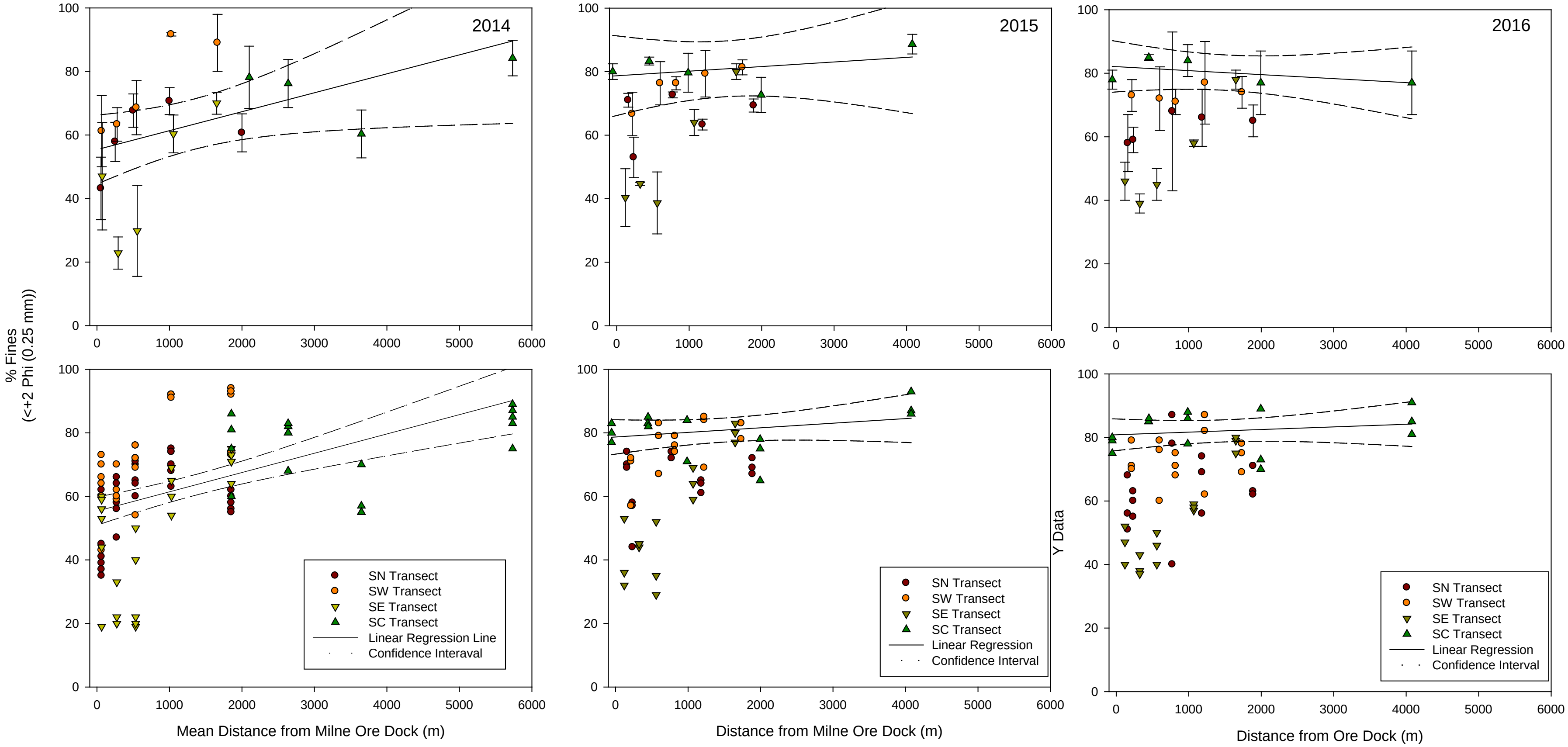


Figure 3.20 Percent Fines at Increasing Distance from Milne Ore Dock.

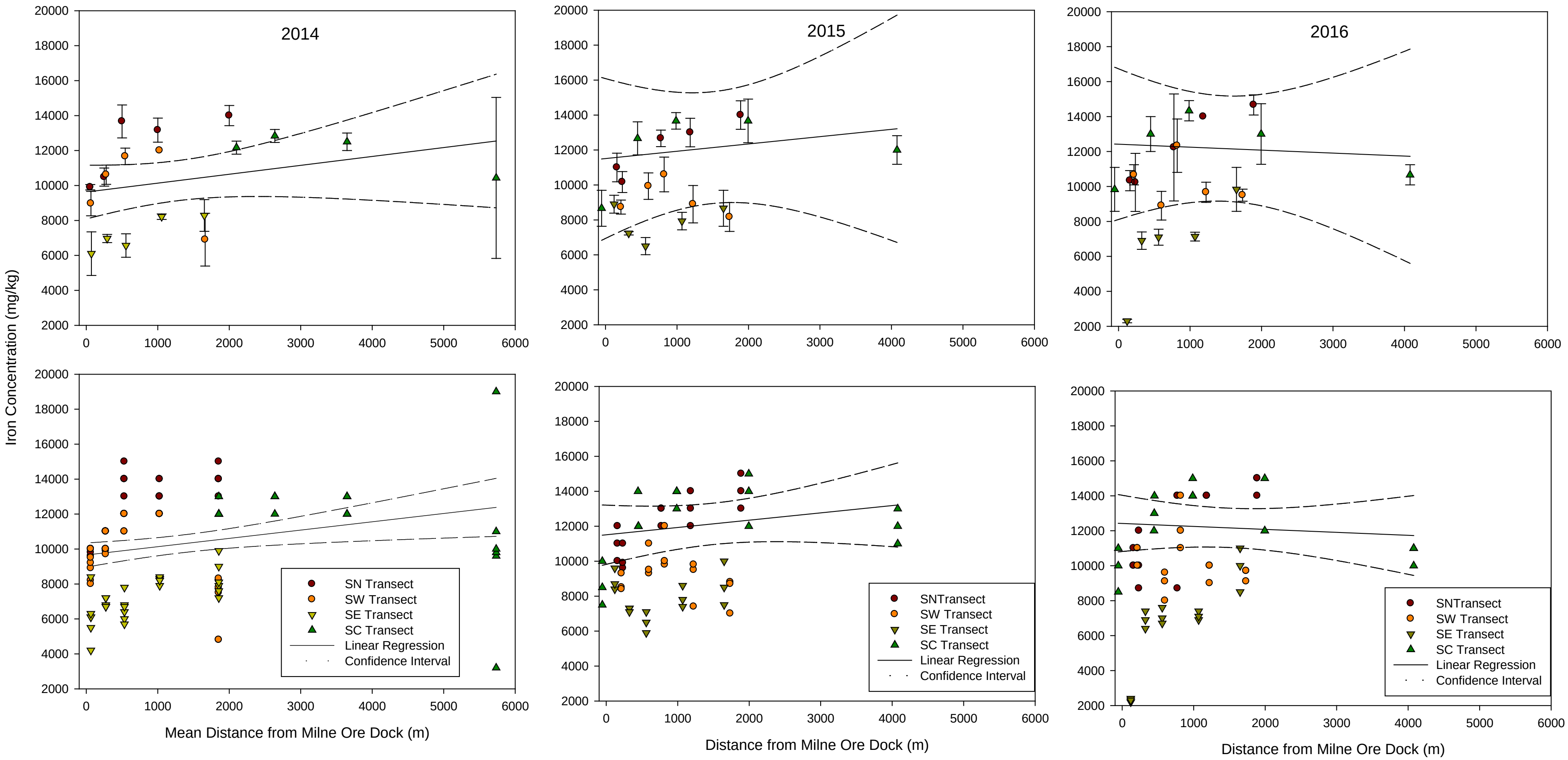


Figure 3.21 Sediment Iron Concentrations at Increasing Distance from Milne Ore Dock.

The first two years of grouping data by stations based on distance from the ore dock had not, as expected, provided many strong indications of existing gradients. The initial relationships continue to reflect the natural variability within the system and the existing site conditions under low Project induced pressure. Any deviation from the baseline gradients may provide the basis for demonstrating changes related to Project activities as additional EEM data are collected. Increased R-values, lower standard deviations and a change to linear regressions with negative slopes would be strong indicators of Project induced change (i.e., higher iron concentrations closer to the ore dock; particle size will be open to interpretation). In the future, the regression analysis may benefit from different types of regression, such as quadratic equations, to further refine the ability to detect change with increasing distance from the ore dock. As more EEM data is collected over additional years, alternatives to linear regression should be explored to increase the power of the statistical analyses.

3.3 Milne Inlet Habitat Surveys

Eight continuous video transects were completed to characterize the substrate distribution and macroflora and macrofauna communities associated with the marine benthic habitat. A total of 19,968 m of substrate were recorded in proximity to the Milne Port and subsequently delineated into smaller segments for analyses (Table 3.32). Transects included two replicates (R1 and R2) at each of the four transects (West, East, Coastal, North). Each replicate followed the corresponding transect established in 2014 to the extent field conditions would permit.

As in previous years, each replicate was subdivided into segments, three of which were analyzed (S1, S2 and S3) along each replicate, with each segment being of increasing distance from the ore dock consistent with the radial gradient design. Video data from between 29% and 54% of each continuous transect was analyzed in detail as summarized in Table 3.33. Overall, 6,400 m or 31% of the total available video was assessed in detail. The un-analyzed portion of the video data has been archived and could be utilized in future years if required.

Results of the habitat surveys for substrate, macroflora and macrofauna are summarized in the following sections while additional detail is provided in Appendix D.

Table 3.32 Locations of Video Data Collection along each Transect, Milne Inlet, 2016.

Location	Replicate ID	Segment ID	Video Start and End Time	Distance from Transect Origin Start and End (m)	Video Length Analyzed (m)	Total Video Length (m)	Percent Video Analyzed (%)	% Not Interpretable[1]
West Transect	R1	S1	0:00:01 – 0:12:29, 0:36:37 – 0:40:25	75 - 460	385	2,092	54	0.3
		S2	0:00:01 – 0:03:18, 0:33:36 – 0:39:52	1,040 – 1,290	250			
		S3	0:09:45 – 0:25:06	1,350 – 1,595	245			
	R2	S1	0:00;01 – 0:03:18, 0:33:36 – 0:39:52	190 - 460	270	2,093	48	5.6
		S2	0:04:52 – 0:13:53	1,040 – 1,290	250			
		S3	0:00:01 – 0:02:52, 0:09:17 – 0:19:11	1,350 – 1,595	245			
East Transect	R1	S1	0:00:01 – 0:01:12, 0:03:59 – 0:14:50	200 - 410	210	1,925	49	0.1
		S2	0:09:48 – 0:20:46	540 - 745	205			
		S3	0:28:16 – 0:41:29	930 – 1,150	220			
	R2	S1	0:05:45 – 0:15:46	200 - 410	210	2,044	46	-
		S2	0:21:39 – 0:30:10	540 - 745	205			
		S3	0:05:28 – 0:20:10	930 – 1,150	220			
Coastal Transect	R1	S1	0:00:01 – 0:09:34, 0:00:01 – 0:02:51	15 - 270	255	3,587	29	0.6
		S2	0:22:26 – 0:34:48	695 – 945	250			
		S3	0:13:43 – 0:24:53	1,530 – 1,780	250			
		S4	0:27:24 – 0:34:37	3890 - 4120	230			
	R2	S1	0:02:28 – 0:13:40	15 - 270	255	3,326	30	1.9
		S2	0:34:21 – 0:46:41	695 – 945	250			
		S3	0:26:02 – 0:38:29	1,530 – 1,780	250			
		S4	0:00:01 – 0:08:20, 0:27:26 – 0:29:31	3890 - 4120	230			
North Transect	R1	S1	0:00:00 – 0:14:25	420 - 685	265	2,453	39	-
		S2	0:00:00 – 0:02:48, 0:07:04 – 0:20:00	965 – 1,215	250			
		S3	0:00:01 – 0:09:15, 0:16:10 – 0:20:02	1,450 – 1,700	250			
	R2	S1	0:02:55 – 0:19:35	435 - 685	250	2,448	48	-
		S2	0:06:11 – 0:19:26	965 – 1,215	250			
		S3	0:00:01 – 0:03:51, 0:10:51 – 0:21:34	1,450 – 1,700	250			

Table 3.32 Locations of Video Data Collection along each Transect, Milne Inlet, 2016. (Cont'd)

Location	Replicate ID	Segment ID	Video Start and End Time	Distance from Transect Origin Start and End (m)	Video Length Analyzed (m)	Total Video Length (m)	Percent Video Analyzed (%)	% Not Interpretable[1]
Total	**8**	**26**			**6,400**	**19,968**	**31**	**8.5**

[1] Video length analyzed was uninterpretable due to camera being out of the water, camera being off the bottom, image being out of focus, camera image being black or blank and other similar reasons.

Table 3.33 provides a comparison of the distances between each replicate for each segment analyzed for substrate, macroflora and macrofauna. The average distance between replicates was 8.4 m, 5.4 m, 5.2 m, and 4.2 m for the West, East, North and Coastal transects respectively. The difficulty in precisely replicating the video segments was in part related to the accuracy of the navigation system on the boat charter, but was also related to the challenges of keeping the video system in a vertical orientation during the survey. This was related to environmental conditions including winds and water currents, and the boat had to constantly adjust speed and location in order to maintain the vertical orientation of the video camera system. More precise replication of video transects will likely continue to be a challenge until an improved sampling platform can be chartered.

Table 3.33 Comparison of Replicates for Each Transect Segment.

Transect/Replicate	Maximum (m)	Minimum (m)	Mean (m)	Transect Mean (m)
West S1	18.4	0	7.4	8.4
West S2	20.4	0	7.3	
West S3	19.0	4.3	10.4	
East S1	17.5	0	6.9	5.4
East S2	10.0	0	3.6	
East S3	18.1	0	5.8	
North S1	9.4	0.4	2.9	5.2
North S2	17.4	0.4	7.8	
North S3	17.6	0.4	4.9	
Coastal S1	10.0	0	4.9	4.2
Coastal S2	7.0	0	3.6	
Coastal S3	15.8	0	5.8	
Coastal S4	8.3	0	2.6	

3.3.1 West Transect

3.3.1.1 Substrate Distribution

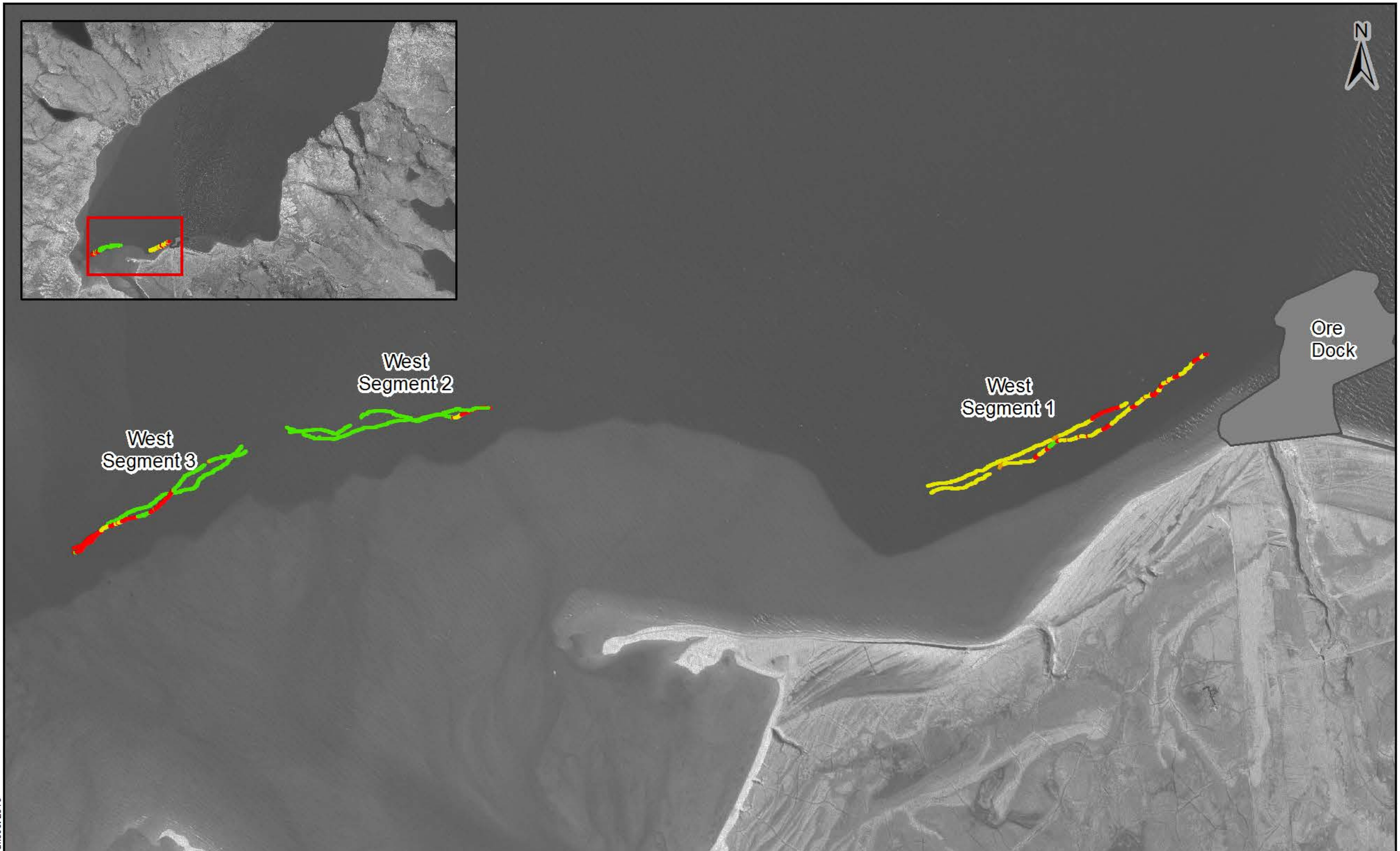
The distribution of substrate types as determined from underwater video analyses for the West Transect is presented in Table 3.34. Data were summarized to include the percent or relative occurrence (% of total time) for each segment and replicate. The identified substrates were generally a combination of two or more types. Overall, the West Transect contained primarily fine substrates mixed with heterogeneous medium sized substrate (gravel/sand/shell). It is noteworthy that shells were an important component of most of the detailed substrate classes. Data were combined into a smaller number of aggregated substrate classes after Kelly *et al*. (2009, draft) (Table 3.35, Figure 3.22). "Fine" was the dominant aggregated substrate class (53%).

Table 3.34 Detailed Substrate Classes for the West Transect.

Substrate Type/Class	WTS1		WTS2		WTS3	
	R1 (%)	R2 (%)	R1 (%)	R2 (%)	R1 (%)	R2 (%)
Boulder, Cobble, Gravel, Sand, Shell	-	-	-	-	-	-
Boulder, Gravel, Sand, Shell	-	1.2	-	-	-	-
Rubble, Cobble, Gravel, Sand, Shell	-	-	-	-	-	-
Cobble, Gravel, Sand, Shell	1.2	0.7	0.6	-	-	0.1
Cobble, Gravel, Sand	-	-	-	0.9	-	-
Cobble, Sand, Shell	-	-	-	0.2	-	-
Cobble, Sand	-	-	-	4.1	-	-
Gravel, Sand, Shell	96.8	95.4	99.4	0.2	99.2	59.6
Gravel, Sand	-	-	-	48.3	0.8	26.2
Sand, Shell	-	-	-	1.7	-	0.5
Sand	-	-	-	43.9	-	11.1
Not Classifiable	1.9	2.7	-	-	-	2.5
Total Time Viewed (s)	**978**	**578**	**981**	**542**	**921**	**767**

Table 3.35 Aggregated Substrate Classes for the West Transect.

Substrate Type/Class	Time Viewed (s)	Percent (%)
Fine	2,510	52.7
Medium	1,319	27.7
Medium/Fine	893	18.7
Not Classifiable	42	0.9
Total Time Viewed/Percent	**4,764**	**100**



Legend

Substrate Class

- Fine
- Medium/Fine
- Medium
- Not Classifiable

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY.

0 100 200 300 Meters

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MARY RIVER PROJECT

Substrate
West Transect 2016

SEM

REF NO.
070-025-1-015

FIGURE 3.22

REV
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FIGURE ID: 070-025-1-015 Substrate West Transect 2016

3.3.1.2 Macrofloral Distributions

Table 3.36 provides a detailed listing of the macroflora types identified in the underwater video for the West Transect. Overall there was a moderate density of macroflora with no flora observed in 47% of the video. Data were aggregated into a smaller number of macrofloral classes owing to the varying levels of taxonomic description (Table 3.37). Figure 3.23 displays the distribution of the aggregated macroflora classes. The dominant feature of the macrofloral video data was the distribution of *Desmarestia* sp., brown algae (66%) while the aggregated macrofloral classes, after 'no flora' (47.2%), were primarily composed of brown algae (36.9%).

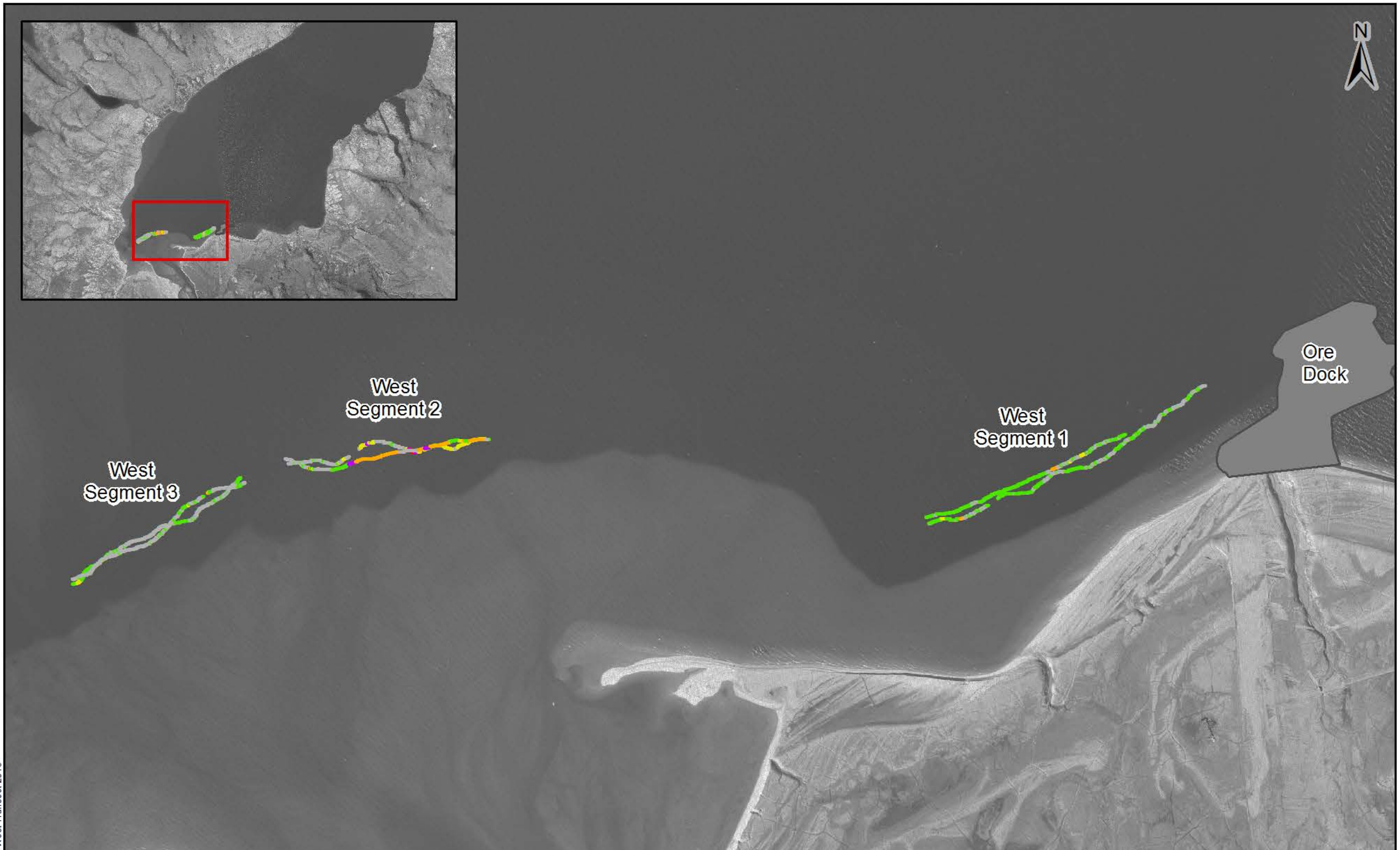
Table 3.36 Detailed Relative Percent Cover of Macrofloral Types for the West Transect.

Taxa	Common Name	Macroflora Type	Time Viewed (s)	Percent (%)
Agarum cribrosum	Sea colander	Brown Algae	227	9.0
Desmarestia sp.	Sour weed	Brown Algae	1,666	66.1
Laminaria sp.	Brown bladed kelp	Brown Algae	56	2.2
Chondrus crispus	Red irish moss	Red Algae	530	21.0
	Seagrass		41	1.6
Wrack	Fucus		1	0.04
Total Time Viewed/Percent			**2,521**	**100**

Table 3.37 Aggregated Macrofloral Classes for the West Transect.

Macrofloral Class	Taxa	Time Viewed (s)	Percent (%)
Brown Algae	*(Agarum cribrosum, Desmarestia* sp., *Laminaria* sp., *Punctuaria* sp.*)*	1,787	36.9
Red Algae	*(Chondrus crispus)*	530	10.9
Wrack	(*Fucus* sp.)	1	0.02
Not Classifiable		238	4.9
No Flora		2,292	47.2
Total Time Viewed/Percent		**4,848**	**100**

Macroflora were moderately common and were identified in all six transects (Table 3.38). The dominant macrofloral class was brown algae (*Desmarestia*) and red algae (*Chondrus*) also in prominent quantities. The percent occurrence indicates the proportion of the total area occupied by each taxon. A total of five vegetation types were identified in the study area with two classes commonly identified including *Desmarestia* (sour weed) and *Chondrus crispus* (Irish moss), representing 67.6 and 21.1% of the relative abundance, respectively.



Legend
Macroflora Cover

- No Cover
- 1 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- Not Classified

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 100 200 300 Meters

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MARY RIVER PROJECT

Macroflora Cover
West Transect 2016

SEM

REF NO.
070-025-01-020

FIGURE 3.23

REV
0

FIGURE ID: 070-025-01-020 Macroflora Cover West Transect 2015

Table 3.38 Macroflora Frequency of Occurrence along the West Transect.

Transect ID	Segment ID	Video Duration (min:sec)	Frequency of Occurrence (number of times viewed)				
			Agarum cribrosum (Sea colander)	*Laminaria* sp. (Brown bladed kelp)	*Chondrus crispus* (Irish moss)	*Desmarestia* sp. (Sour weed)	*Fucus* sp. (Wrack)
WT	S1-R1	16:17	121	21	12	475	-
WT	S1-R2	9:46	105	26	6	388	-
WT	S2-R1	16:19	-	7	118	573	-
WT	S2-R2	9:01	1	2	96	85	-
WT	S3-R1	15:21	-	-	180	170	-
WT	S3-R2	12:47	-	-	118	11	1
Total			**227**	**56**	**530**	**1,702**	**1**
Percent (%)			**9.0**	**2.2**	**21.1**	**67.6**	**0.04**

3.3.1.3 Benthic Epifauna

Table 3.39 provides a detailed listing of the macrofauna types observed in the underwater video for the West Transect. A total of 3,876 individuals from 16 taxa were identified of which the dominant fauna included brittle star (n=1,937) and sea urchin (n=1,190).

Table 3.39 Macrofauna Taxa Observed along the West Transect.

Taxa	Common Name	Total Abundance	Relative Abundance (%)
Ophiuridea	Brittle star	1,937	50.0
Echinoida sp.	Sea urchin	1,190	30.7
Placopecten magellanicus	Sea scallop	400	10.3
Limacina helicina	Sea butterfly	149	3.8
	Unidentified worm	76	2.0
Ctenophora sp.	Ctenophore	31	0.8
Chordata sp.	Sea squirts	24	0.6
Cladocera sp.	Water flea	23	0.4
Clypeasteroida sp.	Sand dollar	19	0.5
Ctenodiscus crispatus	Mud star	15	0.4
Buccinum undatum	Common whelk	4	0.1
Actiniaria	Sea anemone	3	0.1
Bourgueticrinina	Sea lily	2	0.05
Myoxocephalus sp.	Sculpin	2	0.05
Pandalus sp.	Red shrimp	1	0.03
Total/Percent		**3,876**	**100**

3.3.2 East Transect

3.3.2.1 Substrate Distribution

The distribution of substrate types as determined from underwater video analyses for the East Transect is presented in Table 3.40. Data were summarized to include the percent or relative occurrence (% of total time) for each segment and replicate. The identified substrate was generally a combination of two or more types. Overall, the East Transect contained primarily medium substrates with a heterogeneous mix of substrates with the combination of cobble/gravel/sand/shell and gravel/sand/shell being dominant. Shells were a component of nearly all detailed substrate types. Due to the large number of substrate combinations observed, the data were aggregated into a smaller number of substrate classes (Table 3.41, Figure 3.24). "Medium" was the dominant aggregated substrate class (82%) followed by "medium/fine" (10%).

Table 3.40 Detailed Substrate Classes for the East Transect.

Substrate Type/Class	ETS1		ETS2		ETS3	
	R1 (%)	R2 (%)	R1 (%)	R2 (%)	R1 (%)	R2 (%)
Boulder, Cobble, Gravel, Sand, Shell	-	-	-	0.4	0.4	-
Boulder, Cobble, Gravel, Sand	-	-	-	-	-	0.2
Boulder, Gravel, Sand, Shell	1.2	0.3	0.9	-	0.6	-
Rubble, Cobble, Gravel, Sand, Shell	-	0.5	0.5	0.6	3.3	9.0
Rubble, Cobble, Gravel, Sand	-	-	-	-	-	0.2
Rubble, Gravel, Sand, Shell	1.9	0.2	2.4	-	0.4	--
Cobble, Gravel, Sand, Shell	8.1	83.9	13.2	85.1	31.9	90.7
Gravel, Sand, Shell	87.8	15.3	83.0	13.9	63.6	-
Not Classifiable	0.8	-	-	-	-	-
Total Times Viewed	**723**	**601**	**659**	**512**	**793**	**881**

Table 3.41 Aggregated Substrate Classes for the East Transect.

Substrate Type/Class	Time Viewed (s)	Percent (%)
Fine	314	7.5
Medium	3,420	82.1
Medium/Fine	432	10.4
Total Time Viewed/Percent	**4,166**	**100**

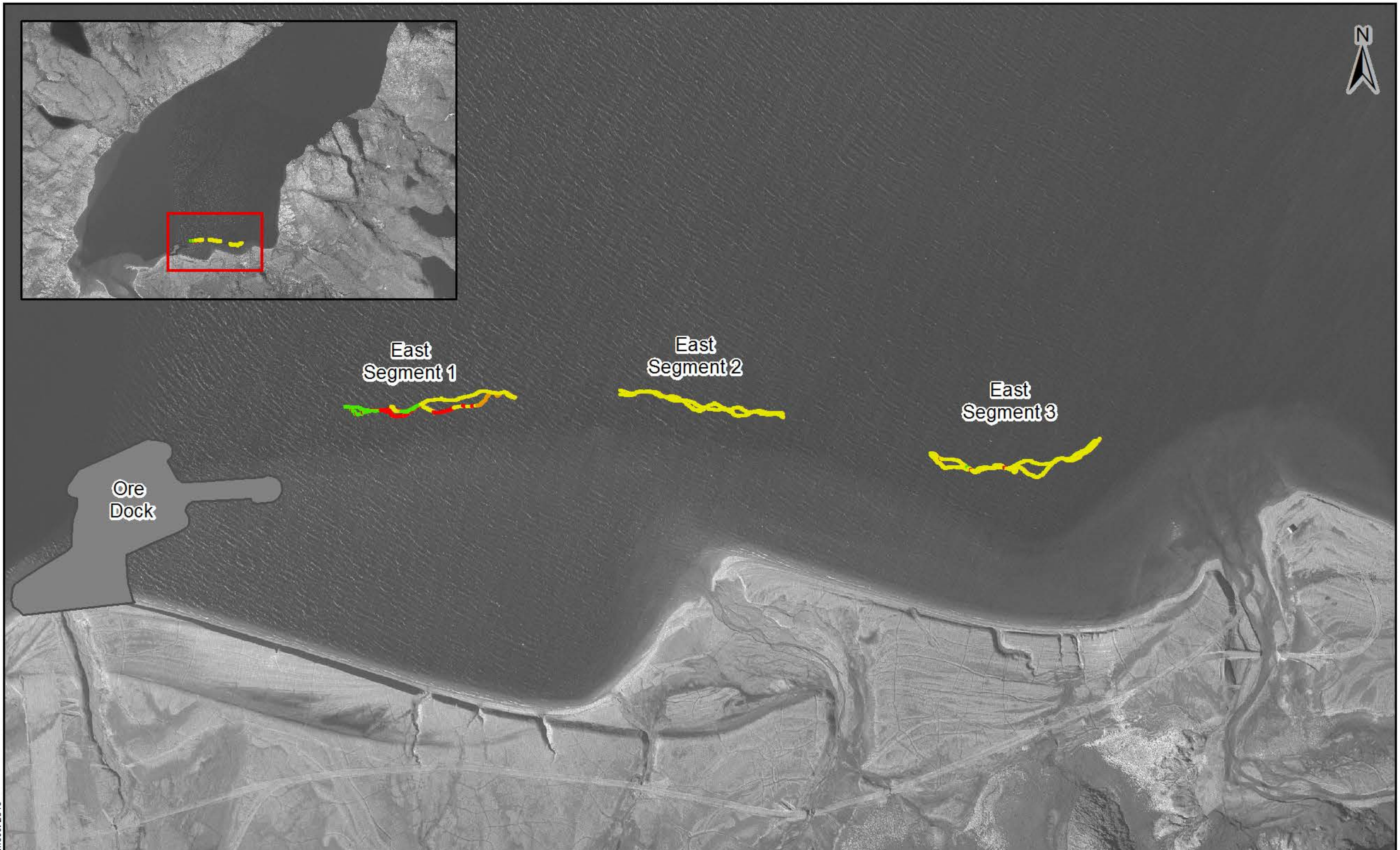

FIGURE ID: 070-025-1-013 Substrate East Transect 2016

Legend

Substrate Class

- Fine
- Medium/Fine
- Medium
- Not Classifiable

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

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Substrate
East Transect 2016

SEM

REF NO.
070-025-1-013

FIGURE 3.24

REV
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3.3.2.2 Macrofloral Distributions

Table 3.42 provides a detailed listing of the macroflora types identified in the underwater video. Overall there was a relatively low diversity of macroflora. Due to varying levels of taxonomic description, data were aggregated into a smaller number of macrofloral classes (Table 3.43). Figure 3.25 displays the distribution of the aggregated macroflora. The aggregated macrofloral classes consisted primarily of brown algae (66%). Areas categorized as having no flora were viewed 28.5% of the time.

Table 3.42 Detailed Relative Percent Cover of Macrofloral Types for the East Transect.

Taxa	Common Name	Macroflora Type	Time Viewed (s)	Percent (%)
Desmarestia sp.	Sour Weed	Brown Algae	2,730	77.45
Agarum cribrosum	Sea Colander	Brown Algae	533	15.12
Chondrus crispus	Irish Moss	Red Algae	231	6.55
Laminaria sp.	Brown Bladed Kelp	Brown Algae	29	0.82
Fucus sp.		Wrack	2	0.06
Total Time Viewed/Percent			**3,525**	**100**

Table 3.43 Aggregated Macrofloral Classes for the East Transect.

Macrofloral Class	Taxa	Time Viewed (s)	Percent (%)
Brown Algae	(*Agarum cribrosum, Desmarestia* sp., *Laminaria* sp.)	2,898	66.3
Red Algae	*(Chondrus crispus)*	228	5.2
Wrack	(*Fucus* sp.)	2	0.05
No Flora		1,244	28.5
Total Time Viewed/Percent		**4,372**	**100**

Note [1]: Total time viewed is less than in Table 3.44 as macroalgal types were observed together at many locations.

Macroflora were relatively common and were identified in all six transects (Table 3.44). The percent occurrence indicates the proportion of the total area occupied by each taxon. A total of four vegetation types were identified at the study area with *Desmarestia* (sour weed) representing the highest proportion (77.4%). The three macrofloral classes viewed were brown algae with various *Agarum*, *Desmarestia* and, to a much lesser extent, *Laminaria* species, red algae represented by *Chondrus* species, and wrack represented by *Fucus* species.

Legend
Macroflora Cover

- No Cover
- 1 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- Not Classified

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 100 200 300 Meters

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MARY RIVER PROJECT

Macroflora Cover
East Transect 2016

SEM

REF NO. 070-025-01-017

FIGURE 3.25

REV 0

FIGURE ID: 070-025-01-017 Macroflora Cover East Transect 2016

Table 3.44 Macroflora Frequency of Occurrence along the East Transect.

Transect ID	Segment ID	Video Duration (min:sec)	Frequency of Occurrence (number of times viewed)				
			Agarum cribrosum (Sea Colander)	*Laminaria* sp. (Brown Bladed Kelp)	*Chondrus crispus (Irish Moss)*	*Desmarestia* sp. (Sour Weed)	*Fucus* sp. (Wrack)
ET	S1-R1	14:21	77	20	4	357	-
ET	S1-R2	10:02	32	2	-	33	2
ET	S2-R1	10:59	137	1	28	621	-
ET	S2-R2	8:31	70	-	3	372	-
ET	S3-R1	13:13	145	6	195	549	-
ET	S3-R2	14:41	72	-	1	797	-
Total			**533**	**29**	**231**	**2,729**	**2**
Percent (%)			**15.1**	**0.8**	**6.6**	**77.4**	**0.1**

3.3.2.3 Benthic Epifauna

Table 3.45 provides a detailed listing of the macrofauna types observed in the underwater video for the East Transect. A total of 5,264 individuals from 14 taxa were identified of which the dominant fauna included brittle star (n=3,141) and sea urchins (n=1,783).

Table 3.45 Macrofauna Taxa Observed along the East Transect.

Taxa	Common Name	Total Abundance	Relative Abundance (%)
Ophiuridea	Brittle star	3,141	59.67
Echinoida sp.	Sea urchin	1,783	33.87
Placopecten magellanicus	Sea scallop	198	3.67
Limacina helicina	Sea butterfly	32	0.61
Bivalvia sp.	Clam	26	0.49
Ctenophora sp.	Ctenophore	17	0.32
Actiniaria	Sea anemone	16	0.30
Asteriid sp.	Sea star	15	0.29
Echinocardium cordatum	Sea potato	11	0.21
Myoxocephalus sp.	Sculpin	8	0.15
Bourgueticrinina	Sea lily	4	0.08
Cnidarian sp.	Jelly fish	3	0.06
Clypeasteroida	Sand dollar	2	0.04
Buccinum undatum	Common whelk	1	0.02
Total/Percent		**5,264**	**100**

3.3.3 North Transect

3.3.3.1 Substrate Distribution

The distribution of substrate types as determined from underwater video analyses for the North Transect is presented in Table 3.46. Data were summarized to include the percent or relative occurrence (% of total time) for each segment and replicate. The identified substrate was generally a combination of two or more types. Overall, the North Transect contained primarily fine substrates with a heterogeneous mix of gravel/sand/shell occurring most frequently. Due to the large number of substrate combinations observed, data were aggregated into a smaller number of substrate classes (Table 3.47, Figure 3.26). "Fine" was the dominant aggregated substrate class (65.6%) followed by "medium/fine" (23.2%).

Table 3.46 Detailed Substrate Classes for the North Transect.

Substrate Type/Class	NTS1		NTS2		NTS3	
	R1 (%)	R2 (%)	R1 (%)	R2 (%)	R1 (%)	R2 (%)
Boulder, Rubble, Cobble, Gravel, Sand, Shell	-	0.7	0.5	0.8	-	-
Boulder, Cobble, Gravel, Sand, Shell	-	-	1.7	1.1	1.8	0.1
Boulder, Gravel, Sand, Shell	2.1	1.1	-	0.6	0.8	1.3
Rubble, Cobble, Gravel, Sand, Shell	-	1.1	10.6	6.9	1.0	1.5
Rubble, Cobble, Sand, Shell	-	0.4	0.5	-	-	-
Rubble, Gravel, Sand, Shell	1.2	0.3	1.4	1.4	-	1.0
Rubble, Sand, Shell	-	0.9	-	-	-	-
Cobble, Gravel, Sand, Shell	8.2	6.1	57.9	54.0	45.7	17.6
Cobble, Gravel, Sand	-	-	-	0.9	-	-
Cobble, Sand, Shell	1.7	6.4	3.4	-	-	-
Cobble, Sand	-	-	-	0.5	-	-
Gravel, Sand, Shell	75.7	41.8	23.4	31.6	50.8	70.5
Sand	-	-	-	2.4	-	3.4
Sand, Shell	11.1	41.3	0.6	-	-	4.6
Total Times Viewed	**864**	**1,000**	**945**	**795**	**787**	**874**

Table 3.47 Aggregated Substrate Classes for the North Transect.

Substrate Type/Class	Time Viewed (s)	Percent (%)
Fine	3,457	65.6
Medium	590	11.2
Medium/Fine	1,223	23.2
Total Time Viewed/Percent	**5,270**	**100**

Legend

- Fine
- Medium/Fine
- Medium
- Not Classifiable

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

0 125 250 375 Meters

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Substrate North Transect 2016

SEM

REF NO. 070-025-1-014

FIGURE 3.26

REV 0

FIGURE ID: 070-025-1-014 Substrate North Transec 2015

3.3.3.2 Macrofloral Distributions

Table 3.48 provides a detailed listing of the macroflora types identified in the North Transect underwater video. Overall there was a very low diversity and abundance of macroflora. For consistency with other transects, the data were aggregated into a smaller number of macrofloral classes (Table 3.49). Figure 3.27 displays the distribution of the aggregated macroflora. The aggregated macrofloral classes consisted of red algae (0.6%) and wrack (0.1%), while the areas categorized as having no flora were viewed 99.3% of the time. This is as expected due to the increasing depth along the North Transect, with most of the transect being outside of the euphotic zone.

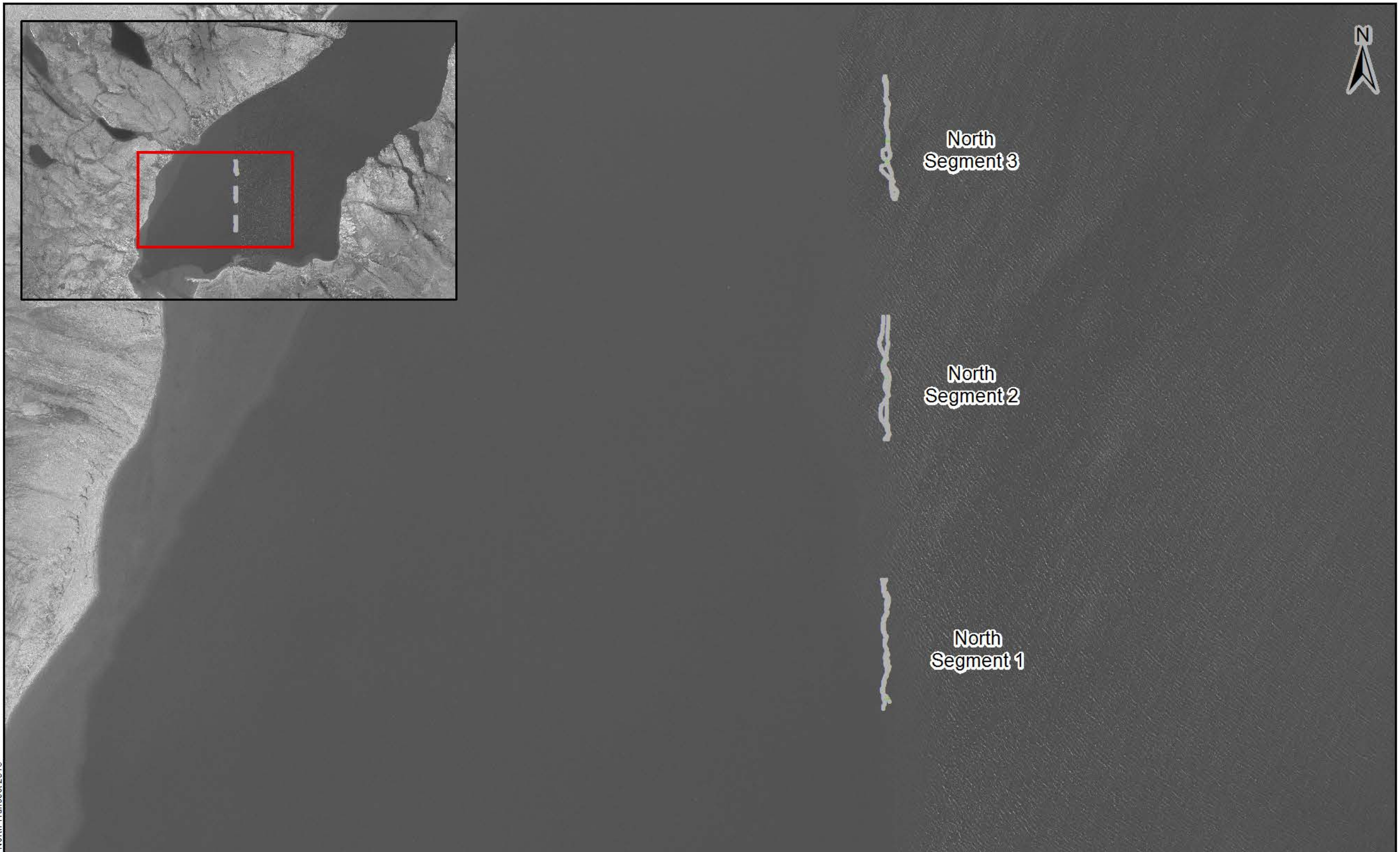
Table 3.48 Detailed Relative Percent Cover of Macrofloral Types for the North Transect.

Taxa	Common Name	Macroflora Type	Time Viewed (s)	Percent (%)
Chondrus crispus	Irish Moss	Red Algae	30	88.2
Fucus sp.	Wrack	Wrack	4	11.8
Total Time Viewed/Percent			**34**	**100**

Table 3.49 Aggregated Macrofloral Classes for the North Transect.

Macrofloral Class	Taxa	Time Viewed (s)	Percent (%)
Red Algae	*(Chondrus crispus)*	30	0.6
Wrack	(*Fucus* sp.)	4	0.1
No Flora		5,236	99.3
Total Time Viewed/Percent		**5,270**	**100**

Macroflora were uncommon but were identified in all six transects (Table 3.50). The two macrofloral types viewed were red algae with *Chondrus* species apparent and wrack with *Fucus* species (one transect only).



Legend
Macroflora Cover
- No Cover
- 1 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- Not Classified

NOTES
1. BASE MAP: COPYRIGHT EAGLE MAPPING, SATELLITE IMAGERY

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Macroflora Cover
North Transect 2016

SEM

REF NO.
070-021-1-018

FIGURE 3.27

REV
0

FIGURE ID: 070-021-1-018 Macroflora Cover North Transect 2015

Table 3.50 Macroflora Frequency of Occurrence along the North Transect.

Transect ID	Segment ID	Video Duration (min:sec)	Frequency of Occurrence (number of times viewed)	
			***Chondrus crispus* (Irish Moss)**	***Fucus* sp. (Wrack)**
NT	S1-R1	14:25	3	4
NT	S1-R2	16:40	3	-
NT	S2-R1	15:45	7	-
NT	S2-R2	13:15	3	-
NT	S3-R1	13:07	2	-
NT	S3-R2	14:35	12	-
	Total		**30**	**4**
	Percent (%)		**88**	**12**

3.3.3.3 Benthic Epifauna

Table 3.51 provides a detailed listing of the macrofauna types observed in the underwater video for the North Transect. A total of 5,294 individuals from 17 taxa were identified of which the dominant fauna included brittle star (n=4,602) and feather duster worms (n=318), which was a very large increase from 2015 (444 organisms).

Table 3.51 Macrofauna Taxa Observed along the North Transect.

Taxa	Common Name	Time(s) or Number Viewed	Percent
Ophiuridea	Brittle star	4,602	86.9
Sabellidae	Feather duster worm	318	6.0
Echinoida sp.	Sea urchin	179	3.4
Ctenophora sp.	Ctenophore	57	0.9
Asteriid sp.	Sea star	39	0.7
Actiniaria	Sea anemone	23	0.4
Crossaster papposus	Sun star	17	0.3
Bourgueticrinina	Sea lily	17	0.3
Ctenodiscus crispatus	Mud star	12	0.2
Buccinum undatum	Common whelk	11	0.2
Cnidaria sp.	Cnidarian	7	0.1
	Eelpout	7	0.1
Myoxocephalus sp.	Sculpin	2	0.0
Limacina helicina	Sea butterfly	2	0.0
Echinocardium cordatum	Sea potato	1	0.0
Placopecten magellanicus	Sea scallop	1	0.0
Pandalus sp.	Red shrimp	1	0.0
Total/Percent		**5,294**	**100**

3.3.4 Coastal Transect

3.3.4.1 Substrate Distribution

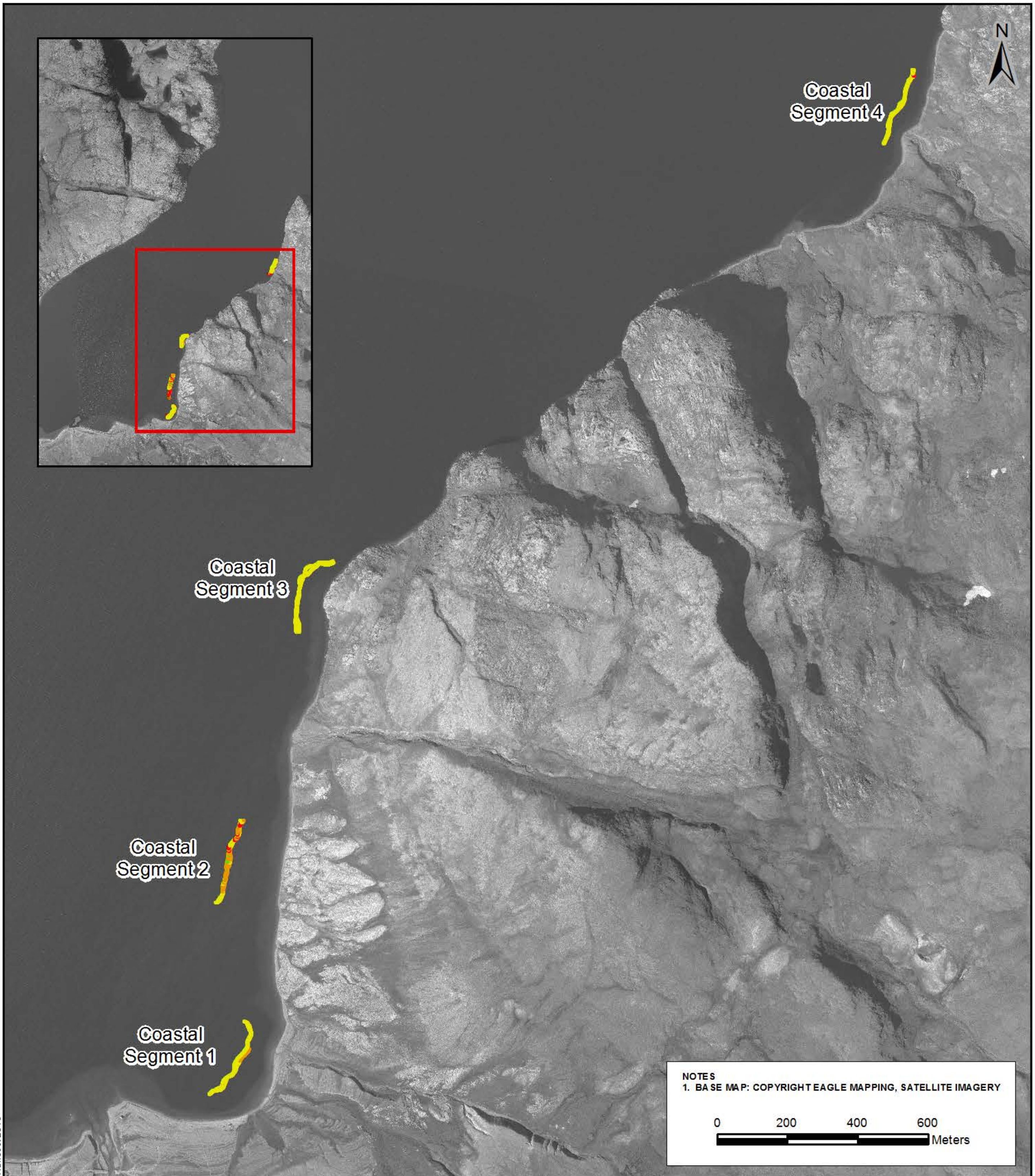
The distribution of substrate types for the Coastal Transect is presented in Table 3.52. Data were summarized to include the percent or relative occurrence (% of total time) for each segment and replicate. The identified substrate was generally a combination of two or more types. Overall, the Coastal Transect contained primarily medium sized substrate with a heterogeneous mix cobble/gravel/sand shell occurring most frequently. Shells were apparent in eleven of fifteen detailed substrate classes. Due to the large number of substrate combinations observed, data were aggregated into a smaller number of substrate classes (Table 3.53, Figure 3.28). "Medium" was the dominant aggregated substrate class (77%).

Table 3.52 Detailed Substrate Classes for the Coastal Transect.

Substrate Type/Class	CTS1		CTS2		CTS3		CTS4	
	R1 (%)	R2 (%)	R1 (%)	R2 (%)	R1 (%)	R2 (%)	R1 (%)	R2 (%)
Boulder, Rubble, Cobble, Gravel, Sand, Shell	-	-	-	-	-	0.5	-	0.5
Boulder, Cobble, Gravel, Sand, Shell	-	2.7	-	-	0.7	2.4	-	1.6
Boulder, Gravel, Sand, Shell	-	1.5	-	0.9	0.1	2.5	1.4	3.0
Boulder, Gravel, Shell	-	-	-	0.5	-	-	-	-
Rubble, Cobble, Gravel, Sand, Shell	1.2	1.6	-		4.2	6.1	1.8	0.6
Rubble, Gravel, Sand, Shell	0.3	0.4	-	0.3	0.7	3.3	0.9	4.6
Cobble, Gravel, Sand, Shell	38.5	76.7	10.5	2.7	69.3	36.4	40.6	21.9
Cobble, Gravel, Sand	0.4	-	-		-	-	-	-
Cobble, Gravel, Shell	-	-	-	1.8	-	-	-	-
Gravel, Sand, Shell	19.7	17.1	17.6	26.0	24.3	48.4	55.3	67.7
Gravel, Sand	6.4	-	14.1		-	-	-	-
Gravel, Shell	-	-	-	10.9	-	-	-	-
Sand, Shell	-	-	-	3.5	-	-	-	-
Sand	-	-	0.3	-	-	-	-	-
Not Classifiable	33.4	-	57.5	53.3	0.6	0.3	-	-
Total Times Viewed	**745**	**672**	**742**	**730**	**670**	**747**	**433**	**625**

Table 3.53 Aggregated Substrate Classes for the Coastal Transect.

Substrate Type/Class[1]	Time Viewed (s)	Percent (%)
Fine	28	0.5
Medium	4,139	76.9
Medium/Fine	141	2.6
Not Classifiable	1,073	19.9
Total Time Viewed/Percent	**5,381**	**100**



Legend

Substrate Class

- Fine
- Medium/Fine
- Medium
- Not Classifiable

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Substrate
Coastal Transect 2016

REF NO.
070-025-01-016

FIGURE 3.28

REV
0

FIGURE ID: 070-025-01-016 Substrate Coastal Transect 2016

3.3.4.2 Macrofloral Distributions

Table 3.54 provides a detailed listing of the macroflora types identified in the underwater video. Overall there was a moderate diversity of macroflora. Due to the varying levels of taxonomic description, data were aggregated into a smaller number of macrofloral classes (Table 3.55). Figure 3.29 displays the distribution of the aggregated macroflora. The aggregated macrofloral classes consisted of brown (93%), red algae (0.2%) and wrack (0.2%). Areas categorized as having no flora were viewed only 2.8% of the time while 3.6% of the video could not be classified.

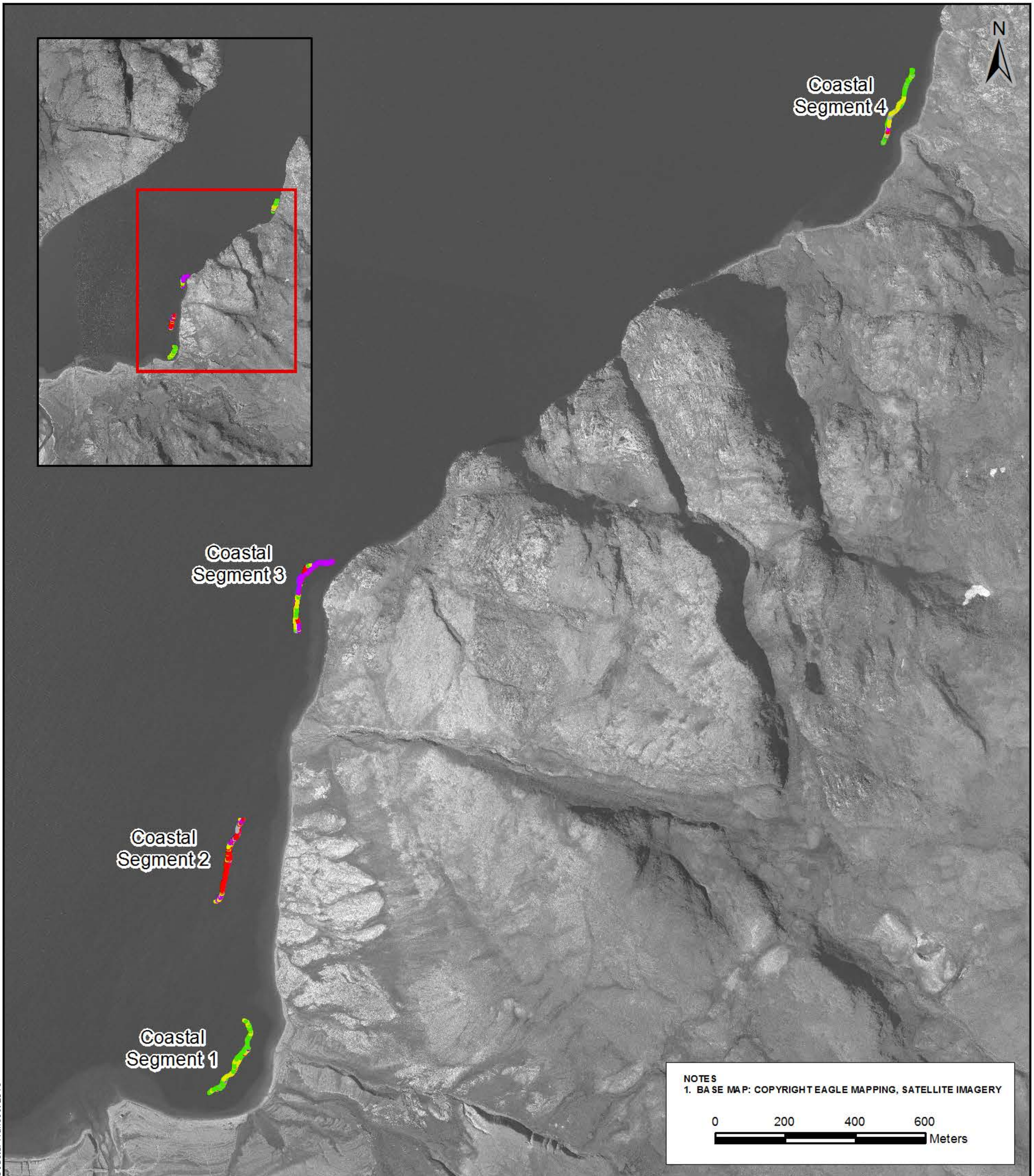
Table 3.54 Detailed Relative Percent Cover of Macrofloral Types for the Coastal Transect.

Taxa	Common Name	Macroflora Type	Time Viewed (s)	Percent (%)
Agarum cribrosum	Sea colander	Brown Algae	1,286	19.7
Desmarestia sp.	Sour weed	Brown Algae	5,004	76.5
Laminaria sp.	Brown bladed kelp	Brown Algae	228	3.5
Chondrus crispus	Red irish moss	Red Algae	13	0.2
Fucus sp.		Wrack	9	0.1
Total Time Viewed/Percent			**6,540**	**100**

Table 3.55 Aggregated Macrofloral Classes for the Coastal Transect.

Macrofloral Type	Taxa	Time Viewed (s)	Percent (%)
Brown Algae	(*Agarum cribrosum, Desmarestia* sp., *Laminaria* sp.)	5,041	93.2
Red Algae	(*Chondrus crispus*)	13	0.2
Wrack	(*Fucus* sp.)	9	0.2
Not Classifiable		196	3.6
No Flora		151	2.8
Total Time Viewed/Percent		**5,410**	**100**

Macroflora were relatively common and were identified in eight transects (Table 3.56). The dominant macrofloral type was brown algae with various *Agarum*, *Desmarestia* and *Laminaria* species apparent. A total of three vegetation classes were commonly identified, with *Desmarestia* (sour weed) and *Agarum cribrosum* (sea colander) representing the majority with 77 and 20% of the relative abundance, respectively.



Legend
Macroflora Cover

- No Cover
- 1 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- Not Classified

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Macroflora Cover
Coastal Transect 2016

SEM

REF NO.
070-025-01-018

FIGURE 3.29

REV
0

FIGURE ID: 070-025-01-018 Macroflora Cover Coastal Transect 2016

Table 3.56 Macroflora Frequency of Occurrence along the Coastal Transect.

Transect ID	Segment ID	10:25	Frequency of Occurrence (number of times viewed)				
			Agarum cribrosum (Sea colander)	*Laminaria* sp. (Brown bladed kelp)	*Chondrus crispus* (Irish moss)	*Desmarestia* sp. (Sour weed)	*Fucus* sp. (Wrack/ Rockweed)
CT	S1-R1	8:35	136	10	13	579	-
CT	S1-R2	11:13	203	9	-	664	-
CT	S2-R1	12:23	102	30	-	743	-
CT	S2-R2	12:21	77	22	-	688	-
CT	S3-R1	11:11	235	38	-	644	5
CT	S3-R2	12:28	285	93	-	748	-
CT	S4-R1	7:14	90	4	-	404	4
CT	S4-R2	10:26	158	11	-	534	-
	Total		**1,286**	**217**	**13**	**5,004**	**9**
	Percent (%)		**19.7**	**3.3**	**0.2**	**76.6**	**0.1**

3.3.4.3 Benthic Epifauna

Table 3.57 provides a detailed listing of the macrofauna types observed in the underwater video for the Coastal Transect. A total of 6,328 individuals from 14 taxa were identified of which the dominant fauna included brittle star (n=5,028) and sea urchin (n=1,071).

Table 3.57 Macrofauna Taxa Observed along the Coastal Transect.

Taxa	Common Name	Time(s) or Number Viewed	Percent
Ophiuridea	Brittle star	5,028	79.5
Echinoida sp.	Sea urchin	1,071	16.9
Placopecten magellanicus	Sea scallop	95	1.5
Cnidaria sp.	Cnidarian	55	0.9
Ctenophora sp.	Ctenophore	50	0.8
Limacina helicina	Sea butterfly	7	0.1
Asteriid sp.	Sea star	4	0.06
Myoxocephalus sp.	Sculpin	4	0.06
Actiniaria	Sea anemone	3	0.05
Bivalvia sp.	Clam	3	0.05
Clypeasteroida	Sand dollar	3	0.05
Crossaster papposus	Sun star	2	0.03
Sabellidae	Feather duster worm	1	0.02
Buccinum undatum	Common whelk	1	0.02
Total/Percent		**6,328**	**100**

3.3.5 Summary

In 2016, detailed habitat surveys were completed in the Milne Port area along the same four distinct transects surveyed in both 2014 and 2015, with the exception that video data was not collected from the North Transect in 2014 due to safety considerations in relation to the increased vessel traffic in the area. The four transects were replicated to produce two datasets per transect (R1 and R2) along the same approximate depth contour of 15 m. Data from the replicates reflected high heterogeneity within a small area. Habitat surveys followed DFO protocols (Kelly *et al*. 2009, draft) and video was analyzed for substrate, macroflora and benthic epifauna.

Habitats along the West Transect contained primarily fine substrates (53%), with a heterogeneous mix of medium (28%) sized material. Overall there was a moderate density and diversity of macroflora, with brown and red algae, principally various *Desmarestia* (66%), *Chondrus crispus* (Red algae 21%), *Agarum cribrosum* (9%), and *Laminaria* (2%) species apparent. *Chlorophyta* was absent in 2016 (0.1% in 2015). Macrofauna observed in the underwater video were dominated by brittle star (1,937; 50%) and sea urchin (1,190 individuals; 31%).

Habitats along the East Transect contained primarily medium substrates (82%), with minor amounts of fine (7.5%) sized material. Overall there was good abundance but moderate diversity of macroflora, with the dominant type being brown algae with various *Desmarestia* (77%), *Agarum cribrosum* (15%) and *Laminaria* (1%) species apparent. Red algae (*Chondrus crispus*; 7%) was also present. Macrofauna observed in the underwater video were dominated by brittle star (3,141 individuals; 60%) and sea urchin (1,783; 34%)

Habitats along the North Transect contained primarily fine substrates (66%), with a heterogeneous mix of medium fine (23%) sized material. Overall there was low abundance and diversity of macroflora, with only red algae (*Chondrus crispus;* 88%; 0.6% of analysis) present in all transects and wrack (*Fucus sp*.; 12%; 0.1% of analysis). There was a large increase in the number of macrofauna observed in the underwater video, which for 2016 were dominated by brittle star (4,602 individuals; 87%) and feather duster worm (318; 6%).

Habitats along the Coastal Transect contained primarily medium substrates (77%), with a heterogeneous mix of medium/fine (2.6%) sized material. Overall there was good abundance but moderate diversity of macroflora dominated by brown algae with various *Desmarestia*

(77%), *Agarum cribrosum* (20%) and *Laminaria* (4%) species apparent. Red algae (*Chondrus crispus;* 0.2%) was present in much lower numbers than in 2015 (17%). Macrofauna observed in the underwater video was dominated by brittle star (5,028 individuals; 80%) and sea urchin (1,071; 17%).

The substrate distribution along the four transects was dominated by fine to medium/fine to medium materials, depending on the location and depth. Macrofloral composition was similar along the three 15 m depth transects being dominated by brown algae and varying amounts of red algae while the deeper North Transect had a very low abundance of only red algae and a near negligible amount of wrack. The dominant taxa from the 15 m depth transects included, *Desmarestia* (66-77%), *Agarum cribrosum* (9-20%), and *Laminaria* (1-4%). Red algae were present in lower abundance varying between 0.2 and 21%. Macrofaunal abundances ranged from 3,876 to 6,328 individuals observed, a considerable increase from 2015 at all transects (444 to 2,678 individuals). The dominant taxa included brittle star (1,937 to 5,028 individuals) and sea urchin (179 to 1,783 individuals).

3.3.6 EEM Analysis – Percent Macroflora Cover

Environmental changes resulting from the redistribution of sediment and/or deposition of dust as a result of Project activities (i.e., ore loading) around the Milne ore dock has been selected as a candidate for the MEEMP. Fines percent was previously selected for inclusion in the MEEMP and percent macroflora cover was selected as a biological indicator of the effects of habitat alteration due to sediment deposition and redistribution. The percent macroflora cover for 2014, 2015 and 2016 was plotted against distance from transect origins and an analysis of covariance was conducted in order to determine whether the slopes from the linear regressions were significantly different between years.

It is important to note that there has been high natural variability shown between adjacent transects collected in the same year during the 2014 baseline data collection, and considerable variability shown for each segment along the transects in relation to distance from the point source of potential perturbation. There are also challenges in precisely relocating transects between years. For these reasons, significant differences between years should be interpreted cautiously until there are more than two years of non-baseline data for corroboration of the apparent distribution patterns.

West Transect

Analysis of covariance indicated there was a significant difference in slopes of regression lines among years and the covariate distance along the West Transect (P=<0.001) shown in Figure 3.30. Therefore, the EEM null hypothesis can be rejected, indicating an increase in the percentage of macroflora cover with increasing distance from the ore dock compared to 2014. Percent macroflora cover close to the ore dock has lower variability from year to year, whereas values at greater distance from the ore dock are more variable. Significant differences should be interpreted cautiously given that only two years of operational data are available for comparison.

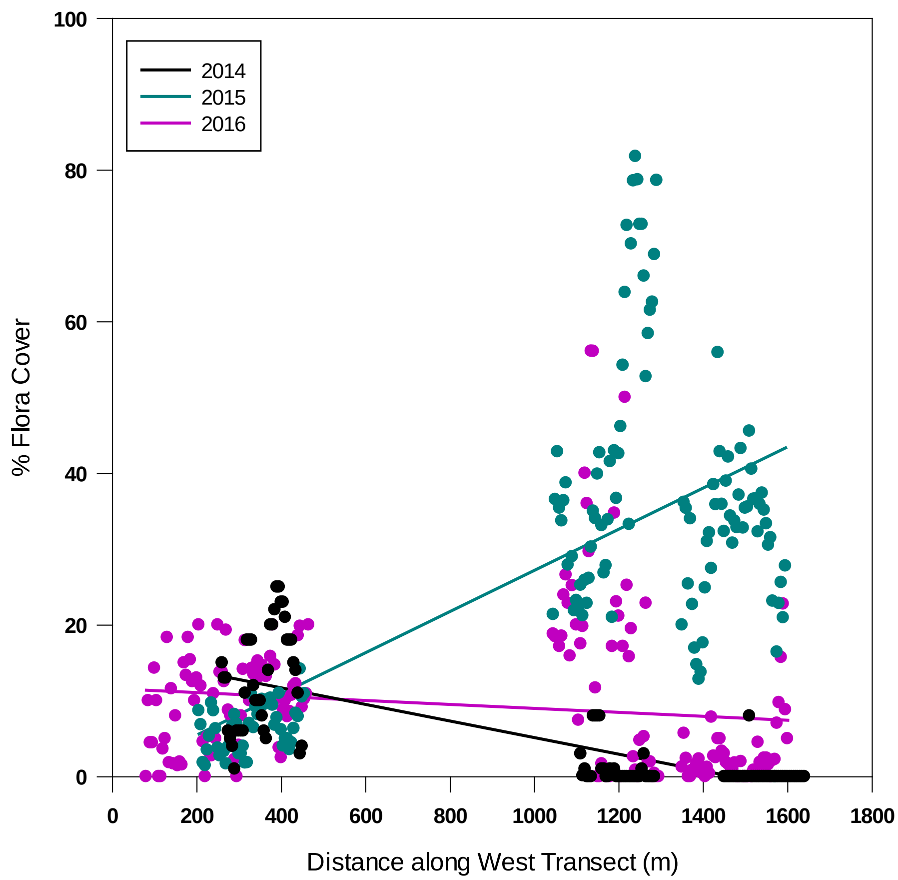


Figure 3.30 Percent (%) Macroflora Cover, West Transect.

East Transect

Analysis of covariance indicated there was a significant difference in slopes of regression lines among years and the covariate distance along the East Transect (P=<0.001) shown in Figure 3.31. Therefore, the EEM null hypothesis can be rejected, indicating a decrease in the percentage of macroflora cover with increasing distance from the ore dock compared to 2014. Data in 2015 had higher variability than in 2014 or 2016, producing a regression slope close to zero. Percent macroflora cover in 2014 and 2016 both have positive regression slopes, however, macroflora cover is lower in 2016 at increasing distance from the ore dock compared to cover in 2014. Significant differences should be interpreted cautiously given that only two years of operational data are available for comparison.

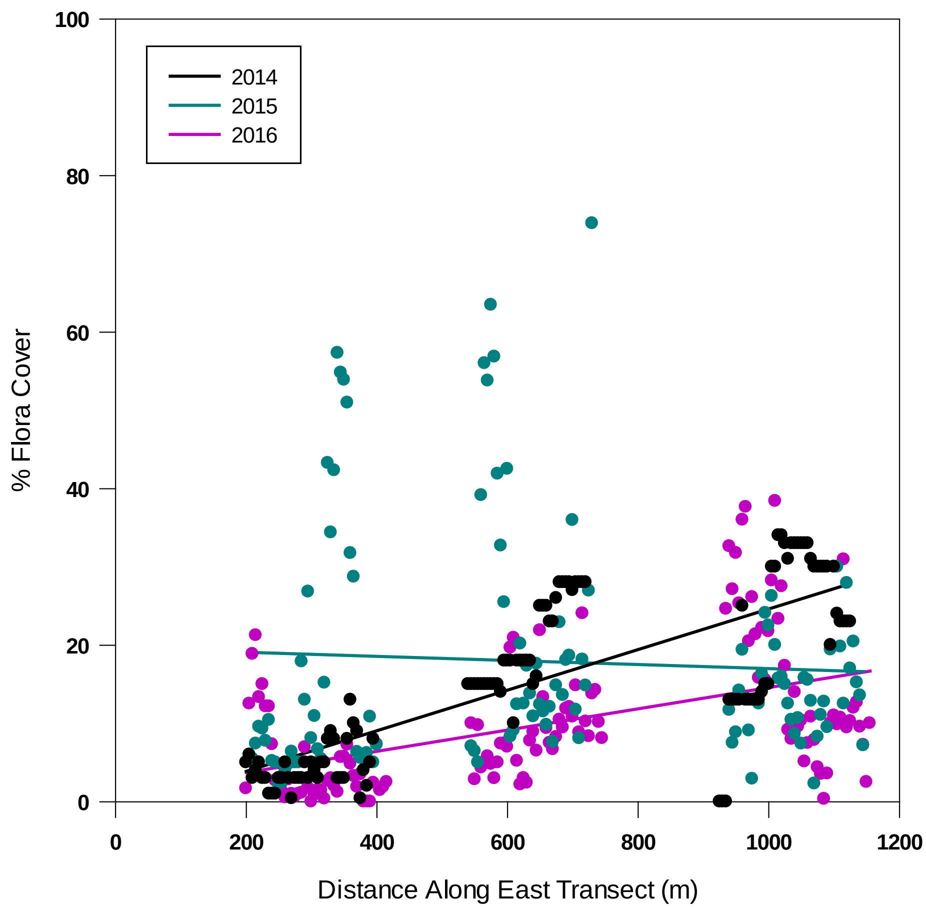


Figure 3.31 Percent (%) Macroflora Cover, East Transect.

Coastal Transect

Analysis of covariance indicated there was a significant difference in slopes of regression lines among years and the covariate distance along the Coastal Transect (P=<0.001) shown in Figure 3.32. Therefore, the EEM null hypothesis can be rejected, indicating a decrease in the percentage of macroflora cover with increasing distance from the ore dock in both 2015 and 2016 compared to 2014. Data showed high variability across all years, especially in close proximity to the ore dock. Slopes of regression lines are both negative for operational years (2015 and 2016) whereas slope of the regression in 2014 was slightly positive. Significant differences should be interpreted cautiously given that only two years of operational data are available for comparison.

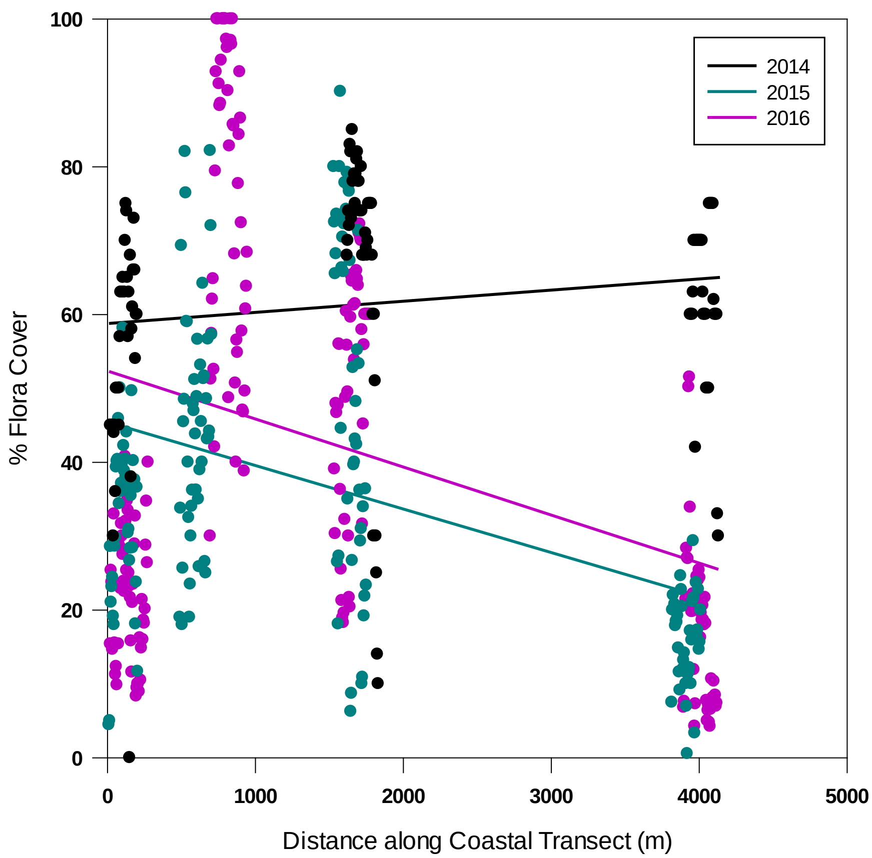


Figure 3.32 Percent (%) Macroflora Cover, Coastal Transect.

North Transect

Video data was not collected in 2014 due to safety considerations in relation to the increased ship traffic in the area and therefore a comparison is only made between 2015 and 2016.

Analysis of covariance indicated that there was no significant difference between years (P=0.126) and the slopes are not significantly different from zero, indicating no significant effect of the covariate distance along the North Transect (P=0.357), shown in Figure 3.33. Since the slopes are not significantly different, the y-intercepts can be compared to determine if the magnitude of percent macroflora cover differs between years. The y-intercepts were not significantly different since the adjusted means for the groups were not significantly different (P=0.126). The lack of significant differences should be interpreted cautiously given that only two years of operational data are available for comparison, and that baseline data from 2014 is unavailable. The very low % macrofloral cover in this transect may make interpretation of this variable for the North Transect irrelevant.

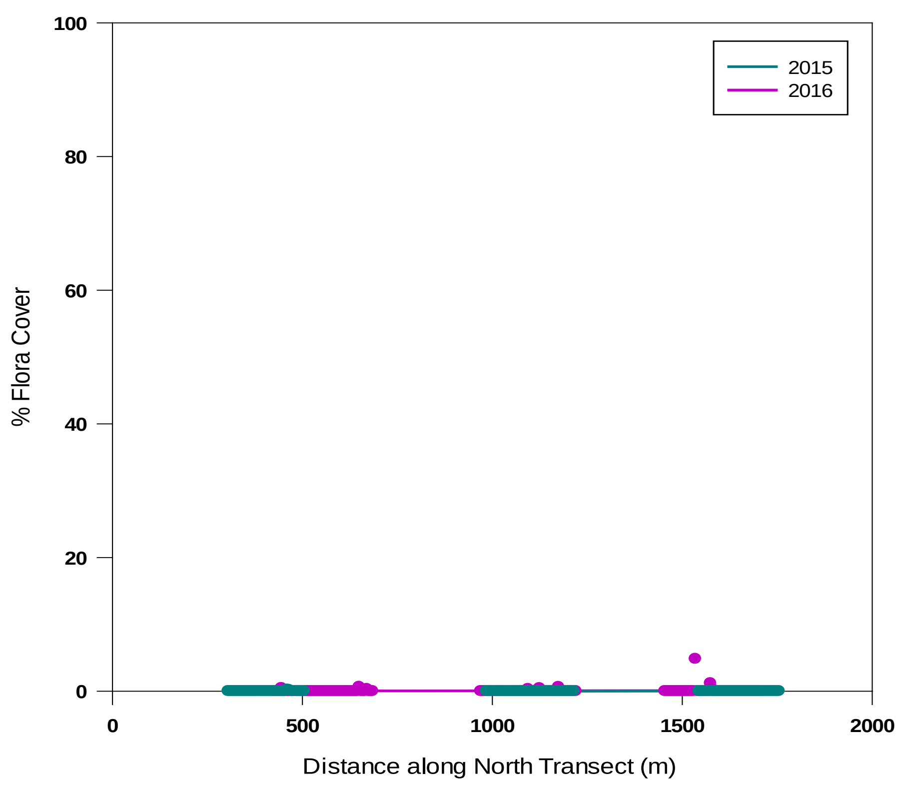


Figure 3.33 Percent (%) Macroflora Cover, North Transect.

3.3.7 EEM Analysis - Benthic Epifaunal Distributions

As discussed above, it is important to include biological indicator(s) of environmental change in addition to the physical and chemical indicators found in sediment quality analysis. Similar to the macroflora cover analysis, linear regression analysis was conducted for total abundance of benthic epifauna along increasing distance from the point source of contaminants (ore dock). Linear regression slopes were compared for 2014, 2015 and 2016 using an analysis of covariance. Similar analyses of individual taxa, taxonomic groupings, or benthic community indices could be conducted in future years as more data becomes available.

Significant differences between years should be interpreted cautiously until additional years of data are available for corroboration, owing to high natural variability between adjacent transects, variability for each segment along the transects, and challenges in replicating transects among years.

West Transect

Analysis of covariance indicated there was a significant difference in slopes of regression lines among years and the covariate distance along West Transect (P=0.025), as shown in Figure 3.34. Therefore, the EEM null hypothesis can be rejected, indicating a small decrease in epifaunal abundance with increasing distance from the ore dock compared to 2014. Epifaunal abundance close to the ore dock has higher variability each year compared to values at greater distance from the ore doc. Significant differences should be interpreted cautiously since the P value (0.025) is very close to the alpha of 0.05, and given that only two years of operational data are available for comparison.

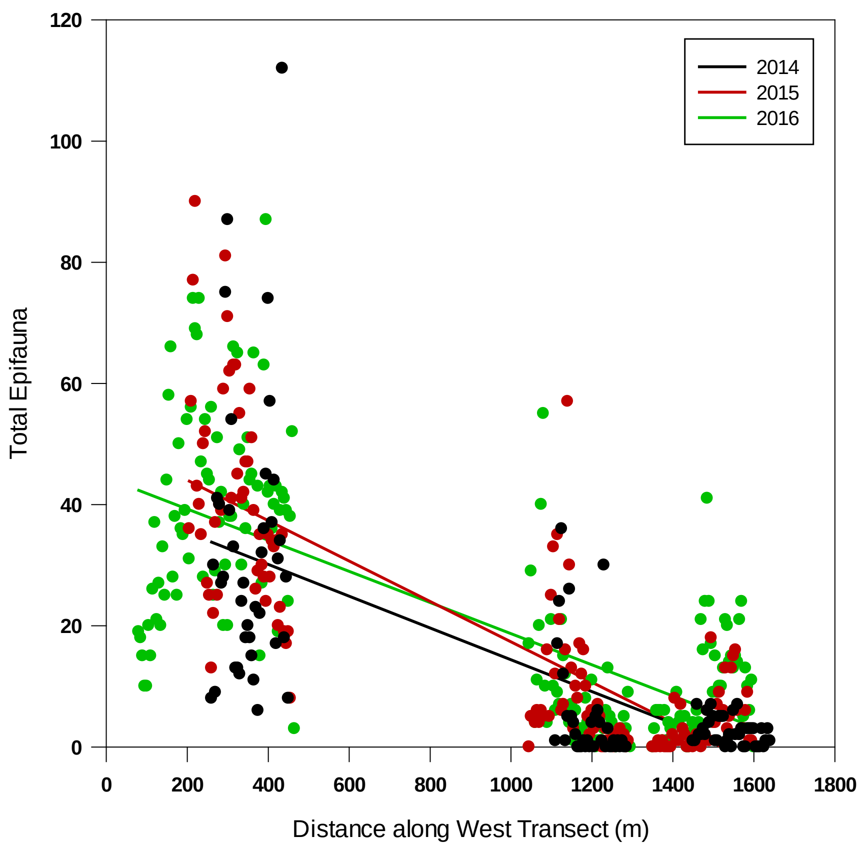


Figure 3.34 Total Benthic Epifauna Abundance, West Transect.

East Transect

Analysis of covariance indicated there was a significant difference in slopes of regression lines among years and the covariate distance along the East Transect (P=<0.001), as shown in Figure 3.35. Therefore, the EEM null hypothesis can be rejected. Epifaunal abundance appears to remain consistent with increasing distance from the ore dock in 2015, whereas it appears to decrease in both 2014 and 2016. Significant differences displayed in the ANCOVA should be interpreted cautiously since the slopes of the baseline year and the current year are very similar, and given that only two years of operational data are available for comparison.

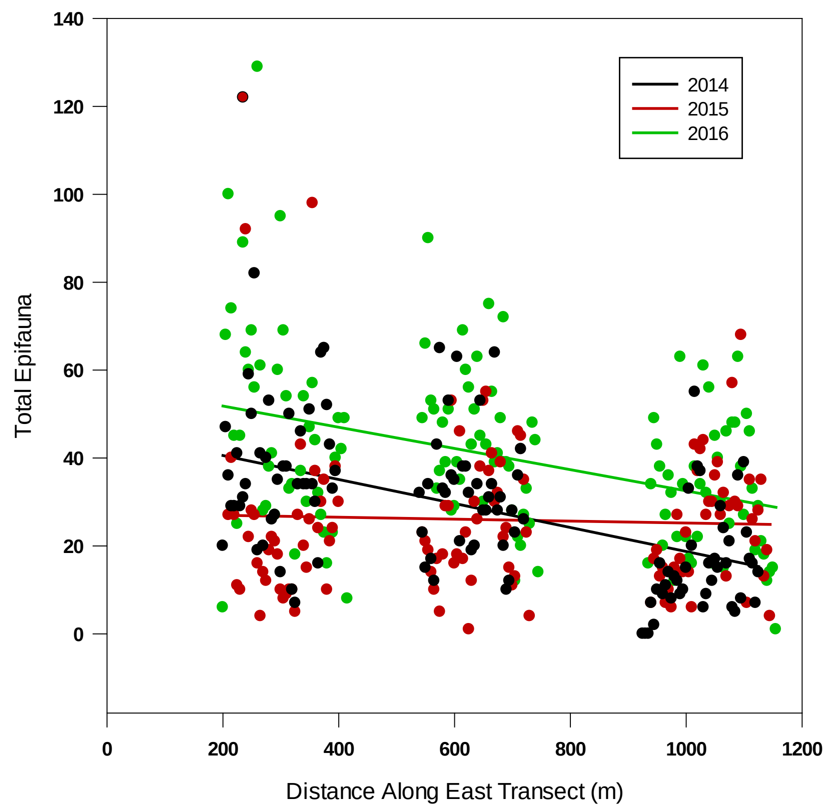


Figure 3.35 Total Benthic Epifauna Abundance, East Transect.

Coastal Transect

Analysis of covariance indicated there was not a significant difference in slopes of regression lines among years and the covariate of increasing distance along the Coastal Transect (P=<0.001), as shown in Figure 3.36. However, the y-intercepts were found to be significantly different, suggesting that while a similar distribution pattern of epifaunal abundance might exist along this transect, the magnitude of those abundances appears to differ. The y-intercepts appear to decrease with increasing years, suggesting that overall abundances in the area may be decreasing. Significant differences should be interpreted cautiously given that only two years of operational data are available for comparison.

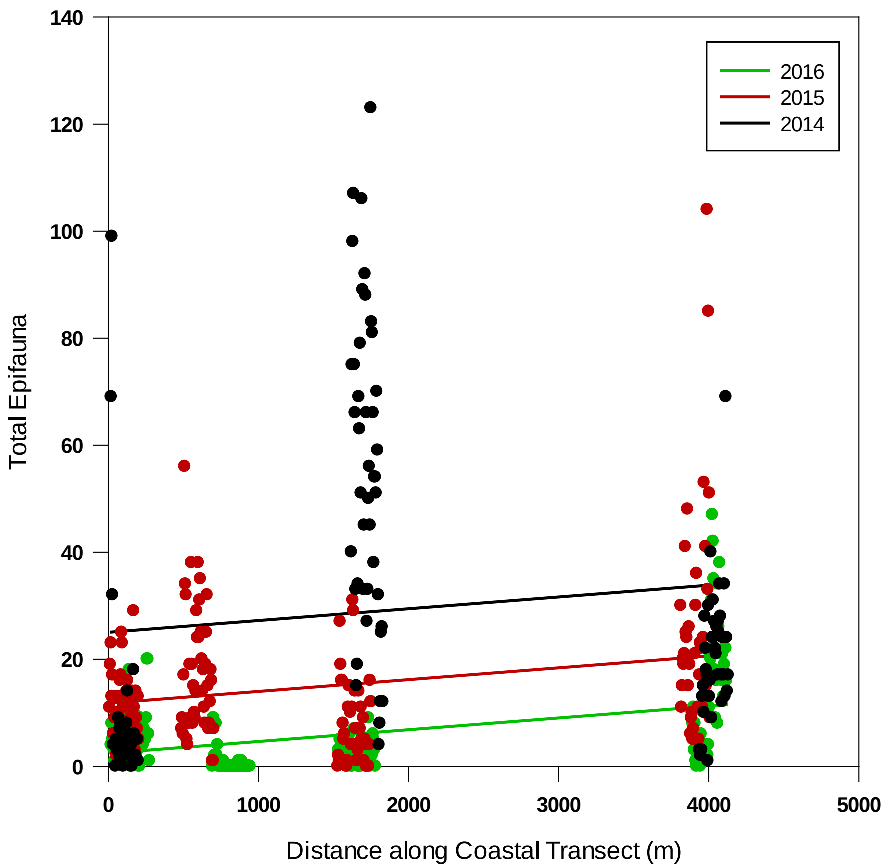


Figure 3.36 Total Benthic Epifauna Abundance, Coastal Transect.

North Transect

As indicated in the section on macroflora cover, video data was not collected in 2014 due to safety considerations in relation to the increased vessel traffic in the area.

Analysis of covariance indicated there was a significant difference in slopes of regression lines between years and the covariate of increasing distance along the North Transect (P=<0.001), as shown in Figure 3.37. There appears to be an overall increase in epifauna abundance along the North Transect, particularly closer to the ore dock which accounts for the negative slope of the regression line. Significant differences should be interpreted cautiously given that only two years of operational data are available for comparison, and that baseline data from 2014 is unavailable.

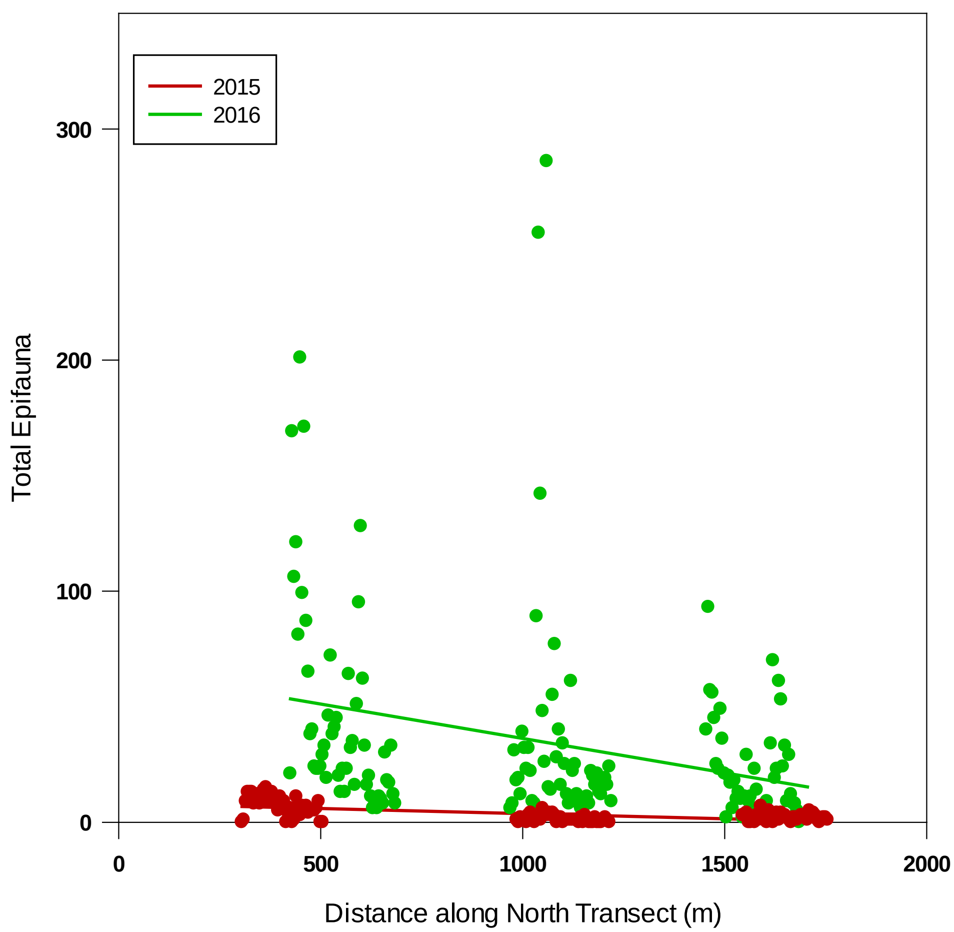


Figure 3.37 Total Benthic Epifauna Abundance, North Transect.

3.4 Fish and Mobile Epifauna

Gill nets and baited Fukui traps were deployed to capture finfish and mobile epifauna associated with the Milne Port and adjacent areas. Fishing locations were not based upon the radial gradient MEEMP study design but were loosely targeted to the Milne ore dock and the shoreline east of the dock. Fukui traps were primarily set in the vicinity of the ore dock for the entire sampling period in order to maximize the chances of recapture of marked fish. Conversely, gill net effort was focused on traditional fishing areas used by local Inuit (eastern shore) given the low catch rate experienced in previous years using gill nets (i.e., pelagic fish) in the vicinity of the ore dock. Fishing locations are provided in Table 3.58 and Figures 2.10 and 2.11. The fishing effort was considerable over the study period; however, results provide a 'point in time' representation of the fish community at capture locations. Fish are highly mobile and are able to move within, as well as to and from, the study area in response to changing environmental and habitat conditions, feeding conditions and prey availability, requirements for various life processes (e.g., spawning and rearing) and other considerations. Some species, such as anadromous Arctic char (*Salvelinus alpinus*), only reside in the marine environment for discrete well defined periods and therefore, are transient within the study area. The fish sampling effort in 2016 complements and expands upon previous sampling efforts in 2007 and 2010 (NSC 2010), 2013 (SEM 2014), 2014 (SEM 2015a Draft) and 2015 (SEM 2016).

Table 3.58 Fishing Locations, 2016.

Date	Location	Gear ID*	Shore End			Open Water End		
			Easting	Northing	Depth (m)	Easting	Northing	Depth (m)
Aug 5-13	Milne Port	FT-1	504213	7976584	1	504214	7976603	1.5
Aug 5-13	Milne Port	FT-2	504634	7976710	1.8	504636	7976730	8
Aug 5-13	Milne Port	FT-3	504375	7976629	13.5	504378	7976657	16.3
Aug 6-13	Milne Port	FT-4	503962	7976679	2.9	503952	7976668	3.9
Aug 13-16	Milne Port	FT-5	505111	7977267	3.7	505111	7977267	6.3
Aug 13-18	Milne Port	FT-6	502876	7976400	2	502891	7976391	10
Aug 13-18	Milne Port	FT-7	502579	7976466	2	502591	7976442	4.5
Aug 13-18	Milne Port	FT-8	502258	7976457	2	502246	7976464	8
Aug 16-21	Milne Port	FT-9	503469	7976592	1.5	503471	7976594	1.7
Aug 18-21	Milne Port	FT-10	503578	7976658	2	503580	7976684	11
Aug 18-21	Milne Port	FT-11	503965	7976659	2	503971	7976684	6.2
Aug 18-21	Milne Port	FT-12	504106	7976692	14	504118	7976701	17
Aug 16-21	Milne Ore Dock	FTO-1	503369	7976576	1	N/A	N/A	N/A
Aug 16-21	Milne Ore Dock	FTO-2	503465	7976642	1.3	N/A	N/A	N/A
Aug 16-21	Milne Ore Dock	FTO-3	503146	7976499	1.1	N/A	N/A	N/A

Table 3.58 Fishing Locations, 2016. (Cont'd)

Date	Location	Gear ID*	Shore End			Open Water End		
			Easting	Northing	Depth (m)	Easting	Northing	Depth (m)
Aug 10	Milne Port	GN1	505170	7977107	0	505065	7977107	7.8
Aug 11	Milne Port	GN2	505161	7977112	0	505076	7977114	6.8
Aug 11	Milne Port	GN3	505206	7977419	0	505110	7977423	8.7
Aug 12	Milne Port	GN4	505204	7977660	0	505116	7977670	15.7
Aug 12	Milne Port	GN5	505149	7976961	0	505063	7976951	8
Aug 12	Milne Port	GN6	505192	7977375	0	505105	7977380	8
Aug 13	Milne Port	GN7	505166	7976949	0	505077	7976940	5
Aug 16	Milne Port	GN8	504145	7976514	0	504174	7976597	1.8
Aug 17	Milne Port	GN9	504697	7976688	0	504681	7976769	15
Aug 17	Milne Port	GN10	504134	7976573	0	504204	7976630	3
Aug 17	Milne Port	GN11	505162	7976956	0	505077	7976948	5.7
Aug 21	Milne Port	GN12	504153	7976507	0	504174	7976583	1
Aug 20	Milne Port	GN13	504174	7976608	0	504177	7976619	1

Note*: GN = gill net; FT = Fukui trap line
UTM NAD 83, Zone 17

The fish communities were assessed within Milne Inlet from August 5-21, 2016. The Fukui trap sets were, in part, to provide data to support the faunal list for invasive species monitoring and for capture of groundfish. Gill nets were set in traditional fishing locations and were primarily targeted to capture pelagic species and groundfish. A total of three fish species were captured with gill nets including Arctic char, fourhorn sculpin (*Myoxocephalus quadricorni),* and shorthorn sculpin (*Myoxocephalus scorpius*). Four species of finfish were captured in the Fukui traps including fourline snakeblenny (*Eumesogrammus parecisus*), longhorn sculpin (*Myoxocephalus octodecemspinosus*), shorthorn sculpin, and fourhorn sculpin. Although captured in 2015, Atlantic hookear sculpin (*Artediellus atlanticus*), Arctic staghorn sculpin (*Gymnocanthus tricupis*) Arctic sculpin (*Myoxocephalus scorpioides*), and fishdoctor (*Gymnelis viridis*) were not captured in 2016. Invertebrates captured in the Fukui traps included red and green sea urchin (*Strongylocentrotus pallidus, Strongylocentrotus droebachiensis*), brittle star (*Ophiura sarsi*), unidentified shrimp species, and four species of mollusk (*Arctica islandia* and *Siliqua sp., Cyrtodaria silique and Pectinidae sp.*).

A mark-recapture study has focused on sculpin species in Milne Inlet since 2014 in an attempt to provide an estimate of population sizes of species. Obtaining a reasonable estimate of population sizes is the first step to determining the capacity of the population to serve as a monitoring species that could support annual lethal sampling (i.e., body burden for metals). All sculpin captured during the first fishing trip of the year were marked by clipping one of the pelvic fins, however as in previous years, no recaptures were recorded. It is uncertain whether sculpin have a learned avoidance of Fukui traps and gill nets following capture or whether marked fish move to other areas outside of the targeted fishing zone. Estimation of population sizes was not possible owing to low catch rates and the lack of recaptures and therefore an assessment of population size must rely on absolute catch numbers and catch per unit of effort (CPUE).

CPUE, by gear type, provided a relative measure of catchability and abundance of species in the area. Summary of the overall effort, catch and CPUE is provided in Table 3.59 (gill nets) and Table 3.60 (Fukui traps) while the CPUE per net/trap for each species is provided in Table 3.61.

Table 3.59 Summary of Effort, Catch and CPUE, Gill Nets.

		Milne Port Area		
		Effort (Hours)	**N**	**CPUE**
Finfish	Arctic char	53.5	157	2.935
	Fourhorn sculpin	53.5	5	0.112
	Shorthorn sculpin	53.5	1	0.019
Total		**53.5**	**163**	**3.048**

1 unit of effort = 1 hour

Table 3.60 Summary of Effort, Catch and CPUE, Fukui Traps.

		Effort (Hours)	Milne Port Area	
			N	**CPUE**
Finfish	Fourline Snakeblenny	1,894	2	0.001
	Fourhorn sculpin	1,894	13	0.007
	Longhorn sculpin	1,894	2	0.001
	Shorthorn sculpin	1,894	17	0.009
Total Finfish		1,894	**34**	**0.018**
Invertebrates	Green sea urchin	1,894	1	0.001
	Red sea urchin	1,894	6	0.003
	Brittle star	1,894	48	0.025
	Ocean quahog (*Arctica islandia*)	1,894	2	0.001
	Razor clam (*Siliqua sp.*)	1,894	6	0.003
	Northern propellerclams (*Cyrtodaria siliqua*)	1,894	5	0.003
	Scallop (*Pectinidae* family)	1,894	1	0.001
	Unknown invertebrate	1,894	2	0.001
Total Invertebrates		**1,894**	**71**	**0.037**

1 unit of effort = 1 hour

Table 3.61 Fish Catch Summary, Milne Port Area.

Gear	Effort (hours)	Arctic char		Fourline Snakeblenny		Fourhorn Sculpin		Longhorn Sculpin		Shorthorn Sculpin	
		N	CPUE	N	CPUE	N	CPUE	N	CPUE	N	CPUE
FT-1	192.2	-	-	-	-	1	0.005	-	-	1	0.005
FT-2	190.6	-	-	-	-	-	-	-	-	4	0.021
FT-3	190.8	-	-	1	0.005	-	-	-	-	-	-
FT-4	164.1	-	-	-	-	1	0.006	1	0.006	4	0.024
FT-5	74.5	-	-	1	0.013	-	-	-	-	3	0.040
FT-6	126.3	-	-	-	-	1	0.008	-	-	3	0.024
FT-7	125.8	-	-	-	-	-	-	-	-	-	-
FT-8	125.0	-	-	-	-	-	-	-	-	-	-
FT-9	118.8	-	-	-	-	5	0.042			-	-
FT-10	65.83	-	-	-	-	-	-	-	-	-	-
FT-11	64.92	-	-	-	-	-	-	-	-	1	0.015
FT-12	64.00	-	-	-	-	-	-	-	-	1	0.016
FTO-1	115.60	-	-	-	-	2	0.017	-	-	-	-
FTO-2	115.8	-	-	-	-	-	-	-	-	-	-
FTO-3	115.9	-	-	-	-	3	0.026	1	0.009	-	-
GN1	7.00	13	1.857	-	-	-	-	-	-	-	-
GN2	9.8	38	3.878	-	-	4	0.408	-	-	-	-
GN3	7.0	28	4.000	-	-	-	-	-	-	1	0.143
GN4	3.2	-	-	-	-	1	0.313	-	-	-	-
GN5	5.8	13	2.241	-	-	-	-	-	-	-	-
GN6	2.8	14	5.000	-	-	-	-	-	-	-	-
GN7	3.9	21	5.385	-	-	-	-	-	-	-	-
GN8	3.3	2	0.606	-	-	-	-	-	-	-	-
GN9	1.9	5	2.632	-	-	-	-	-	-	-	-
GN10	2.0	7	3.500	-	-	-	-	-	-	-	-
GN11	1.9	4	2.105	-	-	-	-	-	-	-	-
GN12	3.0	12	4.000	-	-	-	-	-	-	-	-
GN13	2.0	-	-	-	-	-	-	-	-	-	-
Total	**1,903.6**	**157**	**0.082**	**2**	**0.001**	**18**	**0.009**	**2**	**0.001**	**18**	**0.009**
Note*: GN = gill net; FT = Fukui trap line, FTO = Fukui Trap at Ore dock											

Gill nets captured a total of 163 fish from three species during a total of 53.5 net hours of fishing resulting in an overall CPUE of 3.048 fish per net hour. Gill nets were much more efficient at catching fish than Fukui traps (mean CPUE of 0.018 finfish per net hour, 0.055 overall, discussed below). Arctic char (n=157) were by far the most catchable species with a CPUE of 2.935 fish per gill net hour followed by fourhorn sculpin (n=5, CPUE 0.112 fish per gill net hour) and shorthorn sculpin (n=1, CPUE 0.019 fish per gill net hour).

As previously noted, Fukui traps were less efficient than gill nets and captured a total of 34 finfish and 71 invertebrates from four and eight species, respectively, during a total of 1,894 trap hours of fishing. It is noteworthy that, due to the type of fishing gear, Fukui traps do not require tending and can therefore be set continuously for extended periods resulting in a much higher effort (i.e., fishing hours). Similarly, due to the position of the nets/traps on the bottom of the ocean and catch method (i.e., fish must actively move into the trap), Fukui traps were, as expected, not effective in catching the larger, more pelagic Arctic char which are generally higher in the water column or swimming along the shorelines.

Shorthorn and fourhorn sculpin (n=17 and 13, respectively) were the most catchable finfish species by Fukui trap each having CPUEs of 0.009 and 0.007 fish per trap hour. Additional species captured included the longhorn sculpin (n=2),) and fourline snakeblenny (n=2).

In addition to fish, Fukui traps captured a total of 71 invertebrates from seven species (taxa) during the same period for a total CPUE of 0.037 organisms per trap hour. The most numerous invertebrates captured were the brittle star (n=48) with a CPUE of 0.025 brittle star per trap hour. Fukui traps are generally considered more effective in catching the most mobile epifauna as they must enter the trap in response to the bait.

Overall, Arctic char (80%) were the most numerous fish species captured followed by fourhorn and shorthorn sculpins (9% each; Figure 3.38). The other two species captured only resulted in an additional 2% of the total fish. In addition to being the most numerous, Arctic char were also the largest of the fish captured, a summary of which is provided in Table 3.62. Additional details on the biological characteristics of the fish are provided in Appendix E.

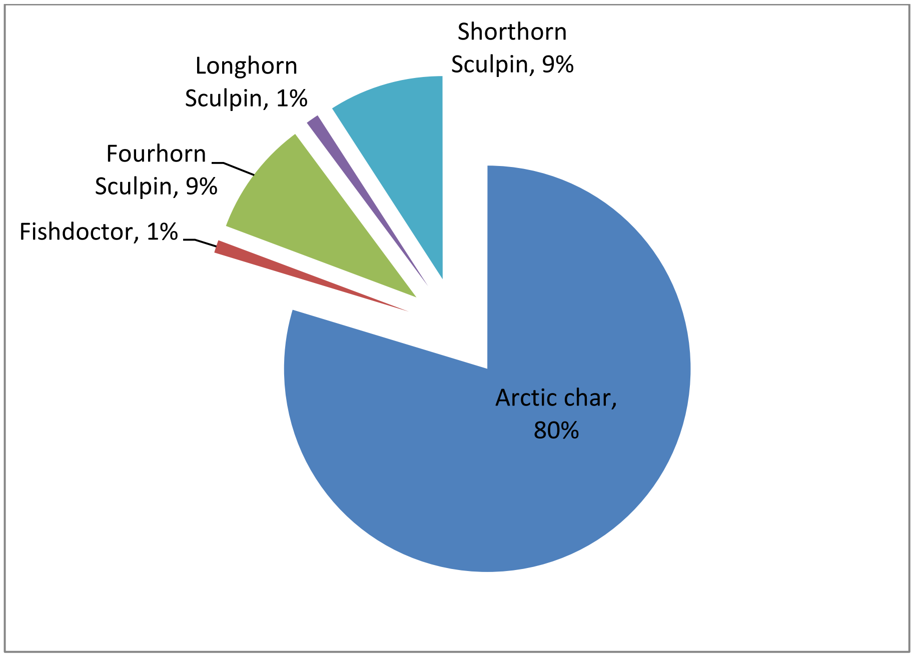


Figure 3.38 Relative Abundance of Fish Species, Milne Port Area.

Table 3.62 Length Statistics for Fish, Milne Port Area.

Species	N	Length[1] (mm)				Weight (g)			
		Min	Max	Mean	Std. Dev.	Min	Max	mean	Std. Dev.
Arctic char	157	300	890	560	121	300	7,300	2,445	1,450
Fourline Snakeblenny	2	130	210	170	57	22	27	25	4
Fourhorn sculpin	18	135	285	204	43	16	300	124	101
Longhorn sculpin	2	195	200	198	4	89	90	90	1
Shorthorn sculpin	18	150	435	238	70	43	485	169	130

[1] Fork Length for Arctic char; Total Length for all other species

All incidental mortalities (Arctic char, n=13) were subsampled for tissue (body burden), otoliths (age), sex and stomach contents. The age of Arctic char sampled varied between nine and 19 years, of which there were seven females and one from which sex was not determined. Eleven Arctic char stomachs contained Hyperiid amphipods, while three contained Arctic cod (Table 3.63).

Table 3.63 Arctic Char Age, Sex and Stomach Contents of Incidental Mortalities at Milne Port in 2016.

Fish ID	Species	Sex[1]	Age[2]	Stomach Contents	
				Contents	Weight (g)
GN-2-1	arctic char	M	10	Hyperiid amphipod	4.6
GN-3-1	arctic char	M	-	Arctic cod	14.2
GN-3-2	arctic char	M	10	Arctic cod / Hyperiid amphipod	1.9(cod) / 3.5(amph)
GN-3-3	arctic char	M	14	Arctic cod	16.2
GN-5-1	arctic char	F	11	Hyperiid amphipod	73.8
GN-6-1	arctic char	M	11	Hyperiid amphipod	30.5
GN-6-2	arctic char	F	12	Hyperiid amphipod	80.5
GN-6-3	arctic char	F	9	Hyperiid amphipod	27.2
GN-6-4	arctic char	-	9	Hyperiid amphipod	15.9
GN-12-1	arctic char	F	18	Hyperiid amphipod	5
GN-12-2	arctic char	F	14	Hyperiid amphipod	33.7
GN-12-3	arctic char	F	19	Hyperiid amphipod	10
GN-12-4	arctic char	F	11	Hyperiid amphipod	54.5

[1] sex could not be determined for GN-6-4 as organism was too small
[2] otolith was not successfully recovered from GN-3-1

Fish tissue samples were sent for baseline body burden analysis to Maxxam in Bedford, NS. A summary of the analysis is presented in Table 3.64. Metals were largely undetected in Arctic char tissue with the exception of arsenic (n=13, mean 0.97 $mg \cdot kg^{-1}$), chromium (n=1, 1.0 $mg \cdot kg^{-1}$),copper (n=13, mean 1.63 $mg \cdot kg^{-1}$), iron (n=1, 19 $mg \cdot kg^{-1}$), mercury (n=13, mean 0.039 $mg \cdot kg^{-1}$) and zinc (n=13, mean 7.18 $mg \cdot kg^{-1}$). None of the samples exceeded Health Canada's previously set (i.e., 2002) guideline of 0.5 $mg \cdot kg^{-1}$ for mercury in fish tissue for human consumption.

Table 3.64 Arctic Char Body Burden Analysis of Incidental Mortalities at Milne Port in 2016.

Parameter	Units	RDL	Health Canada	GN-2-1	GN-3-1	GN-3-2	GN-3-3	GN-5-1	GN-6-1	GN-6-2	GN-6-3	GN-6-4	GN-12-1	GN-12-2	GN-12-3	GN-12-4
Aluminum (Al)	$mg{\cdot}kg^{-1}$	2.5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Antimony (Sb)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic (As)	$mg{\cdot}kg^{-1}$	0.50		1.1	1.1	1	1	1.2	1.3	0.57	1.1	0.81	0.99	0.71	0.78	1
Barium (Ba)	$mg{\cdot}kg^{-1}$	1.5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium (Be)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Boron (B)	$mg{\cdot}kg^{-1}$	1.5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium (Cd)	$mg{\cdot}kg^{-1}$	0.050		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium (Cr)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	ND
Cobalt (Co)	$mg{\cdot}kg^{-1}$	0.20		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper (Cu)	$mg{\cdot}kg^{-1}$	0.50		0.81	0.74	0.73	1.7	1	2.2	1.2	1.1	3.2	0.71	1.1	4.7	2
Iron (Fe)	$mg{\cdot}kg^{-1}$	15		ND	ND	ND	ND	ND	ND	ND	ND	19	ND	ND	ND	ND
Lead (Pb)	$mg{\cdot}kg^{-1}$	0.18		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lithium (Li)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Manganese (Mn)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury (Hg)	$mg{\cdot}kg^{-1}$	0.010	0.5	0.028	0.053	0.04	0.039	0.028	0.078	0.026	0.025	0.054	0.036	0.03	0.034	0.03
Molybdenum (Mo)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel (Ni)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium (Se)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver (Ag)	$mg{\cdot}kg^{-1}$	0.12		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Strontium (Sr)	$mg{\cdot}kg^{-1}$	1.5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium (Tl)	$mg{\cdot}kg^{-1}$	0.020		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin (Sn)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium (U)	$mg{\cdot}kg^{-1}$	0.020		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium (V)	$mg{\cdot}kg^{-1}$	0.50		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc (Zn)	$mg{\cdot}kg^{-1}$	1.5		7.2	10	8.2	6.9	8.4	5.7	5.9	7.3	6.9	8.2	5.4	6.4	6.8

RDL – Reportable Detection Limit
ND = non detected

3.4.1 Summary

The 2016 fishing program relied on two fishing methods, tended gill nets and Fukui traps, largely owing to the requirements to maximize non-lethal sampling. Total catches included five species of finfish and seven species of invertebrates from the Milne area (Tables 3.65 and 3.66). A total of 197 fish were caught with 1,904 hours of fishing effort providing a mean CPUE of 0.103 fish per hour, down from 0.153 in 2015. Gillnets were fished for 53.6 hours and caught 163 fish for a CPUE of 2.93 fish per hour, up from 1.64 in 2015. Fukui traps were fished for 1,850 hours, up from 669 hours in 2015, and caught 34 fish for a CPUE of 0.02 fish per hour. CPUE for gill nets has increased considerably since 2013 which is likely in part due to timing (2013 was later in the season) and fishing location refinement. The overall CPUE for Fukui traps was comparable to previous years despite a larger effort but lower than 2013 despite a higher catch number (Table 3.66).

Table 3.65 CPUE Comparison, 2010 through 2016.

Fishing Method	2010			2013			2014			2015			2016		
	N	E	CPUE	N	E	CPUE	N	E	CPUE	N	E	CPUE	N	E	CPUE
Gill Nets	75	-	-	8	28.5	0.28	52	124	0.42	90	74.8	1.64	163	53.6	2.93
Fukui Trap	-	-	-	8	60.5	0.13	15	497	0.03	21	669	0.03	34	1,850	0.02

N=Number of organisms, E=Effort (hours), CPUE=Catch Per Unit Effort

Table 3.66 Total Fish Catch Comparison, 2010 through 2016.

Species	2010	2013	2014	2015	2016
Arctic char	11	6	3	67	157
Arctic sculpin	0	0	4	1	-
Shorthorn sculpin	50	4	9	8	18
Fourhorn sculpin	7	3	39	13	18
Arctic staghorn sculpin	3	0	0	2	-
Longhorn sculpin	0	2	4	2	2
Arctic hookear sculpin	0	0	5	1	-
Unidentified sculpin sp.	-	-	-	12	-
Greenland cod	4	0	1	0	-
Common lumpfish	0	0	1	0	-
Fishdoctor	0	1	0	3	-
Fourline snakeblenny	0	0	1	2	2
Total	75	16	67	111	197

The overall catch in 2010, where only gill nets were used, was dominated by shorthorn sculpin (n=50) while the dominant finfish species captured in 2014 was fourhorn sculpin (n=39) (Table 3.66). Few fish were captured in 2013, with Arctic char the dominant species despite low numbers (n=6). The 2015 catch was the first year that Arctic char were relatively abundant (n=67) and dominance of this species was repeated in 2016 (n=157). As noted, this may be related to timing, as char undertake feeding migrations in summer prior to returning to freshwater or fishing locations. Despite considerable fishing effort, the continued low catch rates (CPUE's) over all years of sampling appear to indicate that resident fish of any one species are not present in numbers adequate to support an EEM monitoring program that might require sacrificing marine fish. The anadromous Arctic char, although relatively numerous, have not been targeted for body burden analysis as they spend a very short period of time in Milne Inlet's marine water in the vicinity of the Project. A statistically defensible sampling program requiring fish mortality could have significant effects on the local populations and would not be sustainable. Sampling of incidental mortalities during fishing efforts will continue to provide data for assessing change in body burden of fish.

3.5 Aquatic Invasive Species Monitoring Results

3.5.1 Zooplankton

Zooplankton samples were collected at Milne Inlet on August 5 (vertical) and 16 (oblique) 2016 by combination of vertical and oblique tows at each of four sampling sites located at the end of the aquatic invasive species sampling transects. Sample locations and sampling details are provided in Tables 3.67 and 3.68.

Table 3.67 Zooplankton Vertical Sampling Locations, Milne Inlet, August 2016.

Sample ID	Date	Water Depth (m)	Mesh Size (um)	Net Diameter (m)	Number of Tows	Location	
						Easting	Northing
V1	August 5	28	80	0.30 m	3	503570	7976801
V2	August 5	28	80	0.30 m	3	502768	7976524
V3	August 5	20	80	0.30 m	3	502866	7976548
V4	August 5	26	80	0.30 m	3	503028	7976580

UTM NAD 83, Zone 17

Table 3.68 Zooplankton Oblique Sampling Locations, Milne Inlet, August 2016.

Sample ID	Date	Mesh Size (um)	Net Diameter (m)	Speed (km/hr)	Tow Duration (sec)	Mean Distance (m)
H1	August 16	243	0.30 m	2	600	422.5
H2	August 16	243	0.30 m	2	600	404
H3	August 16	243	0.30 m	3	615	441
H4	August 16	243	0.30 m	3	620	455

3.5.1.1 Species Abundance, Composition and Richness

Zooplankton abundances for the vertical tows were determined from the cross sectional area of the plankton tow, the depth of each tow and the number of replicates for each location and are expressed as number of organisms per m^3 of water filtered. Zooplankton abundances for the oblique tows were determined from the cross sectional area of the plankton tow, length of time for each tow and speed of the sampling platform during the tow and are similarly expressed as number of organisms per m^3 of water filtered. A listing of all zooplankton identified in the vertical and oblique tows, including their abundance and relative occurrence, is provided in Tables 3.69 through 3.73.

A total of 3,738 zooplankton organisms representing a total of 29 different taxa and/or taxonomic groups were identified from the four vertical samples associated with Milne Port with a total abundance of 934.50 organisms per m^3. This included 13 discrete species, four genera that could not be further identified to species and 12 groupings including unidentified taxa (n=7, nauplii, larvae, copepodites, etc.) and damaged organisms (n=1). For the oblique tows, a total of 1,683 zooplankton organisms representing a total of 22 different taxa and/or taxonomic groups were identified with a total abundance of 54.32 organisms per m^3. In the oblique tows, this included nine discrete species, five genera that could not be further identified to species and seven groupings including unidentified taxa (n=3, nauplii, larvae, copepodites, etc.) and damaged organisms (n=1).

It is noteworthy that the composition of the zooplankton taxa differed between the vertical and oblique tows. In the vertical tows, the Copepods were more abundant. In the oblique tows, the Cnidarians, Appendicularians and Mollusks were more prevalent. Some taxa present in the vertical tows were not present in the oblique tows and vice versa. This stresses the importance of conducting both vertical and oblique sampling to fully describe the zooplankton community. The zooplankton report supplied by SpryTech can be found in Appendix F.

Table 3.69 Listing of Zooplankton Taxa and Abundance (#/m^3), Milne Port, 2016.

Taxa	H1	H2	H3	H4	V1	V2	V3	V4
Amphipoda								
Unidentified benthic species			0.03					
Appendicularia								
Fritillaria sp.	0.03		1.00	9.70		1.53	2.14	1.10
Chaetognatha								
Eukrohnia hamata							2.86	
Sagittidae damaged					1.02	0.51	0.71	1.10
Cirripedia								
nauplii							0.71	
cyprid larvae								0.55
Cladocera								
Bosmina sp.			0.03		1.02		1.43	
Chydorus sphaericus					0.51	0.51		
Cnidaria								
unidentified				0.14				
Ctenophora								
Beroe cucumis				0.14				
Unidentified								
Copepoda								
Acartia hudsonica	0.71	0.85	0.81	2.43				
Acartia lonigiremis	0.54	0.35	0.32	1.57				
Acartia sp. copepodite	3.14	2.23	1.46	6.28				
Calanus finmarchicus	0.07	0.04		0.57	2.04		1.43	
Calanus glacialis	0.03	0.03	0.03		1.02	1.53		2.20
Calanus hyperboreus					6.12	1.53	5.00	1.65
Clytemnestra scutellata					2.55	1.02	3.57	4.40
Copepod damaged/exoskeletons	0.78	0.81	0.29	1.43	2.04		2.86	0.55
Copepod nauplii	1.79	0.99	1.07	5.85	68.88	31.12	73.57	66.48
Copepod copepodite I-V	0.10	0.07	0.16	1.28	3.57	1.02	2.14	2.75
Euterpina acutifrons								1.10
Harpacticoida		0.32	0.06					
Lucicutia longicornis	0.27	0.14	0.10					
Microsetella norvegica			0.03					2.20
Oithona atlantica					0.51		0.71	1.10
Oithona similis					23.47	17.35	27.86	19.78
Oithona sp.		0.04	0.03		37.24	11.73	28.57	18.68
Oncaeidae					1.53		2.14	2.20

Table 3.69 Listing of Zooplankton Taxa and Abundance (#/m^3), Milne Port, 2016. (Cont'd)

Taxa	H1	H2	H3	H4	V1	V2	V3	V4
Copepoda								
Pseudocalanus sp.	0.37	0.39	0.91	3.85	1.53			
Sapphirina sp.	0.03		0.03	0.16				
Tricornia borealis						0.51		0.55
Echinodermata								
unspecified nauplii						1.02	2.14	1.65
unspecified larvae				0.14				
Mollusca								
Bivalvia larvae					24.49	8.67	10.71	8.24
Limacina helicina								
Limacina sp						1.02		1.65
Polychaeta								
unspeciated larvae				0.14	1.02	0.51	3.57	1.10
Rotifera								
Synchaeta hyperborea					45.41	23.47	55.71	28.02

Table 3.70 Zooplankton Taxa in Order of Decreasing Abundance in Vertical Tows, Milne Port, 2016.

Taxa	Stage	Total Abundance (#/m3)	Mean Abundance (#/m3)
Echinodermata	nauplii	2486	621.50
Copepoda	nauplii	420	105.00
Synchaeta hyperborea	-	264	66.00
Oithona sp.	-	170	42.50
Oithona similis	-	155	38.75
Bivalvia	larvae	95	23.75
Calanus hyperboreus	-	25	6.25
Clytemnestra scutellata	-	20	5.00
Copepoda	copepodite	17	4.25
Polychaeta larvae	-	10	2.50
Oncaeidae	-	10	2.50
Copepoda	damaged	9	2.25
Fritillaria sp.	-	8	2.00
Calanus finmarchicus	-	6	1.50
Limacina sp.	-	5	1.25
Calanus glacialis	-	5	1.25
Microsetella norvegica	-	4	1.00
Echinodermata	nauplii	4	1.00
Oithona atlantica	-	4	1.00

Table 3.70 Zooplankton Taxa in Order of Decreasing Abundance in Vertical Tows, Milne Port, 2016. (Cont'd)

Taxa	Stage	Total Abundance (#/m3)	Mean Abundance (#/m3)
Sagittidae		4	1.00
Pseudocalanus sp.	-	3	0.75
Euterpina acutifrons	-	2	0.50
Bosmina longicornis	-	2	0.50
Tricornia borealis	-	2	0.50
Bosmina longicornis	-	2	0.50
Chaetognatha	-	2	0.50
Chydorus sphaericus	-	2	0.50
Cirripedia	cyprid larvae	1	0.25
Cirripedia	nauplii	1	0.25

Table 3.71 Zooplankton Taxa in Order of Decreasing Abundance in Oblique Tows, Milne Port, 2016.

Taxa	Stage	Total Abundance (#/m^3)	Mean Abundance (#/m^3)
Acartia sp.	-	401	13.11
Fritillaria sp.	-	341	10.74
Copepoda	Nauplii	300	9.70
Pseudocalanus sp.	-	173	5.52
Acartia hudsonica	-	147	4.79
Copepoda	damaged	100	3.31
Acartia lonigiremis	-	86	2.79
Copepoda	copepodite	51	1.62
Calanus finmarchicus	-	21	0.67
Lucicutia longicornis	-	15	0.51
Harpacticoida	-	11	0.38
Sapphirina sp.	-	7	0.22
Beroe cucumis	-	5	0.14
Cnidaria	-	5	0.14
Echinoderm larvae	-	5	0.14
Polychaeta	larvae	5	0.14
Lucictia longicornis	-	4	0.14
Calanus glacialis	-	2	0.07
Oithona sp.	-	2	0.07
Benthic amphipoda	-	1	0.03
Bosmina longicornis	-	1	0.03
Microsetella norvegica	-	1	0.03

Table 3.72 Relative Occurrence of Zooplankton Taxa, Vertical Tows, Milne Port. 2015.

Taxa	n
100% Distribution (4 stations)	
Sagittidae damaged	4
Calanus hyperboreus	4
Clytemnestra scutellata	4
Copepod nauplii	4
Copepod copepodite I-V	4
Oithona similis	4
Oithona sp.	4
Bivalvia larvae	4
unspeciated larvae	4
Synchaeta hyperborea	4
75% Distribution (4 stations)	
Fritillaria sp.	3
Calanus glacialis	3
Copepod damaged/exoskeletons	3
Oithona atlantica	3
Oncaeidae	3
unspecified nauplii	3
50% Distribution (4 stations)	
Bosmina sp.	2
Chydorus sphaericus	2
Calanus finmarchicus	2
Tricornia borealis	2
Limacina sp.	2
25% Distribution (4 stations)	
Eukrohnia hamata	1
nauplii	1
cyprid larvae	1
Euterpina acutifrons	1
Microsetella norvegica	1
Pseudocalanus sp.	1

Table 3.73 Relative Occurrence of Zooplankton Taxa, Oblique Tows, Milne Port, 2015.

Taxa	n
100% Distribution (4 stations)	
Acartia hudsonica	4
Acartia lonigiremis	4
Acartia sp. copepodite	4
Copepod damaged/exoskeletons	4
Copepod nauplii	4
Copepod copepodite I-V	4

Table 3.73 Relative Occurrence of Zooplankton Taxa, Oblique Tows, Milne Port, 2015. (Cont'd)

Taxa	n
100% Distribution (4 stations)	
Pseudocalanus sp.	4
75% Distribution (3 stations)	
Fritillaria sp.	3
Calanus finmarchicus	3
Calanus glacialis	3
Lucicutia longicornis	3
Sapphirina sp.	3
50% Distribution (2stations)	
Harpacticoida	2
Oithona sp.	2
unspeciated larvae	2
25% Distribution (1 station)	
unidentified benthic species	1
Bosmina sp.	1
unidentified	1
Beroe cucumis	1
Microsetella norvegica	1

In 2016, nine of the 38 taxa (24%) identified were not previously recorded in Milne Port (Table 3.74). Of these nine new taxa, only four were identified to the species level. By comparison, 19 of the 40 taxa (48%) identified in 2015 had not previously been identified in 2014 and only seven of those taxa were identified to species level. A total of 63 taxa have been identified in the combined datasets of 2014, 2015, and 2016; 17 of which occurred in all years (Appendix F).

Table 3.74 New Zooplankton Taxa, Milne Port, 2016.

2016 New Zooplankton Taxa
Cirripedia
nauplii
Cnidaria
unidentified
Ctenophora
Beroe cucumis
Copepoda
Acartia hudsonica
Harpacticoida
Lucicutia longicornis

Table 3.74 New Zooplankton Taxa, Milne Port, 2016. (Cont'd)

2016 New Zooplankton Taxa
Echinodermata
unspecified nauplii
unspecified larvae
Rotifera
Synchaeta hyperborea

The taxa accumulation curves for 2014, 2015 and 2016 are plotted in Figure 3.39. As the number of samples increases, the number of taxa present also increases until very few new taxa are identified with each additional sample and the curve approaches an asymptote. The taxa accumulation plots for each year did not reach an asymptote, suggesting that sampling effort might be insufficient for characterizing the full extent of biodiversity at these locations. The taxa accumulation curve for 2014, 2015 and 2016 combined is plotted in Figure 3.40. The combined taxa accumulation plot approached an asymptote at 63 species, suggesting that effort for the combined three years of sampling may be sufficient for characterizing the full extent of biodiversity at Milne Inlet.

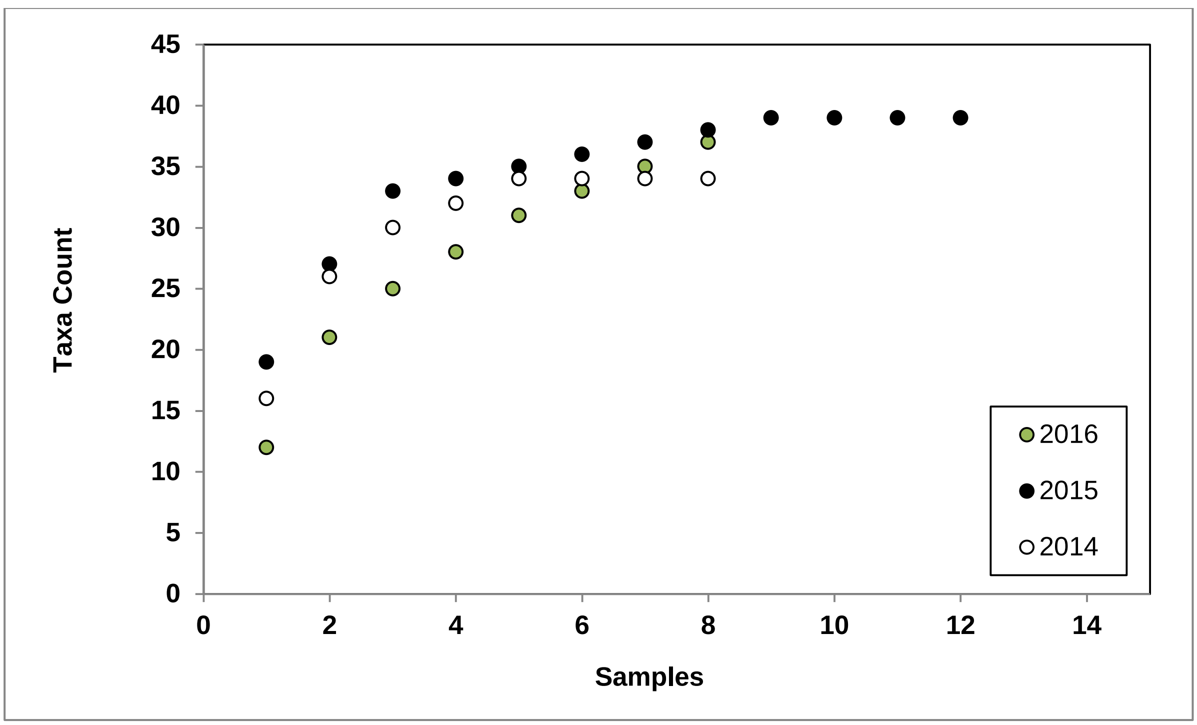


Figure 3.39 Taxa Accumulation Curves for Zooplankton, Milne Inlet, 2014, 2015 and 2016.

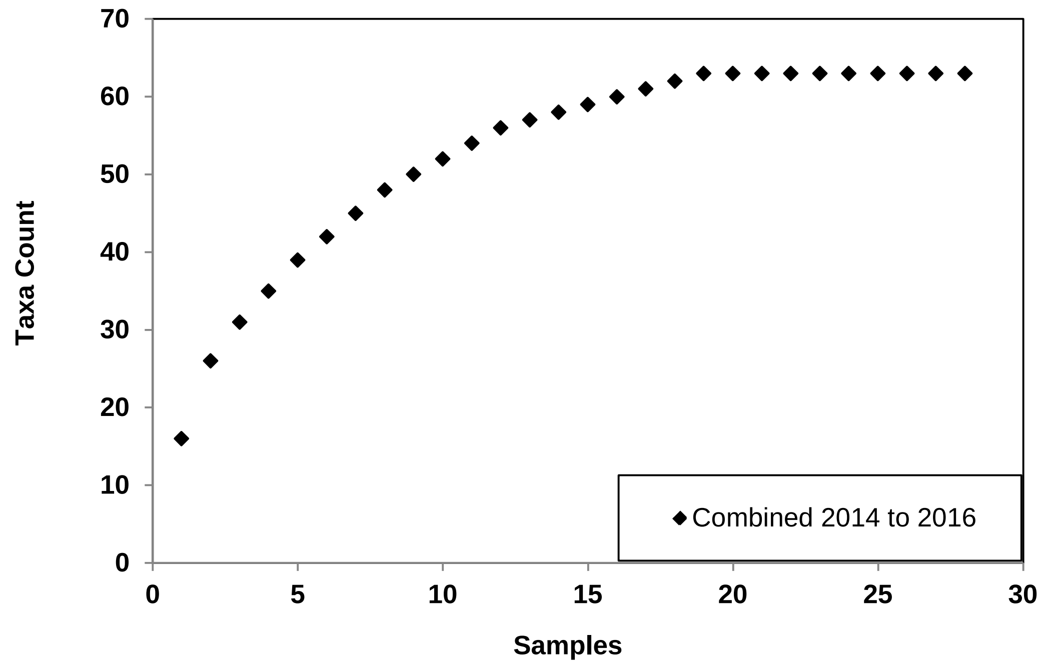


Figure 3.40 Taxa Accumulation Curves for Zooplankton, Milne Inlet, 2014, 2015 and 2016.

Chao2 was calculated for 2014, 2015 and 2016 separately and for all years combined. Table 3.75 displays the values used to calculate Chao2 for the various combinations of datasets. For the 2014 dataset, Chao2 was 38.1, exceeding the observed number of taxa by only 12%. In 2015, Chao2 was 48.3 which exceeded the observed number of taxa by 21%. In 2016, Chao2 was 43.4 which exceeded the observed number of taxa by 17%. When calculating the species richness estimator Chao2 for the three years combined to estimate expected total species numbers, the expected number of species for an infinite number of samples was 93.0, exceeding the total number of observed species by 48%. The zooplankton sampling effort appears to be quite close to capturing the number of taxa expected to be present at the Milne Port location.

Table 3.75 Values for Chao2 calculations, Zooplankton, Milne Port, 2016.

Year	S_{obs}	*a*	*b*	S^*_1 (Chao2)	% S^*_1 exceeds S_{obs}
2014	34	7	6	**38.1**	12%
2015	40	10	6	**48.3**	21%
2016	37	8	5	**43.4**	17%
2014, 2015 & 2016	63	31	16	**93.0**	48%

3.5.2 Benthic Invertebrates

Benthic invertebrate samples were collected at Milne Inlet on August 5 through 9, 13, 14, and 16, 2016. Samples were collected along four transects at three depth strata (3-15 m, 15-25 m and 25–35 m), at locations with varying substrate composition. Locations, depths, and substrate characteristics are provided in Table 3.76.

The report on analyses of benthic invertebrate samples as supplied by Envirosphere, Windsor, NS, can be found in Appendix G.

Table 3.76 Locations, Depth, and Substrate Type for Benthic Invertebrate Samples, Milne Inlet, 2016.

Date	Location	Sample ID	Depth (m)	Number of grabs	Substrate type
05/08/2016	Milne - AIS-Line 4	B-M-1	3-15	6	sand
05/08/2016	Milne - AIS-Line 4	B-M-2	3-15	5	sand
05/08/2016	Milne - AIS-Line 4	B-M-3	3-15	5	sand
05/08/2016	Milne - AIS-Line 4	B-M-4	3-15	4	sand
05/08/2016	Milne - AIS-Line 4	B-M-5	3-15	4	sand
06/08/2016	Milne - AIS-Line 3	B-M-6	3-10	6	sand/silt
06/08/2016	Milne - AIS-Line 3	B-M-7	3-10	8	sand/silt
06/08/2016	Milne - AIS-Line 3	B-M-8	3-10	8	sand/silt
06/08/2016	Milne - AIS-Line 3	B-M-9	3-10	7	sand/silt
06/08/2016	Milne - AIS-Line 3	B-M-10	3-10	7	sand/silt
07/08/2016	Milne - AIS-Line 2	B-M-11	3-15	6	sand/silt
07/08/2016	Milne - AIS-Line 2	B-M-12	3-15	7	sand/silt
07/08/2016	Milne - AIS-Line 2	B-M-13	3-15	7	sand/silt
07/08/2016	Milne - AIS-Line 2	B-M-14	3-15	5	sand/silt
07/08/2016	Milne - AIS-Line 2	B-M-15	3-15	6	sand/silt
07/08/2016	Milne - AIS-Line 1	B-M-16	3-15	5	sand/silt
07/08/2016	Milne - AIS-Line 1	B-M-17	3-15	5	sand/silt
07/08/2016	Milne - AIS-Line 1	B-M-18	3-15	5	sand/silt
07/08/2016	Milne - AIS-Line 1	B-M-19	3-15	5	sand/silt
07/08/2016	Milne - AIS-Line 1	B-M-20	3-15	5	sand/silt
08/08/2016	Milne - AIS-Line 4	B-M-21	15-25	5	cobble/gravel
08/08/2016	Milne - AIS-Line 4	B-M-22	15-25	5	cobble/gravel
08/08/2016	Milne - AIS-Line 4	B-M-23	15-25	5	cobble/gravel

Table 3.76 Locations, Depth, and Substrate Type for Benthic Invertebrate Samples, Milne Inlet, 2016. (Cont'd)

Date	Location	Sample ID	Depth (m)	Number of grabs	Substrate type
08/08/2016	Milne - AIS-Line 4	B-M-24	15-25	5	cobble/gravel
08/08/2016	Milne - AIS-Line 4	B-M-25	15-25	5	clay/rubble
09/08/2016	Milne - AIS-Line 4	B-M-26	25-35	6	clay/gravel
09/08/2016	Milne - AIS-Line 4	B-M-27	25-35	6	clay/gravel
09/08/2016	Milne - AIS-Line 4	B-M-28	25-35	6	clay/cobble
09/08/2016	Milne - AIS-Line 4	B-M-29	25-35	6	clay/cobble
09/08/2016	Milne - AIS-Line 4	B-M-30	25-35	6	clay/cobble
13/08/2016	Milne - AIS-Line 2	B-M-36	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 2	B-M-37	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 2	B-M-38	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 2	B-M-39	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 2	B-M-40	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 1	B-M-41	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 1	B-M-42	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 1	B-M-43	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 1	B-M-44	25-35	3	silt/clay
13/08/2016	Milne - AIS-Line 1	B-M-45	25-35	3	silt/clay
14/08/2016	Milne - AIS-Line 1	B-M-46	15-25	3	silt/clay
14/08/2016	Milne - AIS-Line 1	B-M-47	15-25	3	silt/clay
14/08/2016	Milne - AIS-Line 1	B-M-48	15-25	3	silt/clay
14/08/2016	Milne - AIS-Line 1	B-M-49	15-25	3	silt/clay
14/08/2016	Milne - AIS-Line 1	B-M-50	15-25	3	silt/clay
16/08/2016	Milne - AIS-Line 1	B-M-51	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 1	B-M-52	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 1	B-M-53	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 1	B-M-54	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 1	B-M-55	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 2	B-M-56	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 2	B-M-57	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 2	B-M-58	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 2	B-M-59	15-25	5	silt/clay
16/08/2016	Milne - AIS-Line 2	B-M-60	15-25	5	silt/clay

3.5.2.1 Species Abundance, Composition and Richness

Approximately 7,636 organisms were identified in the benthic invertebrate samples in Milne Port in 2016. Samples each contained from 13 to 53 different taxa, with abundances ranging from 40 to 282 organisms per sample (Table 3.77). Total number of taxa in the collection was at least 209. Some specimens were damaged or present as fragments, or for other reasons could not be identified. Shannon-Wiener Diversity ranged from moderate (e.g. 0.765) to extremely high (e.g. 1.49 in sample B-M-26). Wet weight biomass was mostly moderate to high (maximum of 96.5 g), largely due to the frequent presence of clams in many samples and the occasional occurrence of sea urchins, both of which tend to have high biomass.

Table 3.77 Benthic Invertebrate Abundance, Number of Taxa, Biomass and Shannon-Wiener Diversity Index, Milne Port, 2016.

Sample ID	Total Abundance	Number of Taxa	Biomass	Shannon-Wiener Diversity
B-M-1	126	32	62.2	1.247
B-M-2	120	19	39.6	0.993
B-M-3	115	21	34.9	1.075
B-M-4	96	15	33.6	0.765
B-M-5	72	13	14.3	0.985
B-M-6	106	16	21.3	0.776
B-M-7	124	21	18.2	1.034
B-M-8	208	24	33.0	0.853
B-M-9	144	35	20.7	1.280
B-M-10	226	43	53.0	1.281
B-M-11	107	17	65.4	0.949
B-M-12	156	15	58.6	0.818
B-M-13	120	22	50.3	1.100
B-M-14	147	21	62.8	0.932
B-M-15	282	31	53.7	1.112
B-M-16	96	21	21.4	1.043
B-M-17	118	28	28.7	1.174
B-M-18	117	29	64.4	1.125
B-M-19	210	31	83.0	1.012
B-M-20	113	29	47.5	1.246
B-M-21	103	37	26.2	1.353
B-M-22	81	34	28.3	1.388
B-M-23	139	39	48.4	1.279
B-M-24	77	25	71.6	1.152
B-M-25	128	39	30.7	1.341
B-M-26	151	53	19.7	1.490
B-M-27	60	32	8.0	1.371
B-M-28	123	42	19.1	1.472

Table 3.77 Benthic Invertebrate Abundance, Number of Taxa, Biomass and Shannon-Wiener Diversity Index, Milne Port, 2016. (Cont'd)

Sample ID	Total Abundance	Number of Taxa	Biomass	Shannon-Wiener Diversity
B-M-29	97	27	14.1	1.241
B-M-30	102	37	19.6	1.450
B-M-31	119	34	17.6	1.340
B-M-32	138	28	16.5	1.183
B-M-33	158	43	13.0	1.355
B-M-34	119	33	11.4	1.171
B-M-35	75	21	13.1	1.175
B-M-36	66	24	13.7	1.144
B-M-37	104	25	15.6	1.106
B-M-38	114	37	15.1	1.388
B-M-39	110	33	23.0	1.185
B-M-40	121	40	22.6	1.363
B-M-41	137	38	21.1	1.336
B-M-42	40	21	2.1	1.232
B-M-43	92	31	17.9	1.205
B-M-44	67	37	23.3	1.409
B-M-45	147	41	36.2	1.310
B-M-46	75	33	24.5	1.392
B-M-47	53	29	33.6	1.364
B-M-48	137	42	27.2	1.456
B-M-49	128	37	44.3	1.373
B-M-50	82	31	19.7	1.295
B-M-51	226	47	58.3	1.432
B-M-52	168	45	20.2	1.485
B-M-53	217	43	96.5	1.371
B-M-54	144	44	35.2	1.444
B-M-55	229	44	56.9	1.391
B-M-56	165	36	70.0	1.291
B-M-57	145	35	36.8	1.283
B-M-58	133	34	35.5	1.281
B-M-59	126	30	37.3	1.281
B-M-60	137	31	72.3	1.124
Min	40	13	2.0845	0.765414
Max	282	53	96.5	1.5
Mean	127.3	31.6	34.7	1.2
Total	7636			

The benthic invertebrate taxa collected at Milne Port in order of decreasing abundance are presented in Table 3.78, while the relative abundance is presented in Table 3.79.

Table 3.78 Benthic Invertebrate Taxa in Order of Decreasing Abundance, Milne Port, 2016.

Taxa	Total Abundance
Astarte montagui	923
Pectinaria granulata	922
Hiatella arctica	546
Pholoe minuta	457
Astarte borealis	327
Myodocopida, *Philomedes* sp.	284
Pholoe tecta	282
Tharyx sp.	273
Nereimyra punctata	260
Pholoe sp.	222
Macoma calcarea	208
Owenia fusiformis	202
Nucula tenuis	135
Mya truncata	130
Nuculana minuta	128
Thyasira flexuosa	112
Pista maculata	94
Chaetozone setosa	91
Musculus discors	88
Scalibregma inflatum	88
Nephtys sp.	85
Nematoda	77
Pontoporeia affinis	72
Nereis zonata	65
Gattyana cirrosa	63
Diastylis scorpioides	59
Terebellides stroemi	57
Paroediceros lynceus	56
Pontoporeia femorata	55
Sabellidae	49
Lumbrineris sp.	43
Eteone longa	40
Polychaete unidentified	39
Harmothoe imbricata	37
Scoloplos acutus	35
Nuculana pernula	31
Spionidae	29
Nemertean sp. C	29
Onisimus plautus	27
Clinocardium ciliatum	25
Lumbrineris impatiens	25

Table 3.78 Benthic Invertebrate Taxa in Order of Decreasing Abundance, Milne Port, 2016. (Cont'd)

Taxa	Total Abundance
Nemertean unidentified	25
Guernea nordenskioldi	23
Euchone sp.	22
Lumbrineris fragilis	22
Diastylis echinata	22
Harmothoe extenuata	21
Cirratulidae	20
Nereis sp.	20
Ostracod	20
Maldanidae sp. B	18
Ophelina acuminata	18
Orchomenella minuta	18
Ampharetidae	17
Tunicate sp. A	17
Serripes groenlandicus	16
Delectopecten greenlandicus	15
Margarites groenlandicus	15
Galathowenia oculata	15
Maldane sarsi	15
Prionospio steenstrupi	15
Atylus carinatus	15
Terebellidae	14
Ampelisca eschrichti	14
Calanoid copepod	14
Macoma balthica	13
Strongylocentrotus droebachiensis	13
Spio filicornis	12
Natica clausa	11
Ophiura robusta	11
Eteone sp.	11
Maldanidae	11
Anonyx nugax	11
Balanus sp.	11
Pteropods	11
Mya arenaria	10
Ophiura sarsi	10
Mediomastus ambiseta	10
Hydrachnidia	10
Asabellides sp.	9
Paraonidae	9
Cylichna gouldi	8

Table 3.78 Benthic Invertebrate Taxa in Order of Decreasing Abundance, Milne Port, 2016. (Cont'd)

Taxa	Total Abundance
Tonicella marmorea	8
Cirratulidae sp. A	8
Cossuridae	8
Polycirrus sp.	8
Pseudopotamilla reniformis	8
Lamprops fuscata	8
Priapulus caudatus	8
Lumbrineris tenuis	7
Sabellid sp. F	7
Leucon nascicoides	7
Sphyrapus anomalus	7
Tanaid	7
Nemertean sp. A	7
Harpacticoid copepod	7
Lepeta caeca	6
Amphitrite affinis	6
Gammarus setosus	6
Brachydiastylis resima	6
Eudorella sp.	6
Sipunculid	6
Nemertean sp. F	6
Astarte sp. A	5
Thracia myopsis	5
Harmothoe sp.	5
Laphania boecki	5
Maldanidae sp. C	5
Orchomenella sp.	5
Amphipod unidentified	5
Crystallophrisson sp	4
Capitellidae	4
Oweniidae	4
Travisia sp.	4
Anonyx sarsi	4
Westwoodilla sp.	4
Eudorella truncatula	4
Nemertean sp. B	4
Bivalve unidentified	3
Oenopota violacea	3
Gastropod sp. A	3
Amphicteis gunneri	3
Aricidea sp.	3

Table 3.78 Benthic Invertebrate Taxa in Order of Decreasing Abundance, Milne Port, 2016. (Cont'd)

Taxa	**Total Abundance**
Nephtys ciliata	3
Pista crislata	3
Polynoidae	3
Sabellid sp. A	3
Sabellid sp. B	3
Samytha sp.	3
Harpinia serrata	3
Monoculodes kroyeri	3
Orchomenella groenlandicus	3
Protomedeia fasciata	3
Diastylis sp.	3
Mysis mixta	3
Chlamys islandicus	2
Crenella faba	2
Portlandia arctica	2
Bivalve sp. A	2
Boreocinqulus castanea	2
Cylichna alba	2
Ophiocten sericeum	2
Ampharetid sp. B	2
Aricidea sp. A	2
Bylgides sarsi	2
Bylgides sp.A	2
Diplocirrus hirsutus	2
Lysippe labiata	2
Ophelia limacina	2
Phyllodoce maculata	2
Potamilla neglecta	2
Terebellid sp. C	2
Ampelisca sp.	2
Anonyx sp.	2
Corophiidae	2
Euthemisto sp.	2
Haploops tubicola	2
Monoculodes sp. B	2
Monoculodes sp.	2
Stenothoidae	2
Eudorella emarginata	2
Cumacean unidentified	2
Achelia spinosa	2
Tunicate sp. B	2

Table 3.78 Benthic Invertebrate Taxa in Order of Decreasing Abundance, Milne Port, 2016. (Cont'd)

Taxa	**Total Abundance**
Foraminifer	2
Meiofaunal arthropod	2
Admete couthouyi	1
Oenopota nobilis	1
Oenopota sp.	1
Trichotropis borealis	1
Holothuroidea sp A	1
Ampharetid sp. E	1
Anobothrus gracilis	1
Flabelligera affinis	1
Maldanidae sp. A	1
Marenzellaria sp.	1
Melinna elizabethae	1
Neobylgides sp.	1
Nichomache lumbricalis	1
Phyllodoce groenlandica	1
Phyllodoce mucosa	1
Phyllodocidae	1
Praxilella sp.	1
Sabellid sp. G	1
Spirorbidae	1
Syllidae	1
Terebellid sp. A	1
Polychaeta sp. C	1
Ampeliscidae	1
Anonyx laticoxae	1
Anonyx ochoticus	1
Anonyx pacificus	1
Bathymedon oblusifrons	1
Byblis sp.	1
Byblis sp. B	1
Callisoma crenata	1
Gammarus sp.	1
Haploops sp.	1
Harpinia sp.	1
Hippomedon serratus	1
Monoculodes sp. A	1
Monoculodes sp. C	1
Monoculopsis longicornis	1
Oediceros borealis	1
Oedicerotidae	1

Table 3.78 Benthic Invertebrate Taxa in Order of Decreasing Abundance, Milne Port, 2016. (Cont'd)

Taxa	Total Abundance
Opisa eschrichti	1
Orchomenella pinguis	1
Phoxocephalus holbolli	1
Diastylis sp. A	1
Diastylis sp. B	1
Lamprops sp.	1
Gnathia maxillaris	1
Isopoda sp. A	1
Sclerocrangon boreas	1
Nemertean sp. D	1
Nemertean sp. E	1
Cirripdeia larvae	1
Hydroid sp. A	1

Table 3.79 Relative Occurrence of Benthic Invertebrate Taxa, Milne Port. 2016.

# Taxa	Taxa	N
6	**>75% Distribution** (present in >45 samples)	
	Astarte montagui	58
	Astarte borealis	56
	Hiatella arctica	56
	Pholoe minuta	56
	Pectinaria granulata	54
	Nereimyra punctata	50
12	**51 to 75% Distribution** (present in 31 to 45 samples)	
	Mya truncata	44
	Pholoe sp.	43
	Tharyx sp.	42
	Macoma calcarea	40
	Nuculana minuta	40
	Nucula tenuis	39
	Pholoe tecta	38
	Myodocopida, *Philomedes* sp.	38
	Thyasira flexuosa	36
	Nematoda	35
	Pista maculata	33
	Scalibregma inflatum	32
23	**26 to 50% Distribution** (present in 16 to 30 samples)	
	Chaetozone setosa	30
	Nephtys sp.	30
	Terebellides stroemi	30
	Nereis zonata	29

Table 3.79 Relative Occurrence of Benthic Invertebrate Taxa, Milne Port. 2016. (Cont'd)

# Taxa	Taxa	N
23	**26 to 50% Distribution** (present in 16 to 30 samples)	
	Gattyana cirrosa	26
	Scoloplos acutus	26
	Lumbrineris sp.	25
	Polychaete unidentified	24
	Diastylis scorpioides	23
	Sabellidae	22
	Paroediceros lynceus	21
	Eteone longa	20
	Owenia fusiformis	20
	Pontoporeia femorata	19
	Nemertean sp. C	18
	Musculus discors	17
	Nuculana pernula	17
	Cirratulidae	17
	Nemertean unidentified	17
	Clinocardium ciliatum	16
	Harmothoe imbricata	16
	Onisimus plautus	16
	Diastylis echinata	16
177	**≤25% Distribution** (present in 1 to 14 samples)	
	Lumbrineris fragilis	15
	Spionidae	15
	Guernea nordenskioldi	15
	Serripes groenlandicus	13
	Ampharetidae	13
	Harmothoe extenuata	13
	Prionospio steenstrupi	13
	Galathowenia oculata	12
	Lumbrineris impatiens	12
	Nereis sp.	12
	Delectopecten greenlandicus	11
	Ophiura robusta	11
	Strongylocentrotus droebachiensis	11
	Ophelina acuminata	11
	Terebellidae	11
	Pontoporeia affinis	11
	Ostracod	11
	Natica clausa	10
	Pteropods	10
	Calanoid copepod	10
	Euchone sp.	9

Table 3.79 Relative Occurrence of Benthic Invertebrate Taxa, Milne Port. 2016. (Cont'd)

# Taxa	Taxa	N
177	**≤25% Distribution** (present in 1 to 14 samples)	
	Maldane sarsi	9
	Ophiura sarsi	8
	Asabellides sp.	8
	Cossuridae	8
	Maldanidae sp. B	8
	Anonyx nugax	8
	Orchomenella minuta	8
	Priapulus caudatus	8
	Margarites groenlandicus	7
	Eteone sp.	7
	Paraonidae	7
	Ampelisca eschrichti	7
	Lamprops fuscata	7
	Tanaid	7
	Tunicate sp. A	7
	Cylichna gouldi	6
	Amphitrite affinis	6
	Maldanidae	6
	Mediomastus ambiseta	6
	Polycirrus sp.	6
	Atylus carinatus	6
	Leucon nascicoides	6
	Sipunculid	6
	Astarte sp. A	5
	Lepeta caeca	5
	Amphipod unidentified	5
	Brachydiastylis resima	5
	Nemertean sp. A	5
	Harpacticoid copepod	5
	Mya arenaria	4
	Thracia myopsis	4
	Harmothoe sp.	4
	Laphania boecki	4
	Lumbrineris tenuis	4
	Maldanidae sp. C	4
	Travisia sp.	4
	Anonyx sarsi	4
	Westwoodilla sp.	4
	Eudorella sp.	4
	Sphyrapus anomalus	4
	Balanus sp.	4

Table 3.79 Relative Occurrence of Benthic Invertebrate Taxa, Milne Port. 2016. (Cont'd)

# Taxa	Taxa	N
177	**≤25% Distribution** (present in 1 to 14 samples)	
	Hydrachnidia	4
	Bivalve unidentified	3
	Oenopota violacea	3
	Gastropod sp. A	3
	Amphicteis gunneri	3
	Cirratulidae sp. A	3
	Nephtys ciliata	3
	Pseudopotamilla reniformis	3
	Sabellid sp. B	3
	Samytha sp.	3
	Spio filicornis	3
	Gammarus setosus	3
	Harpinia serrata	3
	Monoculodes kroyeri	3
	Orchomenella sp.	3
	Diastylis sp.	3
	Nemertean sp. B	3
	Nemertean sp. F	3
	Chlamys islandicus	2
	Crenella faba	2
	Macoma balthica	2
	Portlandia arctica	2
	Bivalve sp. A	2
	Boreocinqulu castanea	2
	Cylichna alba	2
	Tonicella marmorea	2
	Crystallophrisson sp	2
	Ophiocten sericeum	2
	Ampharetid sp. B	2
	Aricidea sp. A	2
	Aricidea sp.	2
	Bylgides sarsi	2
	Bylgides sp.A	2
	Capitellidae	2
	Lysippe labiata	2
	Ophelia limacina	2
	Oweniidae	2
	Pista crislata	2
	Polynoidae	2
	Sabellid sp. F	2
	Terebellid sp. C	2

Table 3.79 Relative Occurrence of Benthic Invertebrate Taxa, Milne Port. 2016. (Cont'd)

# Taxa	Taxa	N
177	**≤25% Distribution** (present in 1 to 14 samples)	
	Anonyx sp.	2
	Corophiidae	2
	Euthemisto sp.	2
	Haploops tubicola	2
	Monoculodes sp. B	2
	Monoculodes sp.	2
	Orchomenella groenlandicus	2
	Protomedeia fasciata	2
	Stenothoidae	2
	Eudorella truncatula	2
	Cumacean unidentified	2
	Mysis mixta	2
	Achelia spinosa	2
	Tunicate sp. B	2
	Foraminifer	2
	Admete couthouyi	1
	Oenopota nobilis	1
	Oenopota sp.	1
	Trichotropis borealis	1
	Holothuroidea sp. A	1
	Ampharetid sp. E	1
	Anobothrus gracilis	1
	Diplocirrus hirsutus	1
	Flabelligera affinis	1
	Maldanidae sp. A	1
	Marenzellaria sp.	1
	Melinna elizabethae	1
	Neobylgides sp.	1
	Nichomache lumbricalis	1
	Phyllodoce groenlandica	1
	Phyllodoce maculata	1
	Phyllodoce mucosa	1
	Phyllodocidae	1
	Potamilla neglecta	1
	Praxilella sp.	1
	Sabellid sp. A	1
	Sabellid sp. G	1
	Spirorbidae	1
	Syllidae	1
	Terebellid sp. A	1
	Polychaeta sp. C	1

Table 3.79 Relative Occurrence of Benthic Invertebrate Taxa, Milne Port. 2016. (Cont'd)

# Taxa	Taxa	N
177	**≤25% Distribution** (present in 1 to 14 samples)	
	Ampelisca sp.	1
	Ampeliscidae	1
	Anonyx laticoxae	1
	Anonyx ochoticus	1
	Anonyx pacificus	1
	Bathymedon oblusifrons	1
	Byblis sp.	1
	Byblis sp. B	1
	Callisoma crenata	1
	Gammarus sp.	1
	Haploops sp.	1
	Harpinia sp.	1
	Hippomedon serratus	1
	Monoculodes sp. A	1
	Monoculodes sp. C	1
	Monoculopsis longicornis	1
	Oediceros borealis	1
	Oedicerotidae	1
	Opisa eschrichti	1
	Orchomenella pinguis	1
	Phoxocephalus holbolli	1
	Diastylis sp. A	1
	Diastylis sp. B	1
	Eudorella emarginata	1
	Lamprops sp.	1
	Gnathia maxillaris	1
	Isopoda sp. A	1
	Sclerocrangon boreas	1
	Nemertean sp. D	1
	Nemertean sp. E	1
	Cirripdeia larvae	1
	Meiofaunal arthropod	1
	Hydroid sp. A	1

In 2016, 49 taxa (26%) of the 191 taxa identified were not previously recorded in Milne Port (Table 3.80 and Appendix G). Of these 49 new taxa, only 12 were identified to the species level. When compared to previous years, it was found that 56 taxa were unique in 2010, 59 taxa were unique in 2013, and 57 taxa were unique in 2015. It was also determined that 171 taxa were present in only one year of sampling, 67 taxa in two years of sampling, 49 taxa in three years of sampling, and 45 taxa in all four years off sampling for a grand total of 332 taxa identified in the four years combined (Appendix G).

Table 3.80 Unique Benthic Invertebrate Taxa Identified in 2016, Milne Port.

TAXA
CHORDATA
Tunicate sp.
NEMERTEA
Nemertean sp.
Polychaeta
Ampharetid sp. B
Ampharetid sp. E
Anobothrus gracilis
Aricidea sp. A
Bylgides sp.A
Capitellidae
Cirratulidae sp. A
Flabelligera affinis
Laphania boecki
Lumbrineris impatiens
Maldanidae sp. A
Maldanidae sp. B
Maldanidae sp. C
Marenzellaria sp.
Neobylgides sp.
Nereimyra punctata
Nereis sp.
Phyllodoce mucosa
Pista crislata
Polychaete unidentified
Praxilella sp.
Pseudopotamilla reniformis
Sabellid sp. A
Sabellid sp. B
Sabellid sp. F
Sabellid sp. G
Samytha sp.

Table 3.80 Unique Benthic Invertebrate Taxa Identified in 2016, Milne Port. (Cont'd)

TAXA
ARTHROPODA
Malacostraca
F. Ampeliscidae
F. Corophiidae
Achelia spinosa
Anonyx ochoticus
Anonyx pacificus
Bathymedon oblusifrons
Callisoma crenata
Euthemisto sp.
Gammarus setosus
Gnathia maxillaris
Hippomedon serratus
Onisimus plautus
Opisa eschrichti
Orchomenella pinguis
Phoxocephalus holbolli
MOLLUSCA
Gastropoda
Admete couthouyi
Oenopota nobilis
Oenopota sp.
Gastropod sp. A
Holothuroidea
Holothuroidea sp A

The taxa accumulation curves for 2013, 2015 and 2016 are plotted in Figure 3.41. As the number of samples increases, the number of taxa present also increases until very few new taxa are identified with each additional sample and the curve approaches an asymptote. The taxa accumulation curve for 2013, 2015 and 2016 combined is plotted in Figure 3.42. As the number of samples increase, the number of taxa present also increases until very few new taxa are identified with each additional sample and the curve approaches an asymptote at 347 species.

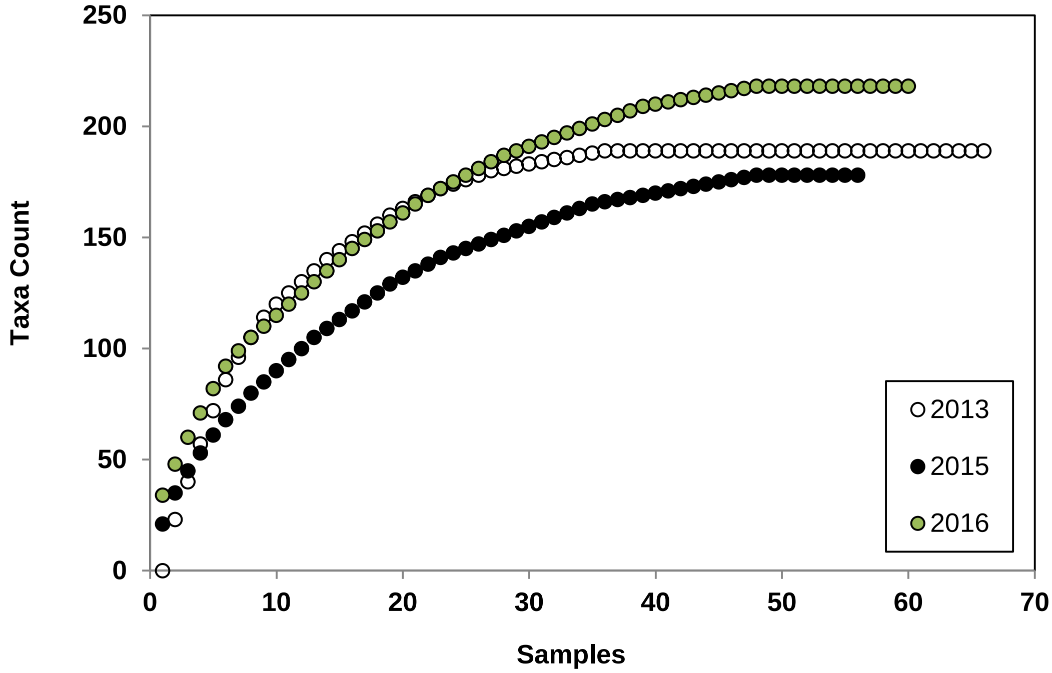


Figure 3.41 Taxa Accumulation Curves for Benthic Invertebrates, Milne Inlet, 2013, 2015 and 2016.

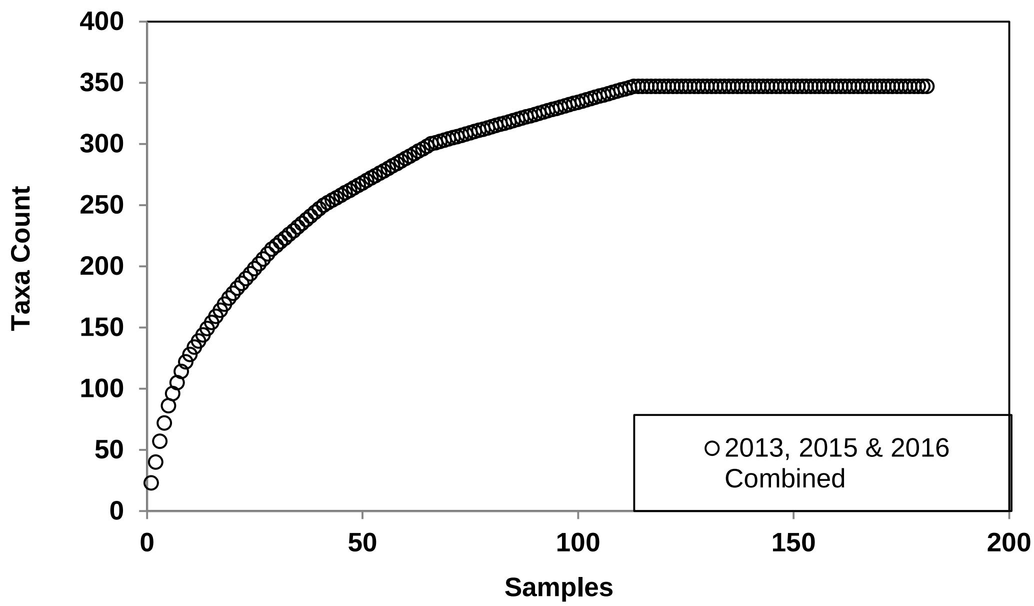


Figure 3.42 Taxa Accumulation Curves for Benthic Invertebrates, Milne Inlet, 2013, 2015 and 2016.

Chao2 was calculated for 2013, 2015 and 2016 separately and also for all three years combined. Table 3.81 displays the values used to calculate Chao2 for the various combinations of datasets. For the 2013 dataset, Chao2 was 278.7, exceeding the observed number of taxa by 48%. In 2015, Chao2 was 246.3 which exceeded the observed number of taxa by 36%. In 2016, Chao2 was 263.8 which exceeded the observed number of taxa by 21%. When calculating the species richness estimator Chao2 for the three years combined to estimate expected total species numbers, the expected number of species for an infinite number of samples was 370.1, exceeding the total number of observed species by 7%, showing that expected number of taxa is comparable to each individual year of data.

Table 3.81 Values for Chao2 calculations, Benthic Invertebrates, Milne Port, 2016.

Year	S_{obs}	*a*	*b*	S^*_1 (Chao2)	% S^*_1 exceeds S_{obs}
2013	188	70	27	**278.7**	48%
2015	181	56	25	**246.3**	36%
2016	218	59	38	**263.8**	21%
2013, 2015 & 2016	347	39	33	**370.1**	7%

It is important to recognize that in the taxonomic identifications, when an organism could not be identified to species level owing to the specimen quality, the specimen would be assigned to a genus and unique species identifier (e.g. *Genus* sp. A, *Genus* sp. B, etc.). It is possible these designations represent same species but that it could not be confirmed by the taxonomist. In the above analyses, the taxa accumulation curves and species richness estimator (Chao2) were determined conservatively assuming all designations represented unique taxa. This presents the possibility of an overestimation of the expected number of taxa for an infinite number of samples.

3.5.2.2 Community Comparisons

Several groupings of samples based on similarity of species composition and abundance were observed in cluster and multidimensional scaling analysis (Figures 3.43 and 3.44). Three groups of samples were observed in the study based on similarity of species composition and abundance (Figure 3.43). All groupings shared occurrences of the most common and abundant species and the differences in groupings were accounted for by particular species which occurred more commonly in particular groups compared with the others. Multidimensional Scaling (MDS) analysis showed the same three groups, with communities in samples from Group A (Figure 3.44) occurring in a grouping to the left; Group B communities in the middle; and Group C communities on the lower right hand side (Figure 3.44). The closeness of the points to each other on the MDS plot reflects their similarity. The stress level of 0.15 (Figure 3.44) indicates the groupings shown in the MDS are moderately good representations of the groupings in communities in the samples (Clarke and Warwick 2001).

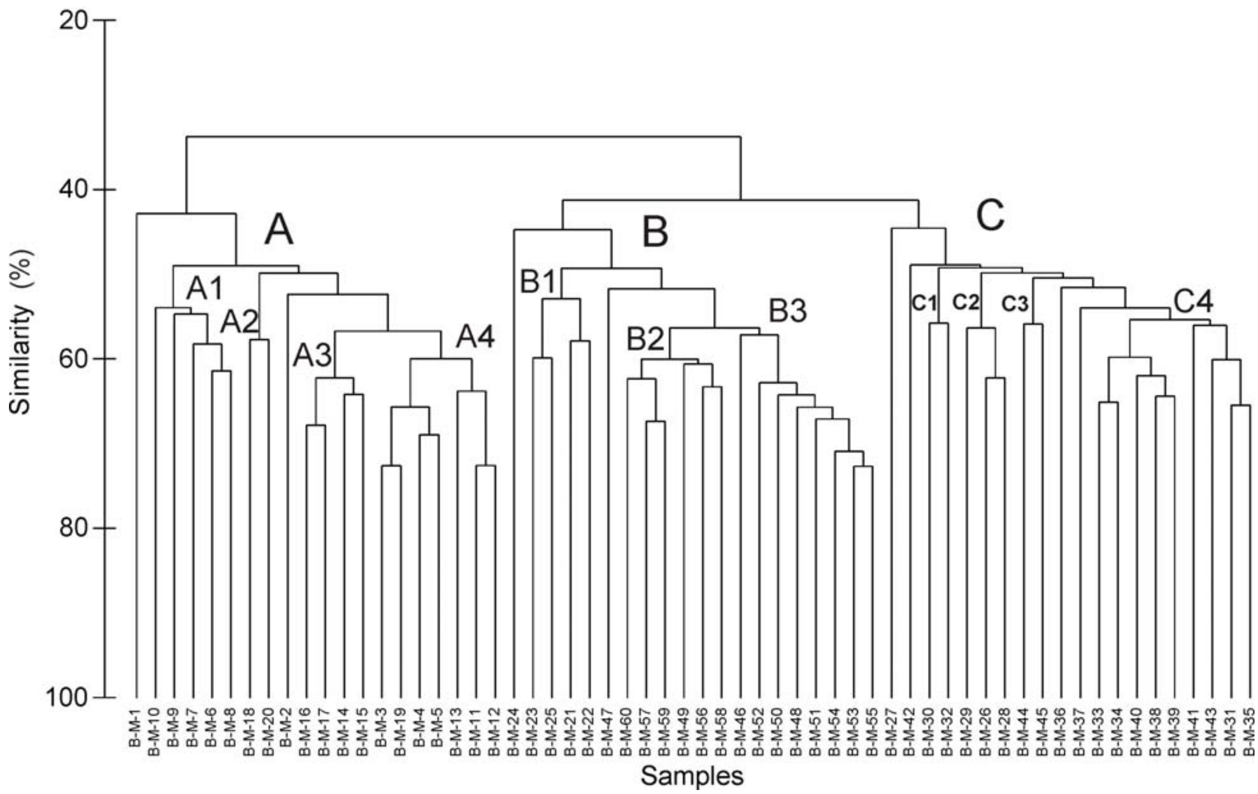


Figure 3.43 Groupings of samples based on similarity of benthic organism composition, Milne Inlet, 2016.

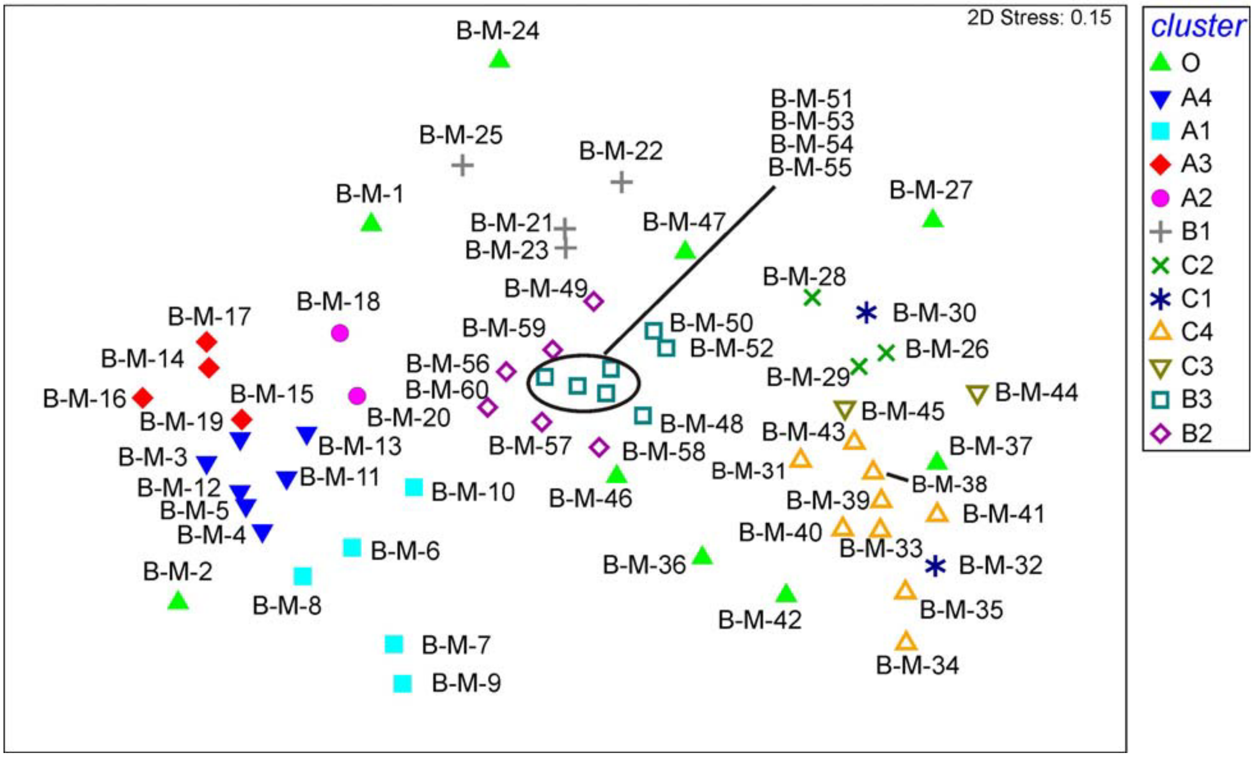


Figure 3.44 Groupings of samples based on similarity of benthic organism composition, MDS Analysis, Milne Inlet, 2016.

Group A

All samples in Group A were from shallow stations (<15 m). Species which were common and abundant in this group overall were polychaetes *Pectinaria granulata, Pholoe minuta, Pholoe tecta*, and *Nereimyra punctata*; and the bivalves *Hiatella arctica, Astarte montagui, Astarte borealis Musculus discors* and *Mya truncata*. Amphipod crustaceans *Paroediceros lynceus*, *Pontoporeia affinis* and *P. femorata* were also relatively important overall in Group A.

Sub-group A1 included all samples at depths of 3-10 m. The most common and abundant species in this group were bivalves or polychaete worms, dominated by polychaetes (*Pectinaria granulata, Phole minuta* and *Pholoe tecta* and *Nereimyra punctata*) and bivalves (*Astarte borealis, A. montagui*, *Hiatella arctica,* and *Macoma calcarea*).

Sub-group A2 contained two samples at depths of 3-15 m. The two samples in this group were dominated by the polychaetes *Pectinaria granulata* and *Pholoe minuta*; and the bivalves *Astarte* *borealis, Astarte montagui, Hiatella arctica,* and *Mya truncata*. An amphipod crustacean *(Paroediceros lynceus)* which occurred in both samples made a significant contribution to the similarity of the samples.

Sub-group A3 contained samples at depths of 3-15 m. The most common and abundant species in this group were bivalves or polychaete worms, dominated by the bivalve *Hiatella arctica* and polychaetes *(Pectinaria granulata, Phole minuta, Pholoe tecta, Nereimyra punctata,* and *Harmothoe imbricata)*. The amphipod crustacean *Pontoporeia femorata* was also relatively common and abundant in this group.

Sub-group A4 contained three samples at depths of 3-15 m. The most common and abundant species in this group were polychaete worms, dominated by *Pectinaria granulata, Phole minuta, Pholoe tecta* and *Nereimyra punctata*; and bivalves *Hiatella arctica*, *Astarte montagui* and *Musculus discors.*

Group B

Group B included samples in moderate to deep water (15-35 m). Species which were common and abundant in this group overall were bivalves *Astarte montagui, Astarte borealis, Hiatella arctica,* and *Nuculana minuta*; and polychaetes (*Pholoe minuta, Pectinaria granulata,* and *Nereimyra punctata).* The ostracod *Philomedes* sp. was also common and abundant in samples in this group.

Sub-group B1 contained mostly samples at depths of 15-25 m. The most common and abundant species in this group were bivalves or polychaete worms, dominated by bivalves *Astarte montagui*, *A. borealis* and *Nucula tenuis;* and polychaetes (*Nereimyra punctata Phole minuta, Pholoe tecta, Nereis zonata* and *Pectinaria granulata*).

Sub-group B2 contained mostly samples at depths of 15-25 m. The most common and abundant species in this group were bivalves and polychaete worms, dominated by bivalves (*Astarte montagui, Astarte borealis, Hiatella arctica, Thyasira flexuosa* and *Macoma calcarea*) and polychaetes (*Pectinaria granulata, Pholoe minuta*, and *Pista maculata)*. The ostracod *Philomedes* sp. was also common and relatively abundant in this sample group.

Sub-group B3 contained mostly samples at depths of 15-25 m. The most common and abundant species in this group were bivalves and polychaete worms, dominated by bivalves (*Astarte montagui, A. borealis* and *Nuculana minuta*) and polychaetes (*Pectinaria granulate, Pholoe minuta, Nephtys* sp. and *Scalibregma inflatum*). The ostracod *Philomedes* sp. also commonly occurred in these samples.

<u>Group C</u>

Group C was a grouping of samples all of which came from relatively deep water all at depths of 25-35 m, but not particularly similar in conditions having mainly silt/clay substrate, but also with clay, gravel and cobble. Group C was dominated by bivalves or polychaete worms, primarily bivalves (*Astarte montagui*, *A. borealis, Macoma calcarea* and *Nucula tenuis*) and polychaetes (*Owenia fusiformis, Tharyx* sp., *Pholoe minuta* and *Pectinaria granulata)*. The ostracod *Philomedes* sp. was also common and abundant in this group.

Sub-groups of Group C mostly were formed of two to three samples with the exception of one group (C4) which included about half the samples. Sub-group C1 (samples B-M-30 and B-M-32) was dominated by polychaetes and bivalves, predominantly the polychaete *Tharyx* sp., with *Owenia fusiformis* and *Scoloplos acutus* also occurring; and bivalves (*Astarte borealis* and *A. montagui, Macoma balthica, Thyasira flexuosa, Mya truncata* and *Nuculana minuta);* with the ostracod *Philomedes sp.* also important. Sub-group C2 (samples B-M-26, B-M-28 & B-M-29) was dominated by bivalves and polychaetes, including the bivalves *Astarte montagui, Nucula tenuis* and *Macoma calcarea*; and the polychaetes *Nereimyra punctata, Tharyx* sp*., Owenia fusiformis*, *Chaetozone setosa*, and *Lumbrineris impatiens*. The cumacean crustacean *Diastylis scorpioides* also was important in Sub-group C2. Sub-group C3 (Samples B-M-44 & B-M-45) was dominated by bivalves and polychaetes, including bivalves (*Astarte montagui, Macoma calcarea)* and polychaetes (*Tharyx sp., Nephtys* sp., *Pholoe minuta,* and spionids, including *Spio filicornis*). The ostracod *Philomedes* sp. was also important in these two samples.

The largest sub-group of samples in Group C in the similarity analysis was C4 (Figure 3.43), in which all samples were from 25-35 m. This group was dominated by bivalves or polychaete worms, including bivalves (*Astarte montagui, Astarte borealis, Macoma calcarea*, *Nucula tenuis*, *Nuculana pernula*¸and *Hiatella arctica*) and polychaetes (*Owenia fusiformis, Tharyx* sp. *Pholoe minuta*, *Chaetozone setosa,* and *Nephtys* sp.) The ostracod *Philomedes* sp., was also common and abundant in this sample group.

Comparison of Groups A, B and C

Occurrences of particular species were distinctive in characterizing each of the similarity groups (A, B, and C). Group A was distinguished from Group B by having occurrences of the polychaetes *Pectinaria granulata, Pholoe minuta* and *P. tecta,* and bivalves *Hiatella arctica* and *Musculus discors*; while Group B included dominant species such as the bivalves *Astarte montagui* and *A. borealis*, the polychaetes *Gattyana cirrosa* and *Tharyx* sp., and the ostracod *Philomedes* sp. which were not particularly important in Group A. These differences were mostly responsible for the separation of Groups A and B. Another species which was important in Group A and which did not occur in Group B, was the amphipod *Pontoporeia affinis*. Other species which were important in Group B, but not in Group A were *Nuculana minuta*, *Macoma calcarea*, *Nucula tenuis*, and the polychaetes *Scalibregma inflatum, Pista maculata* and *Nereis zonata.*

Group C showed differences in species composition from Group A including the occurrence and relative abundance of the polychaetes *Owenia fusiformis* and *Tharyx* sp.; the occurrence of the ostracod *Philomedes* sp.; the higher relative abundance in Group C compared to Group A of the bivalves *Macoma calcarea* and *Nucula tenuis;* and the relatively low abundance in Group C of the polychaete *Pholoe tecta*. Compared with Group C, the polychaetes *Pectinaria granulata, Pholoe tecta, Pholoe minuta,* and *Nereimyra punctata,* were more important in Group A.

Occurrences in Group C of several species distinguished it from Group B, including occurrences and higher relative abundance of the polychaetes *Owenia fusiformis* and *Tharyx sp.;* and a low relative abundance in Group C (compared with Group B) of the polychaetes *Pectinaria granulata, Nereimyra punctata, Nereis zonata, Pholoe tecta, P. minuta* and *Pista maculata*.

Outliers

Species which were common overall were found in nine samples (B-M-1, B-M-2, B-M-10, B-M-24, B-M-27, B-M-32, B-M-36, B-M-37, B-M-47) which were outliers in the cluster analysis (Figure 3.43). These were mostly bivalves or polychaete worms, in particular the bivalves *Astarte montagui*, *Astarte borealis* and *Hiatella arctica*; and the polychaetes (*Pectinaria granulata, Tharyx* sp. and *Nereimyra punctata*); but included the ostracod *Philomedes* sp.. Some other species in these groups which were relatively important and characteristic were the bivalves *Mya truncata, Macoma calcarea*, and *Nucula tenuis*; and the polychaete *Pholoe minuta*.

3.5.3 Benthic Epifauna

Table 3.82 provides a listing of the benthic epifauna types observed in Fukui traps and in the underwater video in 2016. Enumeration or other means of quantification (e.g., % cover) of the benthic epifauna types were not required for invasive species monitoring and therefore taxa were simply listed as present/absent ("X" indicates presence, "-" absence). A total of 25 taxa were identified in 2016 including five taxa not previously observed; Ocean quahog (*Arctica islandia*), Sea lily (*Bourgueticrininia* sp.), Northern propellerclam (*Cyrtodaria silique*), Feather duster worm (S*abellidae* sp.), and Razor clam (*Siliqua* sp.).

Table 3.82 Benthic Epifauna Identified in Fukui Traps and Video Surveys, Milne Port, 2010 to 2016.

Common Name	Taxa	2010	2013	2014	2015	2016
Sea Anemone sp.	*Actiniaria* sp.	X	X	X	X	X
Tube-dwelling Anemone sp.	*Cerianthidae* sp.	X	-	-	-	-
Ocean quahog	*Arctica islandia*		-	-	-	X
Sea Star sp.	*Asteriid* sp.	-	X	X	X	X
Sea lily	*Bourgueticrininia sp.*	-	-	-	-	X
Sar's Spider Sea Star	*Ophiura sarsi*	-	X	-	-	X
Sun Star	*Crossaster pappuosus*	-	-	X	X	X
Mud Star	*Ctenodiscus crispatus*	-	-	X	-	X
Clam sp.	*Bivalvia sp.*	X	-	X	X	X
Wrinkled Rock Borer	*Hiatella arctica*	-	X	-	-	-
Chalky Macoma	*Macoma calcarea*	-	X	-	-	-
Common Whelk	*Buccinum undatum*	-	X	X	X	X
Sea Angel	*Clione limnacina*	-	X	X	-	X
Medusozoa sp.	*Cnidarian* sp.	-	X	-	X	X
Ctenophore sp.	*Ctenophore* sp.	-	-	X	X	X
Northern propellerclam	*Cyrtodaria siliqua*	-	-	-	-	X
Sea Potato	*Echinocardium cordatum*	-	-	-	X	X
Sand Dollar sp.	*Echinoidae sp.*	-	-	X	X	X
Sea Cucumber sp.	*Holothuroidea* sp.	X	X	X	-	X
Sea Butterfly	*Limacina helicina*	-	X	X	X	X
Mussel sp.	*Mytilidae sp.*	X	X	-	X	X
Discordant Mussel	*Musculus laevigatus*	-	X	-	-	-
Brittle Star sp.	*Ophiuridea sp.*	X	X	X	X	X

Table 3.82 Benthic Epifauna Identified in Fukui Traps and Video Surveys, Milne Port, 2010 to 2016. (Cont'd)

Common Name	Taxa	2010	2013	2014	2015	2016
California Grunion	*Ennucula tenuis*		X			
Shrimp sp.	*Pandalus sp*.		X		X	X
Red Boreal Shrimp	*Panalus montagui*		X			
Sea Scallop	*Pecten albicans*	X			X	X
Blunt Gaper	*Mya truncate*		X			
Tube Worm sp.	*Polychaetea sp.*		X		X	X
Green Sea Urchin	*Strongylocentrotus droebachiensis*	X	X	X	X	X
Feather duster worm	*Sabellidae* sp.					X
Razor clam	*Siliqua sp.*					X
Amphipod (no common name)	*Weyprechtia pinguis*		X	X	X	
Bryozoan sp.	*Bryozoa* sp.	X				

3.5.4 Macroflora

Table 3.83 provides a listing of the macroflora types identified in the underwater video in 2014, 2015 and 2016. Overall there was similar level of diversity of macroflora in the MEEMP monitoring transects with three broad classes, including red, green and brown algae observed. As with the macrofauna, enumeration of the macrofloral classes was not required for the invasive species monitoring and therefore taxa were listed as present/absent ("X" indicates presence, "-" indicates absence). A total of six taxa were present in 2014, five taxa in 2015, and five taxa in 2016.

Table 3.83 Macroflora Taxa Identified, Milne Port, 2014, 2015 and 2016.

Taxa	Common Name	2014	2015	2016
Agarum cribrosum	Sea Colander	X	X	X
Chlorophyta sp.	Green Algae	X	X	-
Chondrus crispus	Irish Moss	X	X	X
Desmarestia sp.	Brown Algae	X	X	X
Fucus sp.	Wrack	X	-	X
Laminaria sp.	Brown Algae	X	X	X

3.5.5 Fish and Mobile Epifauna

Gill nets and baited Fukui traps were deployed to capture finfish and mobile epifauna associated with the Milne Port and adjacent areas. The fishing effort was considerable over the study, however, results provide a 'point in time' representation of the fish community at capture locations. Additionally, fish are highly mobile and are able to move within, as well as to and from, study areas. Some species, such as anadromous Arctic char (*Salvelinus alpinus*), reside in the marine environment for discrete well defined periods and are transient within study areas. Arctic cod (*Boreogadus saida)*, not previously captured, were observed in large schools associated with the ore dock coarse rock substrate and specimens were captured and subsequently identified. The results of all sampling efforts have been included in the compilation of a species inventory of fish for 2016 and in previous years.

Fish communities were assessed in the Milne Port area between August 10 and August 21, 2016. Fish and mobile epifauna sampling in 2016 complements and expands upon sampling conducted in 2015 (SEM 2016), as well as previous sampling efforts in 2007 and 2010 (NSC 2010), 2013 (SEM 2014) and 2014 (SEM 2015). All of these data have been used to compile the species inventories for these faunal groups of Milne Port (Table 3.84, where "X" denotes presence and "-" denotes absence).

A total of three species were captured with gill nets including Arctic char (*Salvelinus alpinus*), fourhorn sculpin (*Myoxocephalus quadricorni*), and shorthorn sculpin (*M. scorpius*). Four fish species were captured in Fukui traps including fourhorn sculpin, shorthorn sculpin, longhorn sculpin (*Myoxocephalus octodecemspinosus*), and fourline snakeblenny (*Eumesogrammus parecisus*).

Table 3.84 Compiled Species List of Marine Fish From Surveys in Milne Inlet From 2010 to 2016.

Common Name	Scientific Name	2010	2013	2014	2015	2016
Fourhorn sculpin	*Myoxocephalus quadricorni*	X	X	X	X	X
Shorthorn sculpin	*Myoxocephalus scorpius*	X	X	X	X	X
Longhorn sculpin	*Myoxocephalus octodecemspinosus*	-	-	X	X	X
Twohorn sculpin	*Myoxocephalus*	-	X	-	-	-
Arctic staghorn sculpin	*Gymnocanthus tricuspis*	X	X	-	X	-
Atlantic hookear sculpin	*Artediellus atlanticus*	-	-	X	X	-
Artic sculpin	*Myoxocephalus scorpioides*	-	-	-	X	-
Fishdoctor	*Gymnelus viridis*	-	X	-	X	-
Fourline snakeblenny	*Eumesogrammus parecisus*	-	-	-	X	X
Common lumpfish	*Cyclopterus lumpus*	-	-	X	-	-
Arctic char	*Salvelinus alpinus*	X	X	X	X	X
Greenland cod	*Gadus ogac*	X	-	X	-	-
Arctic cod[1]	*Boreogadus saida*	-	-	-	-	X

[1] first captured in 2016, previously not captured in netting program but present in fish stomachs

4.0 DISCUSSION

The primary objective of the 2106 program was to continue the monitoring for the second year of the MEEMP for the Mary River Project, specifically related to activities associated with the Milne Port. Additionally, data collection continued for the Milne Port species inventories to support monitoring related to AIS.

It should be recognized that operational shipping was only initiated in July 2015 and has been conducted at a relatively low level in comparison to the proposed shipping activities during full operation. As such, potential Project related effects would not expect to be discernable at this stage of the Project and data from 2015 and 2016 could, within reason, be interpreted as the natural variability within baseline conditions. Additionally, some Project effects that are being monitored for, such as alterations of the marine sediments and accumulations of contaminants in the sediments, would not likely occur immediately and it would take a period of time for these possible effects to become apparent. Finally, any possible biological effect would also take time to become apparent as any potential biological response would lag the habitat alteration that possibly could cause that response.

4.1 Marine Environmental Effects Monitoring Program

SEM designed the MEEMP to address regulatory requirements for the implementation of the Mary River Project, as articulated in the NIRB Project Certificate No. 005 Terms and Conditions, in consideration of public concerns and issues related to the Project. The design document addressed scientific requirements related to study design, sampling strategy and analyses of results for significance of effects.

The sampling design for the MEEMP was based on several key principles used for the design of environmental effects monitoring programs. Firstly, the design was based on repeated measures (RM) regression analyses where the same replicates (stations) will be re-sampled at specific time intervals (years). The RM regression design is an alternative to the RM analyses of variance (ANOVA) design and is considered an extension to the familiar repeated measures ANOVA building on standard regression analyses. Secondly, the spatial structure of the MEEMP was based on a radial gradient design as described in detail in Environment Canada (2012). Ellis and Schneider (1997) have advocated the use of gradient design, analyzed by regression analyses, for environmental effects monitoring of the effects dispersing with distance from a point source. They indicate that the design is more sensitive to change than the traditional BACI sampling design. The radial gradient design removes the problem of having to select a suitable control site while being more powerful at detecting changes due to perturbations. The gradient design enables physical, chemical and biological changes to be assessed as a function of distance from a point source and issues such as the spatial scale of impacts can more effectively be addressed. As data is compiled over the longer term, trend analyses can be included to provide an additional level of interpretation and corroboration.

The repeated measures radial gradient design implemented for the Milne Inlet MEEMP was developed in consideration of similar programs implemented for monitoring of offshore oil and gas production on the Grand Banks of Newfoundland and Labrador and elsewhere. For example, the EEM program to assess the effects of Terra Nova offshore oil and gas development on the Grand Banks, 350 km southeast of Newfoundland, focused on assessing the effects of drill cuttings, synthetic drilling muds and produced water on the seafloor environment. The program included an assessment of alterations in sediment quality through changes in sediment chemistry, particle size, toxicity and benthic community structure related to distance from the drill centers (DeBlois *et al*. 2014a and b; Ellis and Schneider 1997; Paine *et al*. 2014). Similarly, coastal EEM programs such as the Voisey's Bay Nickel Company (VBNC) mine and milling operations in Voisey's Bay, NL (VBNC 2006) were reviewed. The Voisey's Bay operation would be expected to reflect similar shoreline processes in northern coastal areas such as Milne Inlet. The Voisey's Bay operation is also characterized by a single point of discharge at a coastal location, similar to the location of the Milne ore dock. The marine EEM program at Voisey's Bay is based on a radial gradient design (three radii), with both near-field and far-field exposure sites and a reference (control) site on each radii. Monitoring targets include water, sediment, marine (benthic) habitat and caged mussels (to represent exposure of fish communities). Unfortunately, the results of the EEM program at Voisey's Bay are not available in the public domain and therefore the effectiveness of the study design could not be evaluated.

The design for the Milne MEEMP requires data collection over multiple years along four transects, three of which radiated out from the Milne Port ore dock as the point source of potential contaminants and as the primary source of physical impacts associated with shipping activities. The design allowed that, for each transect, a gradient in a given indicator variable as a function of distance from the environmental perturbation will be compared over time to identify changes attributable to Project activities. For the Milne MEEMP, transects originated from the Milne ore dock in three distinct directions: West Transect (WT); East Transect (ET); and North

Transect (NT). A fourth transect, Coastal Transect (CT), originated at the end of the East Transect and extended northeastward terminating outside of the predicted ZOI of Project activities (Baffinland 2016). The Coastal Transect captured a gradient beyond the ZOI which was not provided by the other transects given the configuration of the Inlet. With the exception of the North Transect, all transects followed the same depth contour in order to control for influence of variables related to changes in depth. The 15 m depth strata was chosen as it is generally considered to be below the ice scour zone and relatively unaffected by all but the strongest wave and tidal currents. This depth stratum does however remain within the photic zone, the surface layer of the water column that receives sunlight, and has been characterized in baseline studies as having reasonable and representative floral and faunal communities.

Candidate monitoring targets were identified during the environmental assessment process, in consideration of the NIRB Project Certificate Terms and Conditions and through examination of existing baseline information. The following targets have been included in the MEEMP:

- Physical sediment quality (particle size);
- Marine sediment chemistry (iron, hydrocarbons);
- Epibenthic community (benthic epifauna abundance, % macroflora cover);
- Fish community (contaminants in fish flesh of resident species [sculpin] and VECs [Arctic char]); and
- Aquatic invasive species (species inventories pre- and post-Project implementation).

4.2 Water Quality

Water quality was not initially selected as a target for the MEEMP however monitoring of water quality at a surveillance level has been added to the program at the request of Environment and Climate Change Canada (ECCC). Additionally, oceanographic studies have been conducted in Milne Inlet to provide data that could contribute to understanding environmental variability within the inlet and for use in possible future modelling studies (e.g. ballast water dispersion). Relevant oceanographic data have been presented in this report to assist in further characterization of the marine environment in Milne Inlet.

CTD profiles were collected throughout Milne Inlet (including the marine discharge point) in August 2016 (SEM and Moran-CORI). The CTD profiles indicated a consistent pattern with a well-defined vertical gradient in salinity increasing from the surface to the bottom, with the increase greatest in the near surface layers (10 to 15 m, depending on location) with a modest halocline. There was similarly a consistent gradient in temperature, declining from the surface layer to 65-85 m in depth, where the temperature remained consistent or increased with increasing depth. Maximum temperatures varied between 5.8-9.4 °C at the surface which was slightly warmer than the 4.6-7.1°C measured in 2015. The minimum temperatures were approximately 1.5°C near the bottom and were similar to the previous years. Unlike 2015, there was no particular trend in surface temperatures within the inner and outer portions of Milne Inlet; however, the cooler waters measured in previous years generally occurred towards Eclipse Sound which was beyond the scope of work for 2016. CTD data collected in 2016 were by and large consistent with profiles collected in Milne Inlet and Eclipse Sound in August 2014 and 2015.

Previous oceanographic investigations of similar Arctic regions have indicated that during winter, Milne Inlet and Eclipse Sound are ice covered with no freshwater input. CTD profiles indicated that temperature and salinity were relatively uniform with depth at -1.5°C and 32 PSU, respectively (Buckley *et al*. 1987). In the open water season, Milne Inlet and Eclipse Sound receive a significant input of fresh water at the surface and become highly stratified, with a strong halocline at a depth of 5 to 10 m (Fissel *et al*. 1981; Buckley *et al*. 1987). Surface water temperatures of 4.5°C were measured in summer decreasing to -1.5°C at a depth of 45 m, while salinities of 23 PSU were typical of surface waters under open ocean conditions (Buckley *et al*. 1987). CTD casts in August 2016, were strongly stratified, representative of typical open water conditions in the Arctic (CORI 2016).

Water samples were collected for detailed laboratory analyses over five separate sampling events between August and September in relation to the discharge point for surface runoff from the port site. Due to the shallow depth at the sampling sites, only surface samples were collected. Samples were generally comparable between stations with most of the variability occurring between sampling events. Water was generally clear with low TSS, low turbidity and low colour and was circumneutral to slightly alkaline. Nutrients were low and, with the exception of nitrogen ammonia, were generally non-detected. Nitrate and nitrite were frequently below detection with only six of the 20 samples having levels above the detection limit. Orthophosphate was detected in low quantities in 19 of 20 samples.

Laboratory analysis for trace metals indicated that most parameters (not including major ions) were un-detectable excepting boron, strontium and uranium detected in all 20 samples and aluminum, barium, cadmium, molybdenum, titanium and zinc detected in between one and eight samples. There were no exceedances of CCMEs water quality guidelines for the protection of aquatic life. Unlike 2015, mercury was not detected in any sample in 2016.

Hydrocarbons were not detected in any of the water samples collected in 2016, similar to 2015. The presence of hydrocarbons in the marine environment can reflect natural sources (e.g., oil seeps) as well as anthropogenic inputs, including commercial and recreational boating activity. There was no evidence of any input near Milne Port from the current level of activity, however, monitoring of hydrocarbons will continue to be an important aspect of environmental effects monitoring for the Mary River Project. Monitoring will continue at a surveillance level until such time that there is an apparent change in the quantity and distribution of hydrocarbons.

It is important to emphasize that water samples/measurements are a single ‘point in time’ and variability in some parameters would be expected on a temporal scale, including inter-annual, seasonal and diel variations. Samples were collected during five sampling events, but this only represented a short portion of the year (1.5 months), and only during ice free conditions. Seawater temperature and stratification of the water column in Milne Inlet has been demonstrated however this influence is short owing to the very short ice free season. There is also considerable seasonal variability in freshwater input to Eclipse Sound with a significant high flow period in July, related to the spring freshet. The influence of freshwater on the water chemistry near the sampling sites would be lessened by the size and distance from Phillips Creek or other major freshwater inputs. Prevailing current patterns are in a clockwise direction which would take the Phillips Creek freshwater influence away from the site runoff discharge.

The baseline water quality of Milne Inlet has been previously assessed (Baffinland 2012). Water was determined to be circumneutral, hard and clear with moderate to low amounts of nutrients. Nutrient concentrations were greater in deep waters and generally higher during the ice-covered season. Overall, nutrient concentrations in Eclipse Sound and Milne Inlet were within range of those found in previous studies conducted in Canadian Arctic waters. Nutrient levels vary with depth with generally lower nutrients near the surface, where they are used in biological production, and higher in deeper water where they are liberated through decomposition. Given the shallow nature of the sampling sites (completely within the photic zone), nutrients were expected to be low, unless contributed through site runoff. Overall, the water chemistry at the port site was consistent with the ultra-oligotrophic and pristine nature of the marine environment in Eclipse Sound and Milne Inlet.

4.3 Sediment Quality

Sediment samples were collected from each of the transects (West, n=15; East, n=15; North, n=15; and Coastal, n=12), each of which was subdivided into five sampling stations, each at increasing distance from the ore dock. Replicates from each station (n=3) were collected to evaluate variability between samples taken from the same station. Fourteen (14) of 19 stations (i.e., 42 of 57 samples) were collected within the 15-25 m depth strata (West, East and Coastal Transects) while the remaining five stations (15 samples) were collected at depths from 45 to 100 m along the North Transect. Sediment quality included chemical analyses (conventional metals, moisture and petroleum hydrocarbons) and physical characterization (particle size analysis, total organic carbon and carbon by loss on ignition).

There was considerable spatial variability in the particle size characteristics both within and among sampling sites. The highest variability occurred within the East Transect while the highest overall variability was in relation to the sand component. The gravel component in particle size analysis can be biased as one 'heavy' particle can skew the weight distribution. Conversely, coarse material often inhibits the closure of the sampling device and therefore the coarse component of the particle spectrum (i.e., gravel and larger) is generally unrepresented. The North Transect generally demonstrated increasing fines (clay and silt) with increasing depth, which was expected, while the Coastal Transect overall had the highest percentage of clay. The sand component was generally highest in the West and East Transects, likely partially related to their proximity to stream and river mouths, particularly Phillips Creek for the West Transect. Consistent with higher clay and silt fractions, the Coastal Transect had highest concentrations of organic carbon. Overall, samples from the 15 m depth strata were generally composed of silt (1 to 50%) and sand (19-93%). Deviations from the general composition could be explained by depth (SN-2 through SN-5 are deeper sites along the North Transect) or proximity to freshwater sediment sources (e.g., SW-4 and SW-5 which are strongly influenced by Phillips Creek). The reason for high silt and clay content in the Coastal Transect remains unclear.

Sediment size characteristics and organic content are important to assist in interpretation of the chemical data and generally finer sediments with higher organic carbon have a greater affinity for metals (Halcrow *et al*., 1973). Particle size is highly correlated with the environment under which the sediment was deposited. Smaller particles are generally associated with low energy environments while larger particles are associated with higher energy areas. Particle sizes generally decrease with increasing distance (seaward) from the coastline, as was apparent and expected for the North Transect. In the marine environment, the sedimentation process is strongly influenced by tides, waves and currents, as controlled by water depth, and in northern environments ice plays a major role in transportation and deposition. Unlike a lake environment, where there are locations that are depositional environments and sediments are deposited in a layered fashion, marine sediments are exposed to a greater amount of disturbance including that from benthic organisms (Duursma *et al*., 1971).

Project activities considered to potentially alter the physical composition of sediment in proximity to the ore dock included dust dispersion from loading of ore and sediment redistribution as a result of propeller wash from shipping activity. For this reason, the sediment sampling stations were established at increasing distances from the Milne ore dock (potential point source) for the MEEMP design. Project activities are more likely to cause deposition and/or redistribution of lighter weight materials with smaller diameter, consequently, the relationship between percent fines and distance from the ore dock was included in the MEEMP. Due to the relatively short time frame for alteration of sediment particle size composition (two years), and relatively modest level of shipping, large differences between baseline sampling and sampling in the first years of operations were not expected.

In 2014, the West Transect demonstrated a weak positive relationship between fines percent and distance from the ore dock with over 50% of the variation in data explained by the regression. The weak positive relationship remained in 2015; however, only 36% of the data was explained by the regression. In 2016, the positive relationship weakened once again to a point where there was not a significant difference from baseline values.

In 2014, the East Transect also showed a weak positive relationship with distance with close to 50% of the variation in data explained by the regression. The slope remained nearly identical in 2015 with nearly 50% of the variation explained by the regression. In 2016, the slope and intercept were near identical to those from 2015 and again showing no significant differences with the baseline values collected in 2014.

In 2014, the North Transect demonstrated no distinct relationship between fines and distance with only 13% of the variation in data explained by the model. In 2015, there was also no distinct relationship with distance and only 7% of the variation in data was explained by the model. For 2016, the slope and y-intercept remained statistically similar to both 2015 and baseline values with the y-intercept situated between the two years.

In all years, the Coastal Transect showed no distinct relationship with fines and distance from the ore dock with only 6%, 10%, and 6% of the variation in data explained by the regression, respectively. There was not a significant difference between years.

As expected, the regression relationships between the proportion of fines in the sediments and distance from the ore dock remained reflective of baseline conditions with the exception of the West Transect.

Stations will continue to be monitored in future EEM years which will allow for repeated measures for detection of changes in percent fines at each sampling station. The repeated sampling within the radial design, which permits the comparison of the slopes of gradients over time, will provide greater statistical power for detecting changes with each additional sampling year.

There are potential confounding factors that will be addressed in the interpretation of the percent fines in relation to distance from the ore dock. Marine circulation patterns and tidal cycles have an influence on the pattern of deposition of fine materials. Circulation in the Inlet was primarily wind-induced with offshore circulation in a weak clockwise direction. The major freshwater input to the lower Milne Inlet is from Phillips Creek and the influence of this river on sediment deposition was apparent in the spit that is formed on the eastern margin of the confluence of the creek with the marine environment (BIM 2012). This spit demonstrates that while the current pattern along the coast is primarily in a clockwise direction. Sediment inputs from Phillips Creek were also apparent in the surficial sediment character along the West Transect (see above). The ore dock itself will have an influence on the marine circulation pattern particularly in water depths adjacent to the shoreline and up to 30 m depth. Sediments are expected to accumulate along the eastern face of the ore dock while sediment delivery on the western side of the ore dock will be altered. As noted above, there has been a significant change in the percent fines at the West Transect, however, it is too early to determine whether the change is related to project activities or simply related to the influence of the ore dock on sediment transport and deposition. Due to the clockwise motion of the water in Milne Inlet, the ore dock may already be acting as a groyne thus ‘blocking’ the west side of the dock from sediment, particularly the easily moved fines. Monitoring of the ore dock in 2016 did not indicate any large quantities of sediment deposition on the east side of the ore dock (SEM 2017).

Conventional metals within the sediment samples were in relatively low concentrations and were comparable among stations with the exception of aluminum and iron which were found in relatively high concentrations. Aluminum and iron concentrations were highest along the North and Coastal Transects, likely related to the high clay, silt and organic carbon content of these samples. In 2016, there were only 3 exceedances of CCMEs ISQG guideline for the protection of aquatic life, two related to arsenic (CCME 7.24 $mg \cdot kg^{-1}$; SW3 mean 7.3±0.5 $mg \cdot kg^{-1}$, SN-4; mean 6.4±1.0 $mg \cdot kg^{-1}$) and one related to zinc (CCME 124 $mg \cdot kg^{-1}$, SW2 mean 79±113 $mg \cdot kg^{-1}$). In 2015, stations SW-3 and SN-4 also exceeded the CCME ISQG guideline for arsenic for the protection of aquatic life. Mean concentrations of arsenic at those two stations were 6.77 ± 1.17 $mg \cdot kg^{-1}$ and 6.37 ± 0.95 $mg \cdot kg^{-1}$, respectively. Samples from 2013 did not exceed the CCME ISQG guidelines for arsenic with maximum reported concentrations of 6.6 $mg \cdot kg^{-1}$. No parameters have exceeded CCMEs PEL guideline for the protection of aquatic life since 2014.

Hydrocarbons were for the most part below detection with only trace amounts of petroleum hydrocarbons in the lube oil ranges (C_{16}-C_{32}) with hydrocarbon concentrations generally in lower ranges and in fewer samples than detected in 2013 through 2015. Hydrocarbons in sediments have not warranted a change from surveillance level monitoring to a full EEM Program.

Potential sources of hydrocarbons in marine sediments are numerous and diverse and include natural sources (e.g., biogenic sources and petroleum seeps) and anthropogenic sources (e.g., offshore exploration and production, fuel transportation, storage facilities, sewage input, commercial and recreational boat traffic and combustion sources). Deposited hydrocarbons are further altered through bacterial decomposition, weathering, transportation, re-suspension and other processes.

Project activities including dust dispersion from loading of ore may potentially alter the chemical composition of sediment in proximity to the ore dock. Increased shipping activity has potential to increase concentration of petroleum hydrocarbons in the marine environment with deposition and accumulation in sediments. Consequently the relationship between trace metals, using iron as the main indicator and hydrocarbon content in sediment compared to the distance from the ore dock have been included in the MEEMP. Regression analyses of iron content versus distance from the ore dock were completed for each transect. Currently, results of hydrocarbon analyses in sediments did not warrant more detailed analyses in the context of the repeated measures radial gradient. Monitoring of hydrocarbons will continue be conducted at the Surveillance Level, in relation to compliance with the CCME ISQG, at a reduced spatial scale.

Increases in hydrocarbon concentrations as the EEM program progresses could trigger increased monitoring at the EEM level using the repeated measures radial gradient.

As with interpreting changes in physical composition of the sediment, it is important to recognize that initial regression relationships between parameters (e.g., iron concentrations) and distance from the ore dock remain reflective of baseline and early operational conditions. Stations will continue to be re-sampled in future EEM years as per the repeated measures gradient design. With the addition of sampling years, the comparison of slopes of gradients over time will provide additional statistical power for detecting changes. The potential confounding factors identified in relation to spatial patterns in sediment deposition will similarly have an influence on interpretation. Regression models will be used to explicitly consider these influences where necessary (e.g., multivariate models including particle size and organic carbon as covariates). As previously noted, it may be worth exploring additional regression models such as quadratic or exponential regressions with future sampling. Similarly, as the replications from each station have demonstrated relative similarities, decreasing the number of replicates and further increasing the number of stations along the transect may be advisable. The justification for this adjustment in sampling design can be found by comparing the variance among stations to the variance within stations. Through investigation of the sums of squares (SS) in the F table of the analysis of variance (ANOVA), these two sources of variance can be compared. If the combined sums of squares for all terms, excluding the residuals SS, is > 50% of the total sums of squares, then the variance among stations is greater than the variance within stations, and the change in sampling design to increased number of stations with less replication could be made to maximize the effectiveness of the sampling effort.

4.4 Epifauna and Macroflora

The potential influence of the Project on marine habitat will be primarily reflected through deposition and redistribution of sediments, and changes in sediment chemistry, and it is necessary to identify linkages for Project-related effects, be it physical perturbation or chemical contamination, on the biological community. Observed changes in habitat (e.g., sediment quality) need to be linked with a potential pathway for Project-related contaminants to enter the food web. Benthic epifauna (as total abundance) have been selected as a biological indicator as they have relatively small habitat ranges, are generally associated with specific habitat types, and are readily exposed to potential Project related effects. Benthic epifauna can be readily enumerated using underwater videography and therefore can be assessed without the need for lethal sampling.

Linking changes in benthic epifauna to Project activities is important to evaluate the usefulness of this monitoring target. It is recognized that other indicators, such as % macrofloral cover, are also useful when evaluating changes in the benthic marine environment. Changes in the macrofloral assemblage can be related to changes in sedimentation (i.e., smothering) or changes in the epifaunal assemblage (e.g., increased grazing). Monitoring changes in % macrofloral cover will supplement and corroborate information provided in monitoring of sediment quality and the benthic epifauna community.

A comparison of regression slopes for epifauna abundance; % macroflora coverage and distance from the Milne Port have indicated significant differences for the West and East Transects, but not for the Coastal Transect or the North Transect, similar to findings in 2015. These differences must be interpreted cautiously given the high variability within the system coupled with the difficulty in collecting data over the exact same area from year to year. Transects will continue to be re-sampled in future years to increase the power of analysis. The ability to re-sample the same transects in future years will continue to depend on field sampling conditions but every effort will be made to replicate the same transects, to satisfy conditions required for repeated measure design.

As per the MEEMP design (Baffinland 2016), a larger quantity of video data is collected than is analyzed each year. All video data have been archived and are available for additional analyses in the future as required.

Use of video data for determination of epifaunal abundance can be constrained by taxonomic resolution permitted through video interpretation. For the most part, it was possible to identify the epifauna to genus, and often to species, however this was not always possible due to video quality (i.e., image resolution, speed of data collection, height off the bottom, epifauna being obscured by the macroflora) and the fact that anatomical detail required for speciation was not always visible. This is not a concern when total epifauna abundance are used in analyses, however, if future analyses evolves to look at individual taxa, the ability to reliably discriminate individual taxa will become increasingly important, particularly if the indicator taxa are not abundant. Sampling of mobile epifauna with Fukui traps has provided specimens to assist in taxonomic identification. For macroflora, it was often not possible to identify the individual taxa to species and identifications were commonly made at the level of genus or higher (e.g., macrofloral class). Again this was not a concern as the metric used in the analysis was % macrofloral cover. Future analyses may move to enumerate individual taxa, particularly those that may be sensitive to physical perturbations (i.e., smothering) and ability to discriminate individual taxa will be paramount. In this instance, a supplemental program to collect specimens to facilitate taxonomic identifications may need to be considered.

An important aspect of environmental effects monitoring to address changes in the benthic community is the taxonomic level at which the analyses and interpretation are conducted (Ellis and Schneider 1997). The ability to detect gradients of change can be lost when individual species cannot be identified or are grouped into taxonomic classes. An alternative approach is to aggregate species by functional groups (e.g., feeding ecology, habitat preferences, mobility, size). A common response in the benthic community to sediment contamination is the reduction in species number with a corresponding increase in dominance of opportunistic species tolerant of effects (Ellis and Schneider 1997). Future monitoring may examine changes in benthic community through the use of an appropriate community index (i.e., Shannon-Wiener Diversity, Pielou's Evenness, Pielou 1974).

4.5 Fish and Mobile Epifauna

Gill nets and baited Fukui traps were deployed to capture finfish and mobile epifauna associated with the Milne Port and adjacent areas. Fishing locations were not based on the radial gradient MEEMP study design and more generally targeted the Milne ore dock (Fukui traps) and Eastern Shore (Gill nets; traditional Inuit fishing areas). As discussed previously, sample sizes and the possible requirements for lethal sampling of organisms to collect tissues for analyses were an important consideration in selection of monitoring targets for the fish community. Arctic char are only transient in the Milne Port area and have limited exposure to environmental perturbations associated with Milne Port. Char are considered to be a valuable ecological component (VEC) and are regarded as an important food resource for local Inuit. Due to the importance of char as a food source, opportunistic sampling was planned during fishing activities to collect fish flesh of incidental mortalities for contaminant analyses. Of the char captured, only 13 mortalities occurred with the addition of one small sculpin. Sampling indicated that char ranged between nine and 19 years in age and had relatively low body burden contamination. Arsenic, copper mercury and zinc were present in all 13 fish, while chromium (n=1) and iron (n=1) were also present. None of the fish exceeded Health Canada's former guideline for mercury and fish consumption (0.5 mg/kg). The use of char to monitor body burden would have limited value due to the short and transient exposure to potential contaminants associatied with Milne Port.

Resident fish (i.e., non char) in the vicinity of Milne Port were dominated by sculpin species and, while these species are considered suited to assessing Project related effects, previous captures have indicated low abundances. A mark-recapture survey of sculpin was conducted in 2016 for the third year to estimate relative population size to determine if the population could withstand lethal sampling. A total of 38 sculpin were captured in 2016 (down from 61 sculpin in 2014, and 39 in 2015) representing three species (down from six in both 2014 and 2015) with fourhorn and shorthorn sculpin each having 18 individuals caught. There were no recaptures of marked fish for the third year and therefore it was not possible to estimate population size. Although the lack of recaptures could suggest a large population, low CPUEs in all fishing years would suggest small and relatively immobile populations and may further suggest learned avoidance of fishing gear following release. The persistent low CPUEs indicate that the resident sculpin of any one species are not present in numbers adequate to support EEM induced mortalities and that sampling requirements for sacrificed fish would not likely be sustainable. The value of conducting an additional mark-recapture survey of sculpin in future years will be discussed with Baffinland. Opportunistic sampling at the Surveillance Level (i.e., only incidental mortalities from fishing efforts) of char and sculpin tissue samples will be continued as part of the MEEMP until results warrant an increase in sampling effort or alteration of study design.

4.6 Aquatic Invasive Species

Monitoring for aquatic invasive species is based on conducting annual surveys of zooplankton, benthic infauna, epibenthos, macroflora, fish, and encrusting epifauna. Each survey is used to update the list of taxa for each level of biota as new data become available. The updated taxa listings are examined for evidence of new taxa not previously identified and to determine if any of these new taxa may potentially be invasive. Surveys in 2016 represent the third year of surveys completed under a proposed aquatic invasive species monitoring program (SEM 2016) and the first year after operational shipping of iron ore was initiated in July 2015.

Zooplankton samples were collected at Milne Inlet by a combination of vertical and oblique tows. A total of 3,738 zooplankton representing 29 taxa were identified from vertical samples with a total abundance of 934.50 organisms per m^3. A total of 1,683 zooplankton representing 22 taxa were identified in oblique tows with a total abundance of 54.32 organisms per m^3. In 2016, nine of the 38 taxa (24%) were not previously recorded in Milne Port (Table 3.74) while a total of 63 taxa have been identified in the combined datasets of 2014, 2015, and 2016; 17 of which occurred in all years. The taxa accumulation curve for 2014, 2015 and 2016 approached an asymptote at 63 species, suggesting that effort from three years of sampling may be sufficient for characterizing the zooplankton biodiversity at Milne Inlet.

Benthic invertebrate samples (n=60) were collected at Milne Inlet along four transects at three depth strata. Approximately 7,636 organisms were identified with samples containing from 13 to 53 taxa and abundances ranging from 40 to 282 organisms. The total number of taxa in the 2016 collection was at least 209. In 2016, 49 (26%) of the taxa identified were not previously found at Milne Port. In four years of sampling, 171 taxa were present in one year of sampling, 67 taxa in two years of sampling, 49 taxa in three years of sampling, and 45 taxa in all four years of sampling with a total of 332 taxa identified in all years combined. The taxa accumulation curve for 2013, 2015 and 2016 indicated the relationship approached an asymptote at 347 species suggesting the combined sampling effort may be sufficient for characterizing benthic biodiversity at Milne Inlet.

Benthic epifauna were captured in Fukui traps and observed in underwater video in 2016. A total of 25 taxa were identified in 2016 including five taxa not previously observed; Ocean quahog, Sea lily, Northern propellerclam, Feather duster worm, and Razor clam.

Macroflora types were identified in underwater video in 2014, 2015 and 2016 and a similar level of diversity of macroflora was evident in all three monitoring years with three broad classes, including red, green and brown algae, observed. A total of six taxa were present in 2014, five taxa in 2015, and five taxa in 2016.

Gill nets and baited Fukui traps were deployed to capture finfish and mobile epifauna associated with the Milne Port and adjacent areas in 2016. A total of 13 finfish species have been recorded from all sampling efforts from 2010 through 2016, including seven sculpin species. In 2016, three species were captured with gill nets including Arctic char, fourhorn sculpin, and shorthorn sculpin, while four fish species were captured in Fukui traps including fourhorn sculpin, shorthorn sculpin, longhorn sculpin and fourline snakeblenny. Arctic cod, not previously captured, were observed in large schools associated with the ore dock coarse rock substrate.

Settlement baskets for sampling encrusting epifauna were deployed in 2014 and unfortunately could not be located in 2016, and it is probable the traps were disturbed and removed by the shipping traffic at the ore dock. Traps were redeployed in 2016 with recovery planned for 2018.

Monitoring of epibenthos and macroflora has been through the use of underwater video and the ability to identify all taxa to the lowest practical taxonomic level has been compromised by this approach. An alternative technique would be to conduct the surveys using scuba divers and to collect samples of any taxa that could not be identified by the scuba divers and/or traps. Baffinland has chosen not to use scuba diving as a technique for aquatic invasive species sampling due to the high costs and safety considerations associated with such a program. As the AIS monitoring program evolves, alternate techniques such as DNA barcoding should be considered, as not being able to identify taxa to species adds uncertainty to monitoring. These alternative techniques may help add certainty to the monitoring program while potentially reducing costs.

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5.0 SUMMARY AND FUTURE MONITORING

Monitoring activities in 2016 involved implementation of the second year of environmental effects monitoring under the Marine Environmental Effects Monitoring Program (MEEMP) for the Mary River Project, as specifically related to activities associated with the Milne Port. Operational shipping was initiated in late July 2015, and at a reduced level in comparison to full operations, and as such Project related effects would not be expected to be discernable at this early stage of Project operations.

Conductivity/temperature/depth profiles were collected throughout Milne Inlet and profiles indicated a consistent pattern with a well-defined vertical gradient in salinity, increasing from the surface to the bottom, and a similar consistent gradient in temperature, declining from the surface layer to 65-85 m in depth. Surface water samples collected during five sampling events indicated samples were comparable between stations with most variability occurring between events, with most of the variability related to major ion concentration (reflected through conductivity). Water was clear with low TSS, low turbidity and colour, and nutrients were either very low or non-detected. Most metals were un-detectable excepting aluminum, barium, boron, cadmium, molybdenum, strontium, titanium, uranium and zinc. Hydrocarbons were not detected in any water samples collected in 2016.

Sediment samples were collected from each of four transects and there was considerable spatial variability in particle size characteristics within and among sampling sites. The North Transect demonstrated increasing fines (clay and silt) with increasing depth while the Coastal Transect had highest percentages of clay. The sand component was highest in the West and East Transects related to proximity to stream and river mouths (i.e., Phillips Creek). The East Transect demonstrated a weak positive relationship between percent fines and distance from the ore dock while the North and Coastal Transects demonstrated a very week relationship. The West Transect, although demonstrating a positive relationship in 2014 and 2015, no longer displaced a relationship with distance. As such, the ANCOVA analyses indicated that significant differences in the regression relationships between baseline (2014) and the second year of operations was only present for the West Transect as opposed to no significant difference in 2015.

Conventional metals in sediment were in low concentrations, with the exception of aluminum and iron, with concentrations of these elements highest from the North and Coastal Transects related to higher fines and organic carbon. Two stations exceeded CCME ISQG guideline for arsenic while one exceeded the guideline for zinc. Hydrocarbons were mostly undetectable with only trace amounts of petroleum hydrocarbons in the lube oil ranges (C_{16}-C_{32}) detected in a few samples. The West Transect showed a slight decrease in iron concentrations with distance from the ore dock, as in previous years, while only the East Transect showed a significant difference from baseline.

Habitat surveys were completed by underwater video to assess substrate (type and distribution); macroflora (class and distribution); and epifauna (presence and abundance). A comparison of regression slopes for % macroflora and epifauna abundance coverage with distance from the Milne Port indicated significant differences between baseline (2014) and year two (2016) for the West, East and Coastal Transects, but not for the North Transect for macroflora and significant differences for West, East and North Transects but not for the Coastal Transect for epifauna abundance. These differences must be interpreted cautiously given high variability and sampling replication difficulty. Data collection in future years will increase the power of analysis.

Finfish and mobile epifauna were captured from the Milne ore dock and eastern shore at traditional Inuit fishing areas. Opportunistic sampling of incidental mortalities collected flesh for contaminant analyses from 13 Arctic char. Char were between nine and 19 years in age and had relatively low body burden contamination. None of the fish exceeded Health Canada's guideline for mercury and fish consumption (0.5 mg/kg). Resident fish in the vicinity of Milne Port were dominated by sculpin species and a mark-recapture survey was conducted to estimate relative population size. Lack of recaptures and low catch-per-unit-effort in all years since inception indicated resident sculpin are not present in numbers adequate to support sampling requiring fish sacrifice.

Future Monitoring

Year 3 of EEM monitoring will be completed in 2017 consistent with the schedule identified in the MEEMP. This will include continued monitoring of percent fines and iron concentrations in sediment samples collected in accordance with the repeated measures radial gradient sampling design. Regression analyses will be completed for each transect and ANCOVA analyses conducted to look for differences between EEM monitoring years (2015, 2016, 2017) and baseline. The use of fewer replicates with a larger number of sampling stations will be explored in order to increase the power of analysis. Hydrocarbons in sediment will be monitored at a surveillance level to examine for any increase in hydrocarbon levels above baseline levels.

Habitat surveys along replicate transects will be completed to determine epifauna abundance and % macroflora coverage in relation to distance from Milne Port. Regression analyses will be completed and ANCOVA analyses conducted to look for differences between EEM monitoring years and baseline. Opportunistic sampling of fish at the surveillance level will be continued with tissue samples collected from incidental mortalities for contaminants analysis. Water quality monitoring will be completed in relation to the surface runoff discharge from the port site.

As the MEEMP evolves and additional data become available for analyses, the design and approach to analyses should be continuously revisited to optimize the statistical power for interpreting change. As indicated, modifying the sampling design to include more stations along transects with less replication, may increase the statistical power of the analyses without adding to the cost of the program. Other approaches to interpreting the statistical relationships beyond linear regression should be explored. Some of the analyses of baseline relationships in 2014 (e.g. iron concentration data along West and Coastal transects) suggest non-linear models (polynomial quadratic regressions) may better describe the data.

Currently, a proposed expansion to the Mary River Project (Phase 2) is under consideration and will be subject to environmental assessment. The Phase 2 expansion will include construction of a second ore dock and the radial gradient basis for the MEEMP design may need to be refined to include this second point source for environmental perturbation.

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APPENDIX A

Fisheries and Oceans Canada Experimental License to Conduct Fish Investigations, Animal Use Protocol (AUP) Letter of Approval, 2016 Marine Program Milne Inlet and Eclipse Sound

Fisheries and Oceans Canada | Pêches et Océans Canada

Licence #: S-16/17-1014-NU

David Scruton
2nd Floor, 70 Mews Place
St. John's, NU, CA A1B 4N2

Dear David Scruton,

Enclosed is your Licence to Fish for Scientific Purposes issued pursuant to Section 52 of the Fishery (General) Regulations.

Failure to comply with any of the conditions specified on the attached licence may result in a contravention of the Fishery (General) Regulations.

Please be advised that this licence only permits those activities stated on your licence. Any other activity may require approval under the Fisheries Act or other legislation. It is the Project Authority's responsibility to obtain any other approvals.

Please ensure that you include the licence number and project title in any future correspondence and that you complete the Summary Harvest Report upon completion of activities under this licence.

Yours truly,

For Jenna Kayakjuak
License Delivery Officer
Northern Operations
Central and Arctic Region
Fisheries and Oceans Canada

June 22, 2016
Date

Enclosure

LICENCE TO FISH FOR SCIENTIFIC PURPOSES

S-16/17-1014-NU

Pursuant to Section 52 of the Fishery (General) Regulations, the Minister of Fisheries and Oceans hereby authorizes the individual(s) listed below to fish for scientific purposes, subject to the conditions specified.

Project Authority: David Scruton, Sikumiut Environmental Management Limited
2nd Floor, 70 Mews Place
St. John's, NU, CA A1B 4N2

Other Personnel: Grant Vivian; Claire Moor-Gibbons; Jason Lewis
Additional field staff from Pond Inlet will be hired, names to be determined. These individuals will be under the supervision of the above staff.

Objectives:
1. To collect data from Milne Inlet for Environmental Effects Monitoring
2. To assess the effectiveness of fish offsetting in relation to the construction of the Milne ore dock.

CONDITIONS

Specified Conditions:

Other gear types: Fukui traps (a live trapping technique).

Total number of live samples are unknown; purpose is to gather information on distribution, relative abundance, size distribution, and other biological characteristics.

Waters:

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Fourhorn

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Shorthorn

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Ribbed

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Arctic Staghorn

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Spiny Lumpsucker

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Cod, Greenland

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Cod, Arctic

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Invertebrates

Gear: See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
						300		

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Arctic Charr (SR OR LL)

Gear: 10 MM Mesh Gillnets and Larger
Angling
Hand Line
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	50				

Fishing Period: July 15, 2016 to September 15, 2016

A copy of this licence must be available at the study site and produced at the request of a fishery officer.

Live fish may not be retained unless specified in the conditions of this licence.

The licence holder shall immediately cease fishing when the total fish killed or live sampled reaches any of the maximums set for any of the species listed.

Transportation:

Other approvals/permits may be necessary to collect or transport certain species, such as Marine Mammal Transportation Permits. For marine mammal parts, products and derivatives a Marine Mammal Transportation Licence is required for domestic transport and, for international transport a Canadian CITES Export Permit is also required.

Disposal of Fish Caught:

Fish not required for the purpose of dead sampling and/or retention MUST be returned to the water at the site of capture. Retained fish may be made available to the nearest settlement for domestic consumption or sold commercially within the Territory. Any dead fish for commercial sale beyond the Territory in which it was caught requires authorization under the Fish Inspection Regulations. Disposal of any fish remains must be in accordance with local land use regulations.

Report on Activities:

The Project Authority will submit to the License Delivery Officer, Department of Fisheries and Oceans, within one month of the expiry date, a report stating:

i) whether or not the field work was conducted; and if conducted

ii) waterbody location, fishing coordinates, gear types used at each coordinate, numbers or amount of fish (by species) collected and/or marked and the date or period of collection.

A Summary Harvest Report template is provided by the License Delivery Officer at time of issuance of this licence.

The Project Authority also will provide a copy of any published or public access documents which result from the project. Information supplied will be used for population management purposes by the Department of Fisheries and Oceans and becomes part of the public record.

All documents should be sent to:

Fisheries and Oceans Canada
Northern Operations
Central and Arctic Region
P.O. Box 358
Iqaluit, NU X0A 0H0

Attention: License Delivery Officer

Telephone: (867) 979-8005
Fax: (867) 979-8039
E-mail: XCNA-NT-NUpermit@dfo-mpo.gc.ca

Notification of Commencement:

Prior to the commencement of fishing the Project Authority will contact:

Fisheries and Oceans Canada
Northern Operations
Central and Arctic Region
P.O. Box 358
Iqaluit, NU X0A 0H0

Attention: License Delivery Officer

Telephone: (867) 979-8005
Fax: (867) 979-8039
E-mail: XCNA-NT-NUpermit@dfo-mpo.gc.ca

For Larry Dow
Director, Northern Operations
Central and Arctic Region
Fisheries and Oceans Canada

June 22, 2016
Date

For the Minister of Fisheries and Oceans.

Pursuant to Section 52 of the Fishery (General) Regulations.

Canada

Date: June 14, 2016

To: David Scruton
Sikumiut Environmental Management Limited (SEM)
2nd Floor, 79 Mews Place
St. John's, NL, A1B 4N2

Subject: Animal Use Protocol - Letter of Approval

Dear David,

Your 2015 Animal Use Protocol (AUP), number FWI-ACC-2016-013 entitled "Mary River Project – 2016 Marine Environmental Effects Monitoring – Milne Inlet ", has been reviewed and approved by the Freshwater Institute Animal Care Committee. This AUP will expire on October 01, 2016.

Please note: Section 21 For Euthanasia a dose of 250 mg/L of buffered MS222 is sufficient. More is not better in this case as MS222 is an acid and can damage the gills and cause distress while the fish is euthanized.

Keep this signed letter of approval as well as the signed AUP approval form for your records. Please be advised that should there be a need to revise the protocol you are requested to contact the Freshwater Institute Animal Care Committee and obtain approval prior to proceeding.

In addition, you are required to submit a brief report within 30 days of completion of the project outlining the unexpected changes to the protocol, the number of animals used and any unanticipated results or mortalities. The report form is attached in your approval email.

Feel free to contact me if you have any questions or concerns.

Sincerely,

Kerri Pleskach *FWISL-ACC Acting Chairperson*

Freshwater Institute Science Laboratories Animal Care Committee
Arctic Aquatic Research
Central & Arctic / Région du Centre et de l'Arctique
Fisheries and Oceans Canada / Pêches et Océans Canada
501 University Crescent
Winnipeg, Manitoba R3T 2N6
Phone:204 984-2532
Fax:204 984-2403

Enclosure

Canada

APPROVAL BY ANIMAL CARE COMMITTEE MEMBERS

AUP#: ACC-2016-013 Date: June 14, 2016

Signatures of ACC Members

Kerri Pleskach, Chair

Theresa Carmichael

Dr. Ericka Anseeuw D.V.M.

Bob Artes

Kerry Wautier

Jack Orr

Interim Approval ☐ **Final Approval** ☒

APPROVAL BY THE FWI ANIMAL CARE COMMITTEE IS FOR THE PERIOD STATED ON YOUR ANIMAL USE PROTOCOL.

APPENDIX B

Water Quality, Sediment and Fish Tissue Data from Maxxam Analytics, Including Laboratory QA/QC

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560235-02-01, 560235-03-01, 560235-06-01

Report Date: 2016/09/08
Report #: R4158972
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6H1451
Received: 2016/08/11, 10:26

Sample Matrix: Soil
Samples Received: 17

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
TEH in Soil (PIRI) (2)	6	2016/08/16	2016/08/16	ATL SOP 00111	Atl. RBCA v3 m
Mercury (CVAA)	17	2016/08/16	2016/08/17	ATL SOP 00026	EPA 245.5 m
Metals Solids Acid Extr. ICPMS	17	2016/08/16	2016/08/18	ATL SOP 00058	EPA 6020A R1 m
Loss on Ignition at 600 (3)	17	2016/08/17	2016/08/18		Carter 2nd ed 28.3
Moisture	6	N/A	2016/08/17	ATL SOP 00001	OMOE Handbook 1983 m
VPH in Soil (PIRI)	6	2016/08/16	2016/08/18	ATL SOP 00119	Atl. RBCA v3 m
Particle size in solids (pipette&sieve) (4)	8	N/A	2016/08/18	ATL SOP 00012	MSAMS 1978 m
Particle size in solids (pipette&sieve) (4)	9	N/A	2016/08/19	ATL SOP 00012	MSAMS 1978 m
Total Carbon in Soil (1)	17	N/A	2016/08/18	CAM SOP-00468	Lloyd Kahn Method
Total Inorganic Carbon in Soils (1)	15	N/A	2016/08/19		Calculation
Total Inorganic Carbon in Soils (1)	2	N/A	2016/09/02		Calculation
Total Organic Carbon in Soil (1)	15	N/A	2016/08/19	CAM SOP-00468	BCMOE TOC Aug 2014
Total Organic Carbon in Soil (1)	2	N/A	2016/09/02	CAM SOP-00468	BCMOE TOC Aug 2014
ModTPH (T1) Calc. for Soil	6	N/A	2016/08/18	N/A	Atl. RBCA v3 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Analytics Mississauga
(2) Soils are reported on a dry weight basis unless otherwise specified.
(3) Loss on Ignition at 600 is not accredited.
(4) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560235-02-01, 560235-03-01, 560235-06-01

Report Date: 2016/09/08
Report #: R4158972
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6H1451
Received: 2016/08/11, 10:26

Encryption Key Sara Mason
Sara Mason
Project Manager Assistant
08 Sep 2016 15:45:25 -03:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO873	CWO873	CWO874	CWO875	CWO876	CWO877		
Sampling Date		2016/08/08 16:40	2016/08/08 16:40	2016/08/08 17:00	2016/08/08 17:10	2016/08/08 15:55	2016/08/08 16:20		
COC Number		560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-02-01		
	UNITS	**SW-1-1**	**SW-1-1 Lab-Dup**	**SW-1-2**	**SW-1-3**	**SW-2-1**	**SW-2-2**	**RDL**	**QC Batch**
Inorganics									
Total Carbon (C)	mg/kg	35000	34000	42000	39000	42000	41000	500	4624917
Total Inorganic Carbon (C)	mg/kg	11000		9200	10000	9100	10000	500	4619086
Moisture	%	23				20		1.0	4620166
Total Organic Carbon	mg/kg	24000	24000	33000	29000	33000	31000	500	4625137
< -1 Phi (2 mm)	%	90 (1)	94	97	87 (2)	88 (3)	94	0.10	4620153
< 0 Phi (1 mm)	%	88	92	95	85	85	92	0.10	4620153
< +1 Phi (0.5 mm)	%	85	89	91	81	76	88	0.10	4620153
< +2 Phi (0.25 mm)	%	71	77	79	70	60	76	0.10	4620153
< +3 Phi (0.12 mm)	%	46	52	59	51	46	58	0.10	4620153
< +4 Phi (0.062 mm)	%	28	33	41	34	30	35	0.10	4620153
< +5 Phi (0.031 mm)	%	24	26	35	24	22	30	0.10	4620153
< +6 Phi (0.016 mm)	%	17	19	37	9.8	16	21	0.10	4620153
< +7 Phi (0.0078 mm)	%	9.8	11	15	11	9.1	12	0.10	4620153
< +8 Phi (0.0039 mm)	%	7.5	8.8	12	9.9	7.3	9.4	0.10	4620153
< +9 Phi (0.0020 mm)	%	3.8	4.8	7.2	6.3	4.2	5.5	0.10	4620153
Gravel	%	10	5.7 (4)	3.1	13	12	6.3	0.10	4620153
Sand	%	62	61	56	53	58	58	0.10	4620153
Silt	%	20	24	29	24	23	26	0.10	4620153
Clay	%	7.5	8.8	12	9.9	7.3	9.4	0.10	4620153
Miscellaneous Parameters									
Loss on Ignition	%	8.9		11	9.5	9.7	8.7	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sample observation comment: fraction contained a rock
(2) Sample observation comment: fraction contained a large rock
(3) Sample observation comment: fraction contained two small rocks
(4) %RPD acceptable. Duplicate values agree within 10% absolute.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO878	CWO878		CWO879	CWO880		CWO881		
Sampling Date		2016/08/08 16:25	2016/08/08 16:25		2016/08/08 15:35	2016/08/08 15:40		2016/08/08 15:45		
COC Number		560235-03-01	560235-03-01		560235-03-01	560235-03-01		560235-03-01		
	UNITS	SW-2-3	SW-2-3 Lab-Dup	QC Batch	SW-3-1	SW3-2	QC Batch	SW-3-3	RDL	QC Batch
Inorganics										
Total Carbon (C)	mg/kg	43000		4624917	52000	45000	4624917	43000	500	4624917
Total Inorganic Carbon (C)	mg/kg	16000		4644706	9800	6200	4619086	14000	500	4644706
Moisture	%				22		4620166		1.0	
Total Organic Carbon	mg/kg	27000	30000	4646540	42000	39000	4625137	29000	500	4646540
< -1 Phi (2 mm)	%	98		4620153	78 (1)	93	4620153	91	0.10	4620164
< 0 Phi (1 mm)	%	96		4620153	76	90	4620153	89	0.10	4620164
< +1 Phi (0.5 mm)	%	91		4620153	74	84	4620153	82	0.10	4620164
< +2 Phi (0.25 mm)	%	79		4620153	68	75	4620153	71	0.10	4620164
< +3 Phi (0.12 mm)	%	61		4620153	60	57	4620153	51	0.10	4620164
< +4 Phi (0.062 mm)	%	40		4620153	44	34	4620153	30	0.10	4620164
< +5 Phi (0.031 mm)	%	32		4620153	30	28	4620153	23	0.10	4620164
< +6 Phi (0.016 mm)	%	22		4620153	20	16	4620153	16	0.10	4620164
< +7 Phi (0.0078 mm)	%	14		4620153	7.5	7.4	4620153	5.6	0.10	4620164
< +8 Phi (0.0039 mm)	%	11		4620153	4.2	4.9	4620153	3.4	0.10	4620164
< +9 Phi (0.0020 mm)	%	5.8		4620153	2.4	2.4	4620153	2.4	0.10	4620164
Gravel	%	1.9		4620153	22	7.1	4620153	9.0	0.10	4620164
Sand	%	58		4620153	34	59	4620153	61	0.10	4620164
Silt	%	30		4620153	39	29	4620153	27	0.10	4620164
Clay	%	11		4620153	4.2	4.9	4620153	3.4	0.10	4620164
Miscellaneous Parameters										
Loss on Ignition	%	10		4622781	11	11	4622781	9.8	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sample observation comment: fraction contained a large rock

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO881		CWO882	CWO882	CWO883	CWO884		
Sampling Date		2016/08/08 15:45		2016/08/08 15:15	2016/08/08 15:15	2016/08/08 15:20	2016/08/08 15:25		
COC Number		560235-03-01		560235-03-01	560235-03-01	560235-03-01	560235-03-01		
	UNITS	**SW-3-3 Lab-Dup**	**QC Batch**	**SW-4-1**	**SW-4-1 Lab-Dup**	**SW-4-2**	**SW-4-3**	**RDL**	**QC Batch**
Inorganics									
Total Carbon (C)	mg/kg		4624917	37000		42000	42000	500	4624917
Total Inorganic Carbon (C)	mg/kg		4644706	7300		9500	7500	500	4619086
Moisture	%			17				1.0	4620166
Total Organic Carbon	mg/kg		4646540	30000		32000	35000	500	4625137
< -1 Phi (2 mm)	%	86 (1)	4620164	81		99	96	0.10	4620164
< 0 Phi (1 mm)	%	84	4620164	77		97	93	0.10	4620164
< +1 Phi (0.5 mm)	%	79	4620164	70		94	89	0.10	4620164
< +2 Phi (0.25 mm)	%	69	4620164	62		87	82	0.10	4620164
< +3 Phi (0.12 mm)	%	49	4620164	40		60	57	0.10	4620164
< +4 Phi (0.062 mm)	%	28	4620164	16		25	24	0.10	4620164
< +5 Phi (0.031 mm)	%	24	4620164	12		19	20	0.10	4620164
< +6 Phi (0.016 mm)	%	17	4620164	7.2		12	11	0.10	4620164
< +7 Phi (0.0078 mm)	%	5.0	4620164	3.8		4.5	4.2	0.10	4620164
< +8 Phi (0.0039 mm)	%	3.1	4620164	3.2		3.2	3.1	0.10	4620164
< +9 Phi (0.0020 mm)	%	2.0	4620164	1.9		2.1	2.2	0.10	4620164
Gravel	%	14 (2)	4620164	19		1.5	4.1	0.10	4620164
Sand	%	58	4620164	66		74	72	0.10	4620164
Silt	%	25	4620164	12		22	21	0.10	4620164
Clay	%	3.1	4620164	3.2		3.2	3.1	0.10	4620164
Miscellaneous Parameters									
Loss on Ignition	%		4622781	7.9	6.7	11	12	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sample observation comment: fraction contained a large rock
(2) %RPD acceptable. Duplicate values agree within 10% absolute.

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO885	CWO886	CWO887	CWO888	CWO889		
Sampling Date		2016/08/08 14:50	2016/08/08 14:55	2016/08/08 15:00	2016/08/08 16:50	2016/08/08 16:05		
COC Number		560235-03-01	560235-03-01	560235-03-01	560235-06-01	560235-06-01		
	UNITS	**SW-5-1**	**SW-5-2**	**SW-5-3**	**SW-1-1Q**	**SW-2-1Q**	**RDL**	**QC Batch**
Inorganics								
Total Carbon (C)	mg/kg	51000	48000	49000	38000	45000	500	4624917
Total Inorganic Carbon (C)	mg/kg	8800	7800	4100	12000	14000	500	4619086
Moisture	%	19			22		1.0	4620166
Total Organic Carbon	mg/kg	42000	40000	45000	27000	32000	500	4625137
< -1 Phi (2 mm)	%	99	97	87	92	81 (1)	0.10	4620164
< 0 Phi (1 mm)	%	96	94	85	90	78	0.10	4620164
< +1 Phi (0.5 mm)	%	91	88	80	86	72	0.10	4620164
< +2 Phi (0.25 mm)	%	78	75	69	71	60	0.10	4620164
< +3 Phi (0.12 mm)	%	59	57	54	46	45	0.10	4620164
< +4 Phi (0.062 mm)	%	36	34	35	28	30	0.10	4620164
< +5 Phi (0.031 mm)	%	30	27	26	17	25	0.10	4620164
< +6 Phi (0.016 mm)	%	17	14	14	14	16	0.10	4620164
< +7 Phi (0.0078 mm)	%	7.9	6.9	6.3	7.5	8.9	0.10	4620164
< +8 Phi (0.0039 mm)	%	6.4	5.6	5.1	4.2	6.3	0.10	4620164
< +9 Phi (0.0020 mm)	%	3.9	4.1	3.6	2.1	2.5	0.10	4620164
Gravel	%	1.1	3.1	13	8.0	19	0.10	4620164
Sand	%	63	63	52	64	51	0.10	4620164
Silt	%	30	28	29	23	24	0.10	4620164
Clay	%	6.4	5.6	5.1	4.2	6.3	0.10	4620164
Miscellaneous Parameters								
Loss on Ignition	%	11	12	11	10	12	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Sample observation comment: fraction contained two small rocks

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

MERCURY BY COLD VAPOUR AA (SOIL)

Maxxam ID		CWO873	CWO874	CWO875	CWO876	CWO877	CWO878		
Sampling Date		2016/08/08 16:40	2016/08/08 17:00	2016/08/08 17:10	2016/08/08 15:55	2016/08/08 16:20	2016/08/08 16:25		
COC Number		560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-03-01		
	UNITS	SW-1-1	SW-1-2	SW-1-3	SW-2-1	SW-2-2	SW-2-3	RDL	QC Batch
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	ND	0.010	4621608

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CWO879	CWO880	CWO881	CWO882	CWO883	CWO884		
Sampling Date		2016/08/08 15:35	2016/08/08 15:40	2016/08/08 15:45	2016/08/08 15:15	2016/08/08 15:20	2016/08/08 15:25		
COC Number		560235-03-01	560235-03-01	560235-03-01	560235-03-01	560235-03-01	560235-03-01		
	UNITS	SW-3-1	SW3-2	SW-3-3	SW-4-1	SW-4-2	SW-4-3	RDL	QC Batch
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	ND	0.010	4621608

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CWO885	CWO886	CWO887		CWO888	CWO889		
Sampling Date		2016/08/08 14:50	2016/08/08 14:55	2016/08/08 15:00		2016/08/08 16:50	2016/08/08 16:05		
COC Number		560235-03-01	560235-03-01	560235-03-01		560235-06-01	560235-06-01		
	UNITS	SW-5-1	SW-5-2	SW-5-3	QC Batch	SW-1-1Q	SW-2-1Q	RDL	QC Batch
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	4621608	ND	ND	0.010	4621632

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO873		CWO874	CWO875	CWO876	CWO877		
Sampling Date		2016/08/08 16:40		2016/08/08 17:00	2016/08/08 17:10	2016/08/08 15:55	2016/08/08 16:20		
COC Number		560235-02-01		560235-02-01	560235-02-01	560235-02-01	560235-02-01		
	UNITS	**SW-1-1**	**QC Batch**	**SW-1-2**	**SW-1-3**	**SW-2-1**	**SW-2-2**	**RDL**	**QC Batch**
Metals									
Acid Extractable Aluminum (Al)	mg/kg	4200	4621153	5100	4700	4100	4400	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	4.1	4621153	4.1	4.1	2.3	3.9	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	14	4621153	16	19	14	15	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	4621153	ND	ND	ND	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	4621153	ND	ND	ND	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	15	4621153	18	17	14	16	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	3.0	4621153	3.1	3.0	2.6	2.9	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	5.3	4621153	6.0	5.9	7.6	5.5	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	10000	4621153	11000	11000	8000	9600	50	4621187
Acid Extractable Lead (Pb)	mg/kg	4.5	4621153	5.4	4.8	4.6	4.6	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	21	4621153	24	22	19	21	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	110	4621153	120	120	100	120	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	4621153	ND	ND	ND	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	8.5	4621153	10	9.4	8.9	9.4	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	17	4621153	20	19	15	19	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	4621153	ND	ND	ND	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	4621153	ND	ND	ND	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	39	4621153	45	45	39	44	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	4621153	0.11	0.10	ND	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.76	4621153	0.85	0.80	0.63	0.66	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	17	4621153	20	19	15	18	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	14	4621153	16	15	210	14	5.0	4621187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO878	CWO879	CWO880	CWO881	CWO882		
Sampling Date		2016/08/08 16:25	2016/08/08 15:35	2016/08/08 15:40	2016/08/08 15:45	2016/08/08 15:15		
COC Number		560235-03-01	560235-03-01	560235-03-01	560235-03-01	560235-03-01		
	UNITS	SW-2-3	SW-3-1	SW3-2	SW-3-3	SW-4-1	RDL	QC Batch
Metals								
Acid Extractable Aluminum (Al)	mg/kg	4200	5200	4900	4100	3300	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	3.0	7.8	7.3	6.9	3.1	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	15	25	15	14	11	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	ND	ND	ND	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	ND	ND	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	16	20	18	16	15	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	2.9	3.5	3.3	2.9	2.7	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	5.5	7.0	6.5	5.3	5.1	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	9100	14000	12000	11000	9000	50	4621187
Acid Extractable Lead (Pb)	mg/kg	4.7	5.0	4.6	4.1	3.2	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	20	26	23	20	17	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	110	140	150	120	120	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	9.2	11	11	8.8	9.0	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	17	20	19	16	13	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	41	57	53	46	36	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	0.11	ND	ND	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.67	0.76	0.69	0.63	0.62	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	17	20	19	19	12	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	13	15	14	12	23	5.0	4621187

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ND = Not detected

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO883		CWO884	CWO885		CWO886		
Sampling Date		2016/08/08 15:20		2016/08/08 15:25	2016/08/08 14:50		2016/08/08 14:55		
COC Number		560235-03-01		560235-03-01	560235-03-01		560235-03-01		
	UNITS	**SW-4-2**	**QC Batch**	**SW-4-3**	**SW-5-1**	**QC Batch**	**SW-5-2**	**RDL**	**QC Batch**
Metals									
Acid Extractable Aluminum (Al)	mg/kg	3700	4621187	3900	4200	4621248	4000	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	3.8	4621187	3.7	2.1	4621248	2.3	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	14	4621187	15	13	4621248	12	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	4621187	ND	ND	4621248	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	15	4621187	15	15	4621248	14	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	2.8	4621187	3.0	3.2	4621248	2.9	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	5.6	4621187	5.5	7.1	4621248	6.0	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	10000	4621187	10000	9700	4621248	9100	50	4621187
Acid Extractable Lead (Pb)	mg/kg	3.6	4621187	3.8	4.5	4621248	3.9	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	20	4621187	20	22	4621248	22	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	130	4621187	140	160	4621248	140	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	8.4	4621187	8.6	8.7	4621248	8.5	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	14	4621187	15	14	4621248	14	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	4621187	ND	ND	4621248	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	39	4621187	42	41	4621248	44	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.63	4621187	0.67	0.86	4621248	0.76	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	14	4621187	14	15	4621248	14	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	11	4621187	11	13	4621248	11	5.0	4621187

RDL = Reportable Detection Limit
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ND = Not detected

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO887	CWO888		CWO889		
Sampling Date		2016/08/08 15:00	2016/08/08 16:50		2016/08/08 16:05		
COC Number		560235-03-01	560235-06-01		560235-06-01		
	UNITS	**SW-5-3**	**SW-1-1Q**	**QC Batch**	**SW-2-1Q**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	4300	4200	4621248	4600	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	2.1	4.4	4621248	2.8	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	13	15	4621248	15	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	ND	4621248	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	4621248	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	15	15	4621248	16	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	3.4	2.8	4621248	2.8	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	7.4	5.3	4621248	6.3	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	9700	10000	4621248	9100	50	4621187
Acid Extractable Lead (Pb)	mg/kg	4.2	4.3	4621248	4.6	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	23	19	4621248	22	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	150	120	4621248	110	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	8.8	8.6	4621248	9.4	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	15	18	4621248	17	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	ND	4621248	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	ND	4621248	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	42	36	4621248	42	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.84	0.75	4621248	0.68	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	15	17	4621248	18	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	13	15	4621248	16	5.0	4621187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CWO873	CWO876	CWO879	CWO882	CWO885	CWO888		
Sampling Date		2016/08/08 16:40	2016/08/08 15:55	2016/08/08 15:35	2016/08/08 15:15	2016/08/08 14:50	2016/08/08 16:50		
COC Number		560235-02-01	560235-02-01	560235-03-01	560235-03-01	560235-03-01	560235-06-01		
	UNITS	**SW-1-1**	**SW-2-1**	**SW-3-1**	**SW-4-1**	**SW-5-1**	**SW-1-1Q**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4620924
Toluene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4620924
Ethylbenzene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4620924
Total Xylenes	mg/kg	ND	ND	ND	ND	ND	ND	0.050	4620924
C6 - C10 (less BTEX)	mg/kg	ND	ND	ND	ND	ND	ND	2.5	4620924
>C10-C16 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	10	4620890
>C16-C21 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	10	4620890
>C21-<C32 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	15	4620890
Modified TPH (Tier1)	mg/kg	ND	ND	ND	ND	ND	ND	15	4619084
Reached Baseline at C32	mg/kg	NA	NA	NA	NA	NA	NA	N/A	4620890
Hydrocarbon Resemblance	mg/kg	NA	NA	NA	NA	NA	NA	N/A	4620890
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	96	94	96	95	99	96		4620890
n-Dotriacontane - Extractable	%	114	115	109	120	116	124		4620890
Isobutylbenzene - Volatile	%	112	108	80	105	92	117		4620924

RDL = Reportable Detection Limit
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ND = Not detected
N/A = Not Applicable

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.3°C

Revised Report: To add the sampling times for each sample. Also to add TOC, TIC to samples CWO878 & CWO881 originally missed when the job was logged in. Sept. 8, 2016 LMU

Results relate only to the items tested.

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
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Site Location: Baffinland 2016-Milne EEM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4620153	ACU	RPD [CWO873-01]	Gravel	2016/08/18	56 (1)		%	35
			Sand	2016/08/18	1.3		%	35
			Silt	2016/08/18	18		%	35
			Clay	2016/08/18	16		%	35
4620164	ACU	RPD [CWO881-01]	Gravel	2016/08/19	42 (1)		%	35
			Sand	2016/08/19	4.0		%	35
			Silt	2016/08/19	8.0		%	35
			Clay	2016/08/19	8.8		%	35
4620890	BHR	Matrix Spike	Isobutylbenzene - Extractable	2016/08/16		94	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/16		96 (2)	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/16		87	%	30 - 130
			>C16-C21 Hydrocarbons	2016/08/16		84	%	30 - 130
			>C21-<C32 Hydrocarbons	2016/08/16		107	%	30 - 130
4620890	BHR	Spiked Blank	Isobutylbenzene - Extractable	2016/08/16		96	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/16		111	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/16		91	%	30 - 130
			>C16-C21 Hydrocarbons	2016/08/16		87	%	30 - 130
			>C21-<C32 Hydrocarbons	2016/08/16		115	%	30 - 130
4620890	BHR	Method Blank	Isobutylbenzene - Extractable	2016/08/16		95	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/16		102	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/16	ND, RDL=10		mg/kg	
			>C16-C21 Hydrocarbons	2016/08/16	ND, RDL=10		mg/kg	
			>C21-<C32 Hydrocarbons	2016/08/16	ND, RDL=15		mg/kg	
4620890	BHR	RPD	>C10-C16 Hydrocarbons	2016/08/16	NC		%	50
			>C16-C21 Hydrocarbons	2016/08/16	NC		%	50
			>C21-<C32 Hydrocarbons	2016/08/16	NC		%	50
4620924	THL	Matrix Spike	Isobutylbenzene - Volatile	2016/08/18		90	%	60 - 130
			Benzene	2016/08/18		125	%	60 - 130
			Toluene	2016/08/18		114	%	60 - 130
			Ethylbenzene	2016/08/18		107	%	60 - 130
			Total Xylenes	2016/08/18		106	%	60 - 130
4620924	THL	Spiked Blank	Isobutylbenzene - Volatile	2016/08/18		80	%	60 - 130
			Benzene	2016/08/18		74	%	60 - 140
			Toluene	2016/08/18		75	%	60 - 140
			Ethylbenzene	2016/08/18		81	%	60 - 140
			Total Xylenes	2016/08/18		82	%	60 - 140
4620924	THL	Method Blank	Isobutylbenzene - Volatile	2016/08/18		102	%	60 - 130
			Benzene	2016/08/18	ND, RDL=0.025		mg/kg	
			Toluene	2016/08/18	ND, RDL=0.025		mg/kg	
			Ethylbenzene	2016/08/18	ND, RDL=0.025		mg/kg	
			Total Xylenes	2016/08/18	ND, RDL=0.050		mg/kg	
			C6 - C10 (less BTEX)	2016/08/18	ND, RDL=2.5		mg/kg	
4620924	THL	RPD	Benzene	2016/08/18	NC		%	50
			Toluene	2016/08/18	18		%	50

Maxxam Job #: B6H1451
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SEM Ltd.
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Ethylbenzene	2016/08/18	NC		%	50
			Total Xylenes	2016/08/18	17		%	50
			C6 - C10 (less BTEX)	2016/08/18	25		%	50
4621153	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2016/08/17		NC	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/17		115	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/17		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/17		105	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/17		113	%	75 - 125
			Acid Extractable Boron (B)	2016/08/17		95	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/17		100	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/17		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/17		99	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/17		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/17		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/17		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/17		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/17		93	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/17		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/17		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/17		97	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/17		99	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/17		106	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/17		103	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/17		102	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/17		106	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/17		108	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/17		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/17		NC	%	75 - 125
4621153	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/18		98	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		102	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		102	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		103	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		100	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		107	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		102	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		102	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		101	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		104	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		101	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		98	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		104	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		99	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		102	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		102	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		102	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		104	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		102	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		104	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/18		101	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		98	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4621153	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/17	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/17	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/17	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/17	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/17	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/17	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/17	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/17	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/17	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/17	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/17	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/17	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/17	ND, RDL=0.10		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Vanadium (V)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/17	ND, RDL=5.0		mg/kg	
4621153	MLB	RPD	Acid Extractable Lead (Pb)	2016/08/18	126 (3)		%	35
4621187	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2016/08/19		NC	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/19		102	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/19		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/19		102	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/19		89	%	75 - 125
			Acid Extractable Boron (B)	2016/08/19		96	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/19		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/19		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/19		102	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/19		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/19		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/19		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/19		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/19		91	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/19		100	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/19		101	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/19		95	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/19		99	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/19		100	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/19		106	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/19		101	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/19		NC	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/19		103	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/19		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/19		NC	%	75 - 125
4621187	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/18		100	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		103	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		101	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		101	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		101	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		98	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		103	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		109	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		100	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		101	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		106	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		95	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		98	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		104	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		99	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		100	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		102	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		103	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		101	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		103	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		103	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Vanadium (V)	2016/08/18		103	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		117	%	75 - 125
4621187	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/18	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/18	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/18	ND, RDL=2.0		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Uranium (U)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/18	ND, RDL=5.0		mg/kg	
4621187	MLB	RPD	Acid Extractable Lead (Pb)	2016/08/19	58 (3)		%	35
4621248	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2016/08/18		97	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		100	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		104	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		101	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		93	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		103	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		101	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		107	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		92	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		93	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		98	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		98	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		104	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		105	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		103	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		99	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		103	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/18		104	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		NC	%	75 - 125
4621248	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/18		105	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		103	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		103	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		106	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		102	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		101	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		101	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		103	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		103	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		102	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		107	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		103	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		98	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		100	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		99	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		100	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		105	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		102	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		104	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Tin (Sn)	2016/08/18		101	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		105	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/18		103	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		100	%	75 - 125
4621248	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/18	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/18	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/18	ND, RDL=0.10		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Tin (Sn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/18	ND, RDL=5.0		mg/kg	
4621248	MLB	RPD	Acid Extractable Lead (Pb)	2016/08/18	13		%	35
4621608	ARS	Matrix Spike	Mercury (Hg)	2016/08/17		97	%	75 - 125
4621608	ARS	QC Standard	Mercury (Hg)	2016/08/17		73 (4)	%	75 - 125
4621608	ARS	Spiked Blank	Mercury (Hg)	2016/08/17		97	%	80 - 120
4621608	ARS	Method Blank	Mercury (Hg)	2016/08/17	ND, RDL=0.010		mg/kg	
4621608	ARS	RPD	Mercury (Hg)	2016/08/17	NC		%	30
4621632	ARS	Matrix Spike	Mercury (Hg)	2016/08/17		97	%	75 - 125
4621632	ARS	QC Standard	Mercury (Hg)	2016/08/17		73 (4)	%	75 - 125
4621632	ARS	Spiked Blank	Mercury (Hg)	2016/08/17		95	%	80 - 120
4621632	ARS	Method Blank	Mercury (Hg)	2016/08/17	ND, RDL=0.010		mg/kg	
4621632	ARS	RPD	Mercury (Hg)	2016/08/17	NC		%	30
4622781	BBD	QC Standard	Loss on Ignition	2016/08/18		99	%	80 - 120
4622781	BBD	Method Blank	Loss on Ignition	2016/08/18	ND, RDL=0.30		%	
4622781	BBD	RPD [CWO882-01]	Loss on Ignition	2016/08/18	16		%	25
4624917	BMO	QC Standard	Total Carbon (C)	2016/08/18		103	%	75 - 125
4624917	BMO	Method Blank	Total Carbon (C)	2016/08/18	ND, RDL=500		mg/kg	
4624917	BMO	RPD [CWO873-01]	Total Carbon (C)	2016/08/18	2.6		%	35
4625137	BMO	QC Standard	Total Organic Carbon	2016/08/19		110	%	75 - 125
4625137	BMO	Method Blank	Total Organic Carbon	2016/08/19	ND, RDL=500		mg/kg	
4625137	BMO	RPD [CWO873-01]	Total Organic Carbon	2016/08/19	1.9		%	35
4646540	BMO	QC Standard	Total Organic Carbon	2016/09/02		113	%	75 - 125
4646540	BMO	Method Blank	Total Organic Carbon	2016/09/02	ND, RDL=500		mg/kg	

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4646540	BMO	RPD [CWO878-01]	Total Organic Carbon	2016/09/02	8.1		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) %RPD acceptable. Duplicate values agree within 10% absolute.

(2) TEH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

(3) Poor RPD due to sample inhomogeneity. Result confirmed by repeat digestion and analysis.

(4) Reference Material acceptable using control chart criteria.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Colleen Acker, Supervisor, General Chemistry

Cristina Carriere, Scientific Services

Mike MacGillivray, Scientific Specialist (Inorganics)

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

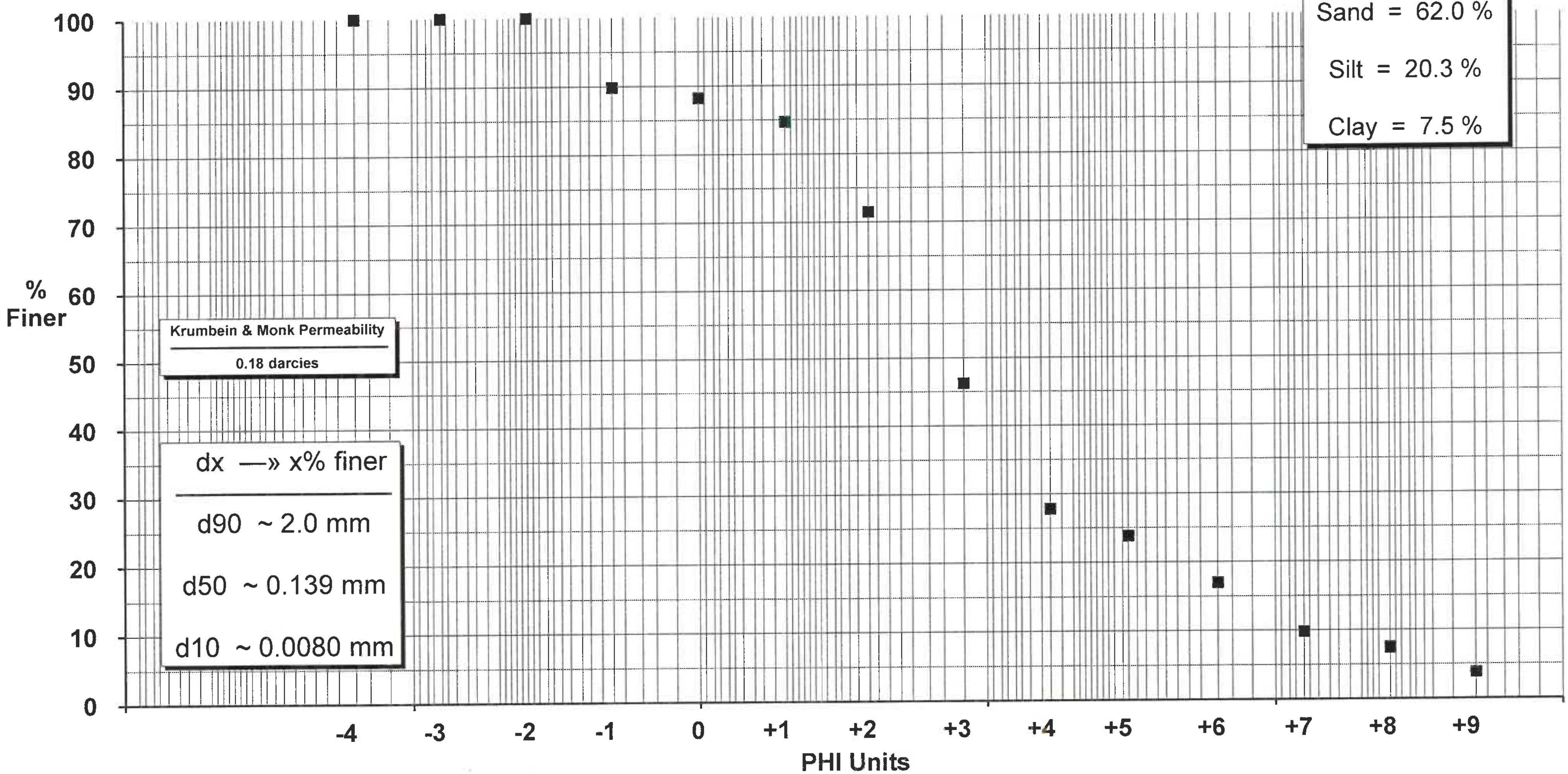
Maxxam ID: CWO873-01

SW-1-1

Percent Coarser than 75 µm (PHI = 3.737)
67.3 %

Percent Coarser than 50 µm (PHI = 4.322)
73.5 %

Wentworth
Gravel = 10.2 %
Sand = 62.0 %
Silt = 20.3 %
Clay = 7.5 %



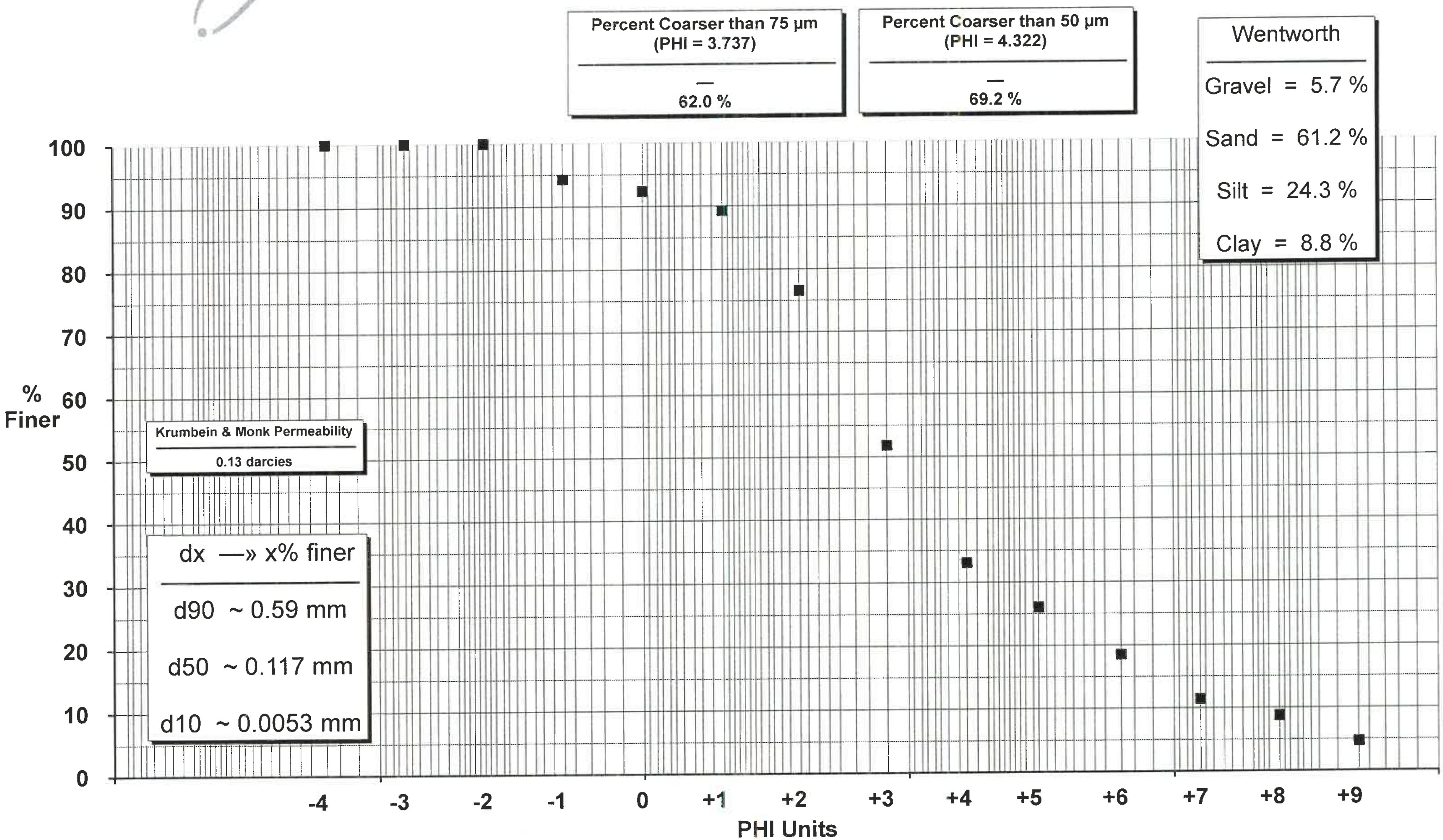
Krumbein & Monk Permeability
0.18 darcies

dx —» x% finer
d90 ~ 2.0 mm
d50 ~ 0.139 mm
d10 ~ 0.0080 mm

Approved

Maxxam ID: CWO873-01:D1

SW-1-1 :D1



Approved

Maxxam

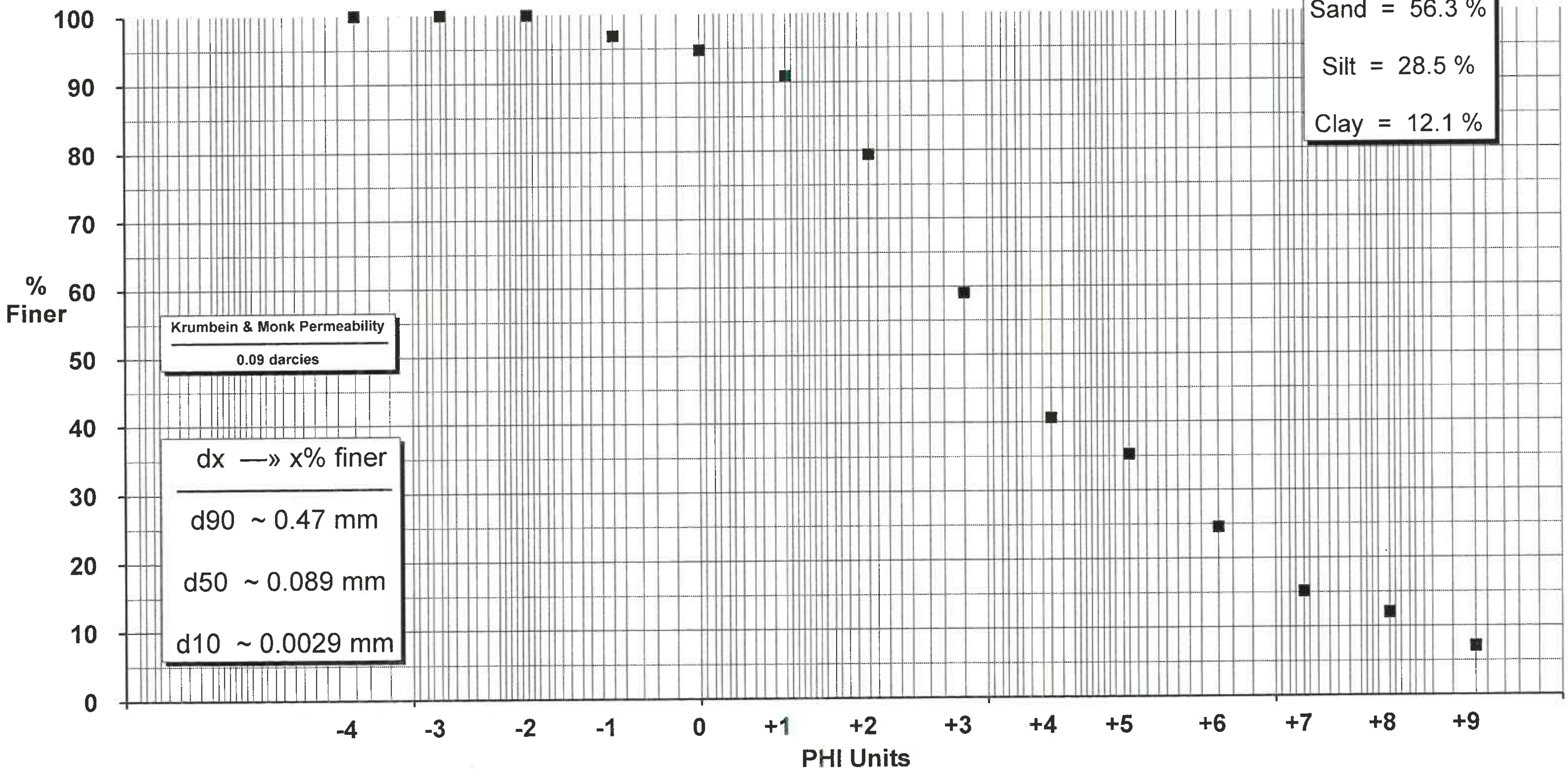
Maxxam ID: CWO874-01

SW-1-2

Percent Coarser than 75 µm (PHI = 3.737)
54.5 %

Percent Coarser than 50 µm (PHI = 4.322)
61.1 %

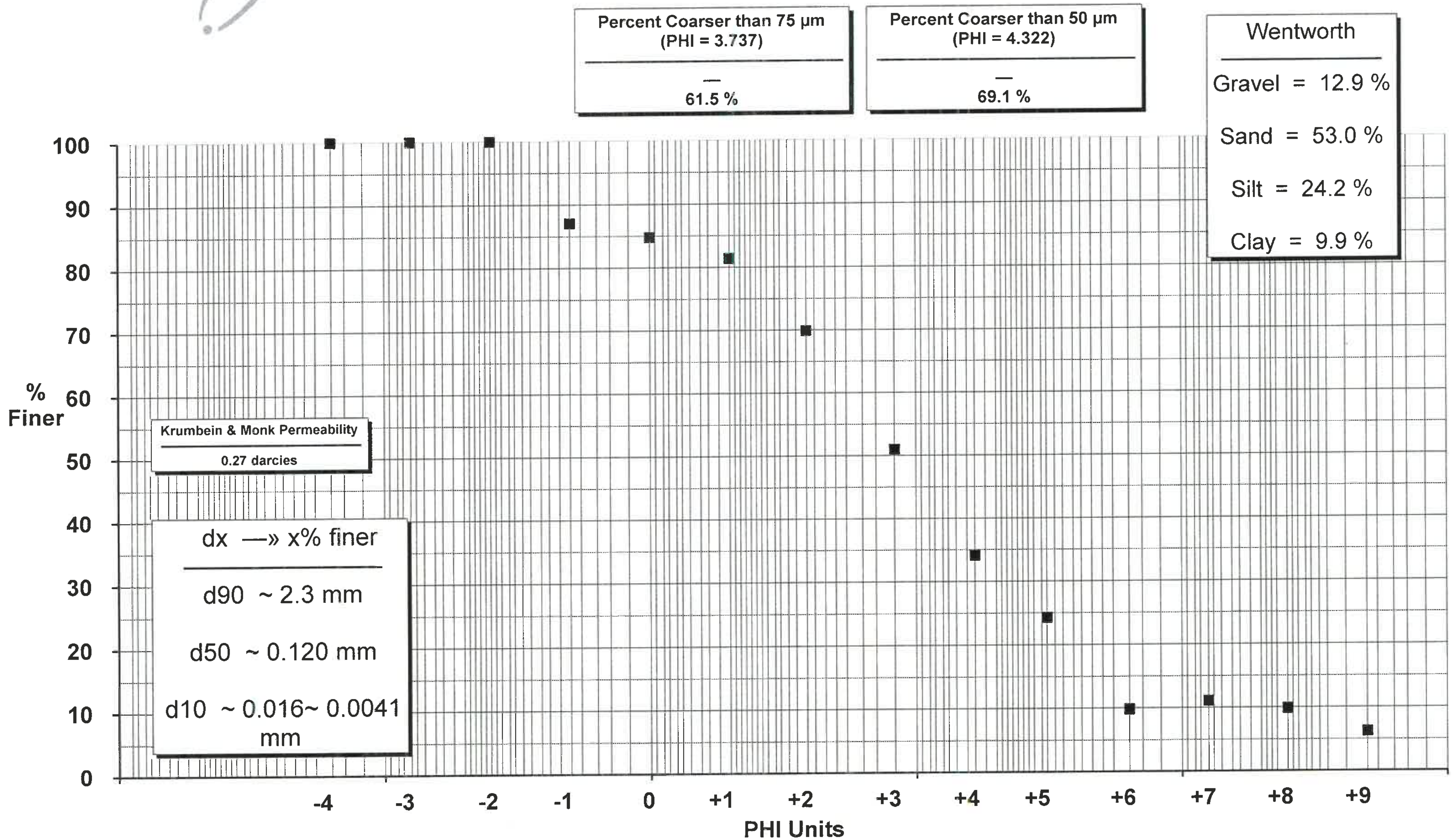
Wentworth
Gravel = 3.1 %
Sand = 56.3 %
Silt = 28.5 %
Clay = 12.1 %



Approved

Maxxam ID: CWO875-01

SW-1-3



Approved

Maxxam

Maxxam ID: CWO876-01

SW-2-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
65.7 %	72.5 %

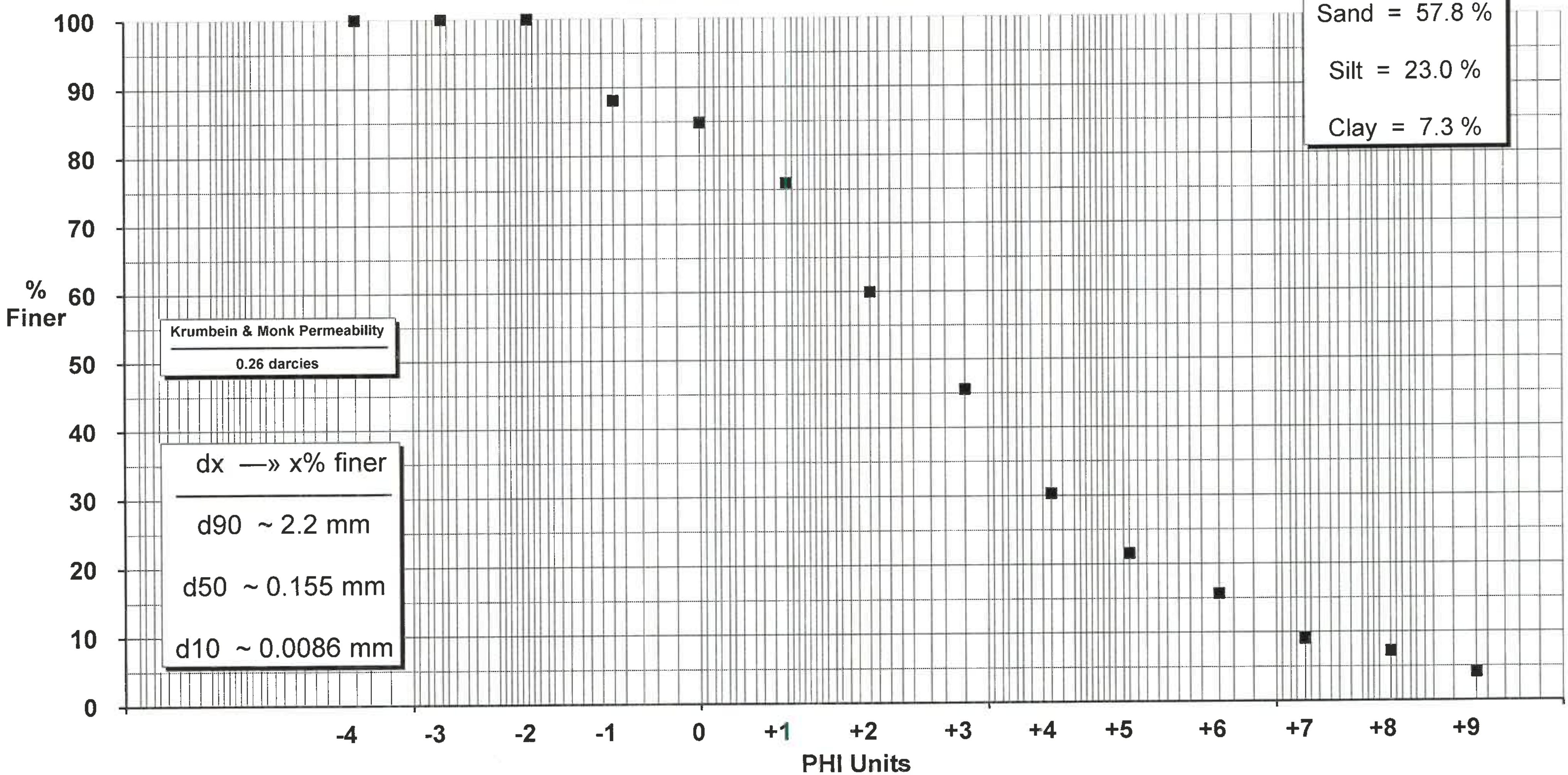
Wentworth

Gravel = 11.9 %

Sand = 57.8 %

Silt = 23.0 %

Clay = 7.3 %



Approved

Maxxam ID: CWO877-01

SW-2-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
58.6 %	66.3 %

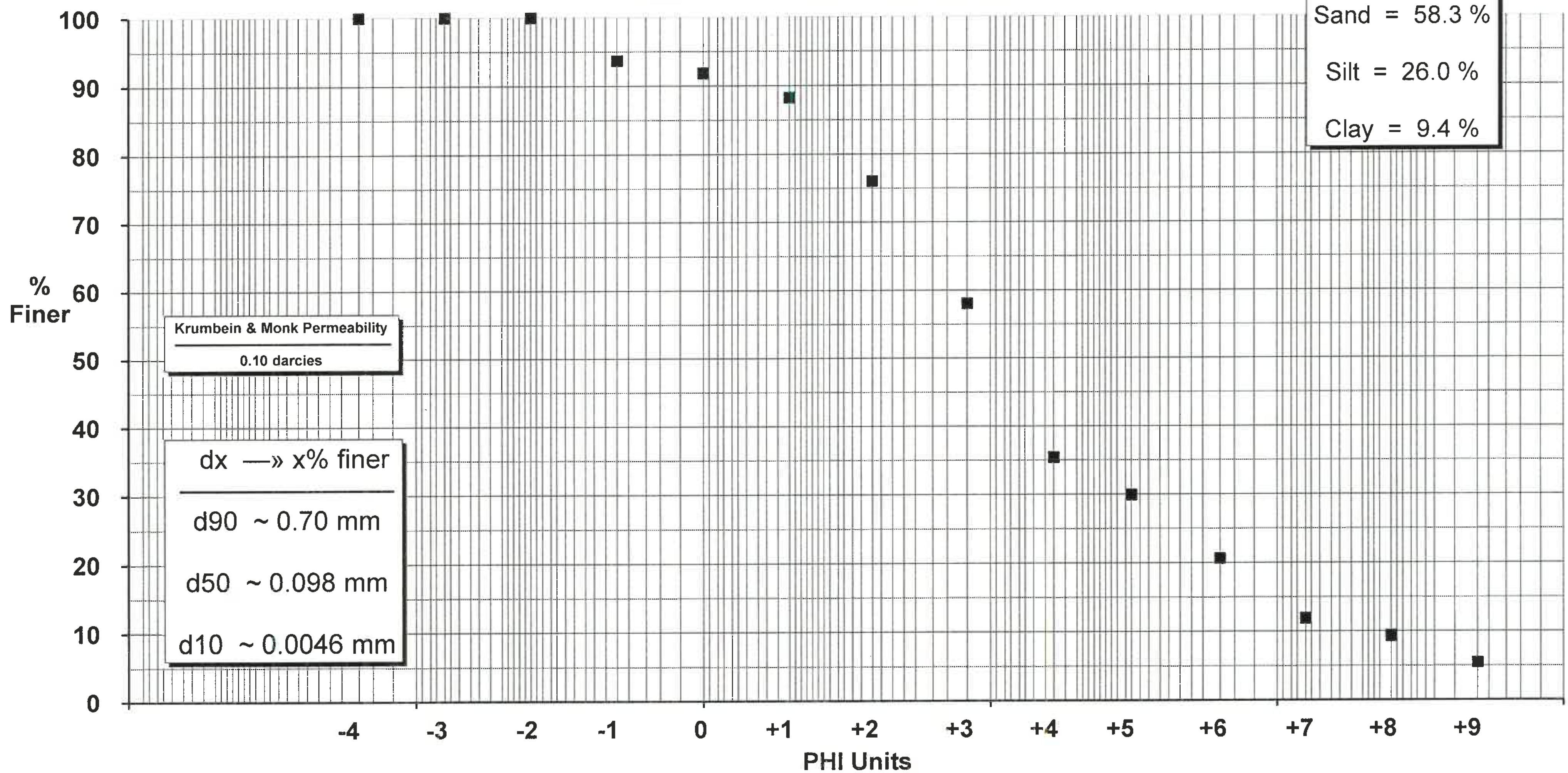
Wentworth

Gravel = 6.3 %

Sand = 58.3 %

Silt = 26.0 %

Clay = 9.4 %



Approved

Maxxam

Maxxam ID: CWO878-01

SW-2-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
54.3 %	62.5 %

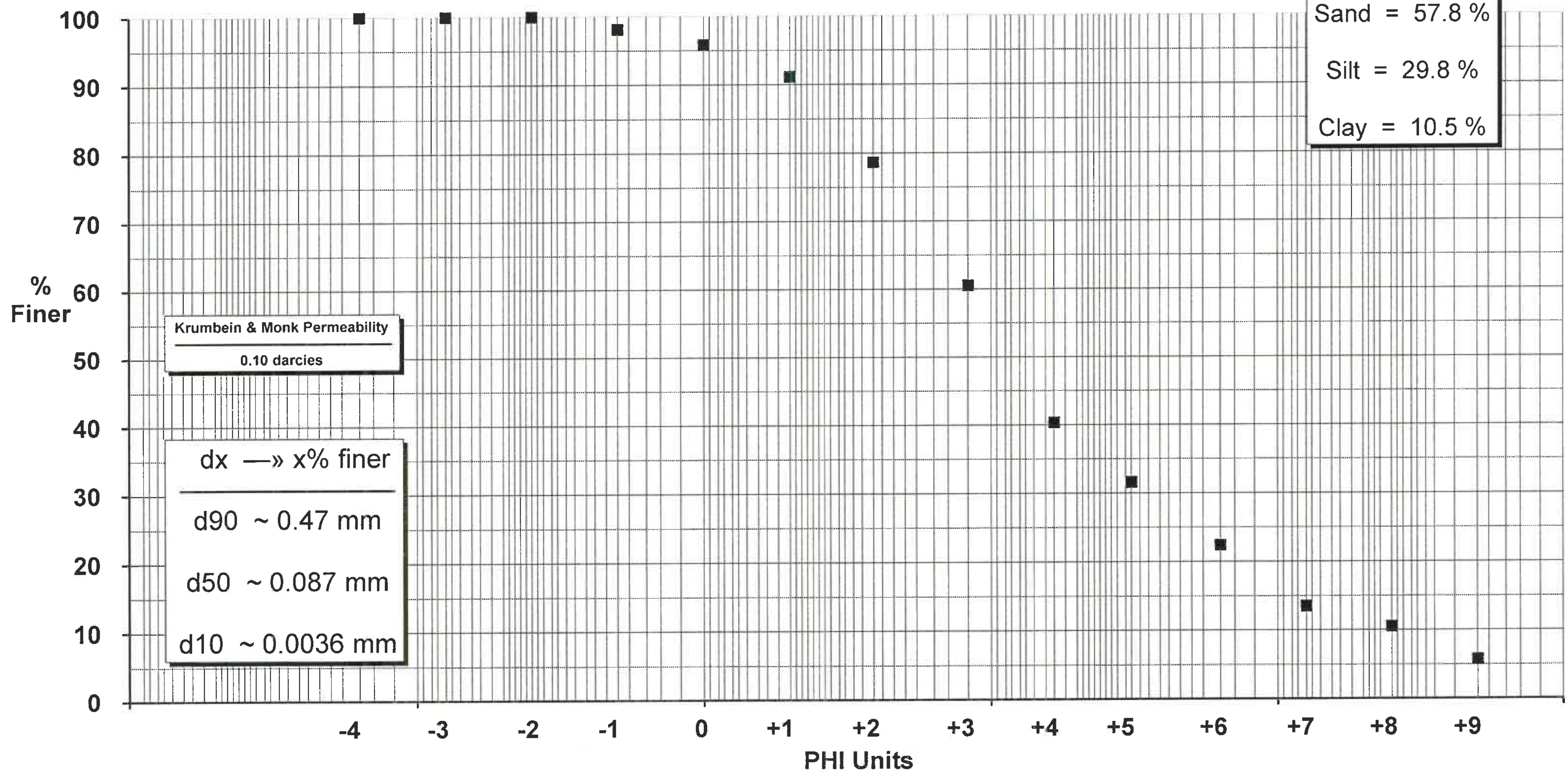
Wentworth

Gravel = 1.9 %

Sand = 57.8 %

Silt = 29.8 %

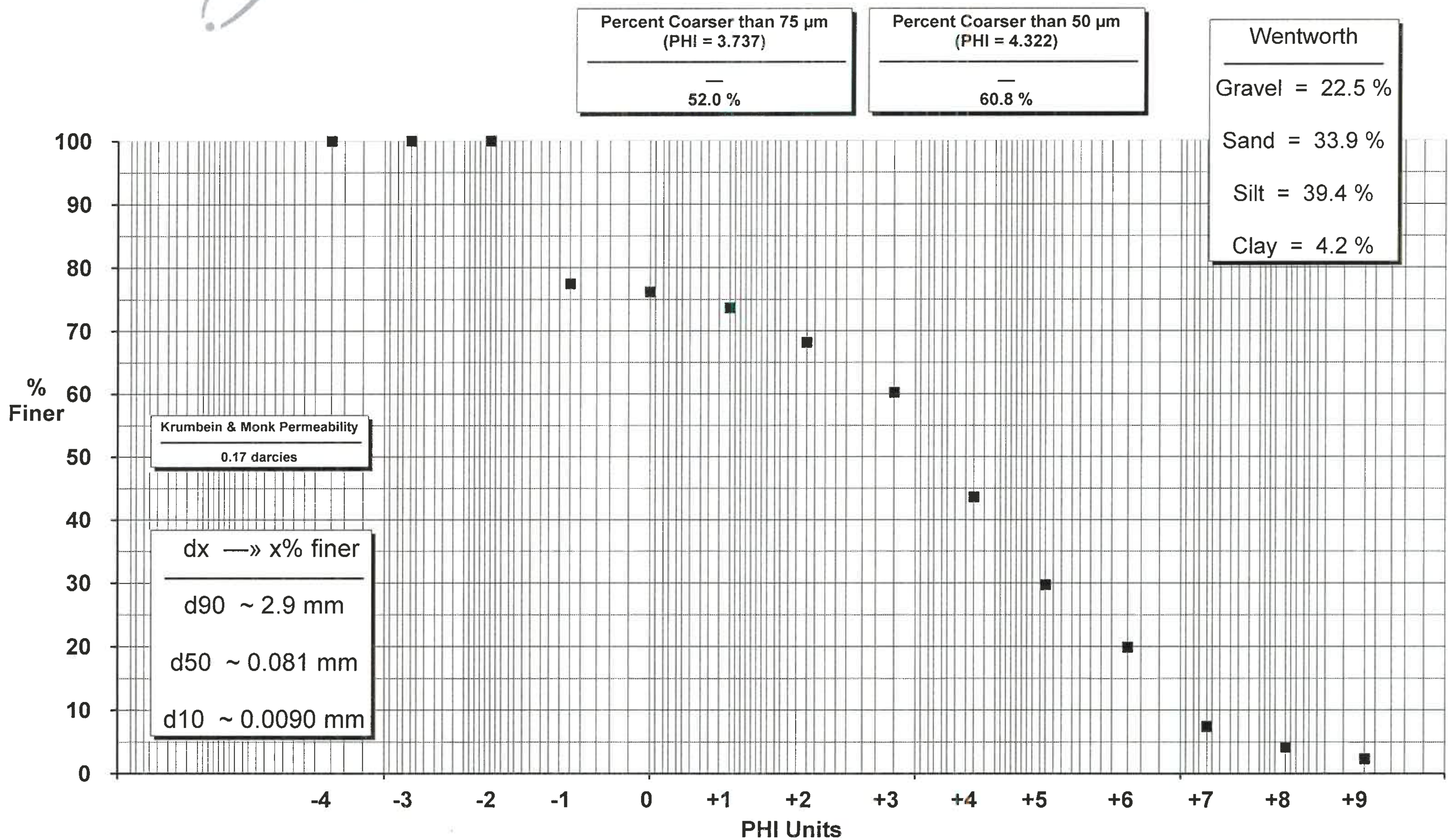
Clay = 10.5 %



Approved

Maxxam ID: CWO879-01

SW-3-1



Approved

Maxxam

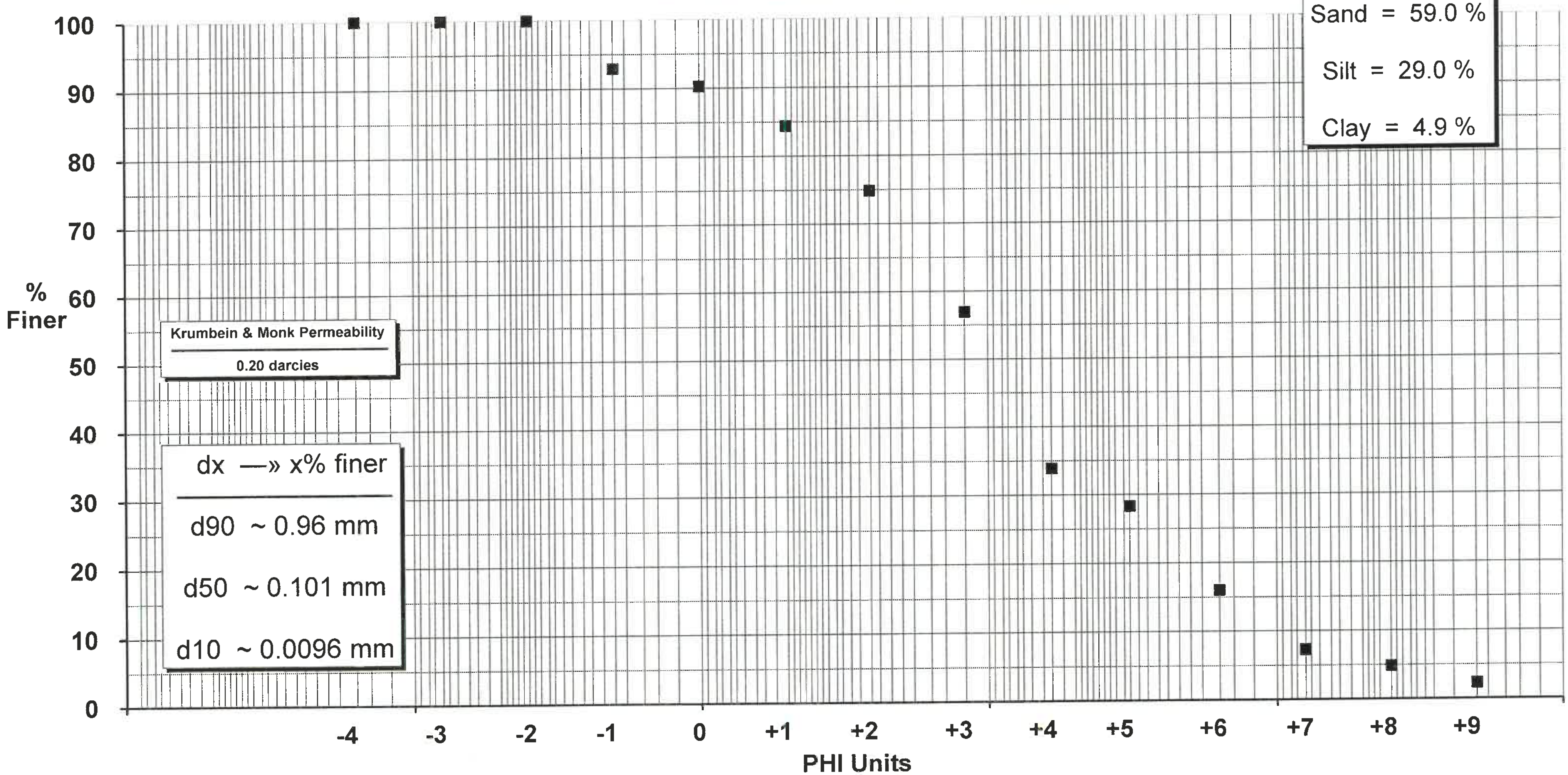
Maxxam ID: CWO880-01

SW3-2

Percent Coarser than 75 µm (PHI = 3.737)
60.0 %

Percent Coarser than 50 µm (PHI = 4.322)
67.9 %

Wentworth
Gravel = 7.1 %
Sand = 59.0 %
Silt = 29.0 %
Clay = 4.9 %



Approved

Approved

Approved

Approved

Approved

Maxxam

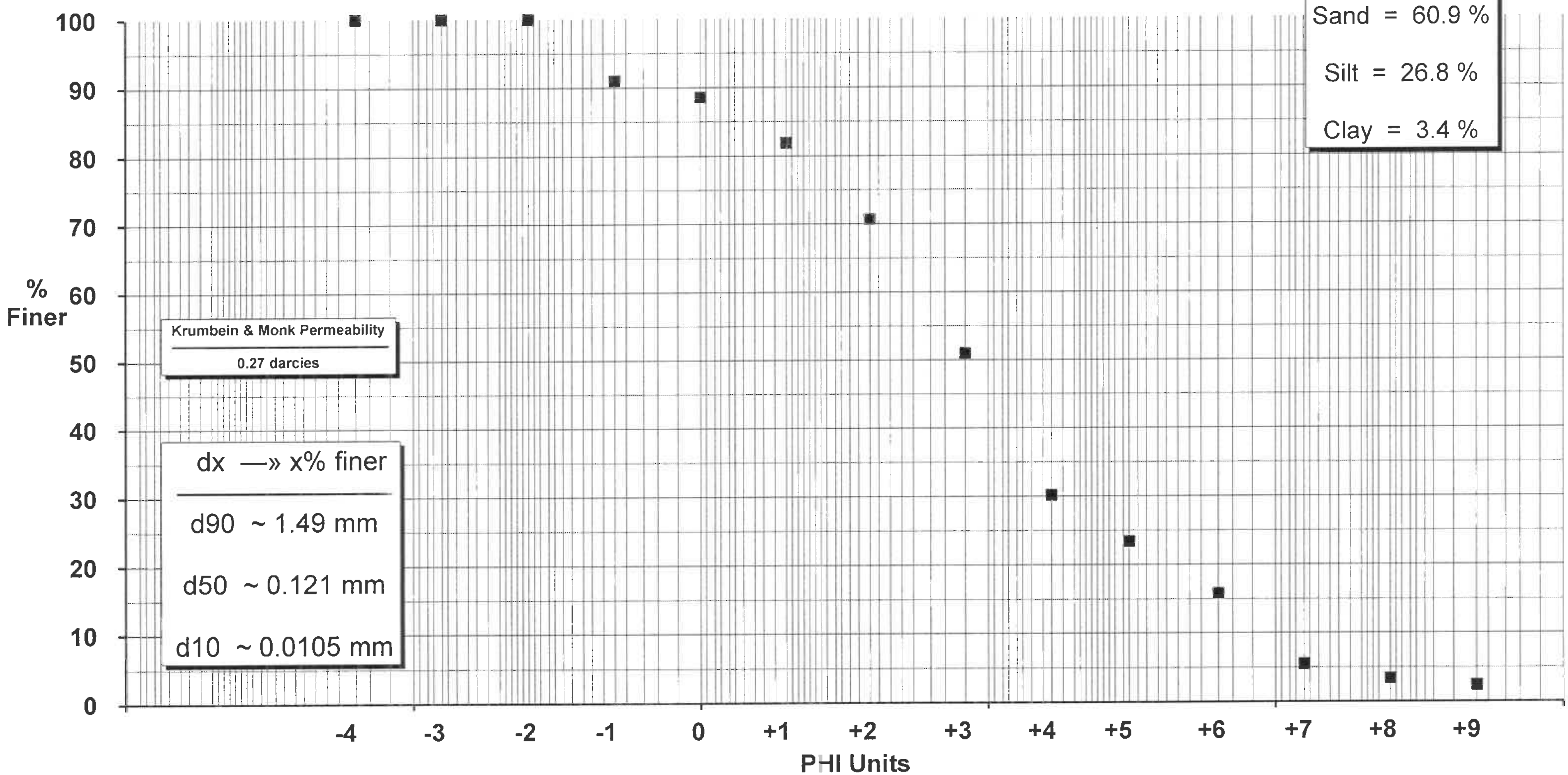
Maxxam ID: CWO881-01

SW-3-3

Percent Coarser than 75 µm (PHI = 3.737)
64.3 %

Percent Coarser than 50 µm (PHI = 4.322)
72.0 %

Wentworth
Gravel = 9.0 %
Sand = 60.9 %
Silt = 26.8 %
Clay = 3.4 %



Krumbein & Monk Permeability
0.27 darcies

dx —» x% finer
d90 ~ 1.49 mm
d50 ~ 0.121 mm
d10 ~ 0.0105 mm

Approved

Maxxam ID: CWO881-01:D1

SW-3-3 :D1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
66.6 %	73.5 %

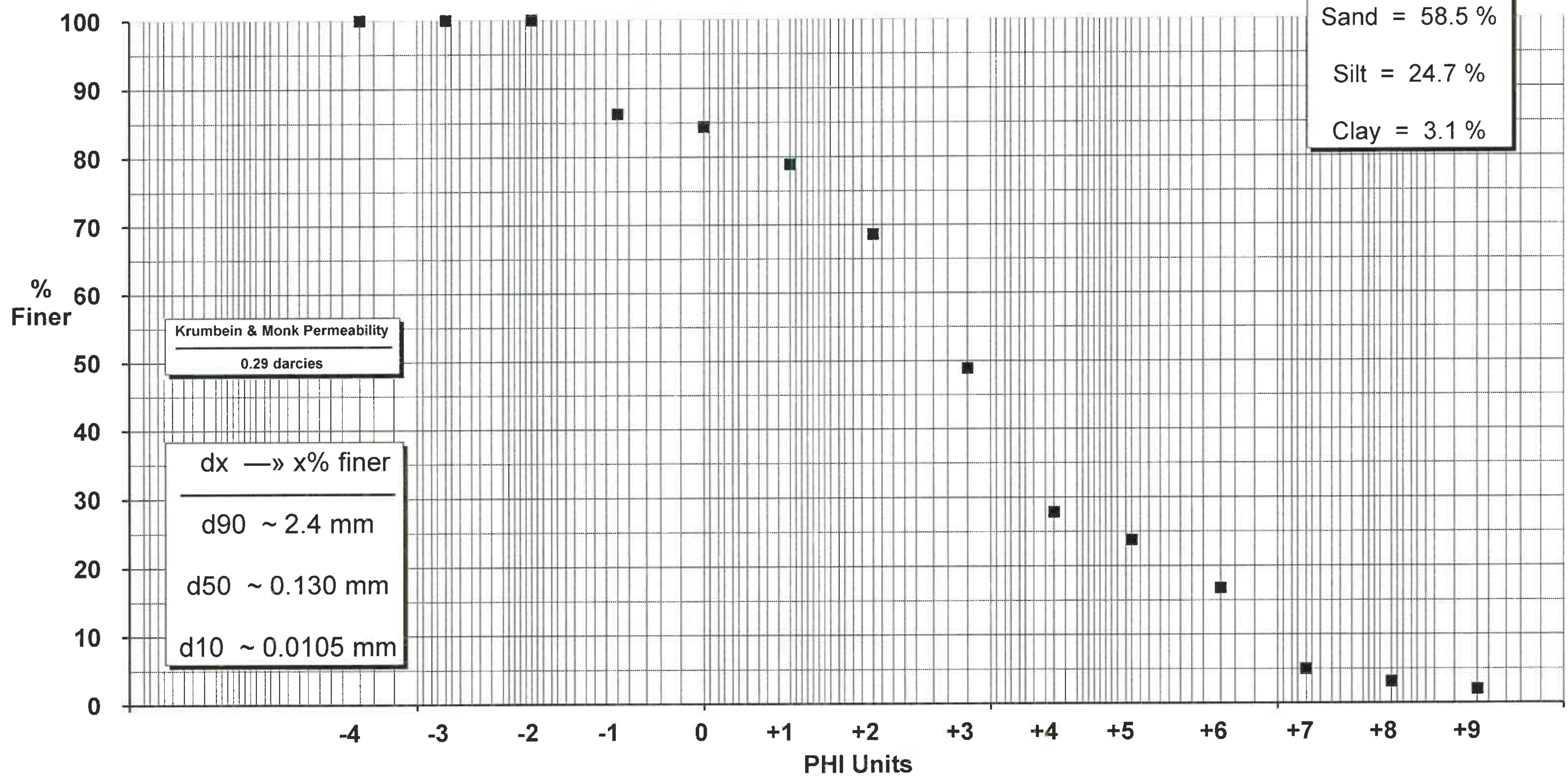
Wentworth

Gravel = 13.7 %

Sand = 58.5 %

Silt = 24.7 %

Clay = 3.1 %



Krumbein & Monk Permeability

0.29 darcies

dx —» x% finer

d90 ~ 2.4 mm

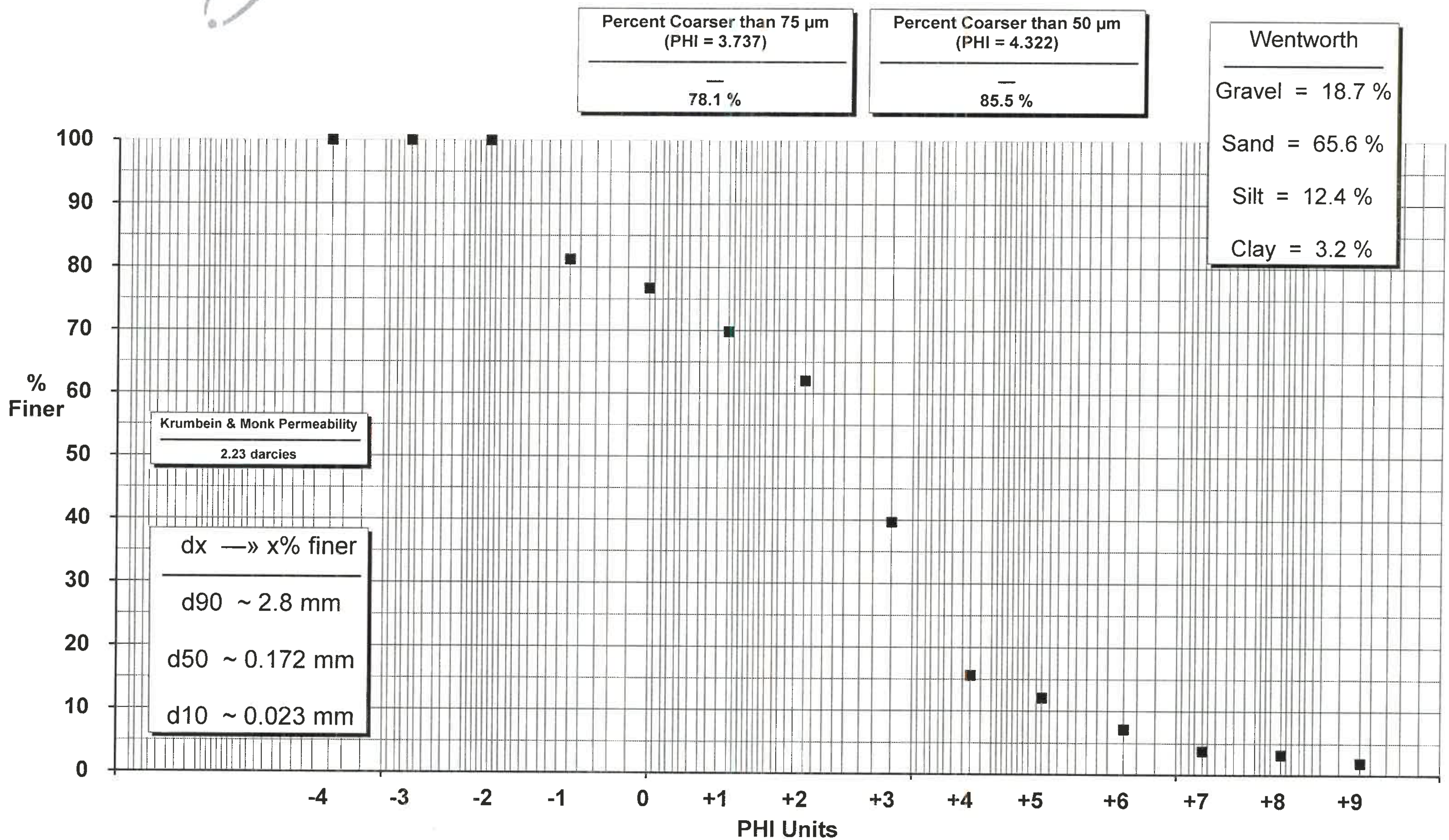
d50 ~ 0.130 mm

d10 ~ 0.0105 mm

Approved

Maxxam ID: CWO882-01

SW-4-1



Approved

Maxxam

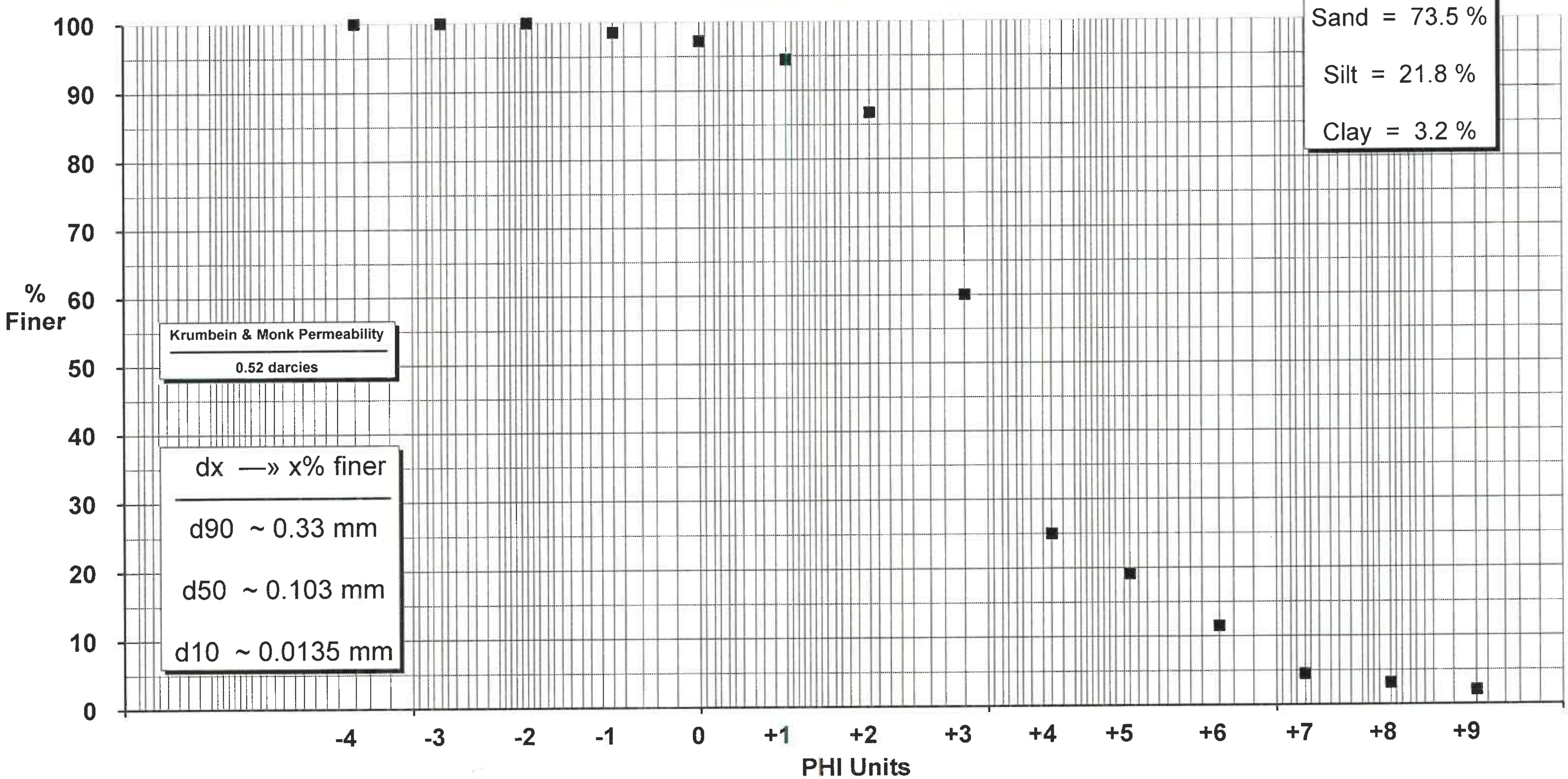
Maxxam ID: CWO883-01

SW-4-2

Percent Coarser than 75 µm (PHI = 3.737)
65.8 %

Percent Coarser than 50 µm (PHI = 4.322)
76.9 %

Wentworth
Gravel = 1.5 %
Sand = 73.5 %
Silt = 21.8 %
Clay = 3.2 %

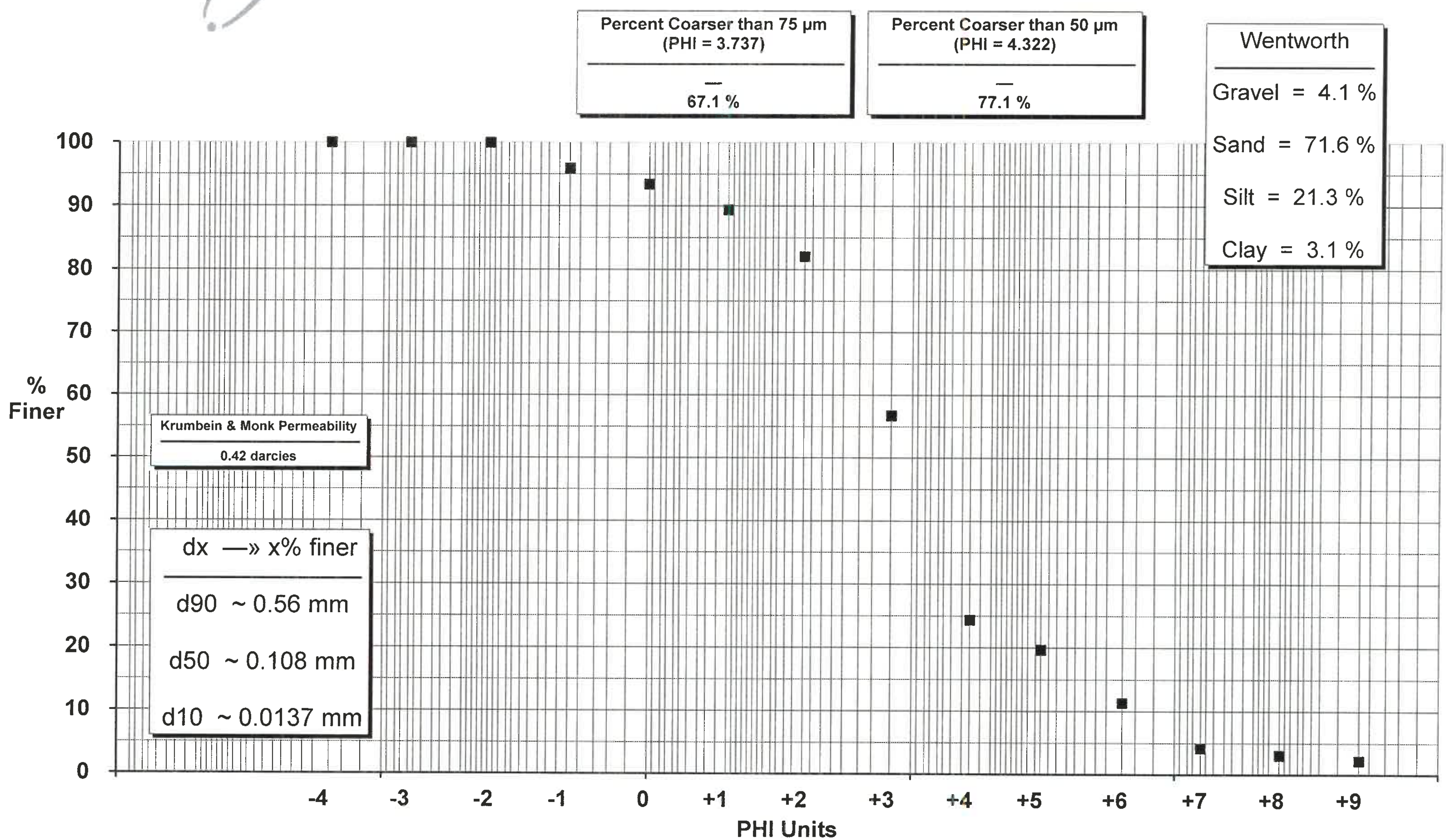


Approved

Maxxam

Maxxam ID: CWO884-01

SW-4-3



Approved

Approved

Approved

Approved

Approved

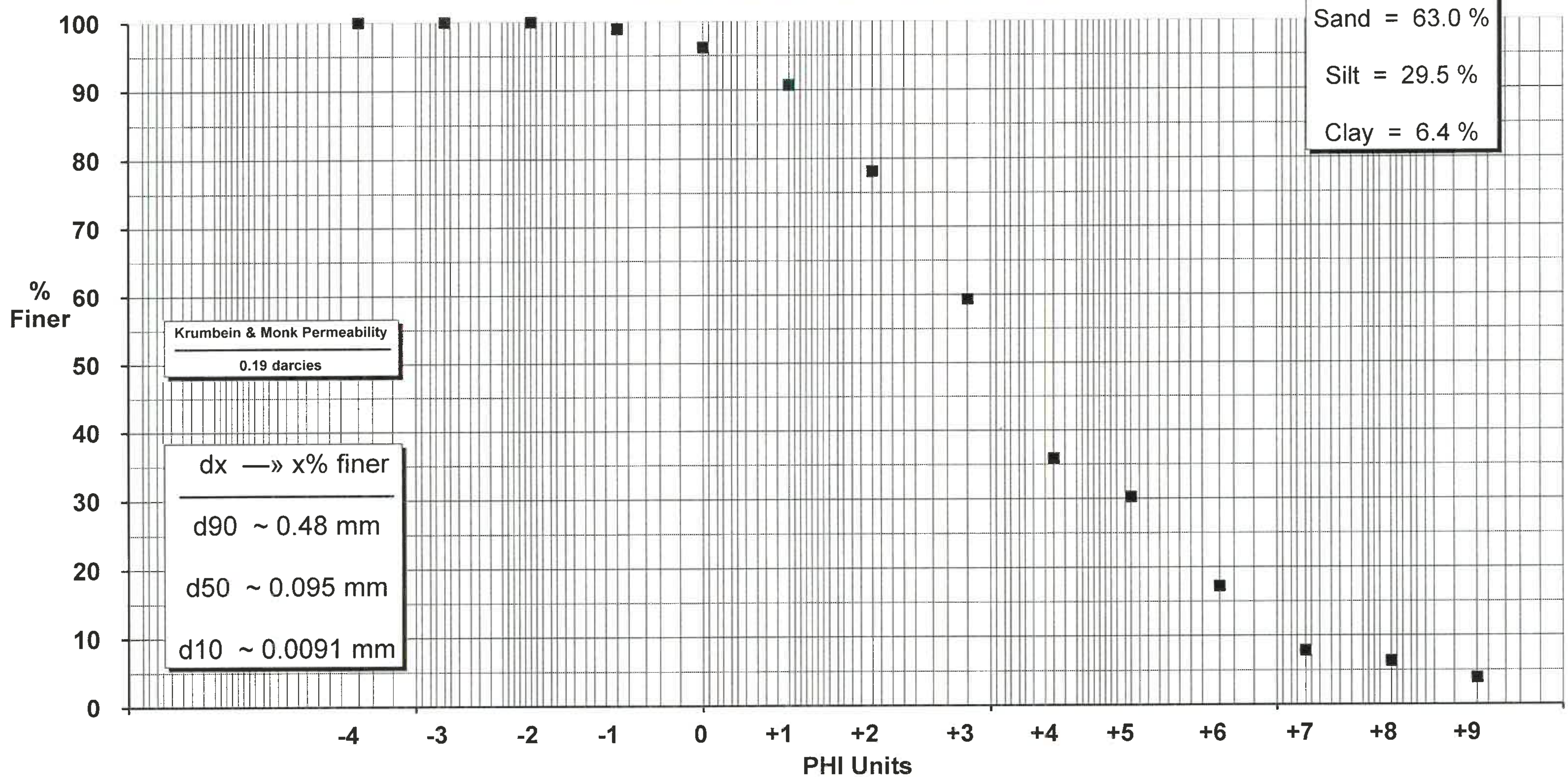
Maxxam

Maxxam ID: CWO885-01

SW-5-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
57.9 %	65.9 %

Wentworth
Gravel = 1.1 %
Sand = 63.0 %
Silt = 29.5 %
Clay = 6.4 %



Krumbein & Monk Permeability
0.19 darcies

dx —» x% finer
d90 ~ 0.48 mm
d50 ~ 0.095 mm
d10 ~ 0.0091 mm

Approved

Maxxam

Maxxam ID: CWO886-01

SW-5-2

Percent Coarser than 75 µm (PHI = 3.737)

60.2 %

Percent Coarser than 50 µm (PHI = 4.322)

68.7 %

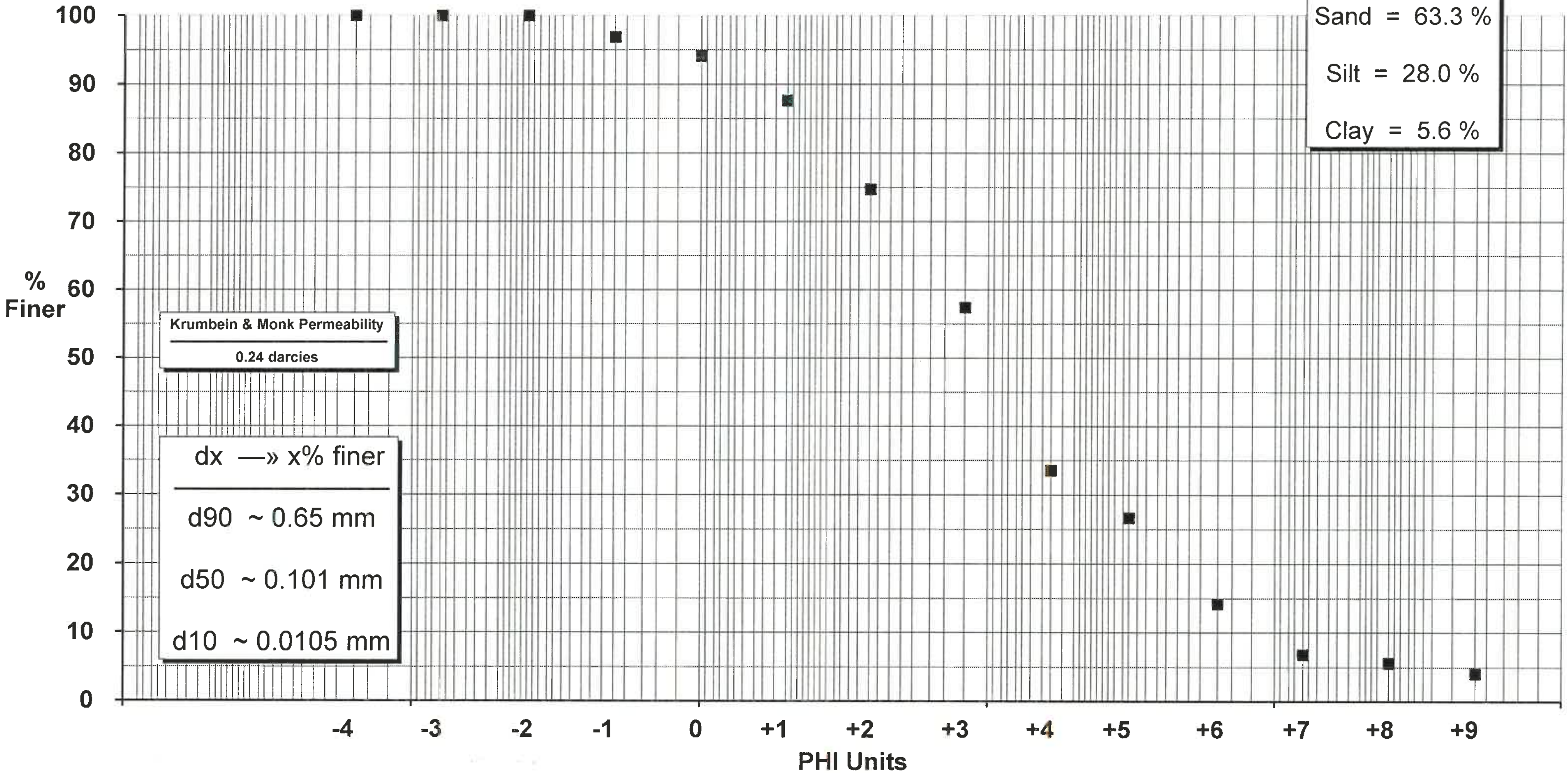
Wentworth

Gravel = 3.1 %

Sand = 63.3 %

Silt = 28.0 %

Clay = 5.6 %



Krumbein & Monk Permeability

0.24 darcies

dx —» x% finer

d90 ~ 0.65 mm

d50 ~ 0.101 mm

d10 ~ 0.0105 mm

Approved

Maxxam

Maxxam ID: CWO887-01

SW-5-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
60.2 %	68.3 %

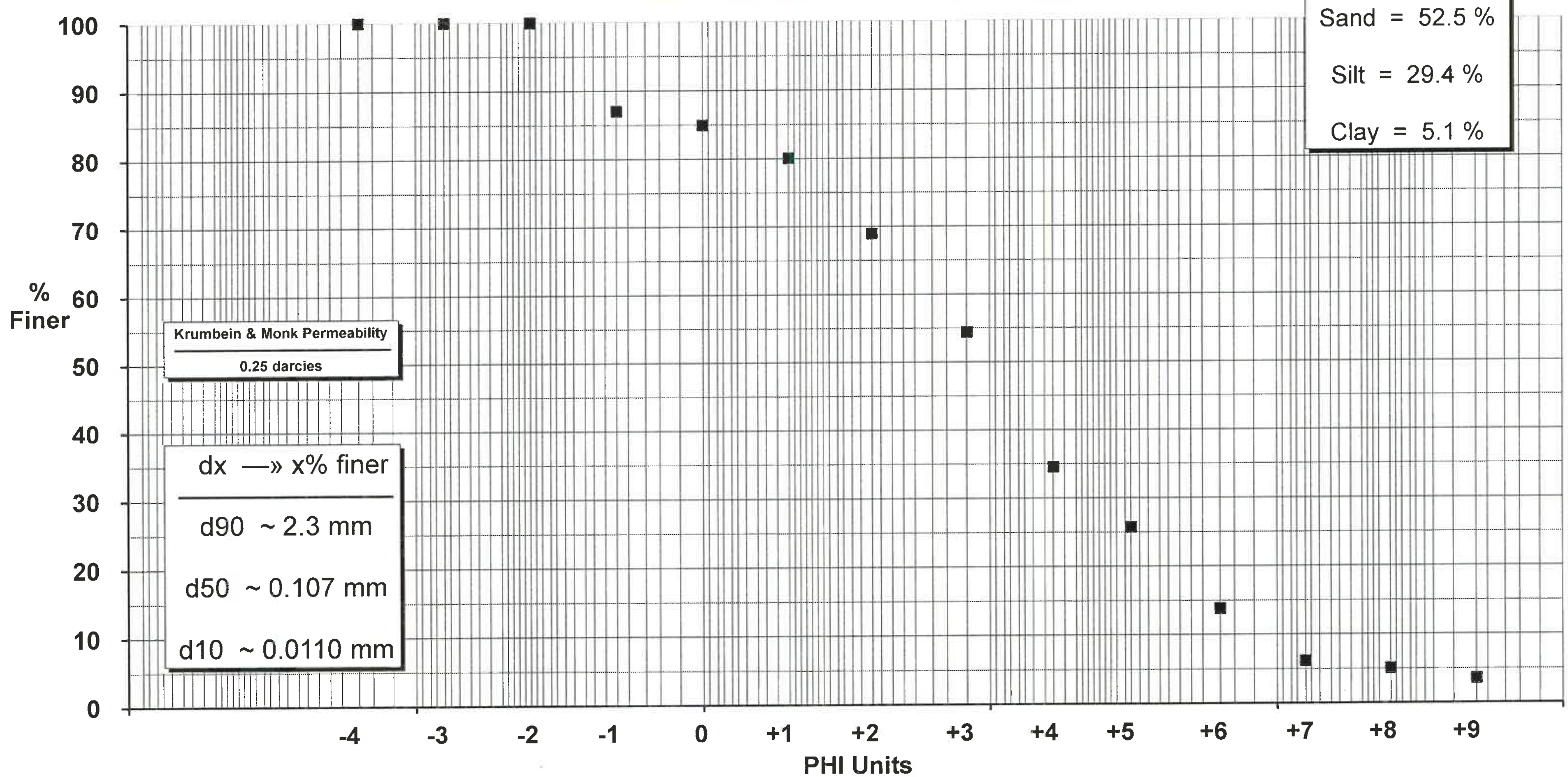
Wentworth

Gravel = 13.0 %

Sand = 52.5 %

Silt = 29.4 %

Clay = 5.1 %



Krumbein & Monk Permeability

0.25 darcies

dx —» x% finer

d90 ~ 2.3 mm

d50 ~ 0.107 mm

d10 ~ 0.0110 mm

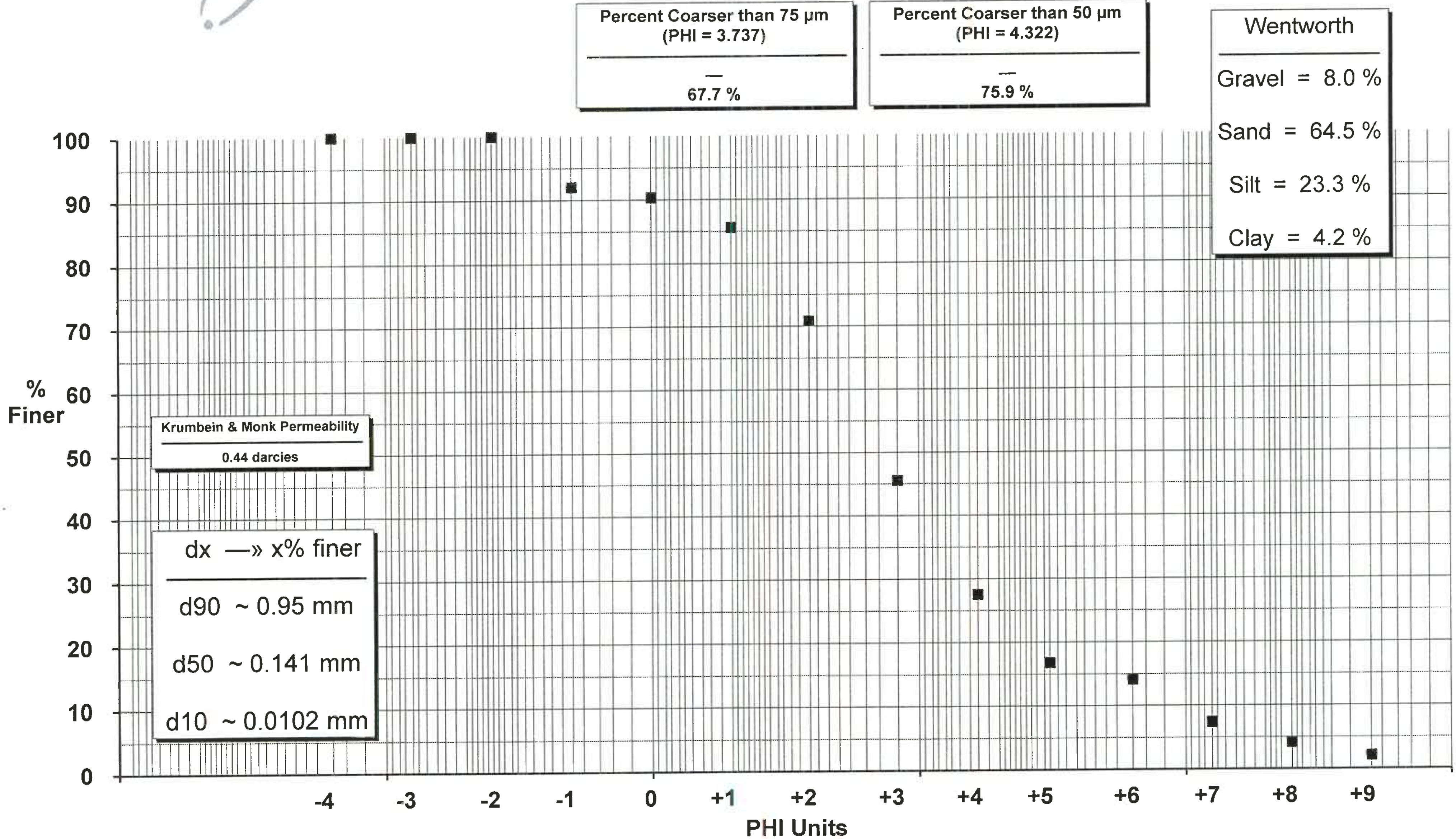
Approved

Maxxam

Maxxam ID: CWO888-01

SW-1-1Q

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
67.7 %	75.9 %

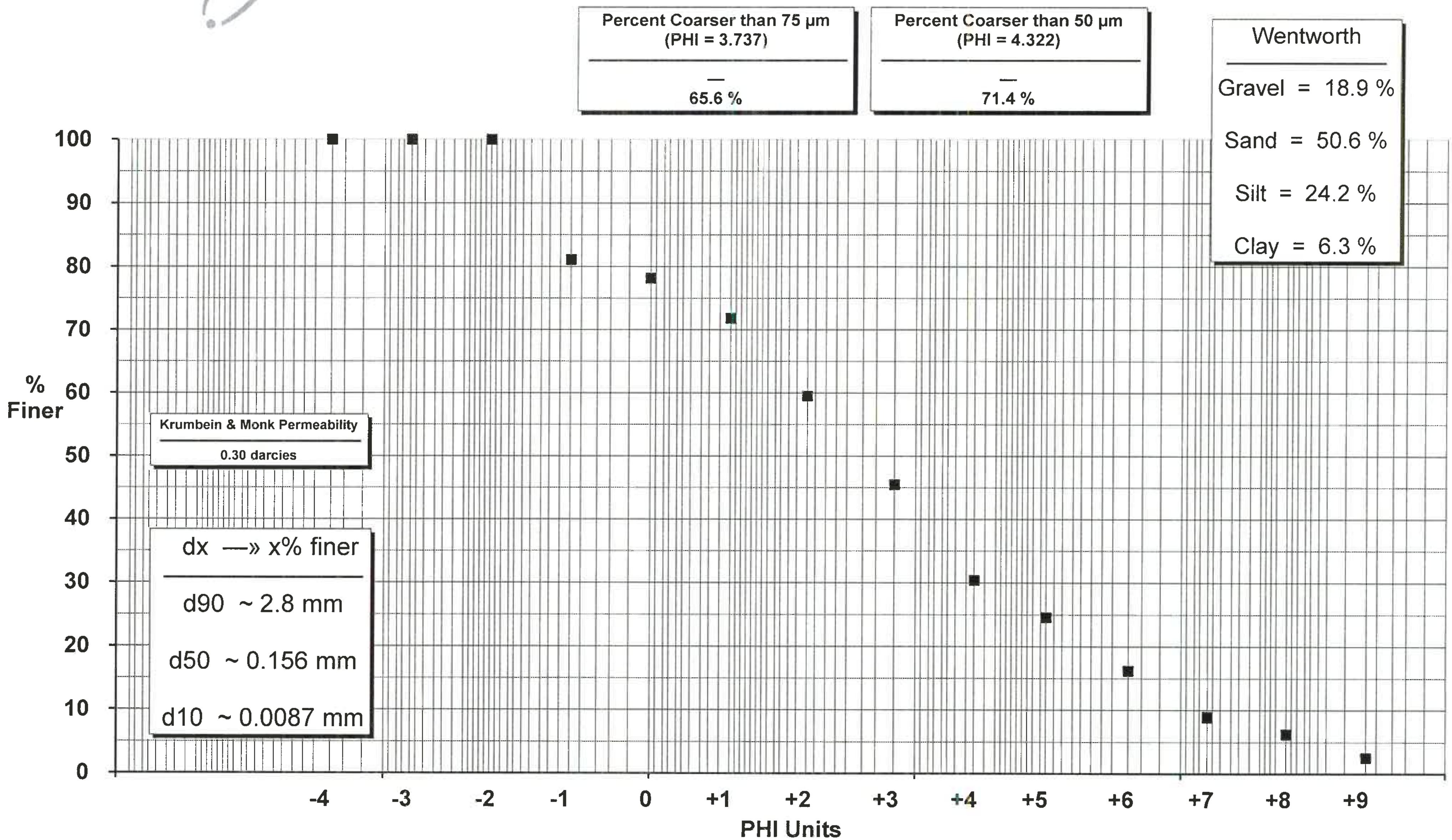


Approved

Maxxam

Maxxam ID: CWO889-01

SW-2-1Q



Approved

Approved

Approved

Approved

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560235-02-01, 560235-03-01, 560235-06-01

Report Date: 2016/09/08
Report #: R4158972
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6H1451
Received: 2016/08/11, 10:26

Sample Matrix: Soil
Samples Received: 17

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
TEH in Soil (PIRI) (2)	6	2016/08/16	2016/08/16	ATL SOP 00111	Atl. RBCA v3 m
Mercury (CVAA)	17	2016/08/16	2016/08/17	ATL SOP 00026	EPA 245.5 m
Metals Solids Acid Extr. ICPMS	17	2016/08/16	2016/08/18	ATL SOP 00058	EPA 6020A R1 m
Loss on Ignition at 600 (3)	17	2016/08/17	2016/08/18		Carter 2nd ed 28.3
Moisture	6	N/A	2016/08/17	ATL SOP 00001	OMOE Handbook 1983 m
VPH in Soil (PIRI)	6	2016/08/16	2016/08/18	ATL SOP 00119	Atl. RBCA v3 m
Particle size in solids (pipette&sieve) (4)	8	N/A	2016/08/18	ATL SOP 00012	MSAMS 1978 m
Particle size in solids (pipette&sieve) (4)	9	N/A	2016/08/19	ATL SOP 00012	MSAMS 1978 m
Total Carbon in Soil (1)	17	N/A	2016/08/18	CAM SOP-00468	Lloyd Kahn Method
Total Inorganic Carbon in Soils (1)	15	N/A	2016/08/19		Calculation
Total Inorganic Carbon in Soils (1)	2	N/A	2016/09/02		Calculation
Total Organic Carbon in Soil (1)	15	N/A	2016/08/19	CAM SOP-00468	BCMOE TOC Aug 2014
Total Organic Carbon in Soil (1)	2	N/A	2016/09/02	CAM SOP-00468	BCMOE TOC Aug 2014
ModTPH (T1) Calc. for Soil	6	N/A	2016/08/18	N/A	Atl. RBCA v3 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Analytics Mississauga
(2) Soils are reported on a dry weight basis unless otherwise specified.
(3) Loss on Ignition at 600 is not accredited.
(4) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560235-02-01, 560235-03-01, 560235-06-01

Report Date: 2016/09/08
Report #: R4158972
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6H1451
Received: 2016/08/11, 10:26

Encryption Key

Sara Mason
Project Manager Assistant
08 Sep 2016 15:45:25 -03:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO873	CWO873	CWO874	CWO875	CWO876	CWO877		
Sampling Date		2016/08/08 16:40	2016/08/08 16:40	2016/08/08 17:00	2016/08/08 17:10	2016/08/08 15:55	2016/08/08 16:20		
COC Number		560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-02-01		
	UNITS	**SW-1-1**	**SW-1-1 Lab-Dup**	**SW-1-2**	**SW-1-3**	**SW-2-1**	**SW-2-2**	**RDL**	**QC Batch**
Inorganics									
Total Carbon (C)	mg/kg	35000	34000	42000	39000	42000	41000	500	4624917
Total Inorganic Carbon (C)	mg/kg	11000		9200	10000	9100	10000	500	4619086
Moisture	%	23				20		1.0	4620166
Total Organic Carbon	mg/kg	24000	24000	33000	29000	33000	31000	500	4625137
< -1 Phi (2 mm)	%	90 (1)	94	97	87 (2)	88 (3)	94	0.10	4620153
< 0 Phi (1 mm)	%	88	92	95	85	85	92	0.10	4620153
< +1 Phi (0.5 mm)	%	85	89	91	81	76	88	0.10	4620153
< +2 Phi (0.25 mm)	%	71	77	79	70	60	76	0.10	4620153
< +3 Phi (0.12 mm)	%	46	52	59	51	46	58	0.10	4620153
< +4 Phi (0.062 mm)	%	28	33	41	34	30	35	0.10	4620153
< +5 Phi (0.031 mm)	%	24	26	35	24	22	30	0.10	4620153
< +6 Phi (0.016 mm)	%	17	19	37	9.8	16	21	0.10	4620153
< +7 Phi (0.0078 mm)	%	9.8	11	15	11	9.1	12	0.10	4620153
< +8 Phi (0.0039 mm)	%	7.5	8.8	12	9.9	7.3	9.4	0.10	4620153
< +9 Phi (0.0020 mm)	%	3.8	4.8	7.2	6.3	4.2	5.5	0.10	4620153
Gravel	%	10	5.7 (4)	3.1	13	12	6.3	0.10	4620153
Sand	%	62	61	56	53	58	58	0.10	4620153
Silt	%	20	24	29	24	23	26	0.10	4620153
Clay	%	7.5	8.8	12	9.9	7.3	9.4	0.10	4620153
Miscellaneous Parameters									
Loss on Ignition	%	8.9		11	9.5	9.7	8.7	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sample observation comment: fraction contained a rock
(2) Sample observation comment: fraction contained a large rock
(3) Sample observation comment: fraction contained two small rocks
(4) %RPD acceptable. Duplicate values agree within 10% absolute.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO878	CWO878		CWO879	CWO880		CWO881		
Sampling Date		2016/08/08 16:25	2016/08/08 16:25		2016/08/08 15:35	2016/08/08 15:40		2016/08/08 15:45		
COC Number		560235-03-01	560235-03-01		560235-03-01	560235-03-01		560235-03-01		
	UNITS	SW-2-3	SW-2-3 Lab-Dup	QC Batch	SW-3-1	SW3-2	QC Batch	SW-3-3	RDL	QC Batch
Inorganics										
Total Carbon (C)	mg/kg	43000		4624917	52000	45000	4624917	43000	500	4624917
Total Inorganic Carbon (C)	mg/kg	16000		4644706	9800	6200	4619086	14000	500	4644706
Moisture	%				22		4620166		1.0	
Total Organic Carbon	mg/kg	27000	30000	4646540	42000	39000	4625137	29000	500	4646540
< -1 Phi (2 mm)	%	98		4620153	78 (1)	93	4620153	91	0.10	4620164
< 0 Phi (1 mm)	%	96		4620153	76	90	4620153	89	0.10	4620164
< +1 Phi (0.5 mm)	%	91		4620153	74	84	4620153	82	0.10	4620164
< +2 Phi (0.25 mm)	%	79		4620153	68	75	4620153	71	0.10	4620164
< +3 Phi (0.12 mm)	%	61		4620153	60	57	4620153	51	0.10	4620164
< +4 Phi (0.062 mm)	%	40		4620153	44	34	4620153	30	0.10	4620164
< +5 Phi (0.031 mm)	%	32		4620153	30	28	4620153	23	0.10	4620164
< +6 Phi (0.016 mm)	%	22		4620153	20	16	4620153	16	0.10	4620164
< +7 Phi (0.0078 mm)	%	14		4620153	7.5	7.4	4620153	5.6	0.10	4620164
< +8 Phi (0.0039 mm)	%	11		4620153	4.2	4.9	4620153	3.4	0.10	4620164
< +9 Phi (0.0020 mm)	%	5.8		4620153	2.4	2.4	4620153	2.4	0.10	4620164
Gravel	%	1.9		4620153	22	7.1	4620153	9.0	0.10	4620164
Sand	%	58		4620153	34	59	4620153	61	0.10	4620164
Silt	%	30		4620153	39	29	4620153	27	0.10	4620164
Clay	%	11		4620153	4.2	4.9	4620153	3.4	0.10	4620164
Miscellaneous Parameters										
Loss on Ignition	%	10		4622781	11	11	4622781	9.8	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sample observation comment: fraction contained a large rock

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO881		CWO882	CWO882	CWO883	CWO884		
Sampling Date		2016/08/08 15:45		2016/08/08 15:15	2016/08/08 15:15	2016/08/08 15:20	2016/08/08 15:25		
COC Number		560235-03-01		560235-03-01	560235-03-01	560235-03-01	560235-03-01		
	UNITS	SW-3-3 Lab-Dup	QC Batch	SW-4-1	SW-4-1 Lab-Dup	SW-4-2	SW-4-3	RDL	QC Batch
Inorganics									
Total Carbon (C)	mg/kg		4624917	37000		42000	42000	500	4624917
Total Inorganic Carbon (C)	mg/kg		4644706	7300		9500	7500	500	4619086
Moisture	%			17				1.0	4620166
Total Organic Carbon	mg/kg		4646540	30000		32000	35000	500	4625137
< -1 Phi (2 mm)	%	86 (1)	4620164	81		99	96	0.10	4620164
< 0 Phi (1 mm)	%	84	4620164	77		97	93	0.10	4620164
< +1 Phi (0.5 mm)	%	79	4620164	70		94	89	0.10	4620164
< +2 Phi (0.25 mm)	%	69	4620164	62		87	82	0.10	4620164
< +3 Phi (0.12 mm)	%	49	4620164	40		60	57	0.10	4620164
< +4 Phi (0.062 mm)	%	28	4620164	16		25	24	0.10	4620164
< +5 Phi (0.031 mm)	%	24	4620164	12		19	20	0.10	4620164
< +6 Phi (0.016 mm)	%	17	4620164	7.2		12	11	0.10	4620164
< +7 Phi (0.0078 mm)	%	5.0	4620164	3.8		4.5	4.2	0.10	4620164
< +8 Phi (0.0039 mm)	%	3.1	4620164	3.2		3.2	3.1	0.10	4620164
< +9 Phi (0.0020 mm)	%	2.0	4620164	1.9		2.1	2.2	0.10	4620164
Gravel	%	14 (2)	4620164	19		1.5	4.1	0.10	4620164
Sand	%	58	4620164	66		74	72	0.10	4620164
Silt	%	25	4620164	12		22	21	0.10	4620164
Clay	%	3.1	4620164	3.2		3.2	3.1	0.10	4620164
Miscellaneous Parameters									
Loss on Ignition	%		4622781	7.9	6.7	11	12	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sample observation comment: fraction contained a large rock
(2) %RPD acceptable. Duplicate values agree within 10% absolute.

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWO885	CWO886	CWO887	CWO888	CWO889		
Sampling Date		2016/08/08 14:50	2016/08/08 14:55	2016/08/08 15:00	2016/08/08 16:50	2016/08/08 16:05		
COC Number		560235-03-01	560235-03-01	560235-03-01	560235-06-01	560235-06-01		
	UNITS	**SW-5-1**	**SW-5-2**	**SW-5-3**	**SW-1-1Q**	**SW-2-1Q**	**RDL**	**QC Batch**
Inorganics								
Total Carbon (C)	mg/kg	51000	48000	49000	38000	45000	500	4624917
Total Inorganic Carbon (C)	mg/kg	8800	7800	4100	12000	14000	500	4619086
Moisture	%	19			22		1.0	4620166
Total Organic Carbon	mg/kg	42000	40000	45000	27000	32000	500	4625137
< -1 Phi (2 mm)	%	99	97	87	92	81 (1)	0.10	4620164
< 0 Phi (1 mm)	%	96	94	85	90	78	0.10	4620164
< +1 Phi (0.5 mm)	%	91	88	80	86	72	0.10	4620164
< +2 Phi (0.25 mm)	%	78	75	69	71	60	0.10	4620164
< +3 Phi (0.12 mm)	%	59	57	54	46	45	0.10	4620164
< +4 Phi (0.062 mm)	%	36	34	35	28	30	0.10	4620164
< +5 Phi (0.031 mm)	%	30	27	26	17	25	0.10	4620164
< +6 Phi (0.016 mm)	%	17	14	14	14	16	0.10	4620164
< +7 Phi (0.0078 mm)	%	7.9	6.9	6.3	7.5	8.9	0.10	4620164
< +8 Phi (0.0039 mm)	%	6.4	5.6	5.1	4.2	6.3	0.10	4620164
< +9 Phi (0.0020 mm)	%	3.9	4.1	3.6	2.1	2.5	0.10	4620164
Gravel	%	1.1	3.1	13	8.0	19	0.10	4620164
Sand	%	63	63	52	64	51	0.10	4620164
Silt	%	30	28	29	23	24	0.10	4620164
Clay	%	6.4	5.6	5.1	4.2	6.3	0.10	4620164
Miscellaneous Parameters								
Loss on Ignition	%	11	12	11	10	12	0.30	4622781

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Sample observation comment: fraction contained two small rocks

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

MERCURY BY COLD VAPOUR AA (SOIL)

Maxxam ID		CWO873	CWO874	CWO875	CWO876	CWO877	CWO878		
Sampling Date		2016/08/08 16:40	2016/08/08 17:00	2016/08/08 17:10	2016/08/08 15:55	2016/08/08 16:20	2016/08/08 16:25		
COC Number		560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-03-01		
	UNITS	SW-1-1	SW-1-2	SW-1-3	SW-2-1	SW-2-2	SW-2-3	RDL	QC Batch
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	ND	0.010	4621608

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CWO879	CWO880	CWO881	CWO882	CWO883	CWO884		
Sampling Date		2016/08/08 15:35	2016/08/08 15:40	2016/08/08 15:45	2016/08/08 15:15	2016/08/08 15:20	2016/08/08 15:25		
COC Number		560235-03-01	560235-03-01	560235-03-01	560235-03-01	560235-03-01	560235-03-01		
	UNITS	SW-3-1	SW3-2	SW-3-3	SW-4-1	SW-4-2	SW-4-3	RDL	QC Batch
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	ND	0.010	4621608

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CWO885	CWO886	CWO887		CWO888	CWO889		
Sampling Date		2016/08/08 14:50	2016/08/08 14:55	2016/08/08 15:00		2016/08/08 16:50	2016/08/08 16:05		
COC Number		560235-03-01	560235-03-01	560235-03-01		560235-06-01	560235-06-01		
	UNITS	SW-5-1	SW-5-2	SW-5-3	QC Batch	SW-1-1Q	SW-2-1Q	RDL	QC Batch
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	4621608	ND	ND	0.010	4621632

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO873		CWO874	CWO875	CWO876	CWO877		
Sampling Date		2016/08/08 16:40		2016/08/08 17:00	2016/08/08 17:10	2016/08/08 15:55	2016/08/08 16:20		
COC Number		560235-02-01		560235-02-01	560235-02-01	560235-02-01	560235-02-01		
	UNITS	SW-1-1	QC Batch	SW-1-2	SW-1-3	SW-2-1	SW-2-2	RDL	QC Batch
Metals									
Acid Extractable Aluminum (Al)	mg/kg	4200	4621153	5100	4700	4100	4400	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	4.1	4621153	4.1	4.1	2.3	3.9	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	14	4621153	16	19	14	15	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	4621153	ND	ND	ND	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	4621153	ND	ND	ND	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	15	4621153	18	17	14	16	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	3.0	4621153	3.1	3.0	2.6	2.9	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	5.3	4621153	6.0	5.9	7.6	5.5	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	10000	4621153	11000	11000	8000	9600	50	4621187
Acid Extractable Lead (Pb)	mg/kg	4.5	4621153	5.4	4.8	4.6	4.6	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	21	4621153	24	22	19	21	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	110	4621153	120	120	100	120	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	4621153	ND	ND	ND	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	8.5	4621153	10	9.4	8.9	9.4	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	17	4621153	20	19	15	19	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	4621153	ND	ND	ND	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	4621153	ND	ND	ND	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	39	4621153	45	45	39	44	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	4621153	0.11	0.10	ND	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	4621153	ND	ND	ND	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.76	4621153	0.85	0.80	0.63	0.66	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	17	4621153	20	19	15	18	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	14	4621153	16	15	210	14	5.0	4621187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO878	CWO879	CWO880	CWO881	CWO882		
Sampling Date		2016/08/08 16:25	2016/08/08 15:35	2016/08/08 15:40	2016/08/08 15:45	2016/08/08 15:15		
COC Number		560235-03-01	560235-03-01	560235-03-01	560235-03-01	560235-03-01		
	UNITS	SW-2-3	SW-3-1	SW3-2	SW-3-3	SW-4-1	RDL	QC Batch
Metals								
Acid Extractable Aluminum (Al)	mg/kg	4200	5200	4900	4100	3300	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	3.0	7.8	7.3	6.9	3.1	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	15	25	15	14	11	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	ND	ND	ND	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	ND	ND	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	16	20	18	16	15	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	2.9	3.5	3.3	2.9	2.7	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	5.5	7.0	6.5	5.3	5.1	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	9100	14000	12000	11000	9000	50	4621187
Acid Extractable Lead (Pb)	mg/kg	4.7	5.0	4.6	4.1	3.2	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	20	26	23	20	17	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	110	140	150	120	120	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	9.2	11	11	8.8	9.0	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	17	20	19	16	13	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	41	57	53	46	36	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	0.11	ND	ND	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	ND	ND	ND	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.67	0.76	0.69	0.63	0.62	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	17	20	19	19	12	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	13	15	14	12	23	5.0	4621187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO883		CWO884	CWO885		CWO886		
Sampling Date		2016/08/08 15:20		2016/08/08 15:25	2016/08/08 14:50		2016/08/08 14:55		
COC Number		560235-03-01		560235-03-01	560235-03-01		560235-03-01		
	UNITS	**SW-4-2**	**QC Batch**	**SW-4-3**	**SW-5-1**	**QC Batch**	**SW-5-2**	**RDL**	**QC Batch**
Metals									
Acid Extractable Aluminum (Al)	mg/kg	3700	4621187	3900	4200	4621248	4000	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	3.8	4621187	3.7	2.1	4621248	2.3	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	14	4621187	15	13	4621248	12	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	4621187	ND	ND	4621248	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	15	4621187	15	15	4621248	14	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	2.8	4621187	3.0	3.2	4621248	2.9	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	5.6	4621187	5.5	7.1	4621248	6.0	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	10000	4621187	10000	9700	4621248	9100	50	4621187
Acid Extractable Lead (Pb)	mg/kg	3.6	4621187	3.8	4.5	4621248	3.9	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	20	4621187	20	22	4621248	22	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	130	4621187	140	160	4621248	140	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	8.4	4621187	8.6	8.7	4621248	8.5	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	14	4621187	15	14	4621248	14	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	4621187	ND	ND	4621248	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	39	4621187	42	41	4621248	44	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	4621187	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	4621187	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.63	4621187	0.67	0.86	4621248	0.76	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	14	4621187	14	15	4621248	14	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	11	4621187	11	13	4621248	11	5.0	4621187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWO887	CWO888		CWO889		
Sampling Date		2016/08/08 15:00	2016/08/08 16:50		2016/08/08 16:05		
COC Number		560235-03-01	560235-06-01		560235-06-01		
	UNITS	**SW-5-3**	**SW-1-1Q**	**QC Batch**	**SW-2-1Q**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	4300	4200	4621248	4600	10	4621187
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Arsenic (As)	mg/kg	2.1	4.4	4621248	2.8	2.0	4621187
Acid Extractable Barium (Ba)	mg/kg	13	15	4621248	15	5.0	4621187
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Boron (B)	mg/kg	ND	ND	4621248	ND	50	4621187
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	4621248	ND	0.30	4621187
Acid Extractable Chromium (Cr)	mg/kg	15	15	4621248	16	2.0	4621187
Acid Extractable Cobalt (Co)	mg/kg	3.4	2.8	4621248	2.8	1.0	4621187
Acid Extractable Copper (Cu)	mg/kg	7.4	5.3	4621248	6.3	2.0	4621187
Acid Extractable Iron (Fe)	mg/kg	9700	10000	4621248	9100	50	4621187
Acid Extractable Lead (Pb)	mg/kg	4.2	4.3	4621248	4.6	0.50	4621187
Acid Extractable Lithium (Li)	mg/kg	23	19	4621248	22	2.0	4621187
Acid Extractable Manganese (Mn)	mg/kg	150	120	4621248	110	2.0	4621187
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Nickel (Ni)	mg/kg	8.8	8.6	4621248	9.4	2.0	4621187
Acid Extractable Rubidium (Rb)	mg/kg	15	18	4621248	17	2.0	4621187
Acid Extractable Selenium (Se)	mg/kg	ND	ND	4621248	ND	1.0	4621187
Acid Extractable Silver (Ag)	mg/kg	ND	ND	4621248	ND	0.50	4621187
Acid Extractable Strontium (Sr)	mg/kg	42	36	4621248	42	5.0	4621187
Acid Extractable Thallium (Tl)	mg/kg	ND	ND	4621248	ND	0.10	4621187
Acid Extractable Tin (Sn)	mg/kg	ND	ND	4621248	ND	2.0	4621187
Acid Extractable Uranium (U)	mg/kg	0.84	0.75	4621248	0.68	0.10	4621187
Acid Extractable Vanadium (V)	mg/kg	15	17	4621248	18	2.0	4621187
Acid Extractable Zinc (Zn)	mg/kg	13	15	4621248	16	5.0	4621187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CWO873	CWO876	CWO879	CWO882	CWO885	CWO888		
Sampling Date		2016/08/08 16:40	2016/08/08 15:55	2016/08/08 15:35	2016/08/08 15:15	2016/08/08 14:50	2016/08/08 16:50		
COC Number		560235-02-01	560235-02-01	560235-03-01	560235-03-01	560235-03-01	560235-06-01		
	UNITS	**SW-1-1**	**SW-2-1**	**SW-3-1**	**SW-4-1**	**SW-5-1**	**SW-1-1Q**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4620924
Toluene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4620924
Ethylbenzene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4620924
Total Xylenes	mg/kg	ND	ND	ND	ND	ND	ND	0.050	4620924
C6 - C10 (less BTEX)	mg/kg	ND	ND	ND	ND	ND	ND	2.5	4620924
>C10-C16 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	10	4620890
>C16-C21 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	10	4620890
>C21-<C32 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	15	4620890
Modified TPH (Tier1)	mg/kg	ND	ND	ND	ND	ND	ND	15	4619084
Reached Baseline at C32	mg/kg	NA	NA	NA	NA	NA	NA	N/A	4620890
Hydrocarbon Resemblance	mg/kg	NA	NA	NA	NA	NA	NA	N/A	4620890
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	96	94	96	95	99	96		4620890
n-Dotriacontane - Extractable	%	114	115	109	120	116	124		4620890
Isobutylbenzene - Volatile	%	112	108	80	105	92	117		4620924

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.3°C

Revised Report: To add the sampling times for each sample. Also to add TOC, TIC to samples CWO878 & CWO881 originally missed when the job was logged in. Sept. 8, 2016 LMU

Results relate only to the items tested.

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4620153	ACU	RPD [CWO873-01]	Gravel	2016/08/18	56 (1)		%	35
			Sand	2016/08/18	1.3		%	35
			Silt	2016/08/18	18		%	35
			Clay	2016/08/18	16		%	35
4620164	ACU	RPD [CWO881-01]	Gravel	2016/08/19	42 (1)		%	35
			Sand	2016/08/19	4.0		%	35
			Silt	2016/08/19	8.0		%	35
			Clay	2016/08/19	8.8		%	35
4620890	BHR	Matrix Spike	Isobutylbenzene - Extractable	2016/08/16		94	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/16		96 (2)	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/16		87	%	30 - 130
			>C16-C21 Hydrocarbons	2016/08/16		84	%	30 - 130
			>C21-<C32 Hydrocarbons	2016/08/16		107	%	30 - 130
4620890	BHR	Spiked Blank	Isobutylbenzene - Extractable	2016/08/16		96	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/16		111	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/16		91	%	30 - 130
			>C16-C21 Hydrocarbons	2016/08/16		87	%	30 - 130
			>C21-<C32 Hydrocarbons	2016/08/16		115	%	30 - 130
4620890	BHR	Method Blank	Isobutylbenzene - Extractable	2016/08/16		95	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/16		102	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/16	ND, RDL=10		mg/kg	
			>C16-C21 Hydrocarbons	2016/08/16	ND, RDL=10		mg/kg	
			>C21-<C32 Hydrocarbons	2016/08/16	ND, RDL=15		mg/kg	
4620890	BHR	RPD	>C10-C16 Hydrocarbons	2016/08/16	NC		%	50
			>C16-C21 Hydrocarbons	2016/08/16	NC		%	50
			>C21-<C32 Hydrocarbons	2016/08/16	NC		%	50
4620924	THL	Matrix Spike	Isobutylbenzene - Volatile	2016/08/18		90	%	60 - 130
			Benzene	2016/08/18		125	%	60 - 130
			Toluene	2016/08/18		114	%	60 - 130
			Ethylbenzene	2016/08/18		107	%	60 - 130
			Total Xylenes	2016/08/18		106	%	60 - 130
4620924	THL	Spiked Blank	Isobutylbenzene - Volatile	2016/08/18		80	%	60 - 130
			Benzene	2016/08/18		74	%	60 - 140
			Toluene	2016/08/18		75	%	60 - 140
			Ethylbenzene	2016/08/18		81	%	60 - 140
			Total Xylenes	2016/08/18		82	%	60 - 140
4620924	THL	Method Blank	Isobutylbenzene - Volatile	2016/08/18		102	%	60 - 130
			Benzene	2016/08/18	ND, RDL=0.025		mg/kg	
			Toluene	2016/08/18	ND, RDL=0.025		mg/kg	
			Ethylbenzene	2016/08/18	ND, RDL=0.025		mg/kg	
			Total Xylenes	2016/08/18	ND, RDL=0.050		mg/kg	
			C6 - C10 (less BTEX)	2016/08/18	ND, RDL=2.5		mg/kg	
4620924	THL	RPD	Benzene	2016/08/18	NC		%	50
			Toluene	2016/08/18	18		%	50

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Ethylbenzene	2016/08/18	NC		%	50
			Total Xylenes	2016/08/18	17		%	50
			C6 - C10 (less BTEX)	2016/08/18	25		%	50
4621153	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2016/08/17		NC	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/17		115	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/17		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/17		105	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/17		113	%	75 - 125
			Acid Extractable Boron (B)	2016/08/17		95	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/17		100	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/17		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/17		99	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/17		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/17		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/17		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/17		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/17		93	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/17		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/17		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/17		97	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/17		99	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/17		106	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/17		103	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/17		102	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/17		106	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/17		108	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/17		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/17		NC	%	75 - 125
4621153	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/18		98	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		102	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		102	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		103	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		100	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		107	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		102	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		102	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		101	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		104	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		101	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		98	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		104	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		99	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		102	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		102	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		102	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		104	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		102	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		104	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/18		101	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		98	%	75 - 125

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Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4621153	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/17	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/17	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/17	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/17	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/17	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/17	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/17	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/17	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/17	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/17	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/17	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/17	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/17	ND, RDL=0.10		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Vanadium (V)	2016/08/17	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/17	ND, RDL=5.0		mg/kg	
4621153	MLB	RPD	Acid Extractable Lead (Pb)	2016/08/18	126 (3)		%	35
4621187	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2016/08/19		NC	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/19		102	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/19		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/19		102	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/19		89	%	75 - 125
			Acid Extractable Boron (B)	2016/08/19		96	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/19		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/19		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/19		102	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/19		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/19		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/19		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/19		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/19		91	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/19		100	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/19		101	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/19		95	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/19		99	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/19		100	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/19		106	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/19		101	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/19		NC	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/19		103	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/19		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/19		NC	%	75 - 125
4621187	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/18		100	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		103	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		101	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		101	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		101	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		98	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		103	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		109	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		100	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		101	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		106	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		95	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		98	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		104	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		99	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		100	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		102	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		103	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		101	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		103	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		103	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Vanadium (V)	2016/08/18		103	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		117	%	75 - 125
4621187	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/18	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/18	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/18	ND, RDL=2.0		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Uranium (U)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/18	ND, RDL=5.0		mg/kg	
4621187	MLB	RPD	Acid Extractable Lead (Pb)	2016/08/19	58 (3)		%	35
4621248	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2016/08/18		97	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		100	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		104	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		101	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		93	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		103	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		101	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		107	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		92	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		93	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		98	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		98	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		104	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		105	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		103	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		99	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		103	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/18		104	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		NC	%	75 - 125
4621248	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/18		105	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		103	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		103	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		106	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		102	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		101	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		101	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		103	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		103	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		102	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		107	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		103	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		98	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		100	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		102	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		99	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		100	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		105	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		102	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		104	%	75 - 125

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Tin (Sn)	2016/08/18		101	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		105	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/18		103	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		100	%	75 - 125
4621248	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/18	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/18	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/18	ND, RDL=0.10		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Tin (Sn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/18	ND, RDL=5.0		mg/kg	
4621248	MLB	RPD	Acid Extractable Lead (Pb)	2016/08/18	13		%	35
4621608	ARS	Matrix Spike	Mercury (Hg)	2016/08/17		97	%	75 - 125
4621608	ARS	QC Standard	Mercury (Hg)	2016/08/17		73 (4)	%	75 - 125
4621608	ARS	Spiked Blank	Mercury (Hg)	2016/08/17		97	%	80 - 120
4621608	ARS	Method Blank	Mercury (Hg)	2016/08/17	ND, RDL=0.010		mg/kg	
4621608	ARS	RPD	Mercury (Hg)	2016/08/17	NC		%	30
4621632	ARS	Matrix Spike	Mercury (Hg)	2016/08/17		97	%	75 - 125
4621632	ARS	QC Standard	Mercury (Hg)	2016/08/17		73 (4)	%	75 - 125
4621632	ARS	Spiked Blank	Mercury (Hg)	2016/08/17		95	%	80 - 120
4621632	ARS	Method Blank	Mercury (Hg)	2016/08/17	ND, RDL=0.010		mg/kg	
4621632	ARS	RPD	Mercury (Hg)	2016/08/17	NC		%	30
4622781	BBD	QC Standard	Loss on Ignition	2016/08/18		99	%	80 - 120
4622781	BBD	Method Blank	Loss on Ignition	2016/08/18	ND, RDL=0.30		%	
4622781	BBD	RPD [CWO882-01]	Loss on Ignition	2016/08/18	16		%	25
4624917	BMO	QC Standard	Total Carbon (C)	2016/08/18		103	%	75 - 125
4624917	BMO	Method Blank	Total Carbon (C)	2016/08/18	ND, RDL=500		mg/kg	
4624917	BMO	RPD [CWO873-01]	Total Carbon (C)	2016/08/18	2.6		%	35
4625137	BMO	QC Standard	Total Organic Carbon	2016/08/19		110	%	75 - 125
4625137	BMO	Method Blank	Total Organic Carbon	2016/08/19	ND, RDL=500		mg/kg	
4625137	BMO	RPD [CWO873-01]	Total Organic Carbon	2016/08/19	1.9		%	35
4646540	BMO	QC Standard	Total Organic Carbon	2016/09/02		113	%	75 - 125
4646540	BMO	Method Blank	Total Organic Carbon	2016/09/02	ND, RDL=500		mg/kg	

Maxxam Job #: B6H1451
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SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4646540	BMO	RPD [CWO878-01]	Total Organic Carbon	2016/09/02	8.1		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) %RPD acceptable. Duplicate values agree within 10% absolute.

(2) TEH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

(3) Poor RPD due to sample inhomogeneity. Result confirmed by repeat digestion and analysis.

(4) Reference Material acceptable using control chart criteria.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B6H1451
Report Date: 2016/09/08

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Colleen Acker, Supervisor, General Chemistry

Cristina Carriere, Scientific Services

Mike MacGillivray, Scientific Specialist (Inorganics)

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

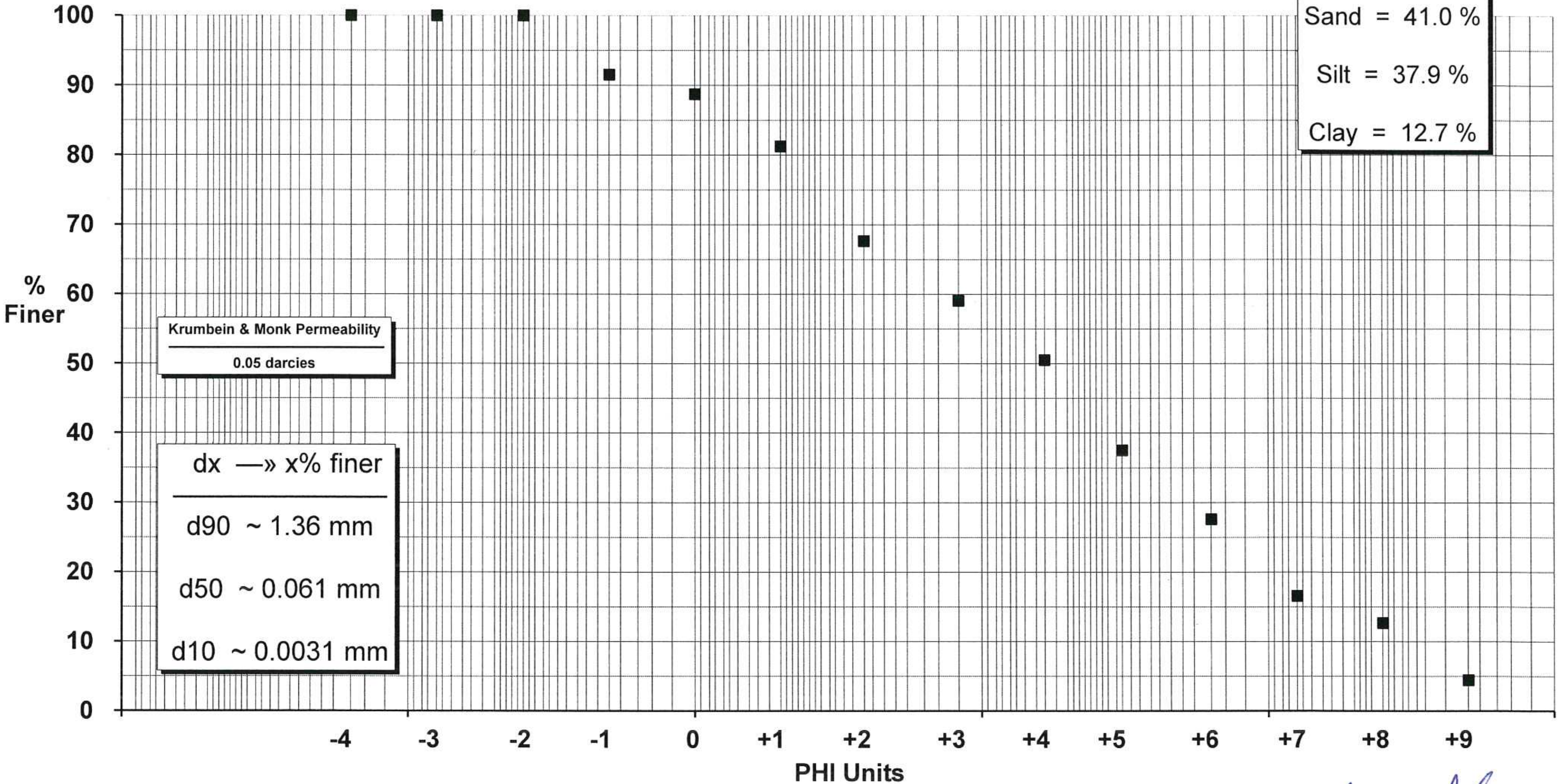
Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam ID: CWT802-01

SN-1-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
47.2 %	53.6 %

Wentworth
Gravel = 8.5 %
Sand = 41.0 %
Silt = 37.9 %
Clay = 12.7 %



Krumbein & Monk Permeability
0.05 darcies

dx —» x% finer
d90 ~ 1.36 mm
d50 ~ 0.061 mm
d10 ~ 0.0031 mm

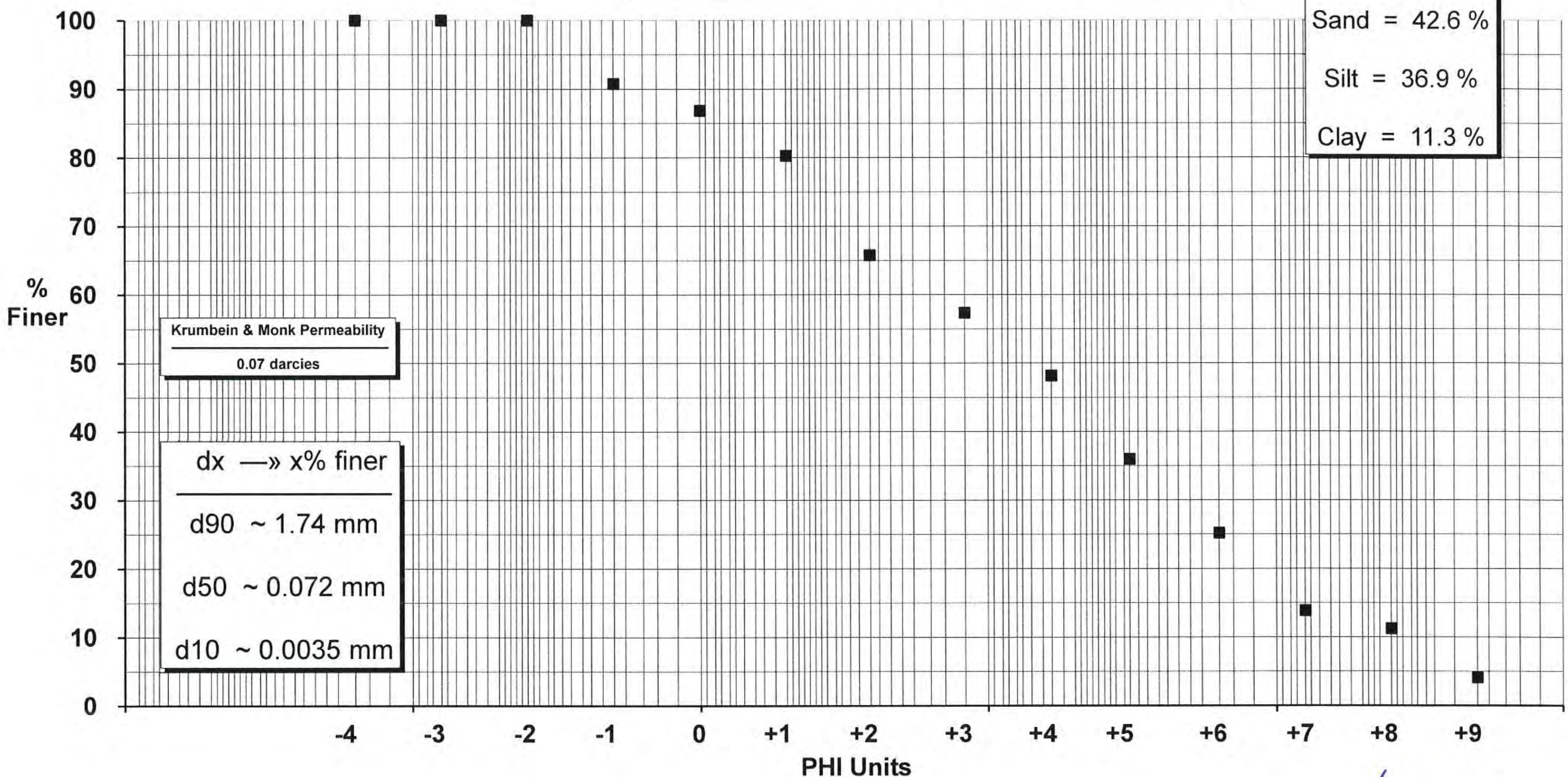
Approved

Maxxam

Maxxam ID: CWT802-01:D1

SN-1-1 :D1

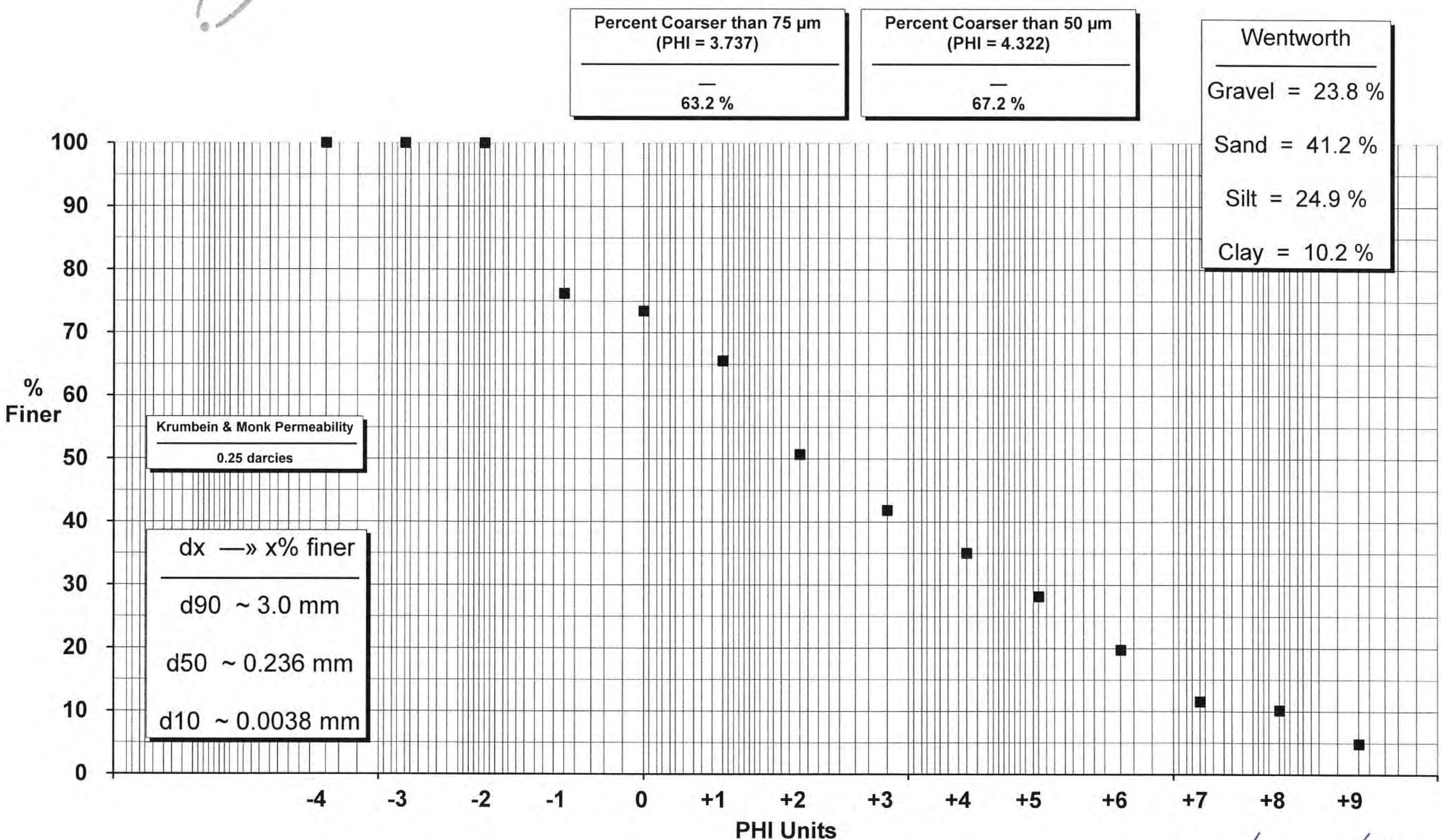
Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
49.4 %	55.7 %



Approved

Maxxam ID: CWT803-01

SN-1-2



Approved

Maxxam

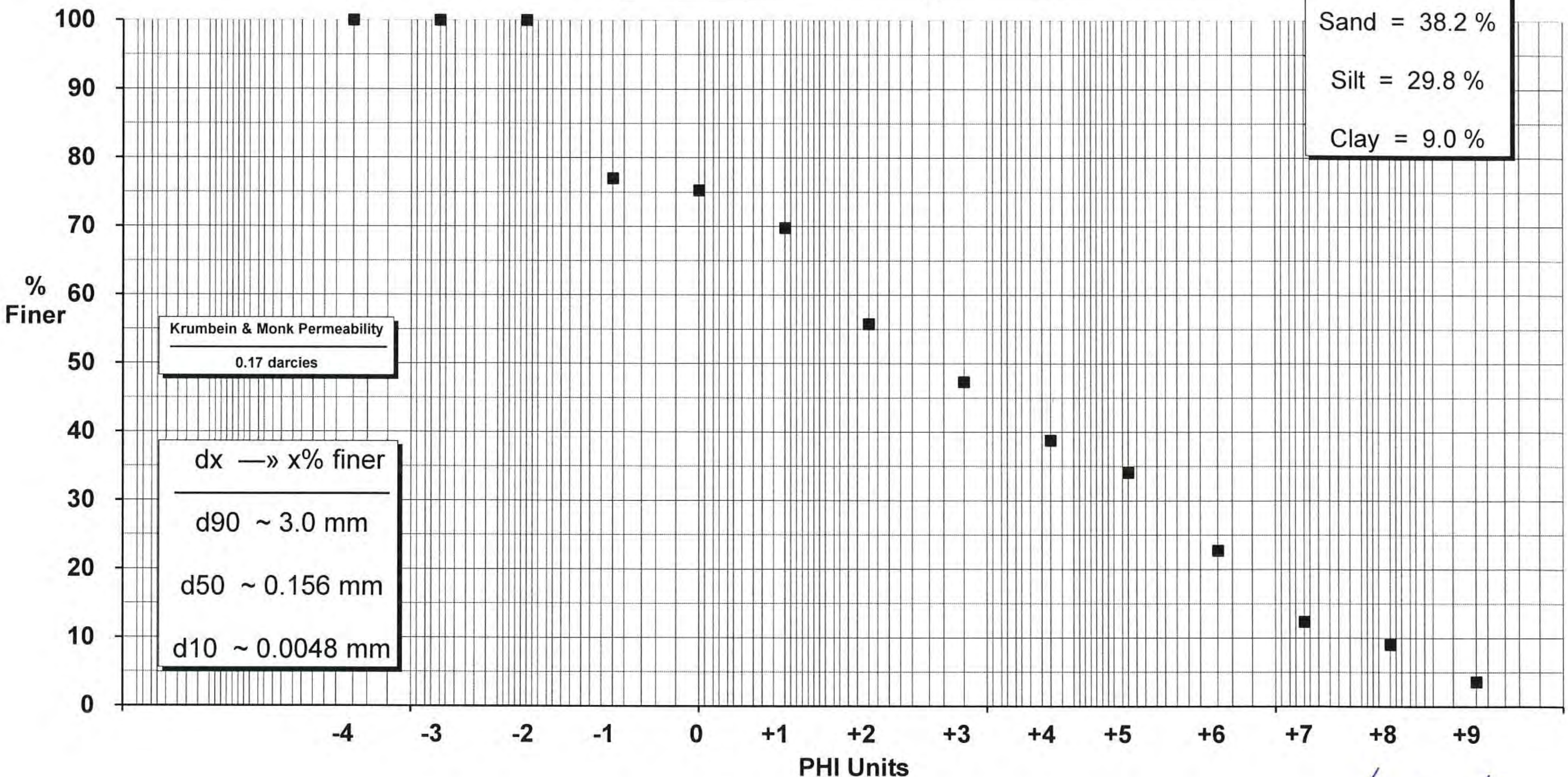
Maxxam ID: CWT804-01

SN-1-3

Percent Coarser than 75 µm (PHI = 3.737)
59.0 %

Percent Coarser than 50 µm (PHI = 4.322)
62.7 %

Wentworth
Gravel = 23.0 %
Sand = 38.2 %
Silt = 29.8 %
Clay = 9.0 %



Krumbein & Monk Permeability
0.17 darcies

dx —» x% finer
d90 ~ 3.0 mm
d50 ~ 0.156 mm
d10 ~ 0.0048 mm

Approved

Maxxam ID: CWT805-01

SN-2-1

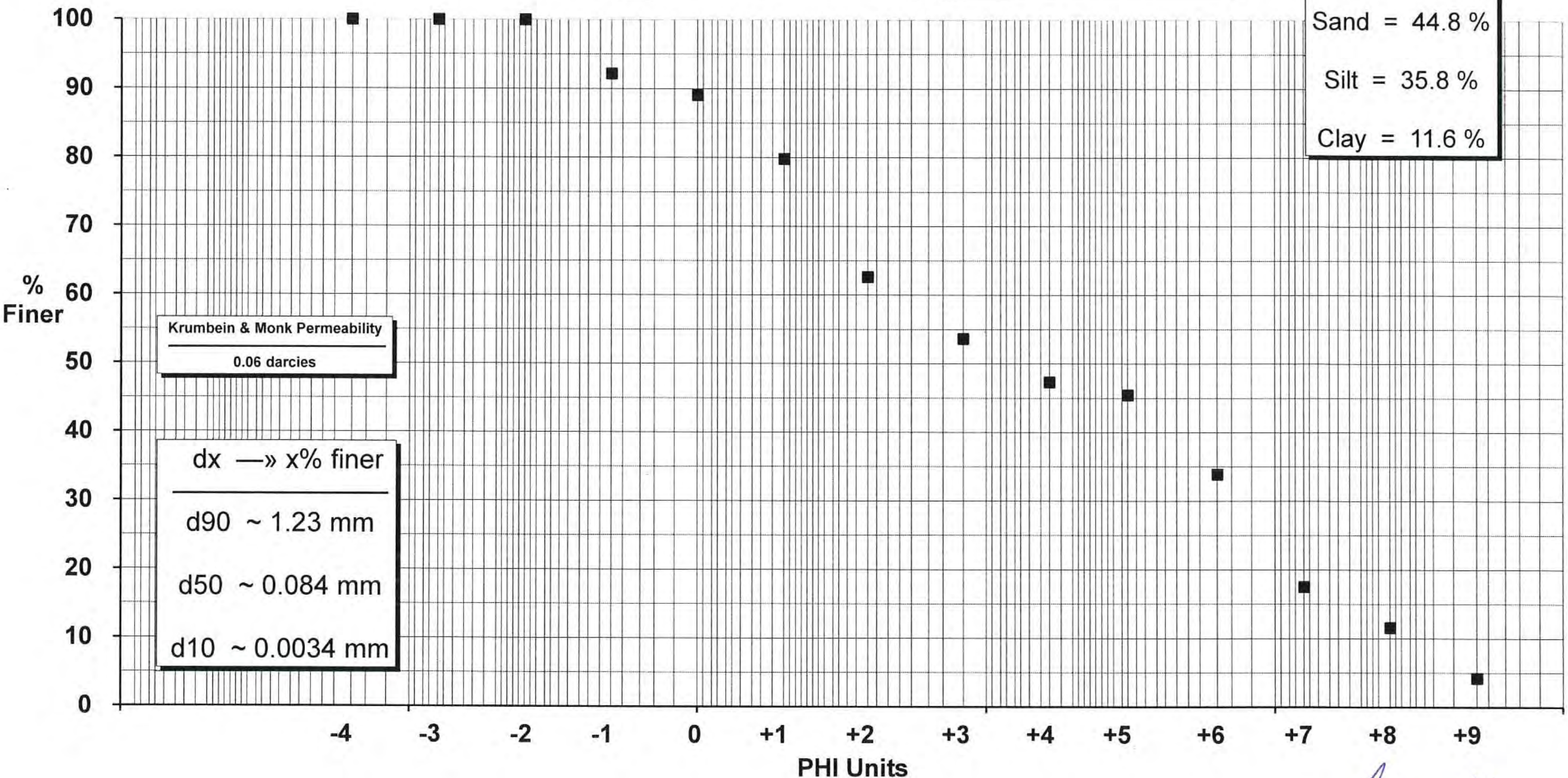
Percent Coarser than 75 µm (PHI = 3.737)
51.0 %

Percent Coarser than 50 µm (PHI = 4.322)
53.3 %

Wentworth
Gravel = 7.8 %
Sand = 44.8 %
Silt = 35.8 %
Clay = 11.6 %

Krumbein & Monk Permeability
0.06 darcies

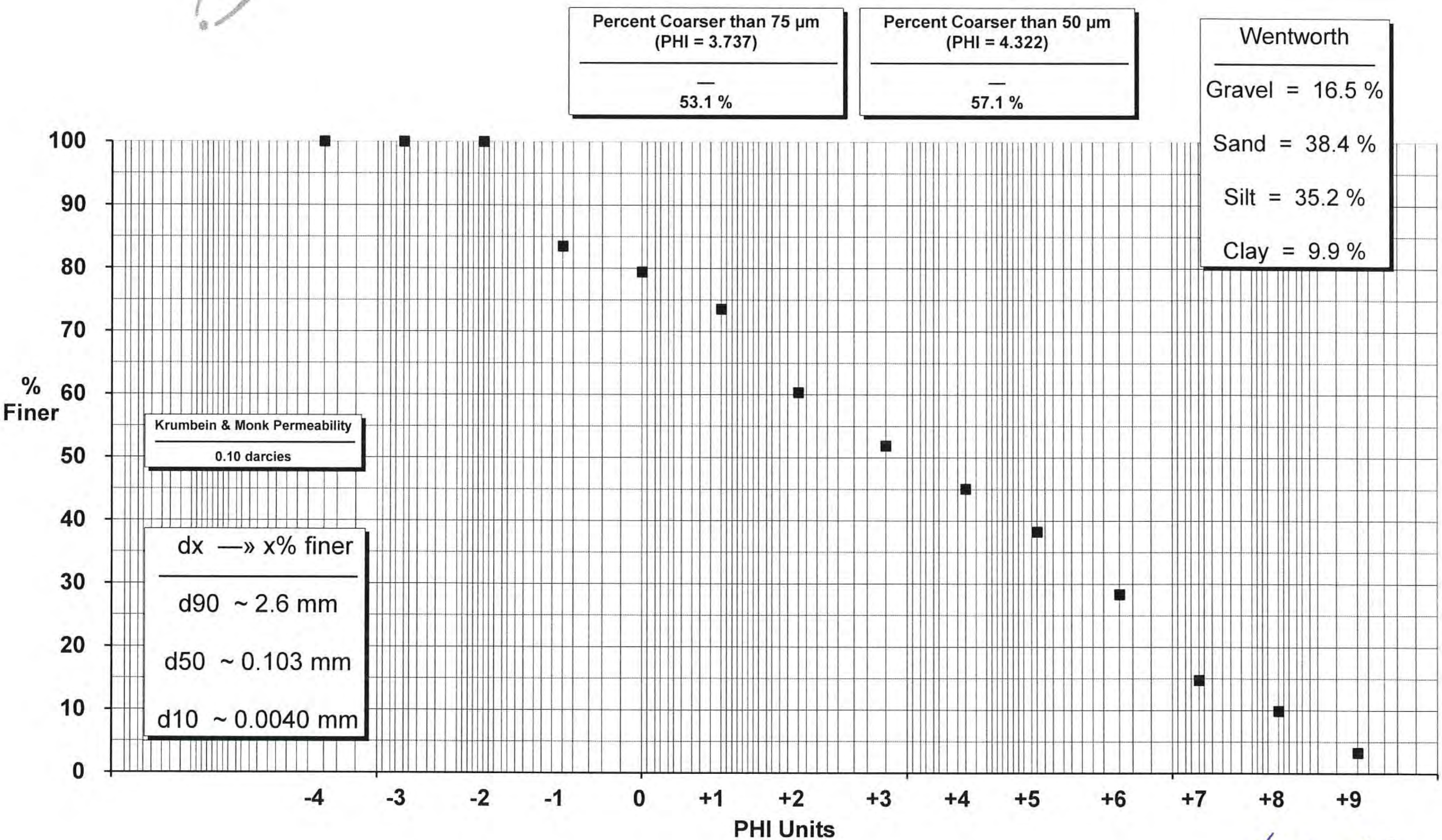
dx —» x% finer
d90 ~ 1.23 mm
d50 ~ 0.084 mm
d10 ~ 0.0034 mm



Approved

Maxxam ID: CWT806-01

SN-2-2

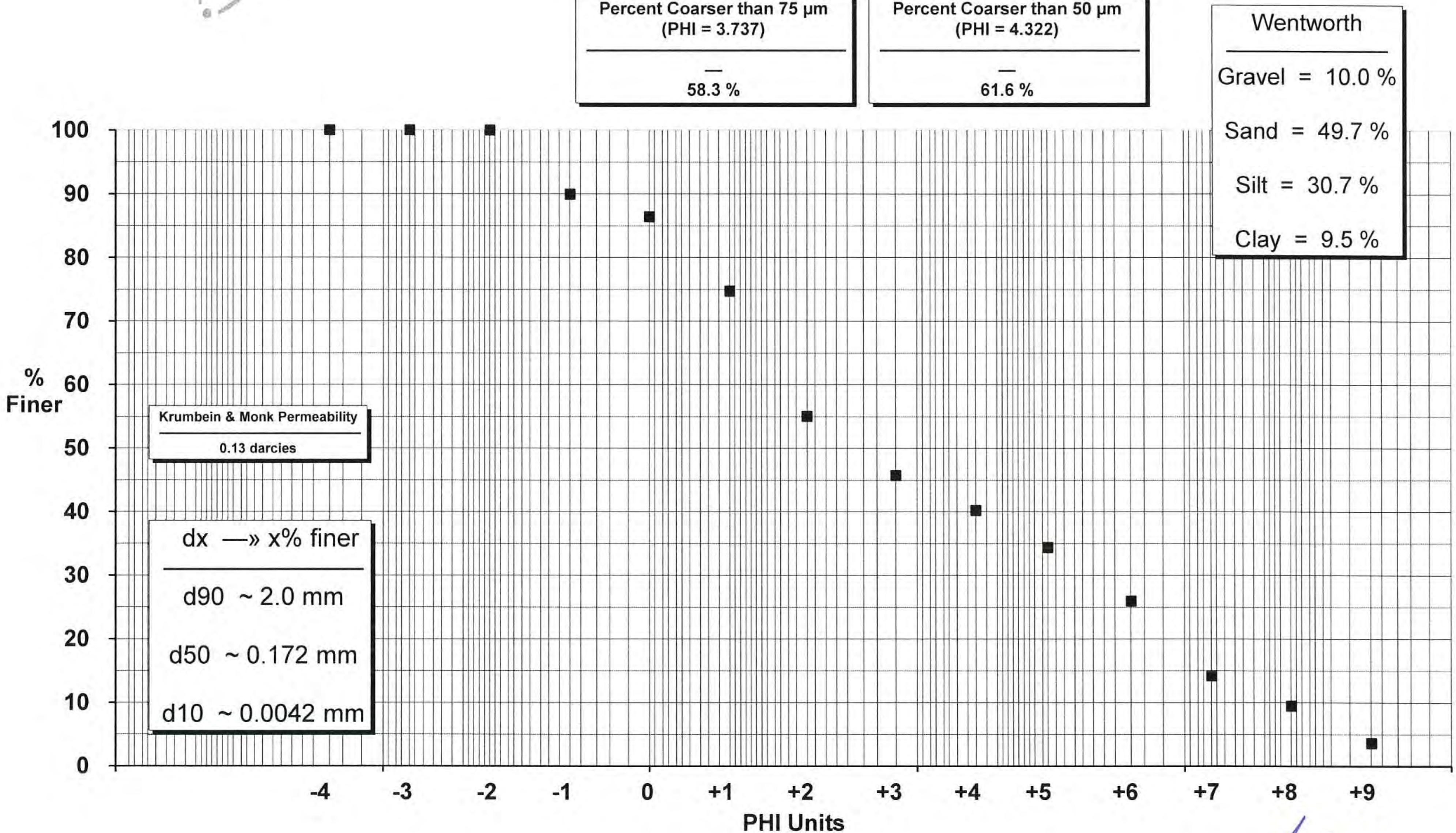


Approved

Maxxam ID: CWT807-01

SN-2-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
58.3 %	61.6 %



Approved

Maxxam ID: CWT808-01

SN-3-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
31.8 %	34.1 %

Wentworth

Gravel = 3.0 %

Sand = 29.7 %

Silt = 55.6 %

Clay = 11.7 %

Krumbein & Monk Permeability

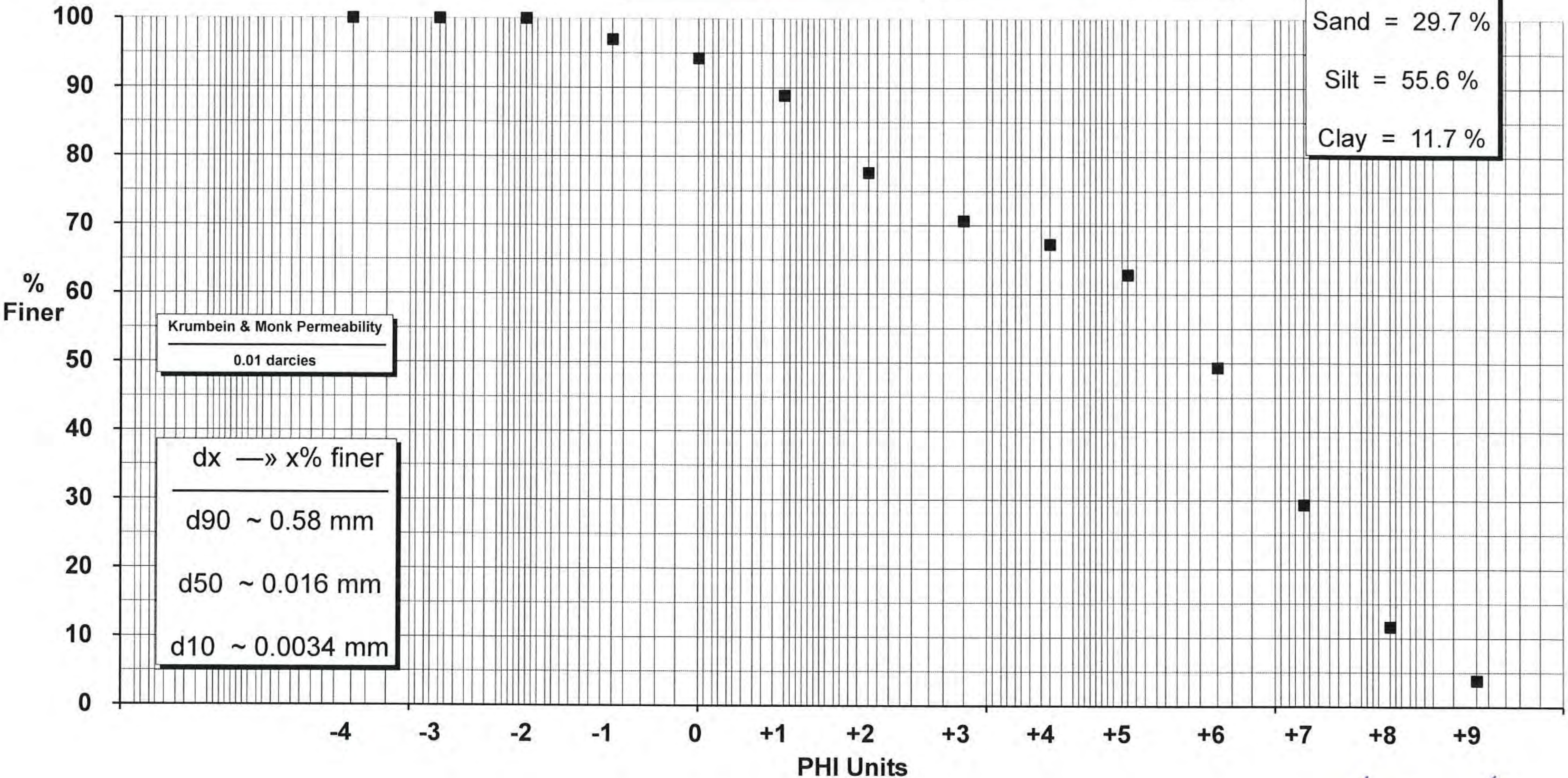
0.01 darcies

dx —» x% finer

d90 ~ 0.58 mm

d50 ~ 0.016 mm

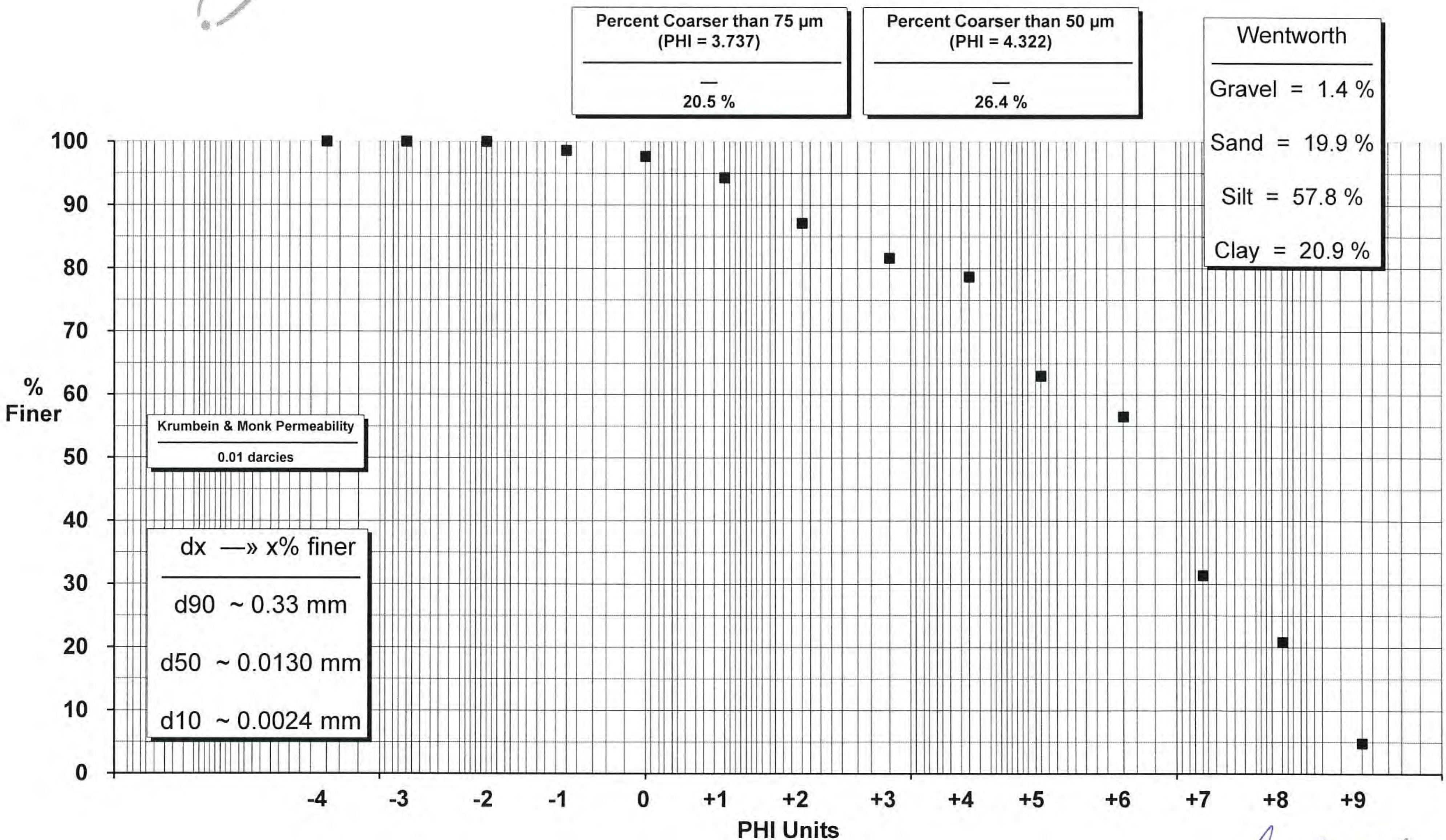
d10 ~ 0.0034 mm



Approved

Maxxam ID: CWT809-01

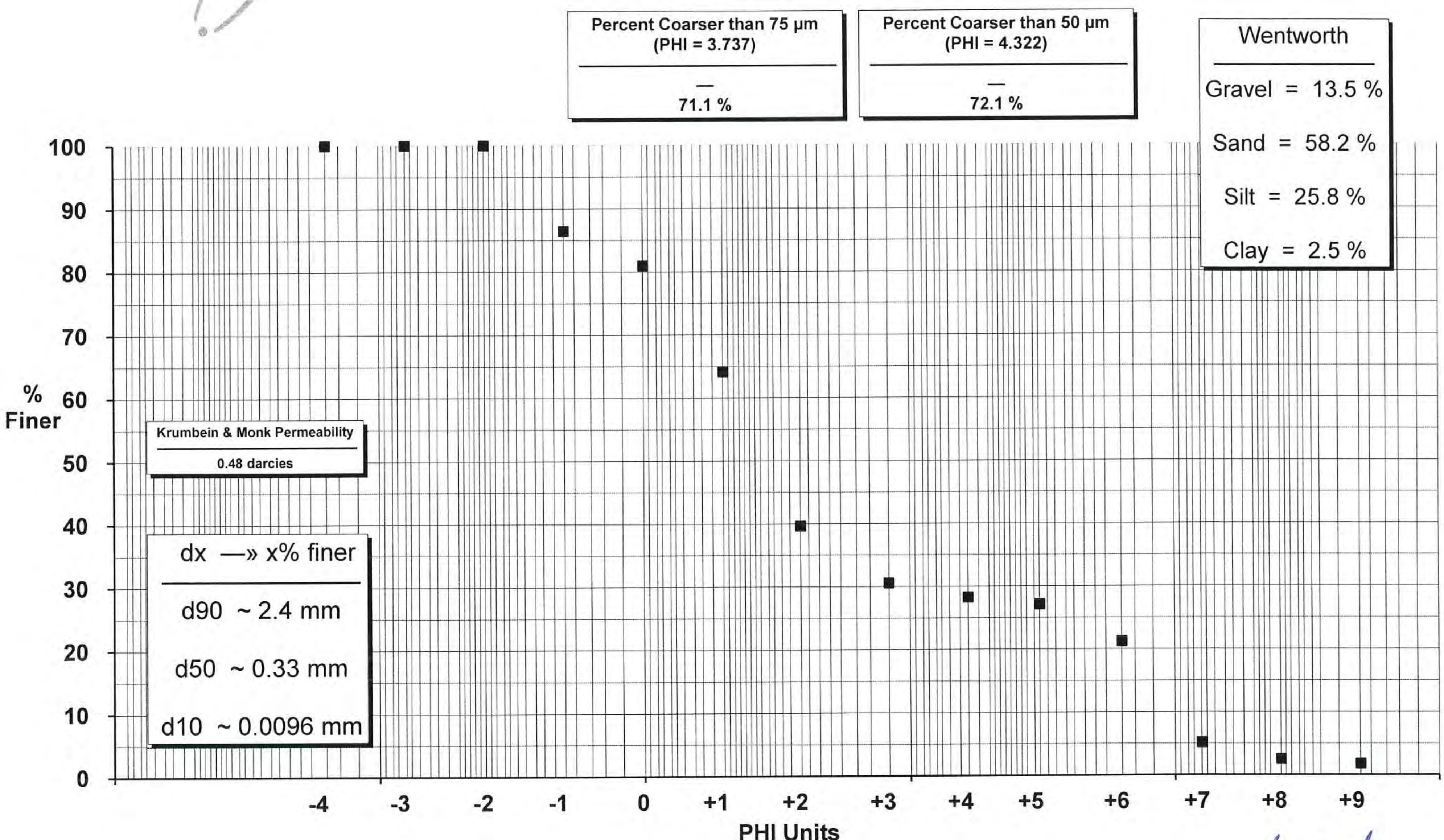
SN-3-2



Approved

Maxxam ID: CWT810-01

SN-3-3



Approved

Maxxam

Maxxam ID: CWT811-01

SN-4-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
— 52.3 %	— 53.8 %

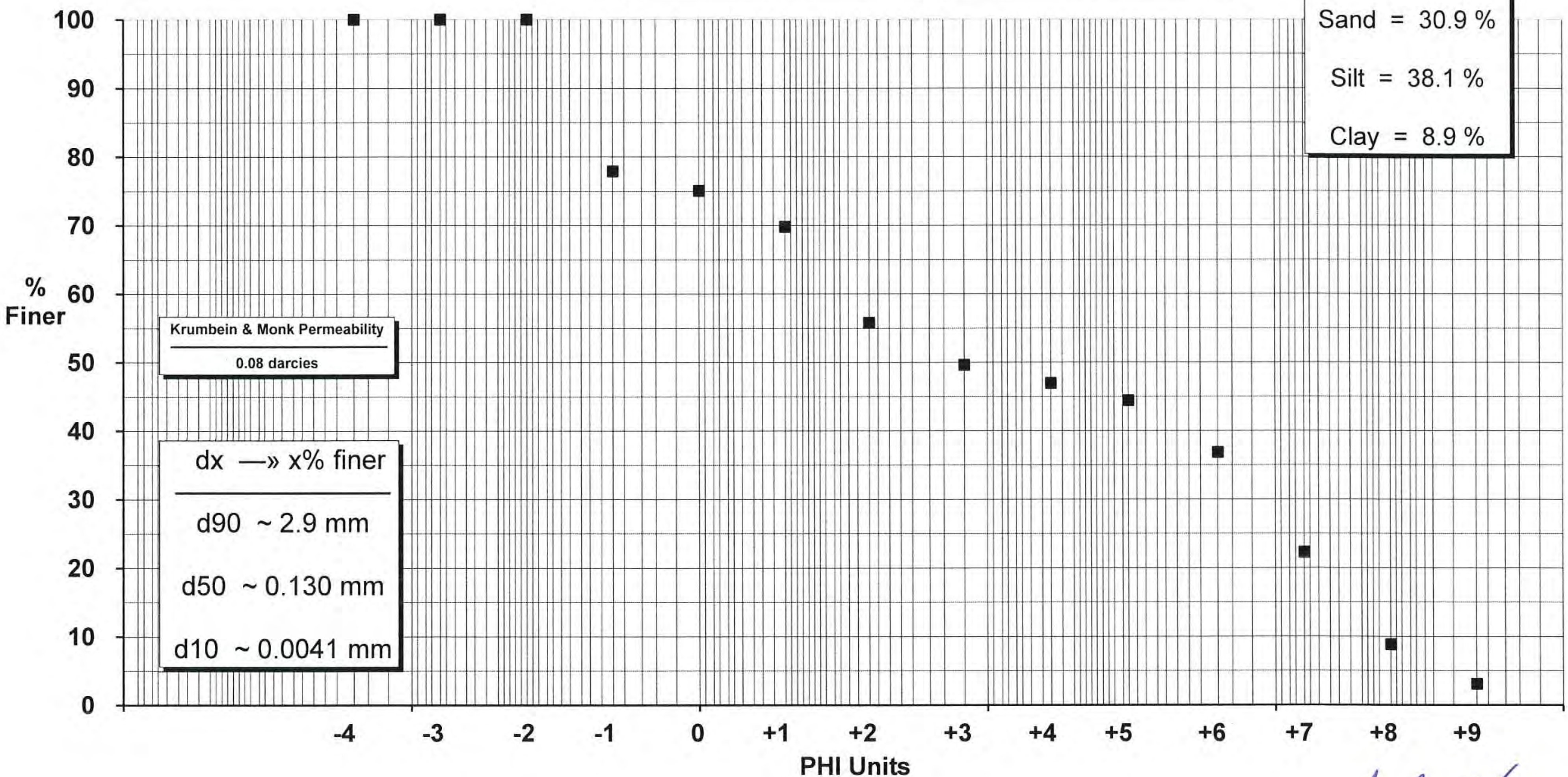
Wentworth

Gravel = 22.1 %

Sand = 30.9 %

Silt = 38.1 %

Clay = 8.9 %



Approved

Maxxam

Maxxam ID: CWT812-01

SN-4-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
36.3 %	36.7 %

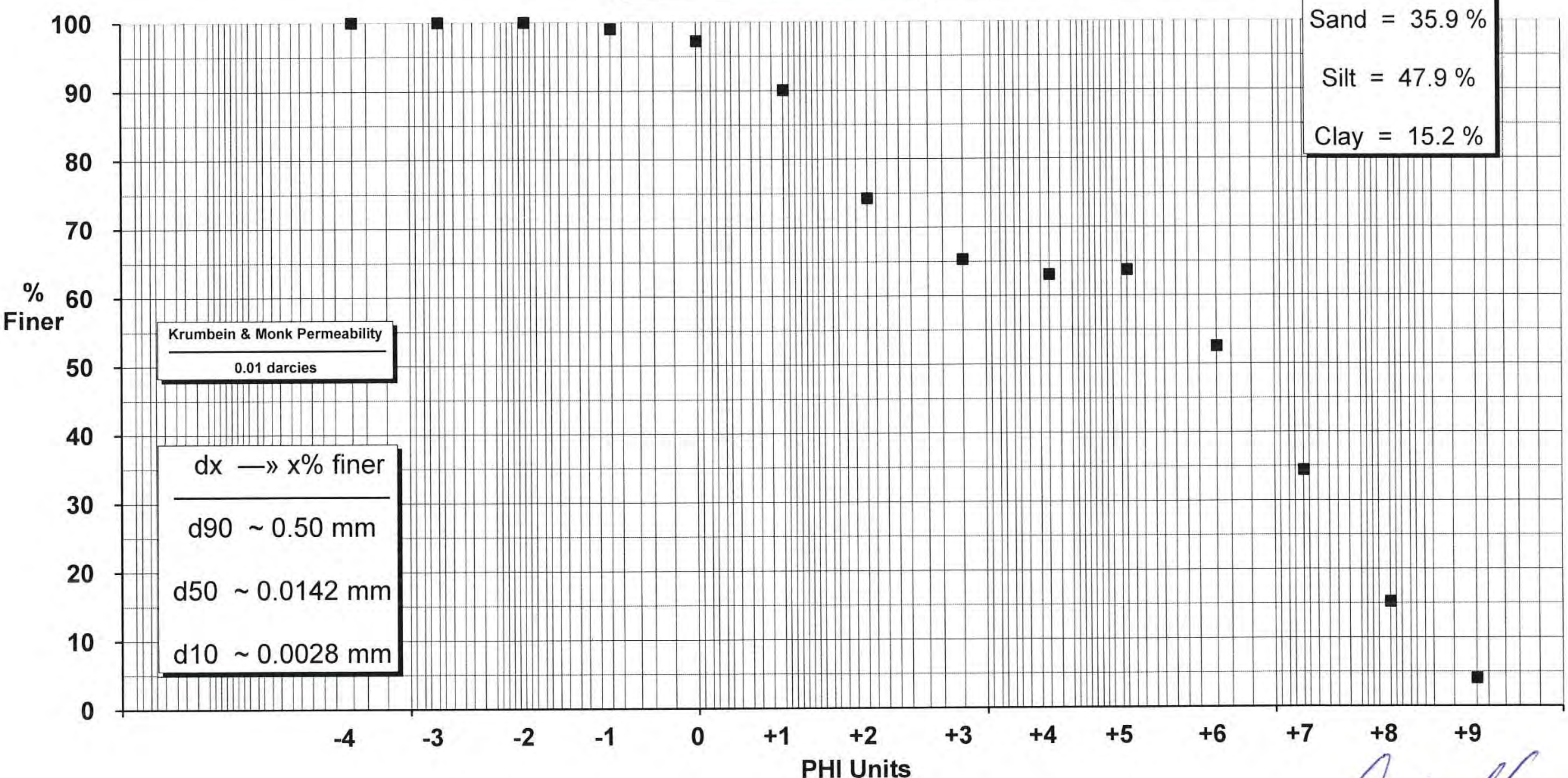
Wentworth

Gravel = 1.0 %

Sand = 35.9 %

Silt = 47.9 %

Clay = 15.2 %



Krumbein & Monk Permeability

0.01 darcies

dx —» x% finer

d90 ~ 0.50 mm

d50 ~ 0.0142 mm

d10 ~ 0.0028 mm

Approved

Maxxam

Maxxam ID: CWT813-01

SN-4-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
40.4 %	42.3 %

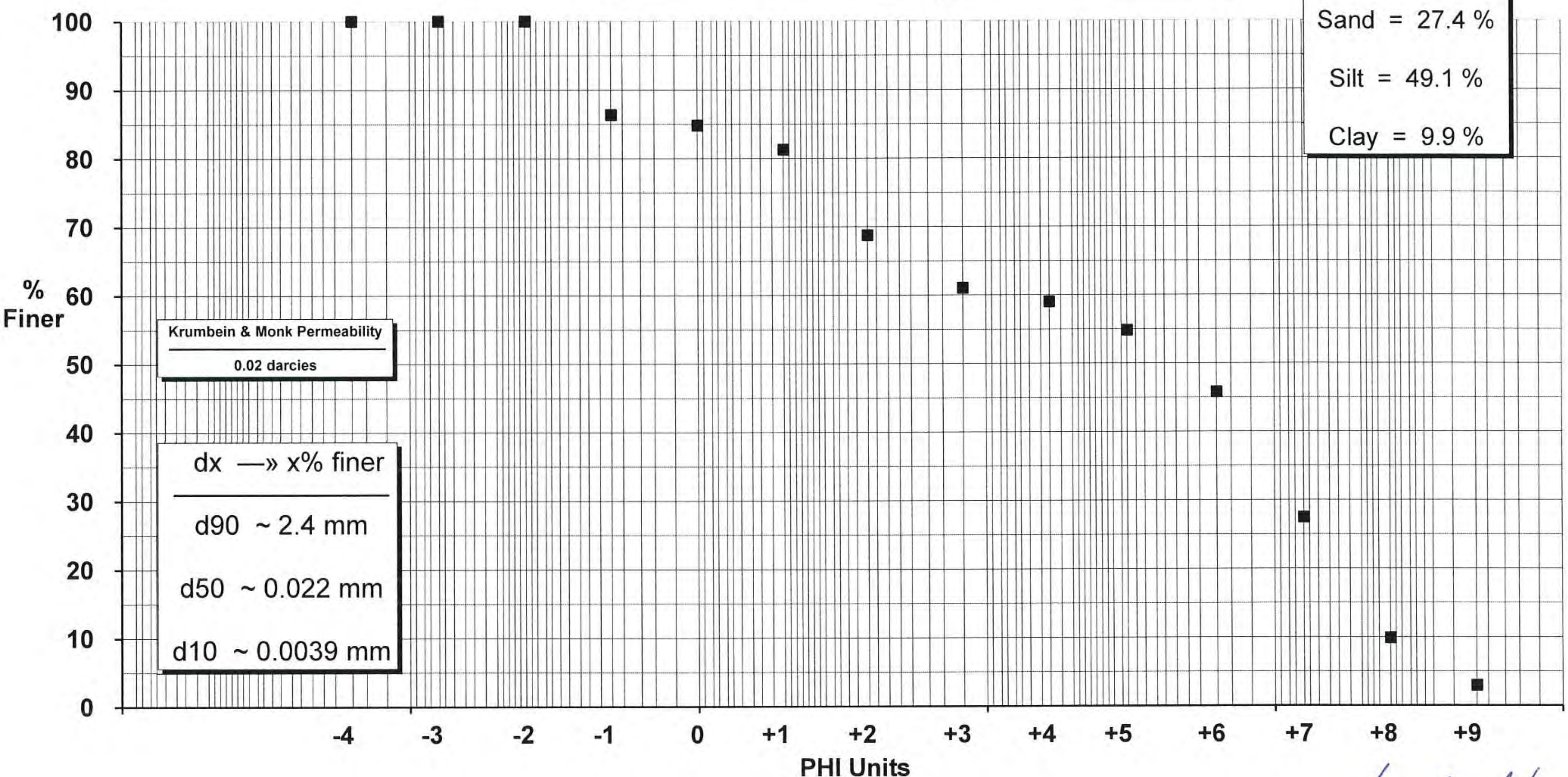
Wentworth

Gravel = 13.6 %

Sand = 27.4 %

Silt = 49.1 %

Clay = 9.9 %



Krumbein & Monk Permeability

0.02 darcies

dx —» x% finer

d90 ~ 2.4 mm

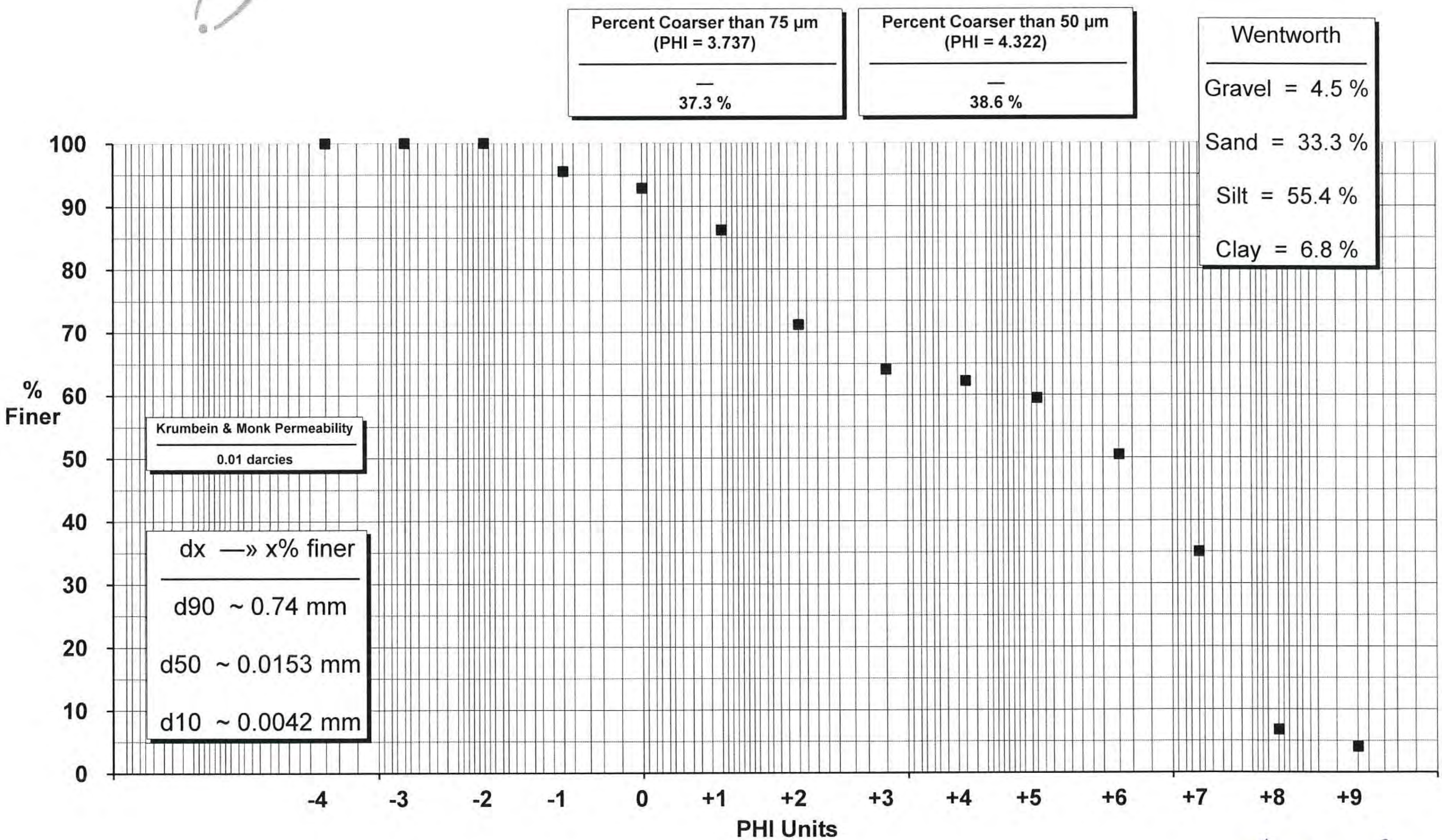
d50 ~ 0.022 mm

d10 ~ 0.0039 mm

Approved

Maxxam ID: CWT814-01

SN-5-1



Approved

Maxxam ID: CWT815-01

SN-5-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
45.4 %	46.4 %

Wentworth

Gravel = 12.5 %

Sand = 33.3 %

Silt = 47.0 %

Clay = 7.2 %

Krumbein & Monk Permeability

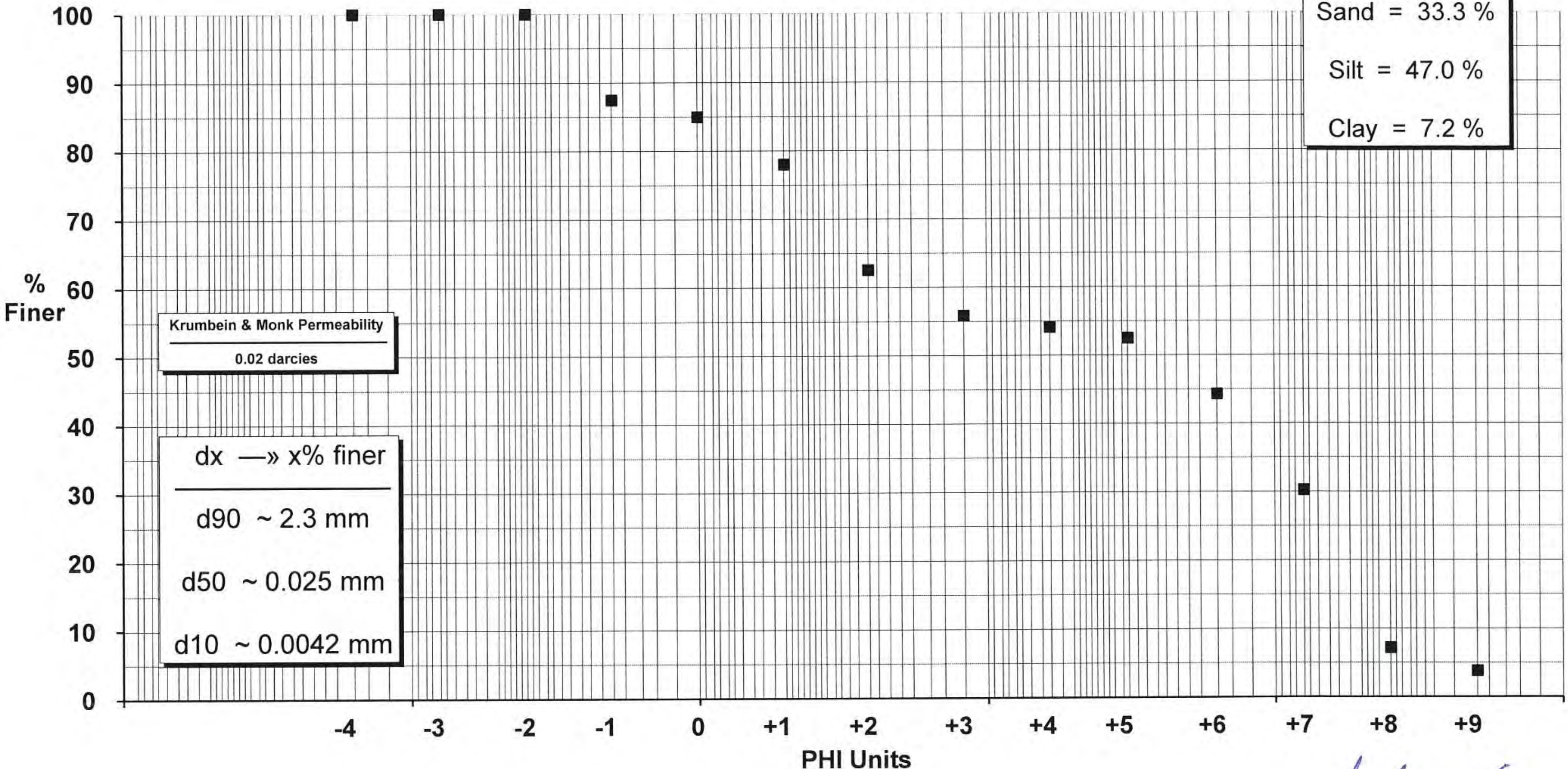
0.02 darcies

dx —» x% finer

d90 ~ 2.3 mm

d50 ~ 0.025 mm

d10 ~ 0.0042 mm



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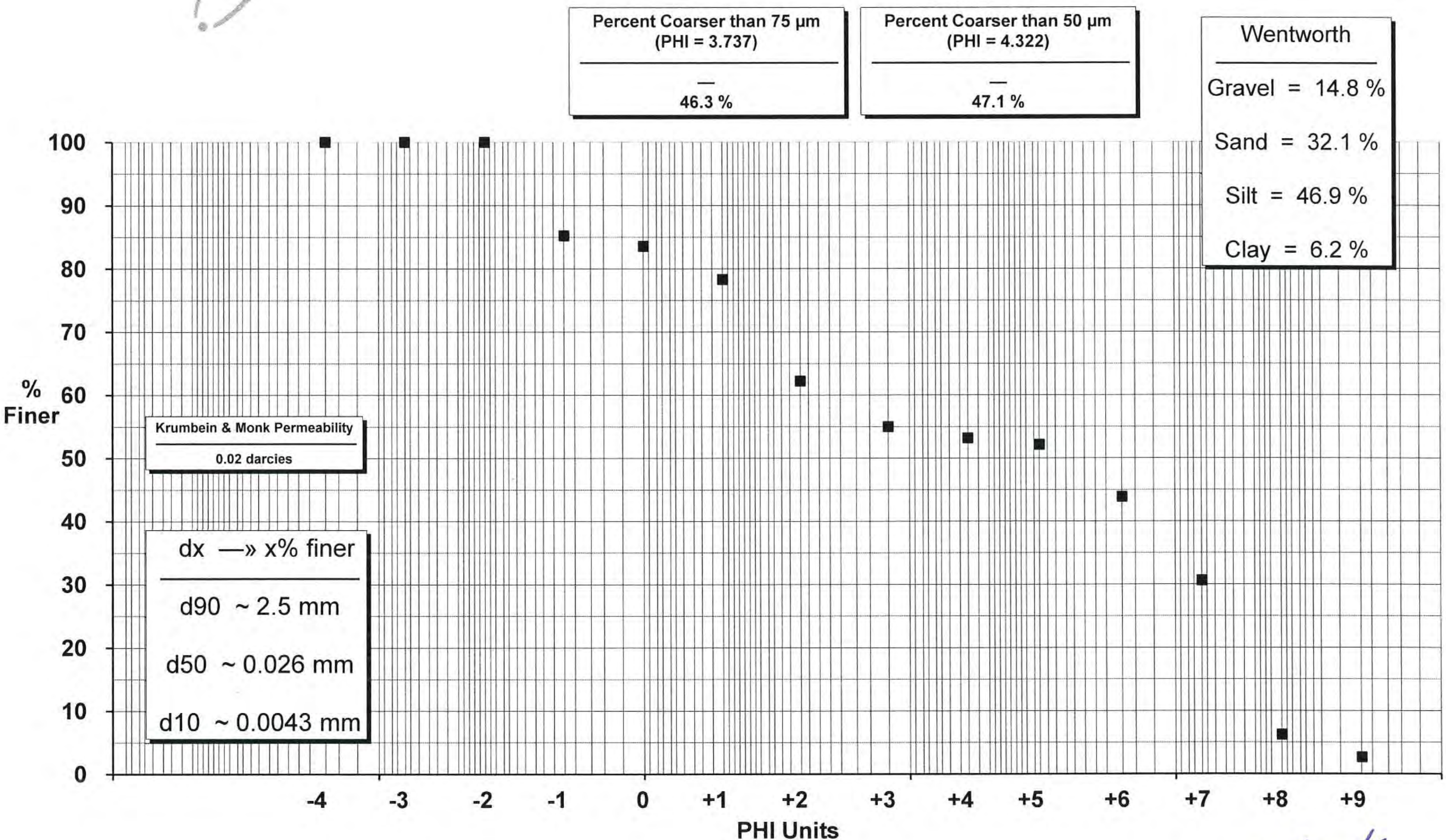
Maxxam

Maxxam ID: CWT816-01

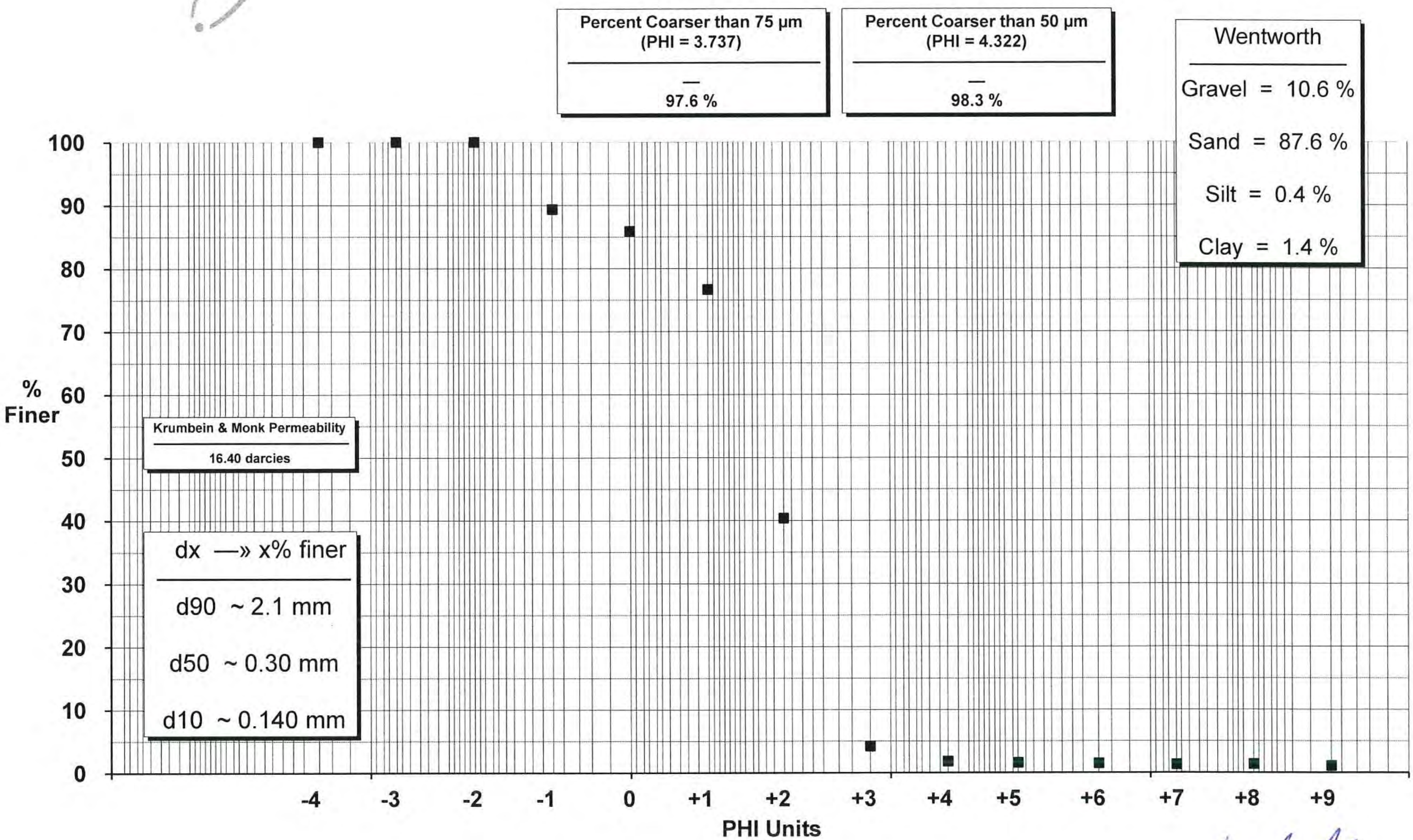
SN-5-3



Approved

Maxxam ID: CWT817-01

SE-1-1



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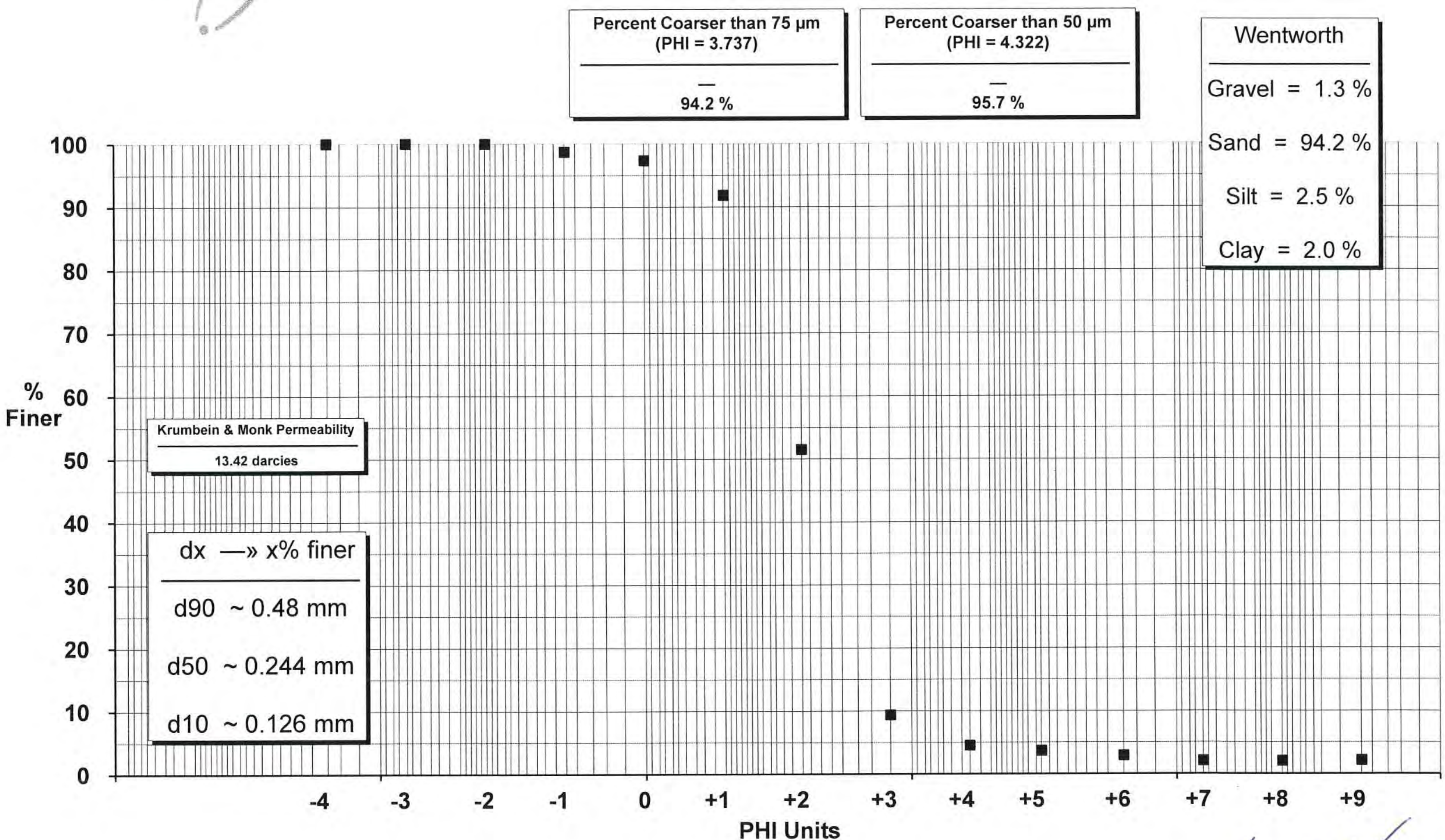
Maxxam ID: CWT818-01

SE-1-2



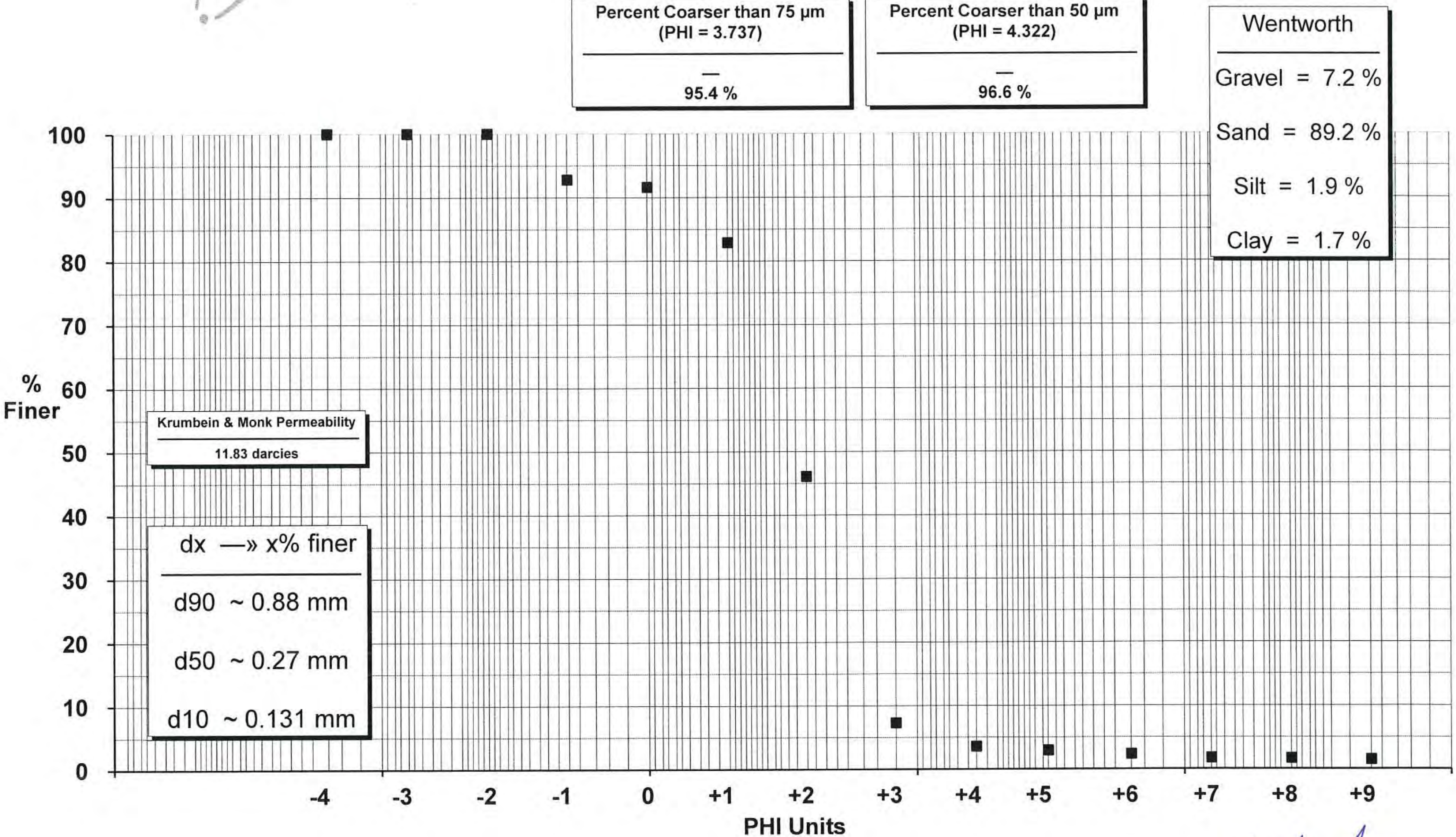
Approved

Maxxam

Maxxam ID: CWT818-01:D1

SE-1-2 :D1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
95.4 %	96.6 %



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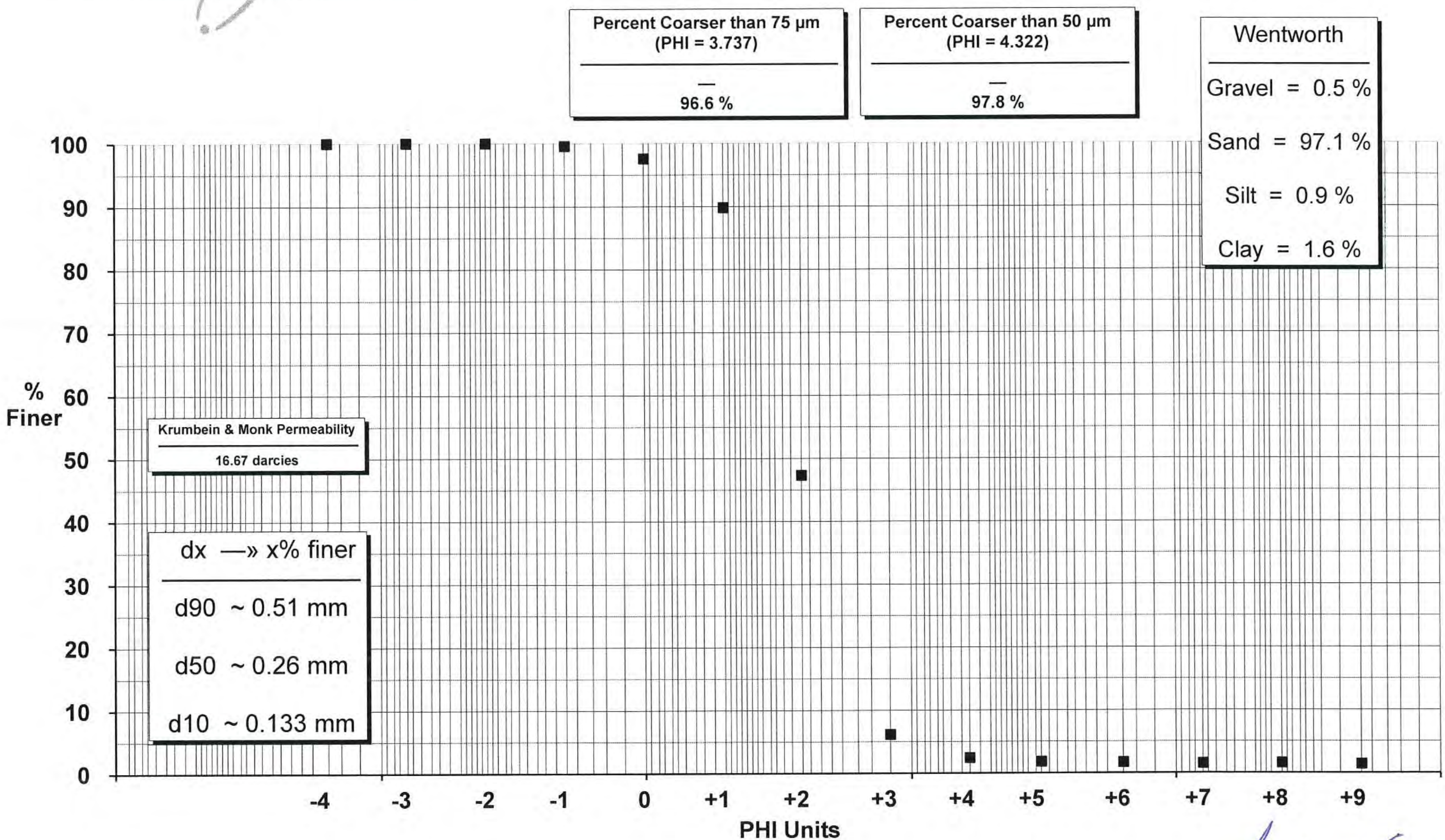
Maxxam ID: CWT819-01

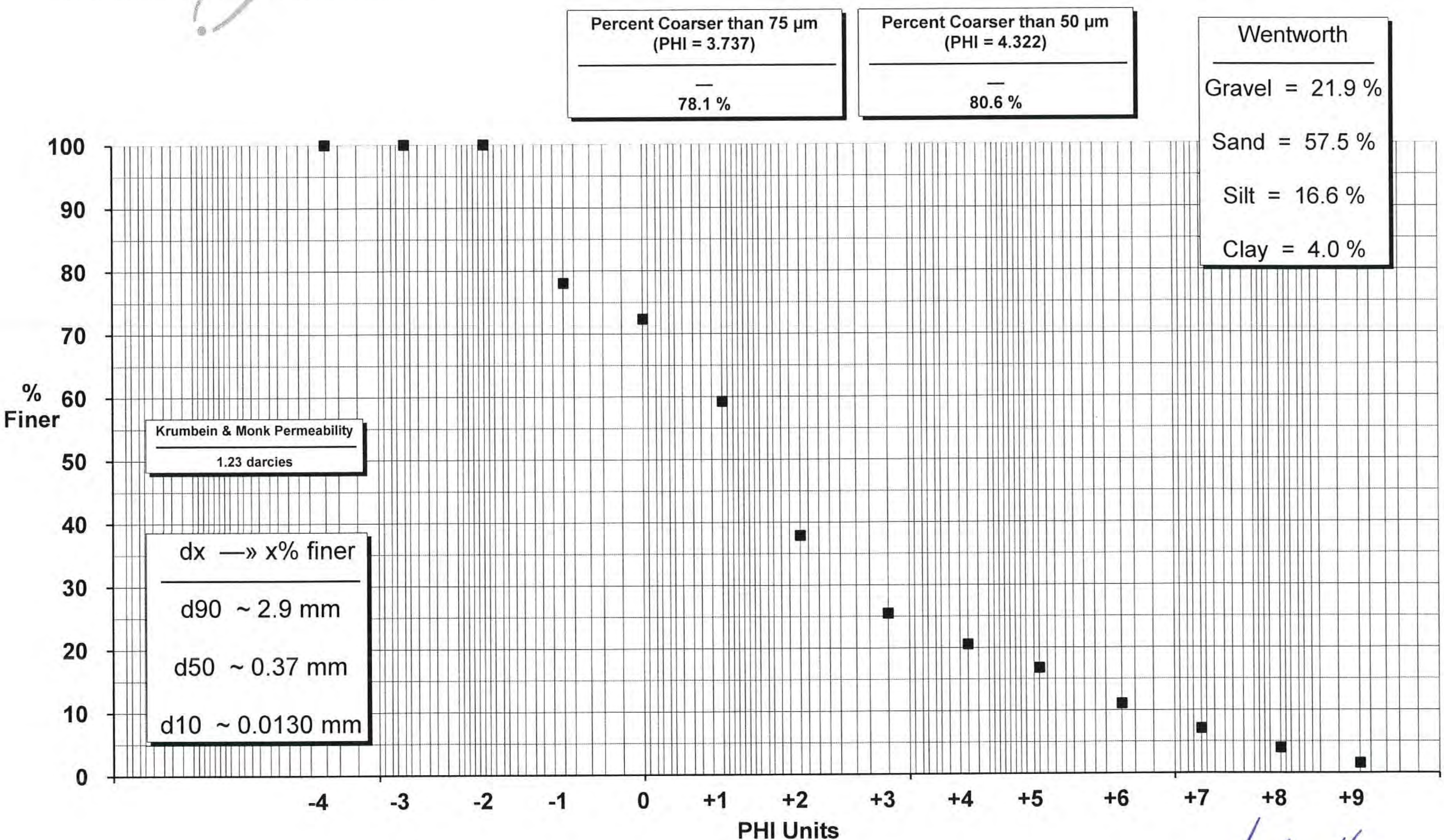
SE-1-3



Approved

Maxxam ID: CWT820-01

SE-2-1



Approved

Maxxam ID: CWT821-01

SE-2-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
74.1 %	77.6 %

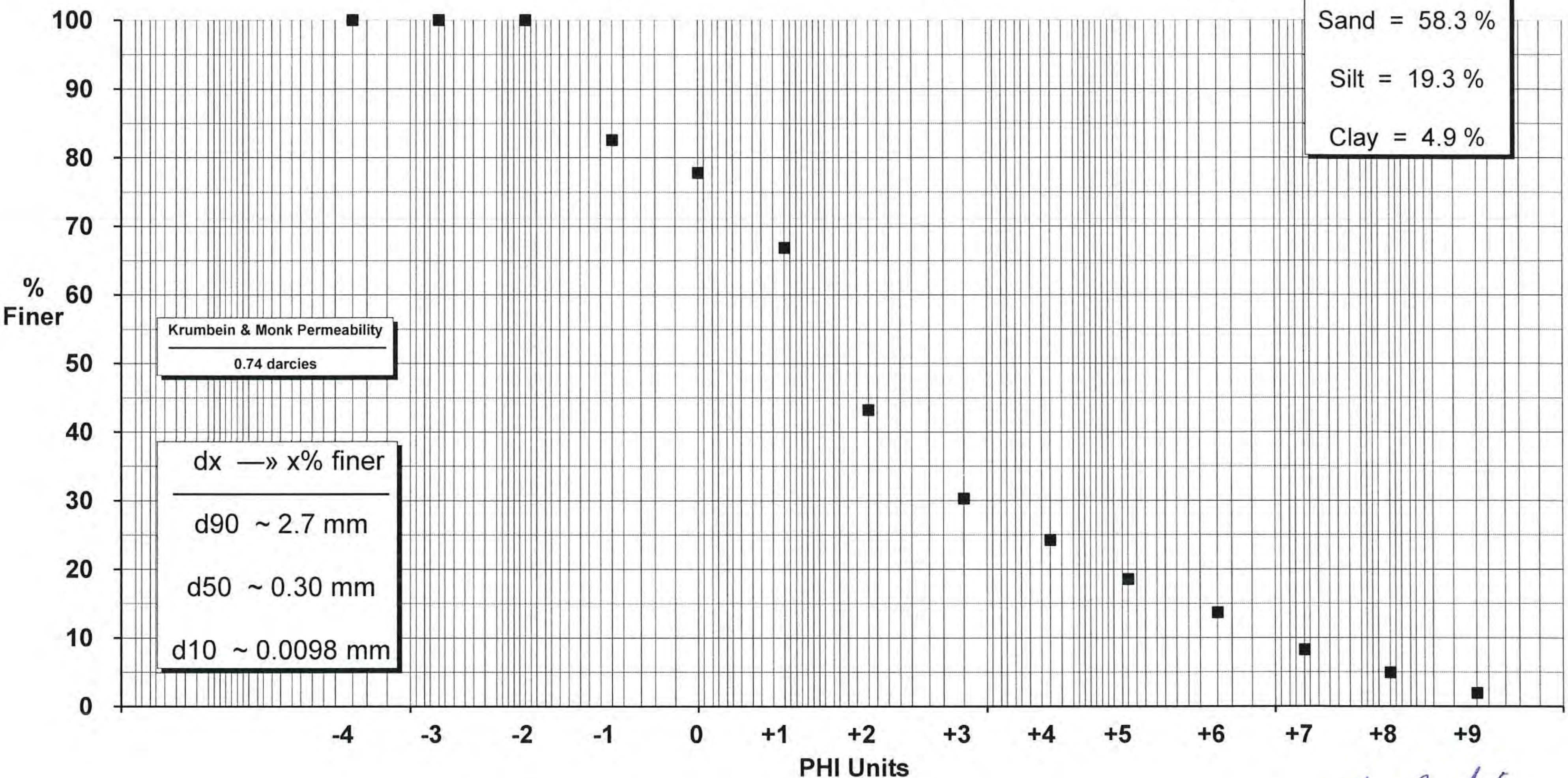
Wentworth

Gravel = 17.4 %

Sand = 58.3 %

Silt = 19.3 %

Clay = 4.9 %



Krumbein & Monk Permeability

0.74 darcies

dx —» x% finer

d90 ~ 2.7 mm

d50 ~ 0.30 mm

d10 ~ 0.0098 mm

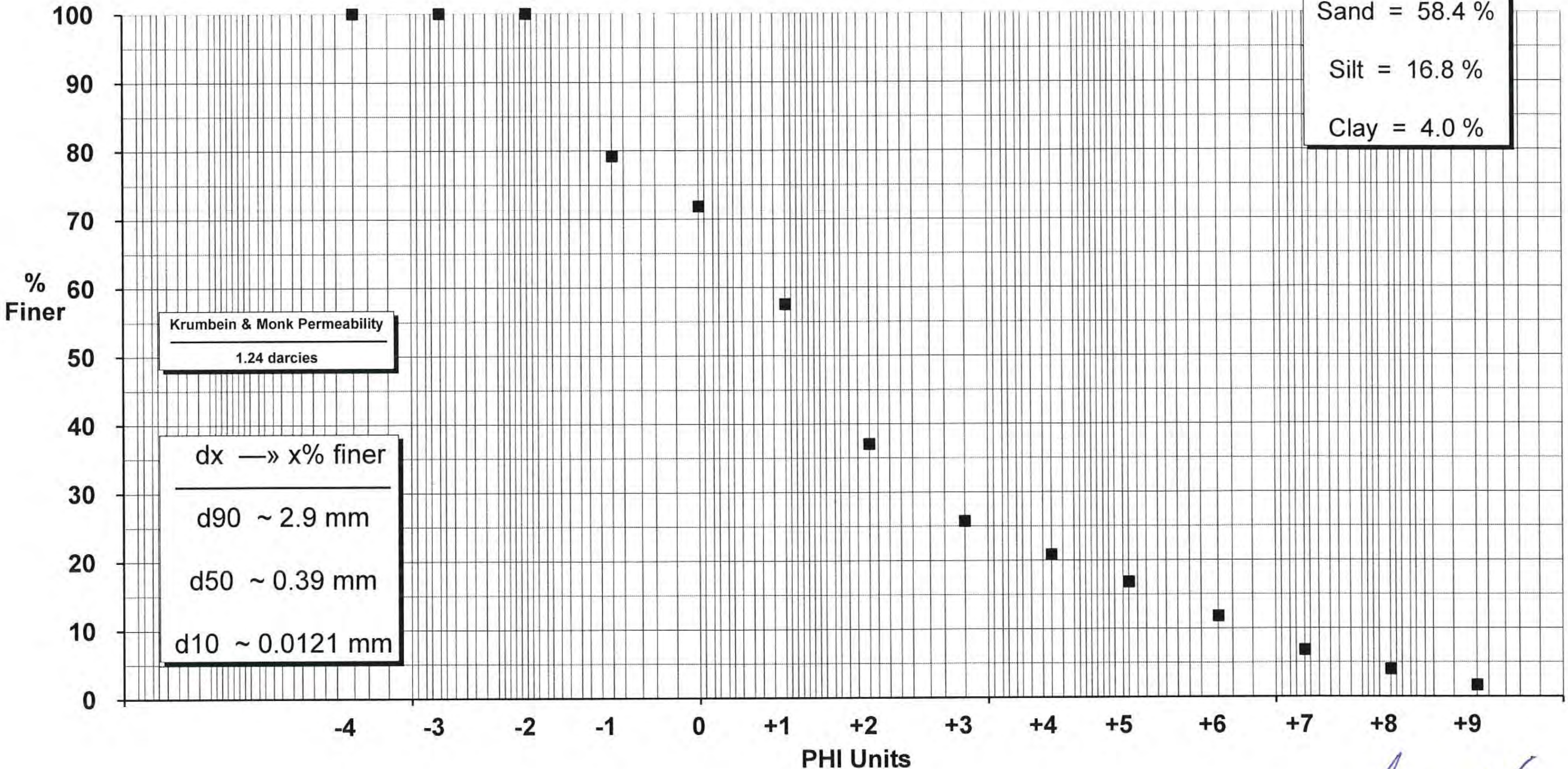
Approved

Maxxam ID: CWT822-01

SE-2-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
77.8 %	80.4 %

Wentworth	
Gravel	= 20.8 %
Sand	= 58.4 %
Silt	= 16.8 %
Clay	= 4.0 %



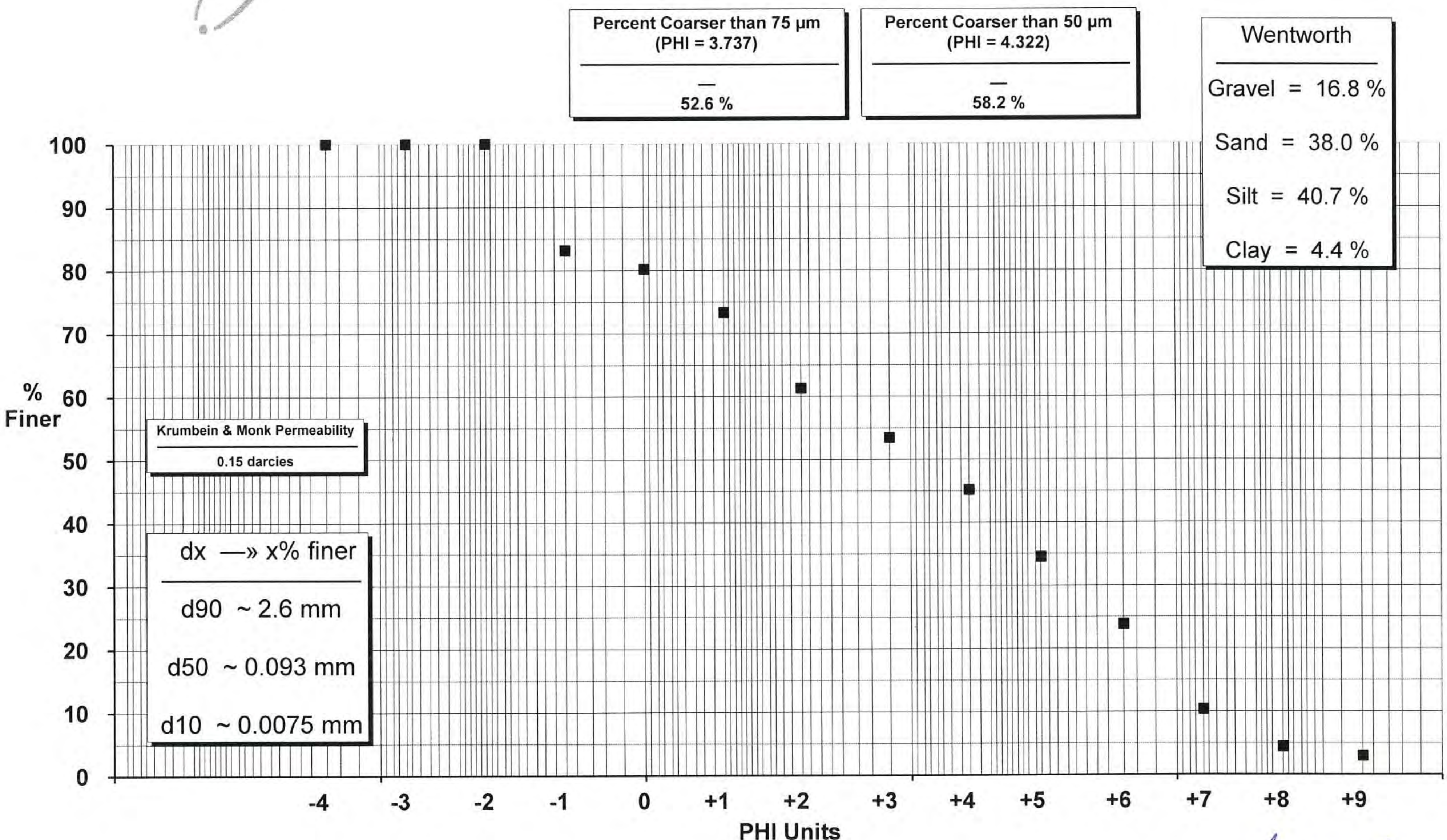
Krumbein & Monk Permeability
1.24 darcies

dx —» x% finer
d90 ~ 2.9 mm
d50 ~ 0.39 mm
d10 ~ 0.0121 mm

Approved

Maxxam ID: CWT823-01

SN-1-1Q



Approved

Maxxam

Maxxam ID: CWT823-01:D1

SN-1-1Q :D1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
50.2 %	56.0 %

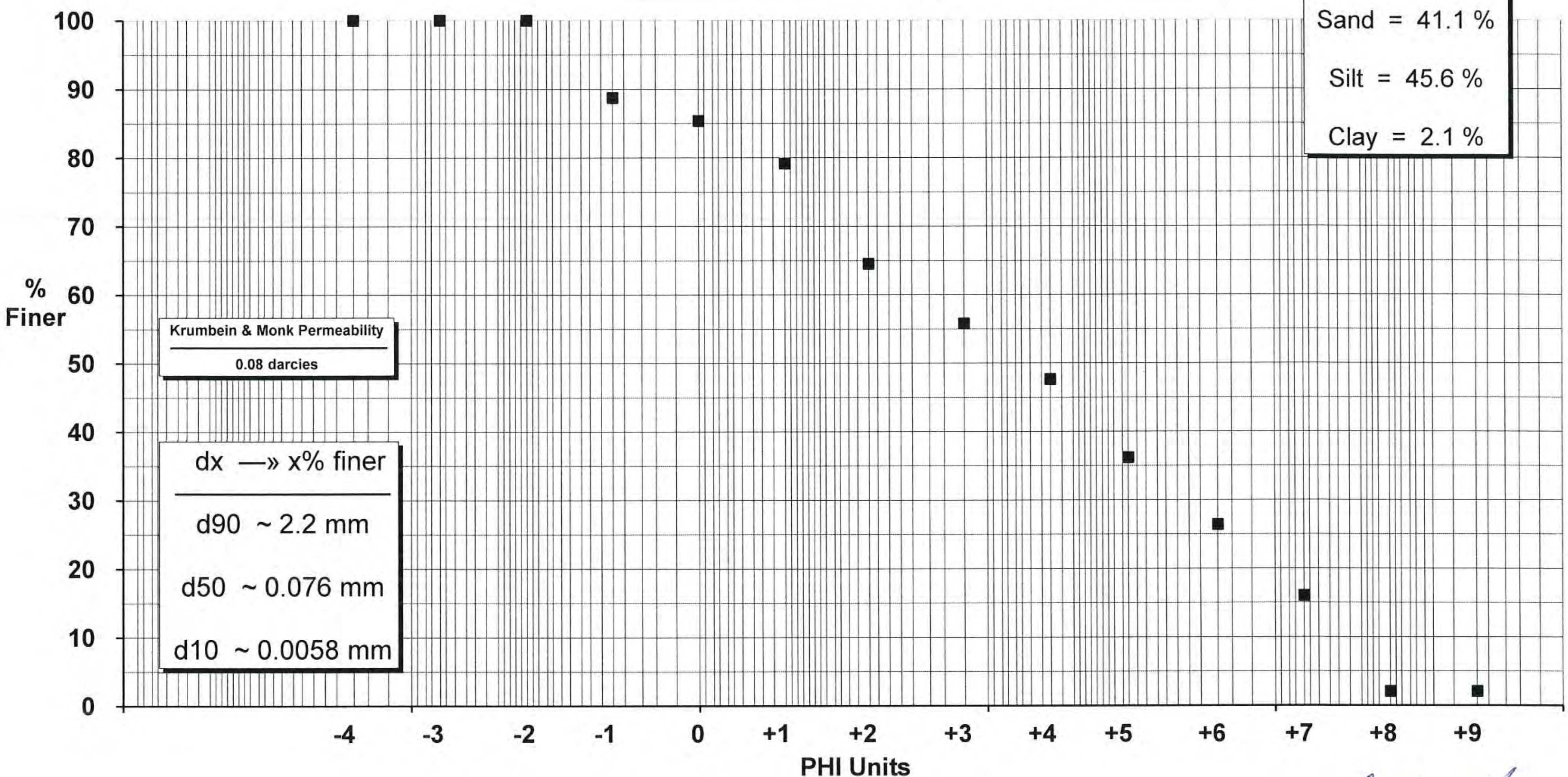
Wentworth

Gravel = 11.3 %

Sand = 41.1 %

Silt = 45.6 %

Clay = 2.1 %



Krumbein & Monk Permeability

0.08 darcies

dx —» x% finer

d90 ~ 2.2 mm

d50 ~ 0.076 mm

d10 ~ 0.0058 mm

Approved

Maxxam ID: CWT824-01

SE-1-1Q

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
97.0 %	98.1 %

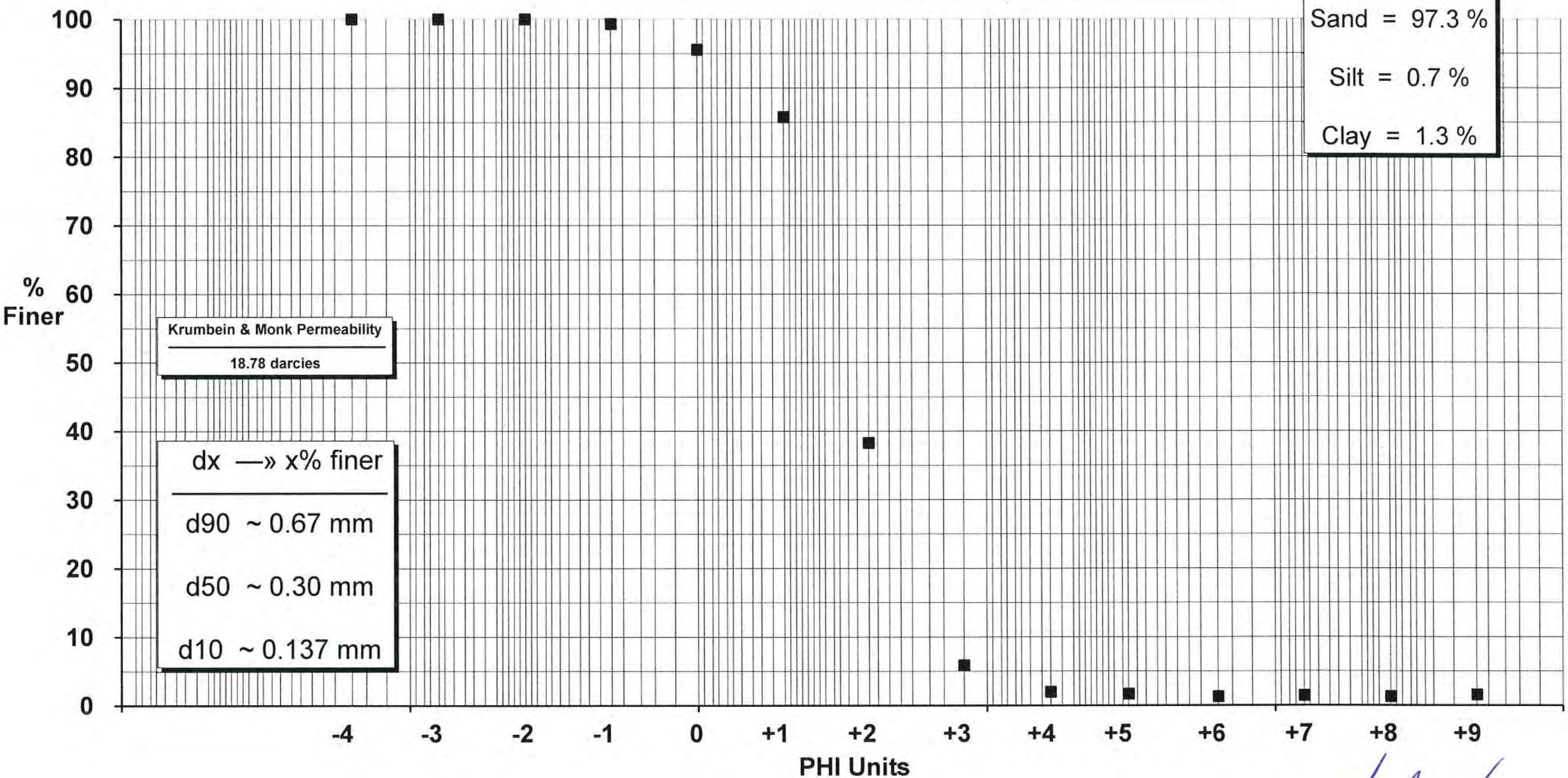
Wentworth

Gravel = 0.7 %

Sand = 97.3 %

Silt = 0.7 %

Clay = 1.3 %



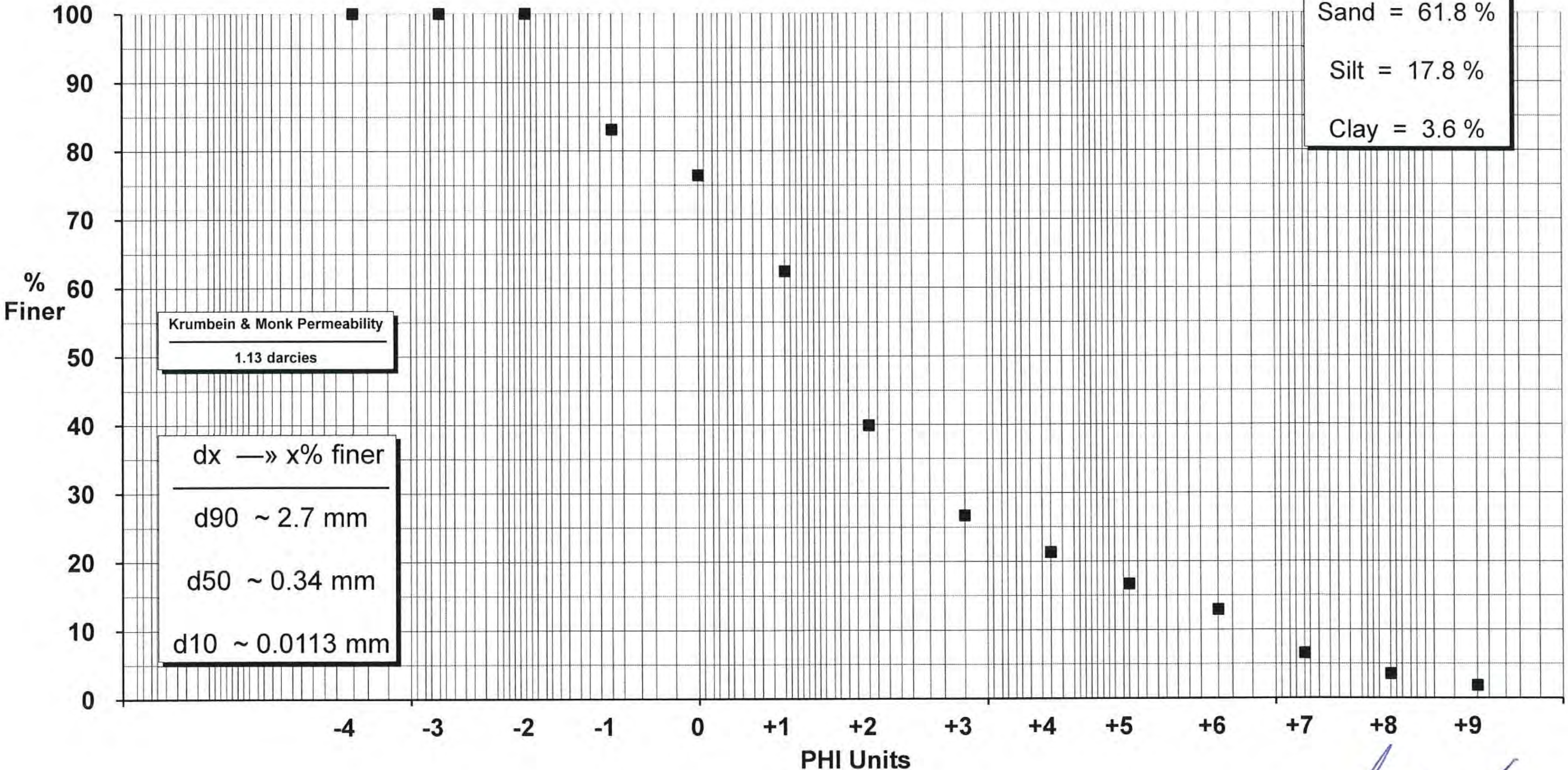
Approved

Maxxam ID: CWT825-01

SE-2-1Q

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
77.3 %	80.2 %

Wentworth
Gravel = 16.9 %
Sand = 61.8 %
Silt = 17.8 %
Clay = 3.6 %



Krumbein & Monk Permeability
1.13 darcies

dx —» x% finer
d90 ~ 2.7 mm
d50 ~ 0.34 mm
d10 ~ 0.0113 mm

Approved

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Your Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

Attention:Claire Moore-Gibbons
SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560235-01-01, 560235-02-01, 560235-04-01, 560235-06-01, 560235-07-01

Report Date: 2016/09/06
Report #: R4156130
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H2494
Received: 2016/08/16, 10:41

Sample Matrix: Soil
Samples Received: 24

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
TEH in Soil (PIRI) (1, 3)	9	2016/08/19	2016/08/19	ATL SOP 00111	Atl. RBCA v3 m
Mercury (CVAA) (1)	23	2016/08/19	2016/08/22	ATL SOP 00026	EPA 245.5 m
Mercury (CVAA) (1)	1	2016/08/26	2016/08/29	ATL SOP 00026	EPA 245.5 m
Metals Solids Acid Extr. ICPMS (1)	1	2016/08/17	2016/08/18	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS (1)	7	2016/08/17	2016/08/19	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS (1)	1	2016/08/22	2016/08/23	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS (1)	14	2016/08/22	2016/08/24	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS (1)	1	2016/08/24	2016/08/24	ATL SOP 00058	EPA 6020A R1 m
Loss on Ignition at 600 (1, 4)	24	2016/08/29	2016/08/30		Carter 2nd ed 28.3
Moisture (1)	9	N/A	2016/08/17	ATL SOP 00001	OMOE Handbook 1983 m
VPH in Soil (PIRI) (1)	9	2016/08/18	2016/08/19	ATL SOP 00119	Atl. RBCA v3 m
Particle size in solids (pipette&sieve) (1, 5)	7	N/A	2016/08/22	ATL SOP 00012	MSAMS 1978 m
Particle size in solids (pipette&sieve) (1, 5)	16	N/A	2016/08/25	ATL SOP 00012	MSAMS 1978 m
Particle size in solids (pipette&sieve) (1, 5)	1	N/A	2016/09/06	ATL SOP 00012	MSAMS 1978 m
Total Carbon in Soil (2)	23	N/A	2016/08/23	CAM SOP-00468	Lloyd Kahn Method
Total Carbon in Soil (2)	1	N/A	2016/08/25	CAM SOP-00468	Lloyd Kahn Method
Total Inorganic Carbon in Soils (2)	24	N/A	2016/08/29		Calculation
Total Organic Carbon in Soil (2)	24	N/A	2016/08/29	CAM SOP-00468	BCMOE TOC Aug 2014
ModTPH (T1) Calc. for Soil (1)	9	N/A	2016/08/22	N/A	Atl. RBCA v3 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford
(2) This test was performed by Maxxam Analytics Mississauga
(3) Soils are reported on a dry weight basis unless otherwise specified.
(4) Loss on Ignition at 600 is not accredited.
(5) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.

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Your Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

Attention:Claire Moore-Gibbons
SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560235-01-01, 560235-02-01, 560235-04-01, 560235-06-01, 560235-07-01

Report Date: 2016/09/06
Report #: R4156130
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H2494
Received: 2016/08/16, 10:41

Encryption Key

Maxxam
06 Sep 2016 18:36:51 -02:30

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RBCA HYDROCARBONS IN SOIL (SOIL)

Maxxam ID		CWT802	CWT805	CWT808	CWT811	CWT814	CWT817		
Sampling Date		2016/08/09 11:55	2016/08/09 11:20	2016/08/09 10:30	2016/08/09 09:30	2016/08/09 08:30	2016/08/09 12:36		
COC Number		560235-01-01	560235-01-01	560235-01-01	560235-01-01	560235-02-01	560235-04-01		
	UNITS	**SN-1-1**	**SN-2-1**	**SN-3-1**	**SN-4-1**	**SN-5-1**	**SE-1-1**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	25	26	30	29	30	16	1.0	4621860
Petroleum Hydrocarbons									
Benzene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4624692
Toluene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4624692
Ethylbenzene	mg/kg	ND	ND	ND	ND	ND	ND	0.025	4624692
Total Xylenes	mg/kg	ND	ND	ND	ND	ND	ND	0.050	4624692
C6 - C10 (less BTEX)	mg/kg	ND	ND	ND	ND	ND	ND	2.5	4624692
>C10-C16 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	10	4626558
>C16-C21 Hydrocarbons	mg/kg	ND	ND	ND	ND	ND	ND	10	4626558
>C21-<C32 Hydrocarbons	mg/kg	ND	28	ND	ND	ND	ND	15	4626558
Modified TPH (Tier1)	mg/kg	ND	28	ND	ND	ND	ND	15	4621288
Reached Baseline at C32	mg/kg	NA	Yes	NA	NA	NA	NA	N/A	4626558
Hydrocarbon Resemblance	mg/kg	NA	COMMENT (1)	NA	NA	NA	NA	N/A	4626558
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	98	94	92	94	94	97		4626558
n-Dotriacontane - Extractable	%	103	86	105	103	101	102		4626558
Isobutylbenzene - Volatile	%	112	98	103	108	109	108		4624692

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable
(1) Unidentified compound(s) in lube oil range. Possible lube oil fraction.

RBCA HYDROCARBONS IN SOIL (SOIL)

Maxxam ID		CWT820	CWT823	CWT824		
Sampling Date		2016/08/09 13:40	2016/08/09 12:00	2016/08/09 12:45		
COC Number		560235-04-01	560235-06-01	560235-07-01		
	UNITS	SE-2-1	SN-1-1Q	SE-1-1Q	RDL	QC Batch
Inorganics						
Moisture	%	18	21	16	1.0	4621860
Petroleum Hydrocarbons						
Benzene	mg/kg	ND	ND	ND	0.025	4624692
Toluene	mg/kg	ND	ND	ND	0.025	4624692
Ethylbenzene	mg/kg	ND	ND	ND	0.025	4624692
Total Xylenes	mg/kg	ND	ND	ND	0.050	4624692
C6 - C10 (less BTEX)	mg/kg	ND	ND	ND	2.5	4624692
>C10-C16 Hydrocarbons	mg/kg	ND	ND	ND	10	4626558
>C16-C21 Hydrocarbons	mg/kg	ND	ND	ND	10	4626558
>C21-<C32 Hydrocarbons	mg/kg	ND	ND	ND	15	4626558
Modified TPH (Tier1)	mg/kg	ND	ND	ND	15	4621288
Reached Baseline at C32	mg/kg	NA	NA	NA	N/A	4626558
Hydrocarbon Resemblance	mg/kg	NA	NA	NA	N/A	4626558
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	96	96	97		4626558
n-Dotriacontane - Extractable	%	104	100	126		4626558
Isobutylbenzene - Volatile	%	94	117	151 (1)		4624692

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable
(1) VPH surrogate not within acceptance limits. Analysis was repeated with similar results.

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWT802	CWT802	CWT803	CWT804	CWT805	CWT806		
Sampling Date		2016/08/09 11:55	2016/08/09 11:55	2016/08/09 12:05	2016/08/09 12:15	2016/08/09 11:20	2016/08/09 11:30		
COC Number		560235-01-01	560235-01-01	560235-01-01	560235-01-01	560235-01-01	560235-01-01		
	UNITS	**SN-1-1**	**SN-1-1 Lab-Dup**	**SN-1-2**	**SN-1-3**	**SN-2-1**	**SN-2-2**	**RDL**	**QC Batch**
Inorganics									
Total Carbon (C)	mg/kg	52000	53000	50000	51000	54000	53000	500	4630746
Total Inorganic Carbon (C)	mg/kg	45000		42000	40000	35000	35000	500	4621285
Total Organic Carbon	mg/kg	7100	7800	8300	11000	19000	18000	500	4636562
< -1 Phi (2 mm)	%	92	91	76	77	92	83	0.10	4624779
< 0 Phi (1 mm)	%	89	87	73	75	89	79	0.10	4624779
< +1 Phi (0.5 mm)	%	81	80	66	70	80	74	0.10	4624779
< +2 Phi (0.25 mm)	%	68	66	51	56	63	60	0.10	4624779
< +3 Phi (0.12 mm)	%	59	57	42	47	54	52	0.10	4624779
< +4 Phi (0.062 mm)	%	51	48	35	39	47	45	0.10	4624779
< +5 Phi (0.031 mm)	%	38	36	28	34	45	38	0.10	4624779
< +6 Phi (0.016 mm)	%	28	25	20	23	34	28	0.10	4624779
< +7 Phi (0.0078 mm)	%	17	14	12	12	18	15	0.10	4624779
< +8 Phi (0.0039 mm)	%	13	11	10	9.0	12	9.9	0.10	4624779
< +9 Phi (0.0020 mm)	%	4.5	4.1	4.9	3.6	4.2	3.3	0.10	4624779
Gravel	%	8.5	9.2	24	23	7.8	17	0.10	4624779
Sand	%	41	43	41	38	45	38	0.10	4624779
Silt	%	38	37	25	30	36	35	0.10	4624779
Clay	%	13	11	10	9.0	12	9.9	0.10	4624779
Miscellaneous Parameters									
Loss on Ignition	%	17	15	15	16	16	17	0.30	4638551

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWT807	CWT808	CWT809		CWT810	CWT811		
Sampling Date		2016/08/09 11:35	2016/08/09 10:30	2016/08/09 10:45		2016/08/09 10:55	2016/08/09 09:30		
COC Number		560235-01-01	560235-01-01	560235-01-01		560235-01-01	560235-01-01		
	UNITS	**SN-2-3**	**SN-3-1**	**SN-3-2**	**QC Batch**	**SN-3-3**	**SN-4-1**	**RDL**	**QC Batch**
Inorganics									
Total Carbon (C)	mg/kg	51000	59000	58000	4630746	40000	53000	500	4630746
Total Inorganic Carbon (C)	mg/kg	43000	47000	46000	4621285	30000	45000	500	4621285
Total Organic Carbon	mg/kg	8700	11000	12000	4636562	10000	8600	500	4636562
< -1 Phi (2 mm)	%	90	97	99	4624779	86	78	0.10	4624786
< 0 Phi (1 mm)	%	86	94	98	4624779	81	75	0.10	4624786
< +1 Phi (0.5 mm)	%	75	89	94	4624779	64	70	0.10	4624786
< +2 Phi (0.25 mm)	%	55	78	87	4624779	40	56	0.10	4624786
< +3 Phi (0.12 mm)	%	46	71	82	4624779	31	50	0.10	4624786
< +4 Phi (0.062 mm)	%	40	67	79	4624779	28	47	0.10	4624786
< +5 Phi (0.031 mm)	%	34	63	63	4624779	27	44	0.10	4624786
< +6 Phi (0.016 mm)	%	26	49	57	4624779	21	37	0.10	4624786
< +7 Phi (0.0078 mm)	%	14	29	31	4624779	5.2	22	0.10	4624786
< +8 Phi (0.0039 mm)	%	9.5	12	21	4624779	2.5	8.9	0.10	4624786
< +9 Phi (0.0020 mm)	%	3.6	3.8	4.8	4624779	1.8	3.1	0.10	4624786
Gravel	%	10	3.0	1.4	4624779	14	22	0.10	4624786
Sand	%	50	30	20	4624779	58	31	0.10	4624786
Silt	%	31	56	58	4624779	26	38	0.10	4624786
Clay	%	9.5	12	21	4624779	2.5	8.9	0.10	4624786
Miscellaneous Parameters									
Loss on Ignition	%	15	19	20	4638551	13	18	0.30	4638551

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWT812	CWT813	CWT814	CWT815	CWT816		
Sampling Date		2016/08/09 10:15	2016/08/09 10:20	2016/08/09 08:30	2016/08/09 08:45	2016/08/09 08:55		
COC Number		560235-02-01	560235-02-01	560235-02-01	560235-02-01	560235-02-01		
	UNITS	**SN-4-2**	**SN-4-3**	**SN-5-1**	**SN-5-2**	**SN-5-3**	**RDL**	**QC Batch**
Inorganics								
Total Carbon (C)	mg/kg	42000	58000	56000	57000	56000	500	4630746
Total Inorganic Carbon (C)	mg/kg	32000	45000	44000	48000	48000	500	4621285
Total Organic Carbon	mg/kg	9600	13000	12000	8900	8200	500	4636562
< -1 Phi (2 mm)	%	99	86	96	87	85	0.10	4624786
< 0 Phi (1 mm)	%	97	85	93	85	84	0.10	4624786
< +1 Phi (0.5 mm)	%	90	81	86	78	78	0.10	4624786
< +2 Phi (0.25 mm)	%	74	69	71	63	62	0.10	4624786
< +3 Phi (0.12 mm)	%	65	61	64	56	55	0.10	4624786
< +4 Phi (0.062 mm)	%	63	59	62	54	53	0.10	4624786
< +5 Phi (0.031 mm)	%	64	55	60	53	52	0.10	4624786
< +6 Phi (0.016 mm)	%	53	46	50	44	44	0.10	4624786
< +7 Phi (0.0078 mm)	%	34	28	35	30	31	0.10	4624786
< +8 Phi (0.0039 mm)	%	15	9.9	6.8	7.2	6.2	0.10	4624786
< +9 Phi (0.0020 mm)	%	4.0	2.9	4.1	3.8	2.7	0.10	4624786
Gravel	%	0.98	14	4.5	13	15	0.10	4624786
Sand	%	36	27	33	33	32	0.10	4624786
Silt	%	48	49	55	47	47	0.10	4624786
Clay	%	15	9.9	6.8	7.2	6.2	0.10	4624786
Miscellaneous Parameters								
Loss on Ignition	%	18	18	19	17	17	0.30	4638551

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWT817	CWT818	CWT818	CWT819	CWT820	CWT821		
Sampling Date		2016/08/09 12:36	2016/08/09 12:50	2016/08/09 12:50	2016/08/09 13:10	2016/08/09 13:40	2016/08/09 13:50		
COC Number		560235-04-01	560235-04-01	560235-04-01	560235-04-01	560235-04-01	560235-04-01		
	UNITS	**SE-1-1**	**SE-1-2**	**SE-1-2 Lab-Dup**	**SE-1-3**	**SE-2-1**	**SE-2-2**	**RDL**	**QC Batch**
Inorganics									
Total Carbon (C)	mg/kg	8100	9600		8000	30000	35000	500	4630746
Total Inorganic Carbon (C)	mg/kg	7200	7700		6800	25000	30000	500	4621285
Total Organic Carbon	mg/kg	900	1800		1100	5100	4900	500	4636562
< -1 Phi (2 mm)	%	89	99	93	100	78	83	0.10	4624787
< 0 Phi (1 mm)	%	86	97	92	98	72	78	0.10	4624787
< +1 Phi (0.5 mm)	%	77	92	83	90	59	67	0.10	4624787
< +2 Phi (0.25 mm)	%	40	52	46	47	38	43	0.10	4624787
< +3 Phi (0.12 mm)	%	4.2	9.4	7.3	6.2	26	30	0.10	4624787
< +4 Phi (0.062 mm)	%	1.8	4.5	3.6	2.4	21	24	0.10	4624787
< +5 Phi (0.031 mm)	%	1.6	3.7	2.9	1.8	17	19	0.10	4624787
< +6 Phi (0.016 mm)	%	1.5	2.9	2.4	1.7	11	14	0.10	4624787
< +7 Phi (0.0078 mm)	%	1.3	2.1	1.7	1.5	7.1	8.3	0.10	4624787
< +8 Phi (0.0039 mm)	%	1.4	2.0	1.7	1.6	4.0	4.9	0.10	4624787
< +9 Phi (0.0020 mm)	%	1.1	2.2	1.5	1.4	1.6	2.0	0.10	4624787
Gravel	%	11	1.3	7.2 (1)	0.46	22	17	0.10	4624787
Sand	%	88	94	89	97	58	58	0.10	4624787
Silt	%	0.42	2.5	1.9	0.87	17	19	0.10	4624787
Clay	%	1.4	2.0	1.7	1.6	4.0	4.9	0.10	4624787
Miscellaneous Parameters									
Loss on Ignition	%	3.4	4.2		3.7	11	11	0.30	4638552

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWT822	CWT822		CWT823	CWT823		CWT824		
Sampling Date		2016/08/09 14:05	2016/08/09 14:05		2016/08/09 12:00	2016/08/09 12:00		2016/08/09 12:45		
COC Number		560235-04-01	560235-04-01		560235-06-01	560235-06-01		560235-07-01		
	UNITS	SE-2-3	SE-2-3 Lab-Dup	QC Batch	SN-1-1Q	SN-1-1Q Lab-Dup	QC Batch	SE-1-1Q	RDL	QC Batch
Inorganics										
Total Carbon (C)	mg/kg	41000	40000	4630734	53000		4630734	10000	500	4634194
Total Inorganic Carbon (C)	mg/kg	30000		4621285	31000		4621285	9900	500	4621285
Total Organic Carbon	mg/kg	11000	13000	4638016	21000		4638016	580	500	4638016
< -1 Phi (2 mm)	%	79		4624787	83	89	4624786	99	0.10	4624787
< 0 Phi (1 mm)	%	72		4624787	80	85	4624786	96	0.10	4624787
< +1 Phi (0.5 mm)	%	58		4624787	73	79	4624786	86	0.10	4624787
< +2 Phi (0.25 mm)	%	37		4624787	61	65	4624786	38	0.10	4624787
< +3 Phi (0.12 mm)	%	26		4624787	54	56	4624786	5.9	0.10	4624787
< +4 Phi (0.062 mm)	%	21		4624787	45	48	4624786	2.0	0.10	4624787
< +5 Phi (0.031 mm)	%	17		4624787	35	36	4624786	1.7	0.10	4624787
< +6 Phi (0.016 mm)	%	12		4624787	24	26	4624786	1.3	0.10	4624787
< +7 Phi (0.0078 mm)	%	6.8		4624787	10	16 (1)	4624786	1.4	0.10	4624787
< +8 Phi (0.0039 mm)	%	4.0		4624787	4.5	2.1 (1)	4624786	1.3	0.10	4624787
< +9 Phi (0.0020 mm)	%	1.7		4624787	2.9	2.1	4624786	1.6	0.10	4624787
Gravel	%	21		4624787	17	11 (1)	4624786	0.70	0.10	4624787
Sand	%	58		4624787	38	41	4624786	97	0.10	4624787
Silt	%	17		4624787	41	46	4624786	0.71	0.10	4624787
Clay	%	4.0		4624787	4.5	2.1 (1)	4624786	1.3	0.10	4624787
Miscellaneous Parameters										
Loss on Ignition	%	11		4638552	17	17	4638552	3.8	0.30	4638552

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CWT824		CWT825		
Sampling Date		2016/08/09 12:45		2016/08/09 13:45		
COC Number		560235-07-01		560235-07-01		
	UNITS	SE-1-1Q Lab-Dup	QC Batch	SE-2-1Q	RDL	QC Batch
Inorganics						
Total Carbon (C)	mg/kg	11000	4634194	33000	500	4630734
Total Inorganic Carbon (C)	mg/kg		4621285	24000	500	4621285
Total Organic Carbon	mg/kg		4638016	9500	500	4638016
< -1 Phi (2 mm)	%		4624787	83	0.10	4624787
< 0 Phi (1 mm)	%		4624787	76	0.10	4624787
< +1 Phi (0.5 mm)	%		4624787	62	0.10	4624787
< +2 Phi (0.25 mm)	%		4624787	40	0.10	4624787
< +3 Phi (0.12 mm)	%		4624787	27	0.10	4624787
< +4 Phi (0.062 mm)	%		4624787	21	0.10	4624787
< +5 Phi (0.031 mm)	%		4624787	17	0.10	4624787
< +6 Phi (0.016 mm)	%		4624787	13	0.10	4624787
< +7 Phi (0.0078 mm)	%		4624787	6.6	0.10	4624787
< +8 Phi (0.0039 mm)	%		4624787	3.6	0.10	4624787
< +9 Phi (0.0020 mm)	%		4624787	1.8	0.10	4624787
Gravel	%		4624787	17	0.10	4624787
Sand	%		4624787	62	0.10	4624787
Silt	%		4624787	18	0.10	4624787
Clay	%		4624787	3.6	0.10	4624787
Miscellaneous Parameters						
Loss on Ignition	%		4638552	11	0.30	4638552

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Site Location: Baffinland 2016-Milne EEM

MERCURY BY COLD VAPOUR AA (SOIL)

Maxxam ID		CWT802	CWT803	CWT804	CWT805	CWT806	CWT807		
Sampling Date		2016/08/09 11:55	2016/08/09 12:05	2016/08/09 12:15	2016/08/09 11:20	2016/08/09 11:30	2016/08/09 11:35		
COC Number		560235-01-01	560235-01-01	560235-01-01	560235-01-01	560235-01-01	560235-01-01		
	UNITS	**SN-1-1**	**SN-1-2**	**SN-1-3**	**SN-2-1**	**SN-2-2**	**SN-2-3**	**RDL**	**QC Batch**
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	0.011	ND	ND	0.010	4626863

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CWT808	CWT809	CWT810	CWT811	CWT812	CWT813		
Sampling Date		2016/08/09 10:30	2016/08/09 10:45	2016/08/09 10:55	2016/08/09 09:30	2016/08/09 10:15	2016/08/09 10:20		
COC Number		560235-01-01	560235-01-01	560235-01-01	560235-01-01	560235-02-01	560235-02-01		
	UNITS	**SN-3-1**	**SN-3-2**	**SN-3-3**	**SN-4-1**	**SN-4-2**	**SN-4-3**	**RDL**	**QC Batch**
Metals									
Mercury (Hg)	mg/kg	0.012	0.011	ND	0.011	0.012	0.011	0.010	4626863

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CWT814	CWT815	CWT816	CWT817	CWT818	CWT819		
Sampling Date		2016/08/09 08:30	2016/08/09 08:45	2016/08/09 08:55	2016/08/09 12:36	2016/08/09 12:50	2016/08/09 13:10		
COC Number		560235-02-01	560235-02-01	560235-02-01	560235-04-01	560235-04-01	560235-04-01		
	UNITS	**SN-5-1**	**SN-5-2**	**SN-5-3**	**SE-1-1**	**SE-1-2**	**SE-1-3**	**RDL**	**QC Batch**
Metals									
Mercury (Hg)	mg/kg	0.013	0.013	0.012	ND	ND	ND	0.010	4626863

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CWT820	CWT821	CWT822	CWT823		CWT824		
Sampling Date		2016/08/09 13:40	2016/08/09 13:50	2016/08/09 14:05	2016/08/09 12:00		2016/08/09 12:45		
COC Number		560235-04-01	560235-04-01	560235-04-01	560235-06-01		560235-07-01		
	UNITS	**SE-2-1**	**SE-2-2**	**SE-2-3**	**SN-1-1Q**	**QC Batch**	**SE-1-1Q**	**RDL**	**QC Batch**
Metals									
Mercury (Hg)	mg/kg	ND	ND	ND	ND	4626866	ND	0.010	4636582

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

MERCURY BY COLD VAPOUR AA (SOIL)

Maxxam ID		CWT825		
Sampling Date		2016/08/09 13:45		
COC Number		560235-07-01		
	UNITS	**SE-2-1Q**	**RDL**	**QC Batch**
Metals				
Mercury (Hg)	mg/kg	ND	0.010	4626866

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWT802	CWT803	CWT804	CWT805	CWT806		
Sampling Date		2016/08/09 11:55	2016/08/09 12:05	2016/08/09 12:15	2016/08/09 11:20	2016/08/09 11:30		
COC Number		560235-01-01	560235-01-01	560235-01-01	560235-01-01	560235-01-01		
	UNITS	**SN-1-1**	**SN-1-2**	**SN-1-3**	**SN-2-1**	**SN-2-2**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	5400	5100	5400	5900	5400	10	4623028
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	2.0	4623028
Acid Extractable Arsenic (As)	mg/kg	3.7	3.6	4.9	6.5	3.9	2.0	4623028
Acid Extractable Barium (Ba)	mg/kg	16	15	17	19	17	5.0	4623028
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	2.0	4623028
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	ND	2.0	4623028
Acid Extractable Boron (B)	mg/kg	ND	ND	ND	ND	ND	50	4623028
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	ND	ND	ND	0.30	4623028
Acid Extractable Chromium (Cr)	mg/kg	18	17	18	18	18	2.0	4623028
Acid Extractable Cobalt (Co)	mg/kg	3.3	3.2	3.3	3.5	3.4	1.0	4623028
Acid Extractable Copper (Cu)	mg/kg	7.0	6.4	6.6	7.7	7.4	2.0	4623028
Acid Extractable Iron (Fe)	mg/kg	10000	10000	11000	12000	10000	50	4623028
Acid Extractable Lead (Pb)	mg/kg	5.5	5.1	5.5	6.1	5.7	0.50	4623028
Acid Extractable Lithium (Li)	mg/kg	24	23	25	27	25	2.0	4623028
Acid Extractable Manganese (Mn)	mg/kg	130	130	140	140	140	2.0	4623028
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	0.10	4623028
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	ND	ND	ND	2.0	4623028
Acid Extractable Nickel (Ni)	mg/kg	10	9.2	9.9	11	10	2.0	4623028
Acid Extractable Rubidium (Rb)	mg/kg	19	17	19	20	18	2.0	4623028
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	1.0	4623028
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	ND	0.50	4623028
Acid Extractable Strontium (Sr)	mg/kg	54	48	48	51	55	5.0	4623028
Acid Extractable Thallium (Tl)	mg/kg	0.11	ND	0.11	0.11	0.10	0.10	4623028
Acid Extractable Tin (Sn)	mg/kg	ND	ND	ND	ND	ND	2.0	4623028
Acid Extractable Uranium (U)	mg/kg	0.92	0.83	0.81	0.85	0.79	0.10	4623028
Acid Extractable Vanadium (V)	mg/kg	20	19	20	23	20	2.0	4623028
Acid Extractable Zinc (Zn)	mg/kg	17	15	16	17	16	5.0	4623028

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWT807	CWT808		CWT809	CWT809		
Sampling Date		2016/08/09 11:35	2016/08/09 10:30		2016/08/09 10:45	2016/08/09 10:45		
COC Number		560235-01-01	560235-01-01		560235-01-01	560235-01-01		
	UNITS	**SN-2-3**	**SN-3-1**	**QC Batch**	**SN-3-2**	**SN-3-2 Lab-Dup**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	4900	8600	4623028	8300	8200	10	4623294
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	4623028	ND	ND	2.0	4623294
Acid Extractable Arsenic (As)	mg/kg	2.9	5.7	4623028	3.9	4.0	2.0	4623294
Acid Extractable Barium (Ba)	mg/kg	14	23	4623028	22	23	5.0	4623294
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	4623028	ND	ND	2.0	4623294
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	4623028	ND	ND	2.0	4623294
Acid Extractable Boron (B)	mg/kg	ND	51	4623028	54	55	50	4623294
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	4623028	ND	ND	0.30	4623294
Acid Extractable Chromium (Cr)	mg/kg	15	24	4623028	26	26	2.0	4623294
Acid Extractable Cobalt (Co)	mg/kg	2.6	4.5	4623028	4.9	4.9	1.0	4623294
Acid Extractable Copper (Cu)	mg/kg	6.2	11	4623028	12	12	2.0	4623294
Acid Extractable Iron (Fe)	mg/kg	8700	14000	4623028	14000	14000	50	4623294
Acid Extractable Lead (Pb)	mg/kg	5.1	8.6	4623028	8.9	8.9	0.50	4623294
Acid Extractable Lithium (Li)	mg/kg	22	37	4623028	40	40	2.0	4623294
Acid Extractable Manganese (Mn)	mg/kg	110	160	4623028	160	160	2.0	4623294
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	4623028	ND	ND	0.10	4623294
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	4623028	ND	ND	2.0	4623294
Acid Extractable Nickel (Ni)	mg/kg	8.5	14	4623028	16	16	2.0	4623294
Acid Extractable Rubidium (Rb)	mg/kg	15	26	4623028	26	27	2.0	4623294
Acid Extractable Selenium (Se)	mg/kg	ND	ND	4623028	ND	ND	1.0	4623294
Acid Extractable Silver (Ag)	mg/kg	ND	ND	4623028	ND	ND	0.50	4623294
Acid Extractable Strontium (Sr)	mg/kg	43	58	4623028	61	62	5.0	4623294
Acid Extractable Thallium (Tl)	mg/kg	ND	0.15	4623028	0.16	0.17	0.10	4623294
Acid Extractable Tin (Sn)	mg/kg	ND	ND	4623028	ND	ND	2.0	4623294
Acid Extractable Uranium (U)	mg/kg	0.70	1.3	4623028	1.4	1.6	0.10	4623294
Acid Extractable Vanadium (V)	mg/kg	18	31	4623028	32	33	2.0	4623294
Acid Extractable Zinc (Zn)	mg/kg	14	24	4623028	24	25	5.0	4623294

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWT810	CWT811	CWT812	CWT813	CWT814		
Sampling Date		2016/08/09 10:55	2016/08/09 09:30	2016/08/09 10:15	2016/08/09 10:20	2016/08/09 08:30		
COC Number		560235-01-01	560235-01-01	560235-02-01	560235-02-01	560235-02-01		
	UNITS	**SN-3-3**	**SN-4-1**	**SN-4-2**	**SN-4-3**	**SN-5-1**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	4000	7000	7100	7500	7900	10	4629596
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Arsenic (As)	mg/kg	3.9	7.4	5.5	6.3	6.0	2.0	4629596
Acid Extractable Barium (Ba)	mg/kg	12	21	21	22	23	5.0	4629596
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Boron (B)	mg/kg	ND	ND	ND	ND	ND	50	4629596
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	ND	ND	ND	0.30	4629596
Acid Extractable Chromium (Cr)	mg/kg	13	21	22	23	24	2.0	4629596
Acid Extractable Cobalt (Co)	mg/kg	2.6	4.3	4.3	4.6	4.8	1.0	4629596
Acid Extractable Copper (Cu)	mg/kg	5.8	9.8	11	10	11	2.0	4629596
Acid Extractable Iron (Fe)	mg/kg	8700	14000	14000	14000	15000	50	4629596
Acid Extractable Lead (Pb)	mg/kg	4.9	8.1	11	8.5	9.0	0.50	4629596
Acid Extractable Lithium (Li)	mg/kg	18	31	30	33	33	2.0	4629596
Acid Extractable Manganese (Mn)	mg/kg	92	160	150	160	170	2.0	4629596
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	0.10	4629596
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Nickel (Ni)	mg/kg	7.8	13	13	14	15	2.0	4629596
Acid Extractable Rubidium (Rb)	mg/kg	14	22	23	24	24	2.0	4629596
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	1.0	4629596
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	ND	0.50	4629596
Acid Extractable Strontium (Sr)	mg/kg	38	58	55	61	62	5.0	4629596
Acid Extractable Thallium (Tl)	mg/kg	ND	0.14	0.13	0.14	0.16	0.10	4629596
Acid Extractable Tin (Sn)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Uranium (U)	mg/kg	0.67	0.94	1.0	1.1	1.2	0.10	4629596
Acid Extractable Vanadium (V)	mg/kg	18	31	31	31	33	2.0	4629596
Acid Extractable Zinc (Zn)	mg/kg	15	21	23	23	26	5.0	4629596

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWT815	CWT816	CWT817	CWT817	CWT818		
Sampling Date		2016/08/09 08:45	2016/08/09 08:55	2016/08/09 12:36	2016/08/09 12:36	2016/08/09 12:50		
COC Number		560235-02-01	560235-02-01	560235-04-01	560235-04-01	560235-04-01		
	UNITS	**SN-5-2**	**SN-5-3**	**SE-1-1**	**SE-1-1 Lab-Dup**	**SE-1-2**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	7700	7600	900	870	940	10	4629596
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Arsenic (As)	mg/kg	6.8	4.8	ND	ND	ND	2.0	4629596
Acid Extractable Barium (Ba)	mg/kg	23	23	ND	ND	ND	5.0	4629596
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Boron (B)	mg/kg	50	ND	ND	ND	ND	50	4629596
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	ND	ND	ND	0.30	4629596
Acid Extractable Chromium (Cr)	mg/kg	23	23	3.6	3.8	3.8	2.0	4629596
Acid Extractable Cobalt (Co)	mg/kg	4.6	4.7	ND	ND	ND	1.0	4629596
Acid Extractable Copper (Cu)	mg/kg	11	11	ND	ND	ND	2.0	4629596
Acid Extractable Iron (Fe)	mg/kg	15000	14000	2200	2200	2400	50	4629596
Acid Extractable Lead (Pb)	mg/kg	8.8	9.0	1.1	1.2	1.3	0.50	4629596
Acid Extractable Lithium (Li)	mg/kg	33	33	3.9	3.5	4.4	2.0	4629596
Acid Extractable Manganese (Mn)	mg/kg	160	150	26	26	29	2.0	4629596
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	0.10	4629596
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Nickel (Ni)	mg/kg	14	14	ND	ND	ND	2.0	4629596
Acid Extractable Rubidium (Rb)	mg/kg	24	24	3.6	3.5	4.5	2.0	4629596
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	1.0	4629596
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	ND	0.50	4629596
Acid Extractable Strontium (Sr)	mg/kg	64	58	11	12	11	5.0	4629596
Acid Extractable Thallium (Tl)	mg/kg	0.15	0.15	ND	ND	ND	0.10	4629596
Acid Extractable Tin (Sn)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Uranium (U)	mg/kg	1.1	1.2	0.23	0.23	0.27	0.10	4629596
Acid Extractable Vanadium (V)	mg/kg	32	33	4.5	4.0	4.3	2.0	4629596
Acid Extractable Zinc (Zn)	mg/kg	25	25	ND	ND	ND	5.0	4629596

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWT819	CWT820	CWT821	CWT822	CWT823		
Sampling Date		2016/08/09 13:10	2016/08/09 13:40	2016/08/09 13:50	2016/08/09 14:05	2016/08/09 12:00		
COC Number		560235-04-01	560235-04-01	560235-04-01	560235-04-01	560235-06-01		
	UNITS	**SE-1-3**	**SE-2-1**	**SE-2-2**	**SE-2-3**	**SN-1-1Q**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	930	3300	3100	3000	5300	10	4629596
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Arsenic (As)	mg/kg	ND	3.2	2.5	2.3	3.9	2.0	4629596
Acid Extractable Barium (Ba)	mg/kg	ND	11	9.8	9.5	16	5.0	4629596
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Boron (B)	mg/kg	ND	ND	ND	ND	ND	50	4629596
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	ND	ND	ND	0.30	4629596
Acid Extractable Chromium (Cr)	mg/kg	3.5	11	11	11	18	2.0	4629596
Acid Extractable Cobalt (Co)	mg/kg	ND	2.2	2.0	2.0	3.5	1.0	4629596
Acid Extractable Copper (Cu)	mg/kg	ND	4.6	4.6	4.2	7.6	2.0	4629596
Acid Extractable Iron (Fe)	mg/kg	2300	7400	6900	6400	11000	50	4629596
Acid Extractable Lead (Pb)	mg/kg	1.1	4.0	4.0	3.4	5.7	0.50	4629596
Acid Extractable Lithium (Li)	mg/kg	4.1	15	14	13	24	2.0	4629596
Acid Extractable Manganese (Mn)	mg/kg	31	83	78	78	130	2.0	4629596
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	0.10	4629596
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Nickel (Ni)	mg/kg	ND	6.9	6.5	8.3	11	2.0	4629596
Acid Extractable Rubidium (Rb)	mg/kg	3.8	12	11	11	19	2.0	4629596
Acid Extractable Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	1.0	4629596
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	ND	ND	0.50	4629596
Acid Extractable Strontium (Sr)	mg/kg	11	42	30	29	47	5.0	4629596
Acid Extractable Thallium (Tl)	mg/kg	ND	ND	ND	ND	0.12	0.10	4629596
Acid Extractable Tin (Sn)	mg/kg	ND	ND	ND	ND	ND	2.0	4629596
Acid Extractable Uranium (U)	mg/kg	0.22	0.62	0.55	0.53	0.94	0.10	4629596
Acid Extractable Vanadium (V)	mg/kg	4.0	14	13	12	21	2.0	4629596
Acid Extractable Zinc (Zn)	mg/kg	ND	11	11	9.9	18	5.0	4629596

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

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Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CWT824	CWT824	CWT824		CWT825		
Sampling Date		2016/08/09 12:45	2016/08/09 12:45	2016/08/09 12:45		2016/08/09 13:45		
COC Number		560235-07-01	560235-07-01	560235-07-01		560235-07-01		
	UNITS	**SE-1-1Q**	**SE-1-1Q Lab-Dup**	**SE-1-1Q Lab-Dup 2**	**QC Batch**	**SE-2-1Q**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	810	1300 (1)	860	4632393	3000	10	4629596
Acid Extractable Antimony (Sb)	mg/kg	ND	ND		4632393	ND	2.0	4629596
Acid Extractable Arsenic (As)	mg/kg	ND	ND		4632393	3.5	2.0	4629596
Acid Extractable Barium (Ba)	mg/kg	ND	ND		4632393	10	5.0	4629596
Acid Extractable Beryllium (Be)	mg/kg	ND	ND		4632393	ND	2.0	4629596
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND		4632393	ND	2.0	4629596
Acid Extractable Boron (B)	mg/kg	ND	ND		4632393	ND	50	4629596
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND		4632393	ND	0.30	4629596
Acid Extractable Chromium (Cr)	mg/kg	3.4	3.5		4632393	11	2.0	4629596
Acid Extractable Cobalt (Co)	mg/kg	ND	ND		4632393	2.0	1.0	4629596
Acid Extractable Copper (Cu)	mg/kg	ND	5.4		4632393	4.4	2.0	4629596
Acid Extractable Iron (Fe)	mg/kg	1900	2900 (1)	1900	4632393	7100	50	4629596
Acid Extractable Lead (Pb)	mg/kg	1.1	9.8 (1)	1.1	4632393	3.7	0.50	4629596
Acid Extractable Lithium (Li)	mg/kg	4.1	5.7		4632393	14	2.0	4629596
Acid Extractable Manganese (Mn)	mg/kg	25	32		4632393	80	2.0	4629596
Acid Extractable Mercury (Hg)	mg/kg	ND	ND		4632393	ND	0.10	4629596
Acid Extractable Molybdenum (Mo)	mg/kg	ND	ND		4632393	ND	2.0	4629596
Acid Extractable Nickel (Ni)	mg/kg	ND	2.8		4632393	6.1	2.0	4629596
Acid Extractable Rubidium (Rb)	mg/kg	3.2	3.5		4632393	11	2.0	4629596
Acid Extractable Selenium (Se)	mg/kg	ND	ND		4632393	ND	1.0	4629596
Acid Extractable Silver (Ag)	mg/kg	ND	ND		4632393	ND	0.50	4629596
Acid Extractable Strontium (Sr)	mg/kg	9.6	13		4632393	31	5.0	4629596
Acid Extractable Thallium (Tl)	mg/kg	ND	ND		4632393	ND	0.10	4629596
Acid Extractable Tin (Sn)	mg/kg	ND	ND		4632393	ND	2.0	4629596
Acid Extractable Uranium (U)	mg/kg	0.19	0.19		4632393	0.58	0.10	4629596
Acid Extractable Vanadium (V)	mg/kg	3.7	3.8		4632393	14	2.0	4629596
Acid Extractable Zinc (Zn)	mg/kg	ND	16 (1)	ND	4632393	9.8	5.0	4629596

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected
(1) Poor RPD due to sample inhomogeneity. Results confimed by repeat digestion and analysis.

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C

Results relate only to the items tested.

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Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4623028	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2016/08/19		89	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/19		103	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/19		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/19		101	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/19		108	%	75 - 125
			Acid Extractable Boron (B)	2016/08/19		97	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/19		103	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/19		NC	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/19		NC	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/19		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/19		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/19		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/19		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/19		98	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/19		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/19		NC	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/19		109	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/19		100	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/19		106	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/19		NC	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/19		108	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/19		107	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/19		115	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/19		NC	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/19		NC	%	75 - 125
4623028	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/19		104	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/19		103	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/19		107	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/19		98	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/19		106	%	75 - 125
			Acid Extractable Boron (B)	2016/08/19		98	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/19		102	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/19		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/19		104	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/19		102	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/19		105	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/19		105	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/19		104	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/19		99	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/19		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/19		101	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/19		103	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/19		102	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/19		103	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/19		109	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/19		107	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/19		110	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/19		112	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/19		103	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/19		104	%	75 - 125
4623028	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/19	ND, RDL=10		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Antimony (Sb)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/19	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/19	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/19	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/19	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/19	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/19	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/19	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/19	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/19	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/19	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/19	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/19	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/19	ND, RDL=2.0		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Zinc (Zn)	2016/08/19	ND, RDL=5.0		mg/kg	
4623028	MLB	RPD	Acid Extractable Aluminum (Al)	2016/08/19	2.7		%	35
			Acid Extractable Antimony (Sb)	2016/08/19	NC		%	35
			Acid Extractable Arsenic (As)	2016/08/19	NC		%	35
			Acid Extractable Barium (Ba)	2016/08/19	3.6		%	35
			Acid Extractable Beryllium (Be)	2016/08/19	NC		%	35
			Acid Extractable Bismuth (Bi)	2016/08/19	NC		%	35
			Acid Extractable Boron (B)	2016/08/19	NC		%	35
			Acid Extractable Cadmium (Cd)	2016/08/19	NC		%	35
			Acid Extractable Chromium (Cr)	2016/08/19	9.2		%	35
			Acid Extractable Cobalt (Co)	2016/08/19	3.0		%	35
			Acid Extractable Copper (Cu)	2016/08/19	1.5		%	35
			Acid Extractable Iron (Fe)	2016/08/19	3.1		%	35
			Acid Extractable Lead (Pb)	2016/08/19	11		%	35
			Acid Extractable Lithium (Li)	2016/08/19	4.6		%	35
			Acid Extractable Manganese (Mn)	2016/08/19	7.0		%	35
			Acid Extractable Mercury (Hg)	2016/08/19	NC		%	35
			Acid Extractable Molybdenum (Mo)	2016/08/19	NC		%	35
			Acid Extractable Nickel (Ni)	2016/08/19	8.4		%	35
			Acid Extractable Rubidium (Rb)	2016/08/19	7.0		%	35
			Acid Extractable Selenium (Se)	2016/08/19	NC		%	35
			Acid Extractable Silver (Ag)	2016/08/19	NC		%	35
			Acid Extractable Strontium (Sr)	2016/08/19	7.1		%	35
			Acid Extractable Thallium (Tl)	2016/08/19	NC		%	35
			Acid Extractable Tin (Sn)	2016/08/19	NC		%	35
			Acid Extractable Uranium (U)	2016/08/19	0.42		%	35
			Acid Extractable Vanadium (V)	2016/08/19	2.7		%	35
			Acid Extractable Zinc (Zn)	2016/08/19	6.4		%	35
4623294	MLB	Matrix Spike [CWT809-01]	Acid Extractable Antimony (Sb)	2016/08/18		100	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		99	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		103	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		104	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		99	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		NC	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		100	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		NC	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		99	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		96	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		100	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		NC	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		91	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		103	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		100	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		101	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		100	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		105	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		NC	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		102	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		108	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		105	%	75 - 125

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SEM Ltd.
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Vanadium (V)	2016/08/18		NC	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		98	%	75 - 125
4623294	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/18		101	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/18		101	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/18		101	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/18		102	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/18		100	%	75 - 125
			Acid Extractable Boron (B)	2016/08/18		97	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/18		100	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/18		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/18		102	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/18		102	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/18		101	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/18		103	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/18		102	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/18		96	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/18		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/18		104	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/18		99	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/18		102	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/18		101	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/18		104	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/18		103	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/18		104	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/18		104	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/18		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/18		102	%	75 - 125
4623294	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/18	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/18	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/18	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/18	ND, RDL=50		mg/kg	

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Lead (Pb)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/18	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/18	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/18	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/18	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/18	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/18	ND, RDL=5.0		mg/kg	
4623294	MLB	RPD [CWT809-01]	Acid Extractable Aluminum (Al)	2016/08/18	0.26		%	35
			Acid Extractable Antimony (Sb)	2016/08/18	NC		%	35
			Acid Extractable Arsenic (As)	2016/08/18	NC		%	35
			Acid Extractable Barium (Ba)	2016/08/18	NC		%	35
			Acid Extractable Beryllium (Be)	2016/08/18	NC		%	35
			Acid Extractable Bismuth (Bi)	2016/08/18	NC		%	35
			Acid Extractable Boron (B)	2016/08/18	NC		%	35
			Acid Extractable Cadmium (Cd)	2016/08/18	NC		%	35
			Acid Extractable Chromium (Cr)	2016/08/18	2.7		%	35
			Acid Extractable Cobalt (Co)	2016/08/18	NC		%	35
			Acid Extractable Copper (Cu)	2016/08/18	3.0		%	35
			Acid Extractable Iron (Fe)	2016/08/18	0.38		%	35
			Acid Extractable Lead (Pb)	2016/08/18	0.52		%	35
			Acid Extractable Lithium (Li)	2016/08/18	0.64		%	35
			Acid Extractable Manganese (Mn)	2016/08/18	0.68		%	35
			Acid Extractable Mercury (Hg)	2016/08/18	NC		%	35
			Acid Extractable Molybdenum (Mo)	2016/08/18	NC		%	35
			Acid Extractable Nickel (Ni)	2016/08/18	1.4		%	35
			Acid Extractable Rubidium (Rb)	2016/08/18	3.1		%	35
			Acid Extractable Selenium (Se)	2016/08/18	NC		%	35
			Acid Extractable Silver (Ag)	2016/08/18	NC		%	35

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Strontium (Sr)	2016/08/18	1.4		%	35
			Acid Extractable Thallium (Tl)	2016/08/18	NC		%	35
			Acid Extractable Tin (Sn)	2016/08/18	NC		%	35
			Acid Extractable Uranium (U)	2016/08/18	12		%	35
			Acid Extractable Vanadium (V)	2016/08/18	2.5		%	35
			Acid Extractable Zinc (Zn)	2016/08/18	NC		%	35
4624692	THL	Matrix Spike	Isobutylbenzene - Volatile	2016/08/18		92	%	60 - 130
			Benzene	2016/08/18		87	%	60 - 130
			Toluene	2016/08/18		81	%	60 - 130
			Ethylbenzene	2016/08/18		80	%	60 - 130
			Total Xylenes	2016/08/18		79	%	60 - 130
4624692	THL	Spiked Blank	Isobutylbenzene - Volatile	2016/08/18		106	%	60 - 130
			Benzene	2016/08/18		85	%	60 - 140
			Toluene	2016/08/18		87	%	60 - 140
			Ethylbenzene	2016/08/18		88	%	60 - 140
			Total Xylenes	2016/08/18		90	%	60 - 140
4624692	THL	Method Blank	Isobutylbenzene - Volatile	2016/08/18		98	%	60 - 130
			Benzene	2016/08/18	ND, RDL=0.025		mg/kg	
			Toluene	2016/08/18	ND, RDL=0.025		mg/kg	
			Ethylbenzene	2016/08/18	ND, RDL=0.025		mg/kg	
			Total Xylenes	2016/08/18	ND, RDL=0.050		mg/kg	
			C6 - C10 (less BTEX)	2016/08/18	ND, RDL=2.5		mg/kg	
4624692	THL	RPD	Benzene	2016/08/18	NC		%	50
			Toluene	2016/08/18	NC		%	50
			Ethylbenzene	2016/08/18	NC		%	50
			Total Xylenes	2016/08/18	NC		%	50
			C6 - C10 (less BTEX)	2016/08/18	NC		%	50
4624779	ACU	RPD [CWT802-01]	Gravel	2016/08/22	8.0		%	35
			Sand	2016/08/22	3.9		%	35
			Silt	2016/08/22	2.6		%	35
			Clay	2016/08/22	12		%	35
4624786	ACU	RPD [CWT823-01]	Gravel	2016/08/25	39 (1)		%	35
			Sand	2016/08/25	7.7		%	35
			Silt	2016/08/25	11		%	35
			Clay	2016/08/25	74 (1)		%	35
4624787	ACU	RPD [CWT818-01]	Gravel	2016/08/25	140 (1)		%	35
			Sand	2016/08/25	5.4		%	35
			Silt	2016/08/25	26		%	35
			Clay	2016/08/25	20		%	35
4626558	BHR	Matrix Spike	Isobutylbenzene - Extractable	2016/08/19		306 (2)	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/19		359 (2)	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/19		NC (3)	%	30 - 130
			>C16-C21 Hydrocarbons	2016/08/19		NC (3)	%	30 - 130
			>C21-<C32 Hydrocarbons	2016/08/19		NC (3)	%	30 - 130
4626558	BHR	Spiked Blank	Isobutylbenzene - Extractable	2016/08/19		94	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/19		97	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/19		83	%	30 - 130
			>C16-C21 Hydrocarbons	2016/08/19		74	%	30 - 130

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			>C21-<C32 Hydrocarbons	2016/08/19		88	%	30 - 130
4626558	BHR	Method Blank	Isobutylbenzene - Extractable	2016/08/19		97	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/19		95	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/19	ND, RDL=10		mg/kg	
			>C16-C21 Hydrocarbons	2016/08/19	ND, RDL=10		mg/kg	
			>C21-<C32 Hydrocarbons	2016/08/19	ND, RDL=15		mg/kg	
4626558	BHR	RPD	>C10-C16 Hydrocarbons	2016/08/22	3.7 (3)		%	50
			>C16-C21 Hydrocarbons	2016/08/22	3.2 (3)		%	50
			>C21-<C32 Hydrocarbons	2016/08/22	0.63 (3)		%	50
4626863	ARS	Matrix Spike	Mercury (Hg)	2016/08/22		98	%	75 - 125
4626863	ARS	QC Standard	Mercury (Hg)	2016/08/22		72 (4)	%	75 - 125
4626863	ARS	Spiked Blank	Mercury (Hg)	2016/08/22		98	%	80 - 120
4626863	ARS	Method Blank	Mercury (Hg)	2016/08/22	ND, RDL=0.010		mg/kg	
4626863	ARS	RPD	Mercury (Hg)	2016/08/22	NC		%	30
4626866	ARS	Matrix Spike	Mercury (Hg)	2016/08/22		99	%	75 - 125
4626866	ARS	QC Standard	Mercury (Hg)	2016/08/22		74 (5)	%	75 - 125
4626866	ARS	Spiked Blank	Mercury (Hg)	2016/08/22		97	%	80 - 120
4626866	ARS	Method Blank	Mercury (Hg)	2016/08/22	ND, RDL=0.010		mg/kg	
4626866	ARS	RPD	Mercury (Hg)	2016/08/22	NC		%	30
4629596	BAN	Matrix Spike [CWT817-01]	Acid Extractable Antimony (Sb)	2016/08/24		108	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/24		105	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/24		110	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/24		103	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/24		108	%	75 - 125
			Acid Extractable Boron (B)	2016/08/24		94	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/24		107	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/24		105	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/24		105	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/24		105	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/24		110	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/24		98	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/24		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/24		100	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/24		109	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/24		105	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/24		104	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/24		106	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/24		111	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/24		106	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/24		110	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/24		117	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/24		115	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/24		106	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/24		106	%	75 - 125
4629596	BAN	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/23		106	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/23		106	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/23		113	%	75 - 125

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Beryllium (Be)	2016/08/23		106	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/23		110	%	75 - 125
			Acid Extractable Boron (B)	2016/08/23		99	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/23		108	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/23		108	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/23		108	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/23		109	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/23		113	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/23		99	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/23		107	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/23		107	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/23		113	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/23		107	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/23		105	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/23		108	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/23		111	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/23		111	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/23		112	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/23		116	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/23		115	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/23		110	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/23		106	%	75 - 125
4629596	BAN	Method Blank	Acid Extractable Aluminum (Al)	2016/08/23	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/23	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/23	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/23	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/23	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/23	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/23	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/23	ND, RDL=2.0		mg/kg	

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Manganese (Mn)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/23	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/23	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/23	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2016/08/23	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/23	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/23	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/23	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/23	ND, RDL=5.0		mg/kg	
4629596	BAN	RPD [CWT817-01]	Acid Extractable Aluminum (Al)	2016/08/24	2.6		%	35
			Acid Extractable Antimony (Sb)	2016/08/24	NC		%	35
			Acid Extractable Arsenic (As)	2016/08/24	NC		%	35
			Acid Extractable Barium (Ba)	2016/08/24	NC		%	35
			Acid Extractable Beryllium (Be)	2016/08/24	NC		%	35
			Acid Extractable Bismuth (Bi)	2016/08/24	NC		%	35
			Acid Extractable Boron (B)	2016/08/24	NC		%	35
			Acid Extractable Cadmium (Cd)	2016/08/24	NC		%	35
			Acid Extractable Chromium (Cr)	2016/08/24	NC		%	35
			Acid Extractable Cobalt (Co)	2016/08/24	NC		%	35
			Acid Extractable Copper (Cu)	2016/08/24	NC		%	35
			Acid Extractable Iron (Fe)	2016/08/24	1.9		%	35
			Acid Extractable Lead (Pb)	2016/08/24	NC		%	35
			Acid Extractable Lithium (Li)	2016/08/24	NC		%	35
			Acid Extractable Manganese (Mn)	2016/08/24	0.11		%	35
			Acid Extractable Mercury (Hg)	2016/08/24	NC		%	35
			Acid Extractable Molybdenum (Mo)	2016/08/24	NC		%	35
			Acid Extractable Nickel (Ni)	2016/08/24	NC		%	35
			Acid Extractable Rubidium (Rb)	2016/08/24	NC		%	35
			Acid Extractable Selenium (Se)	2016/08/24	NC		%	35
			Acid Extractable Silver (Ag)	2016/08/24	NC		%	35
			Acid Extractable Strontium (Sr)	2016/08/24	NC		%	35
			Acid Extractable Thallium (Tl)	2016/08/24	NC		%	35
			Acid Extractable Tin (Sn)	2016/08/24	NC		%	35
			Acid Extractable Uranium (U)	2016/08/24	NC		%	35
			Acid Extractable Vanadium (V)	2016/08/24	NC		%	35

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			Acid Extractable Zinc (Zn)	2016/08/24	NC		%	35
4630734	BMO	QC Standard	Total Carbon (C)	2016/08/23		104	%	75 - 125
4630734	BMO	Method Blank	Total Carbon (C)	2016/08/23	ND, RDL=500		mg/kg	
4630734	BMO	RPD [CWT822-01]	Total Carbon (C)	2016/08/23	3.2		%	35
4630746	BMO	QC Standard	Total Carbon (C)	2016/08/23		103	%	75 - 125
4630746	BMO	Method Blank	Total Carbon (C)	2016/08/23	ND, RDL=500		mg/kg	
4630746	BMO	RPD [CWT802-01]	Total Carbon (C)	2016/08/23	2.1		%	35
4632393	MLB	Matrix Spike [CWT824-01]	Acid Extractable Antimony (Sb)	2016/08/24		103	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/24		106	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/24		109	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/24		107	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/24		103	%	75 - 125
			Acid Extractable Boron (B)	2016/08/24		108	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/24		104	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/24		108	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/24		105	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/24		103	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/24		104	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/24		109	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/24		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/24		96	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/24		105	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/24		105	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/24		105	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/24		107	%	75 - 125
			Acid Extractable Silver (Ag)	2016/08/24		106	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/24		111	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/24		108	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/24		109	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/24		111	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/24		108	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/24		103	%	75 - 125
4632393	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2016/08/24		105	%	75 - 125
			Acid Extractable Arsenic (As)	2016/08/24		105	%	75 - 125
			Acid Extractable Barium (Ba)	2016/08/24		103	%	75 - 125
			Acid Extractable Beryllium (Be)	2016/08/24		105	%	75 - 125
			Acid Extractable Bismuth (Bi)	2016/08/24		103	%	75 - 125
			Acid Extractable Boron (B)	2016/08/24		110	%	75 - 125
			Acid Extractable Cadmium (Cd)	2016/08/24		103	%	75 - 125
			Acid Extractable Chromium (Cr)	2016/08/24		105	%	75 - 125
			Acid Extractable Cobalt (Co)	2016/08/24		105	%	75 - 125
			Acid Extractable Copper (Cu)	2016/08/24		104	%	75 - 125
			Acid Extractable Lead (Pb)	2016/08/24		103	%	75 - 125
			Acid Extractable Lithium (Li)	2016/08/24		107	%	75 - 125
			Acid Extractable Manganese (Mn)	2016/08/24		104	%	75 - 125
			Acid Extractable Mercury (Hg)	2016/08/24		103	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2016/08/24		103	%	75 - 125
			Acid Extractable Nickel (Ni)	2016/08/24		104	%	75 - 125
			Acid Extractable Rubidium (Rb)	2016/08/24		103	%	75 - 125
			Acid Extractable Selenium (Se)	2016/08/24		106	%	75 - 125

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Silver (Ag)	2016/08/24		105	%	75 - 125
			Acid Extractable Strontium (Sr)	2016/08/24		106	%	75 - 125
			Acid Extractable Thallium (Tl)	2016/08/24		106	%	75 - 125
			Acid Extractable Tin (Sn)	2016/08/24		109	%	75 - 125
			Acid Extractable Uranium (U)	2016/08/24		107	%	75 - 125
			Acid Extractable Vanadium (V)	2016/08/24		105	%	75 - 125
			Acid Extractable Zinc (Zn)	2016/08/24		103	%	75 - 125
4632393	MLB	Method Blank	Acid Extractable Aluminum (Al)	2016/08/24	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2016/08/24	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2016/08/24	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2016/08/24	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2016/08/24	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2016/08/24	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2016/08/24	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2016/08/24	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2016/08/24	ND, RDL=1.0		mg/kg	
			Acid Extractable Silver (Ag)	2016/08/24	ND, RDL=0.50		mg/kg	

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Strontium (Sr)	2016/08/24	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2016/08/24	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Uranium (U)	2016/08/24	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2016/08/24	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2016/08/24	ND, RDL=5.0		mg/kg	
4632393	MLB	RPD [CWT824-01]	Acid Extractable Aluminum (Al)	2016/08/24	45 (6)		%	35
			Acid Extractable Antimony (Sb)	2016/08/24	NC		%	35
			Acid Extractable Arsenic (As)	2016/08/24	NC		%	35
			Acid Extractable Barium (Ba)	2016/08/24	NC		%	35
			Acid Extractable Beryllium (Be)	2016/08/24	NC		%	35
			Acid Extractable Bismuth (Bi)	2016/08/24	NC		%	35
			Acid Extractable Boron (B)	2016/08/24	NC		%	35
			Acid Extractable Cadmium (Cd)	2016/08/24	NC		%	35
			Acid Extractable Chromium (Cr)	2016/08/24	NC		%	35
			Acid Extractable Cobalt (Co)	2016/08/24	NC		%	35
			Acid Extractable Copper (Cu)	2016/08/24	NC		%	35
			Acid Extractable Iron (Fe)	2016/08/24	40 (6)		%	35
			Acid Extractable Lead (Pb)	2016/08/24	NC (6)		%	35
			Acid Extractable Lithium (Li)	2016/08/24	NC		%	35
			Acid Extractable Manganese (Mn)	2016/08/24	23		%	35
			Acid Extractable Mercury (Hg)	2016/08/24	NC		%	35
			Acid Extractable Molybdenum (Mo)	2016/08/24	NC		%	35
			Acid Extractable Nickel (Ni)	2016/08/24	NC		%	35
			Acid Extractable Rubidium (Rb)	2016/08/24	NC		%	35
			Acid Extractable Selenium (Se)	2016/08/24	NC		%	35
			Acid Extractable Silver (Ag)	2016/08/24	NC		%	35
			Acid Extractable Strontium (Sr)	2016/08/24	NC		%	35
			Acid Extractable Thallium (Tl)	2016/08/24	NC		%	35
			Acid Extractable Tin (Sn)	2016/08/24	NC		%	35
			Acid Extractable Uranium (U)	2016/08/24	NC		%	35
			Acid Extractable Vanadium (V)	2016/08/24	NC		%	35
			Acid Extractable Zinc (Zn)	2016/08/24	NC (6)		%	35
4634194	BMO	QC Standard	Total Carbon (C)	2016/08/25		104	%	75 - 125
4634194	BMO	Method Blank	Total Carbon (C)	2016/08/25	ND, RDL=500		mg/kg	
4634194	BMO	RPD [CWT824-01]	Total Carbon (C)	2016/08/25	1.1		%	35
4636562	BMO	QC Standard	Total Organic Carbon	2016/08/29		110	%	75 - 125
4636562	BMO	Method Blank	Total Organic Carbon	2016/08/29	ND, RDL=500		mg/kg	
4636562	BMO	RPD [CWT802-01]	Total Organic Carbon	2016/08/29	8.4		%	35
4636582	ARS	Matrix Spike	Mercury (Hg)	2016/08/29		98	%	75 - 125
4636582	ARS	QC Standard	Mercury (Hg)	2016/08/29		73 (5)	%	75 - 125
4636582	ARS	Spiked Blank	Mercury (Hg)	2016/08/29		97	%	80 - 120
4636582	ARS	Method Blank	Mercury (Hg)	2016/08/29	ND, RDL=0.010		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4636582	ARS	RPD	Mercury (Hg)	2016/08/29	NC		%	30
4638016	OK	QC Standard	Total Organic Carbon	2016/08/29		112	%	75 - 125
4638016	OK	Method Blank	Total Organic Carbon	2016/08/29	ND, RDL=500		mg/kg	
4638016	OK	RPD [CWT822-01]	Total Organic Carbon	2016/08/29	15		%	35
4638551	BBD	QC Standard	Loss on Ignition	2016/08/30		101	%	80 - 120
4638551	BBD	Method Blank	Loss on Ignition	2016/08/30	ND, RDL=0.30		%	
4638551	BBD	RPD [CWT802-01]	Loss on Ignition	2016/08/30	9.6		%	25
4638552	BBD	QC Standard	Loss on Ignition	2016/08/30		101	%	80 - 120
4638552	BBD	Method Blank	Loss on Ignition	2016/08/30	ND, RDL=0.30		%	
4638552	BBD	RPD [CWT823-01]	Loss on Ignition	2016/08/30	2.6		%	25

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) TEH surrogate(s) not within acceptance limits due to sample dilution / product interference.

(3) Elevated TEH RDL(s) due to sample dilution.

(4) Reference material acceptable using control chart criteria.

(5) Reference Material acceptable using control chart criteria.

(6) Poor RPD due to sample inhomogeneity. Results confimed by repeat digestion and analysis.

Maxxam Job #: B6H2494
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Baffinland 2016-Milne EEM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Colleen Acker, Supervisor, General Chemistry

Eric Dearman, Scientific Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Kevin MacDonald, Inorganics Supervisor

Rosemarie MacDonald, Scientific Specialist (Organics)

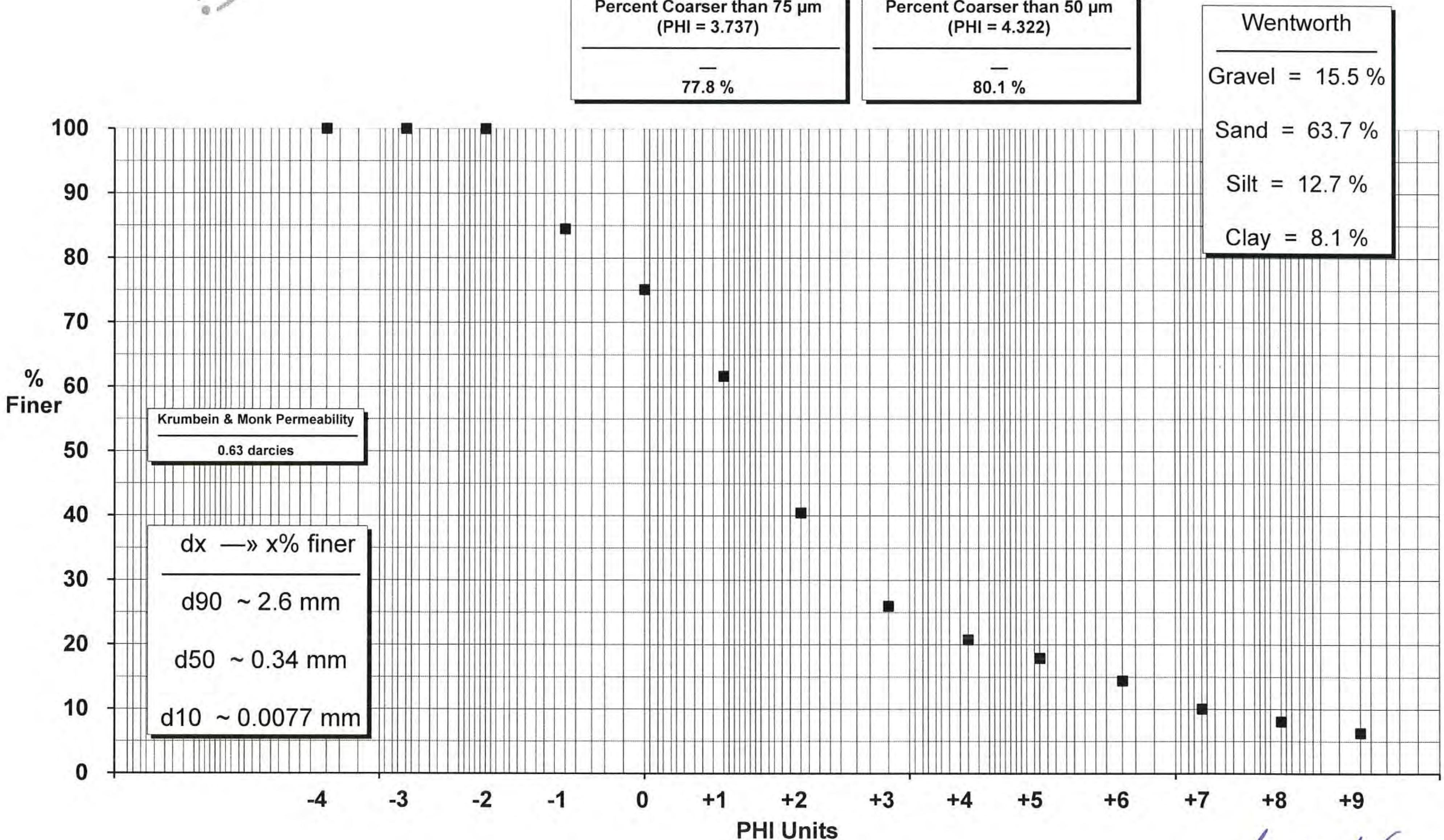
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Maxxam ID: CXG659-01

SE-3-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
77.8 %	80.1 %



Approved

Maxxam ID: CXG659-01:D1

SE-3-1 :D1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
65.5 %	69.1 %

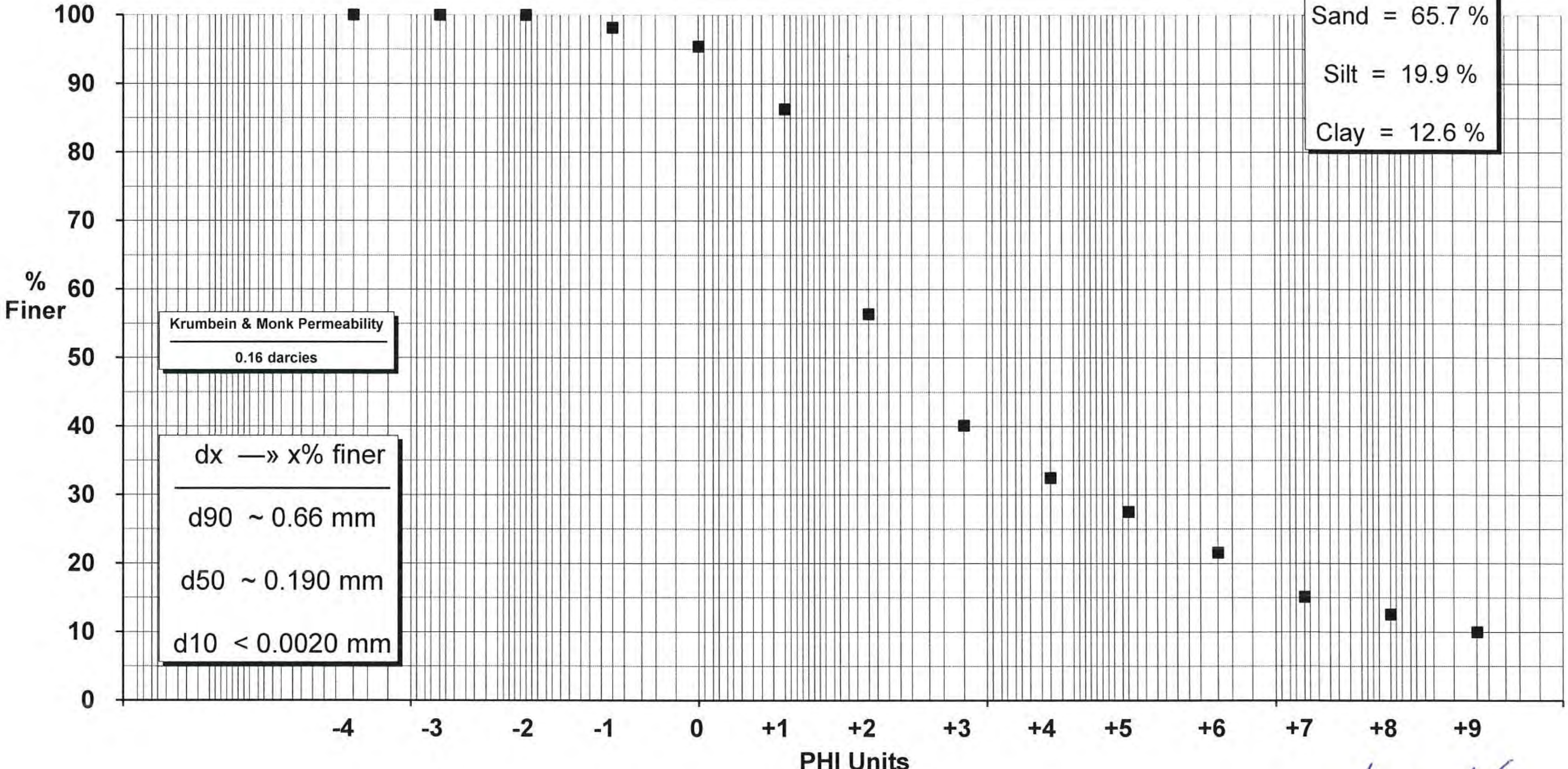
Wentworth

Gravel = 1.8 %

Sand = 65.7 %

Silt = 19.9 %

Clay = 12.6 %



Krumbein & Monk Permeability

0.16 darcies

dx —» x% finer
d90 ~ 0.66 mm
d50 ~ 0.190 mm
d10 < 0.0020 mm

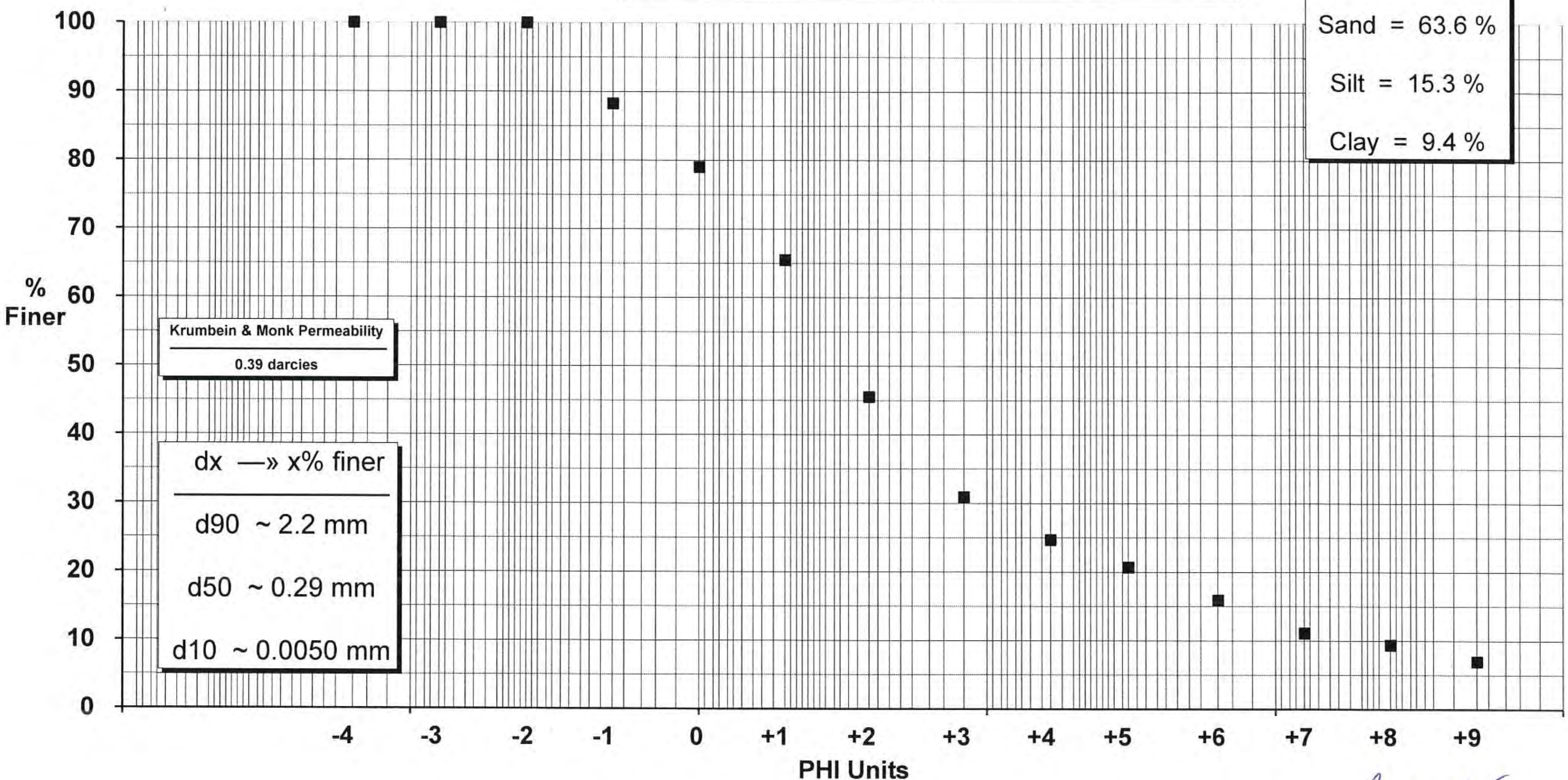
Approved

Maxxam

Maxxam ID: CXG660-01

SE-3-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
73.7 %	76.6 %



Approved

Maxxam ID: CXG661-01

SE-3-3

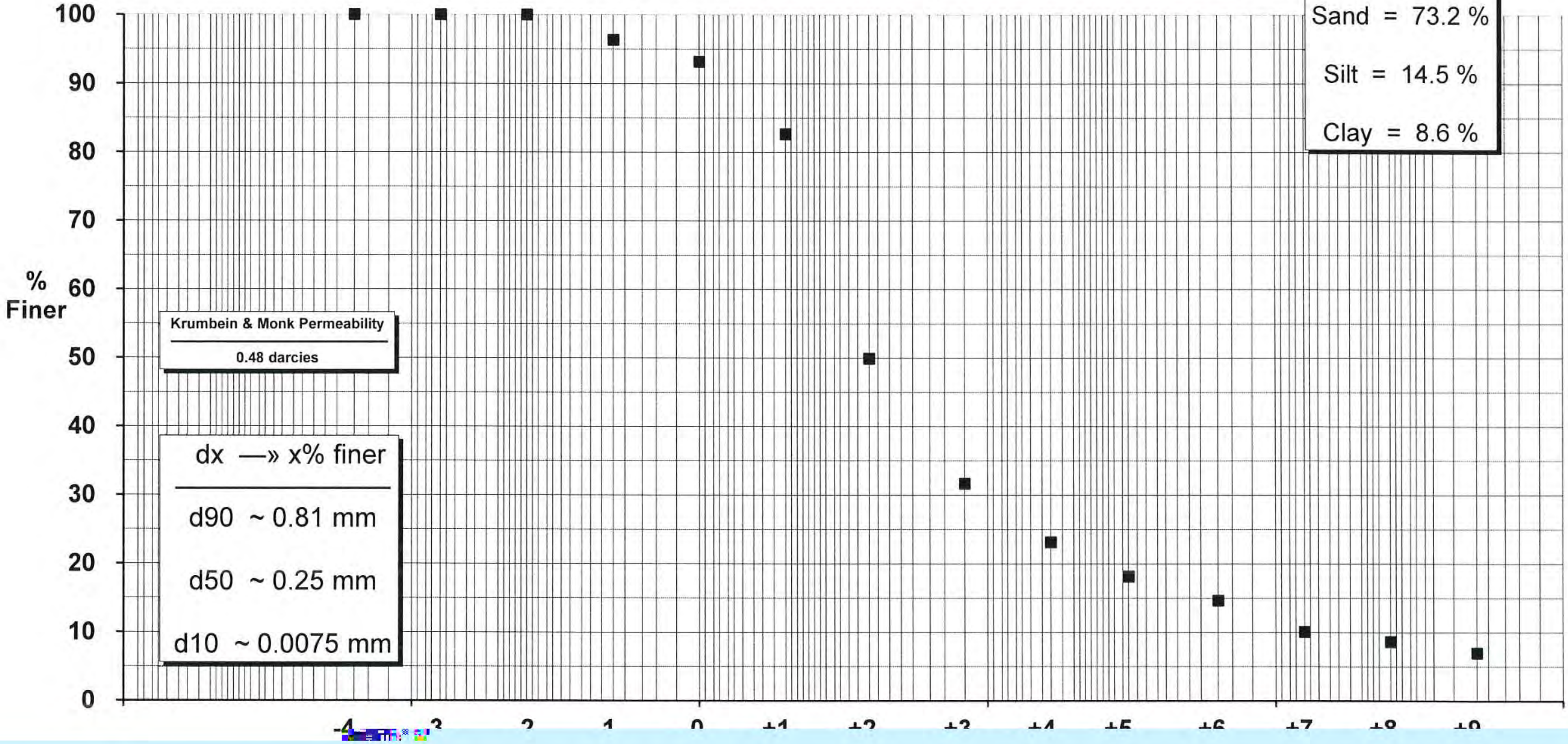
Percent Coarser than 75 µm (PHI = 3.737)
74.6 %

Percent Coarser than 50 µm (PHI = 4.322)
78.5 %

Wentworth
Gravel = 3.7 %
Sand = 73.2 %
Silt = 14.5 %
Clay = 8.6 %

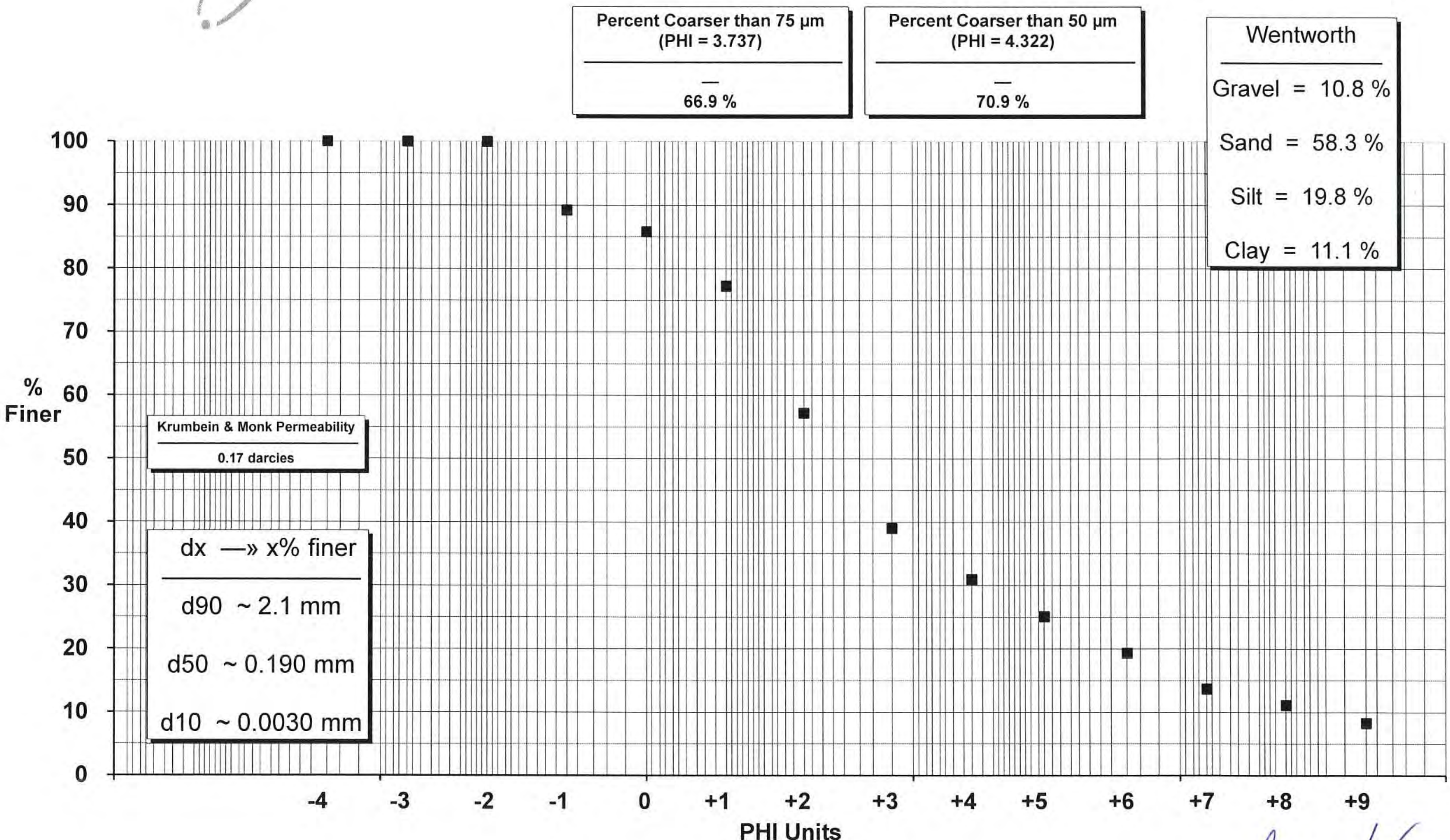
Krumbein & Monk Permeability
0.48 darcies

dx —» x% finer
d90 ~ 0.81 mm
d50 ~ 0.25 mm
d10 ~ 0.0075 mm



Maxxam ID: CXG662-01

SE-4-1



Approved

Maxxam

Maxxam ID: CXG665-01

SE-4-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
67.8 %	72.2 %

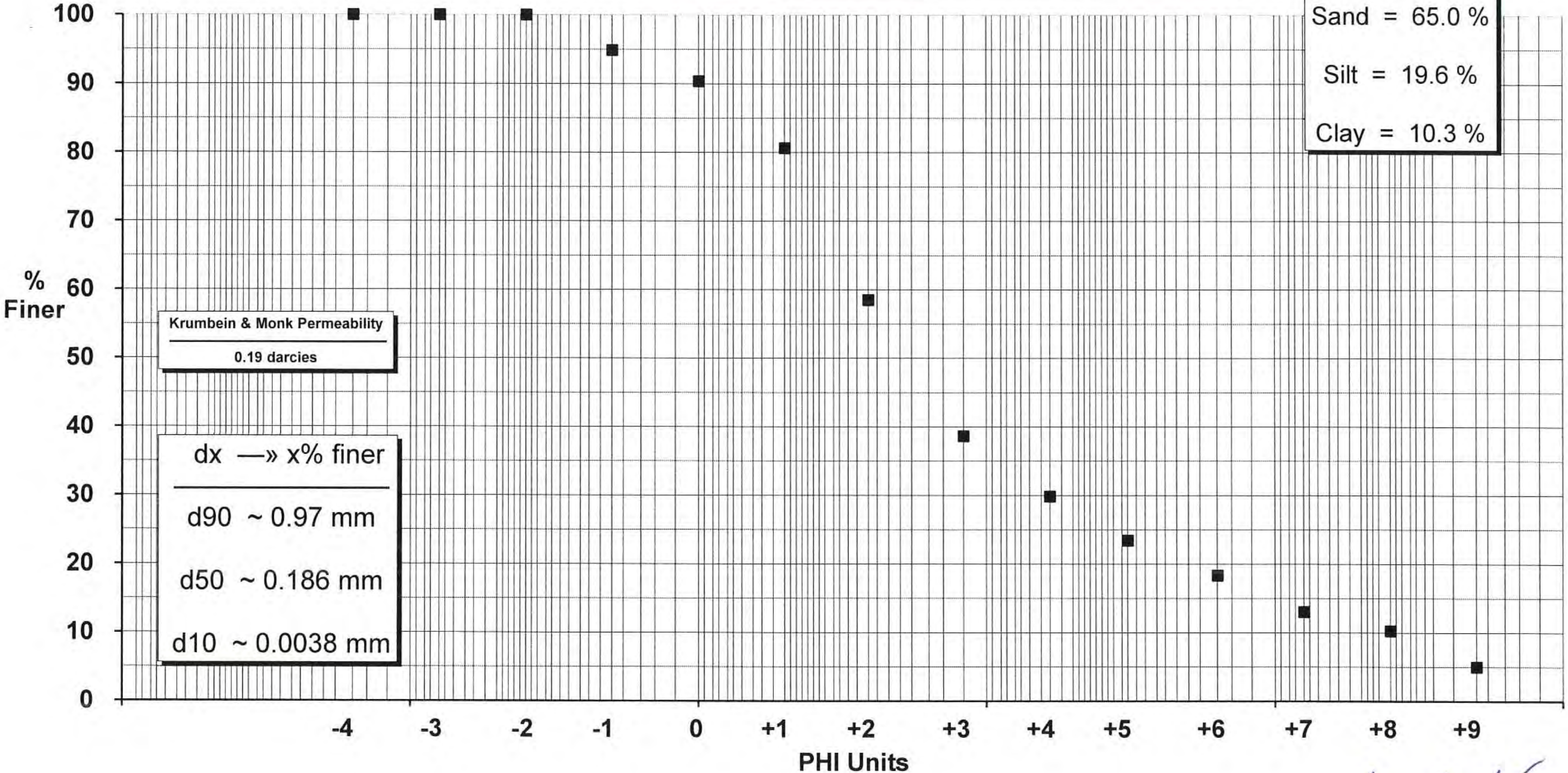
Wentworth

Gravel = 5.1 %

Sand = 65.0 %

Silt = 19.6 %

Clay = 10.3 %



Krumbein & Monk Permeability

0.19 darcies

dx —» x% finer

d90 ~ 0.97 mm

d50 ~ 0.186 mm

d10 ~ 0.0038 mm

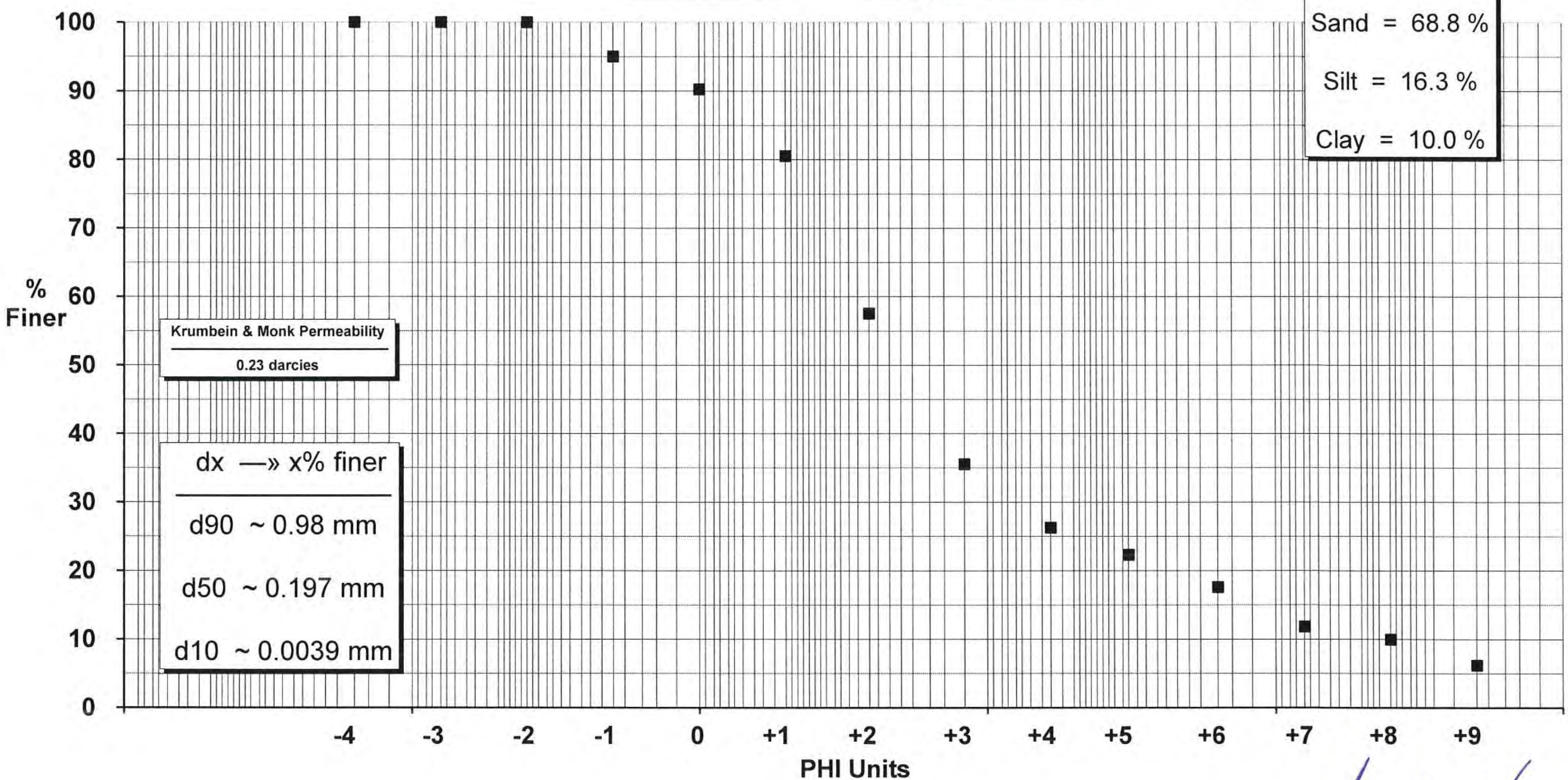
Approved

Maxxam ID: CXG666-01

SE-4-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
71.3 %	75.0 %

Wentworth	
Gravel	5.0 %
Sand	68.8 %
Silt	16.3 %
Clay	10.0 %



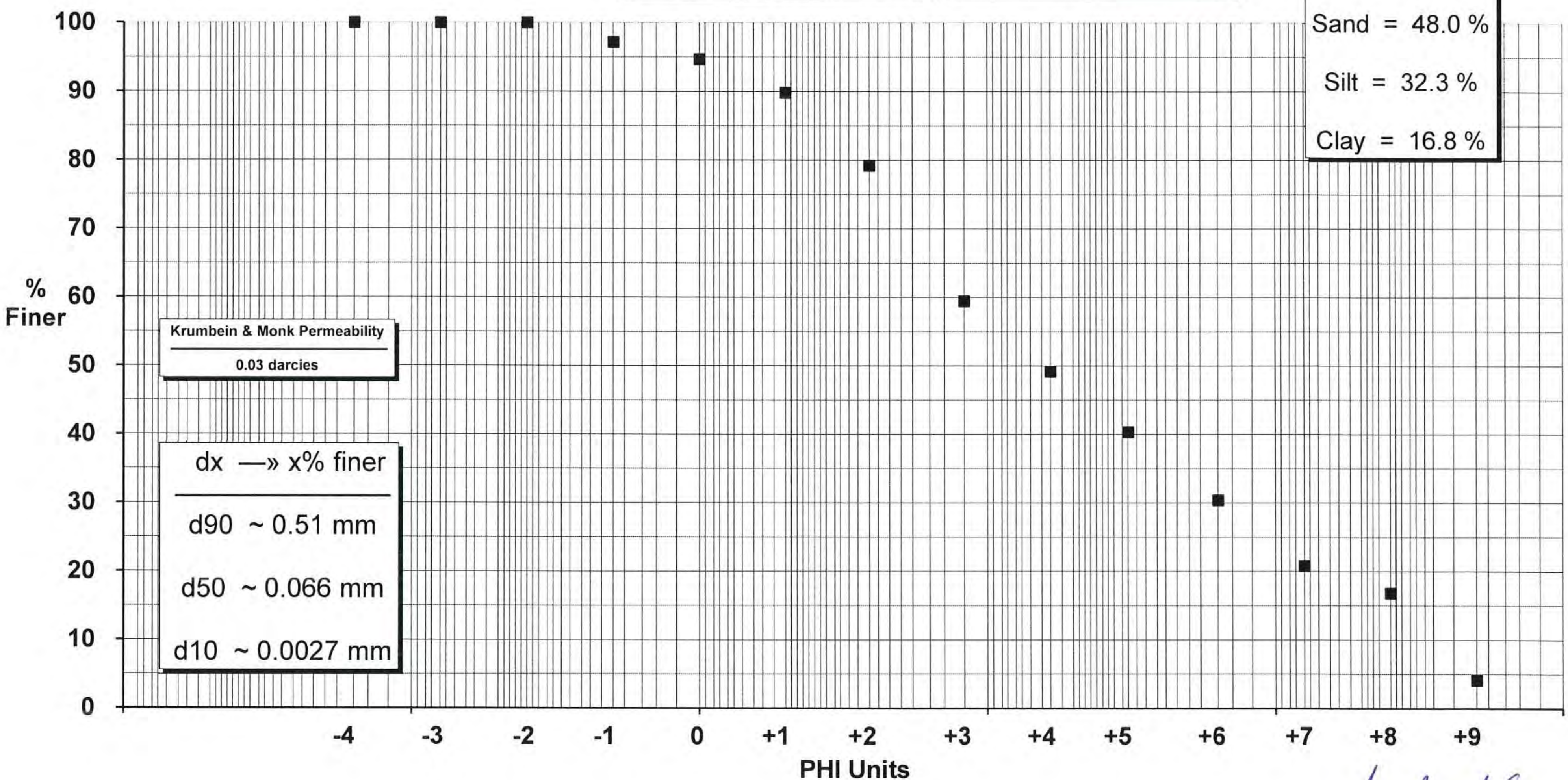
Approved

Maxxam

Maxxam ID: CXG667-01

SE-5-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
48.1 %	53.7 %



Approved

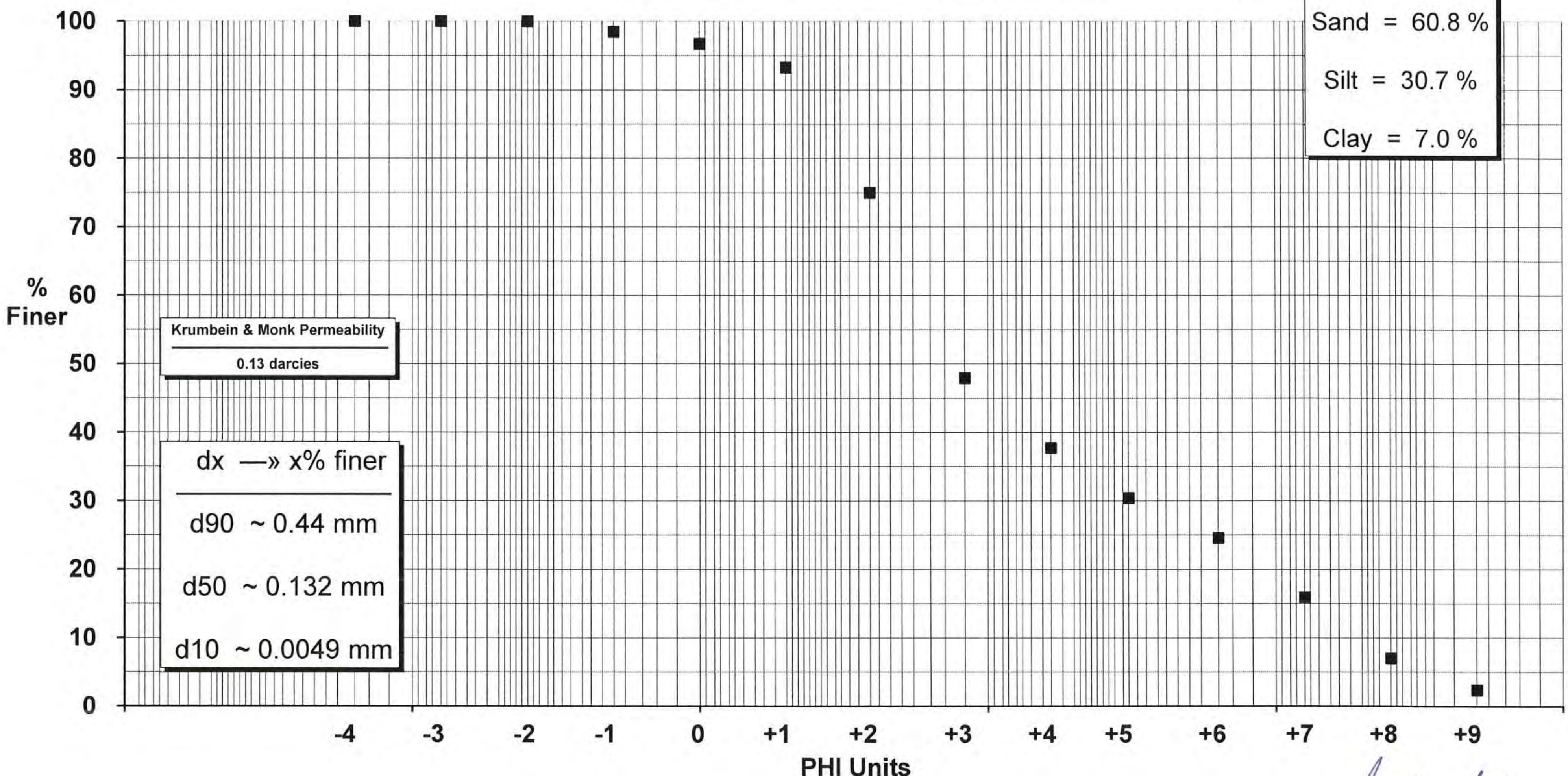
Maxxam ID: CXG668-01

SE-5-2

Percent Coarser than 75 µm (PHI = 3.737)
59.6 %

Percent Coarser than 50 µm (PHI = 4.322)
64.6 %

Wentworth
Gravel = 1.5 %
Sand = 60.8 %
Silt = 30.7 %
Clay = 7.0 %



Krumbein & Monk Permeability
0.13 darcies

dx —» x% finer
d90 ~ 0.44 mm
d50 ~ 0.132 mm
d10 ~ 0.0049 mm

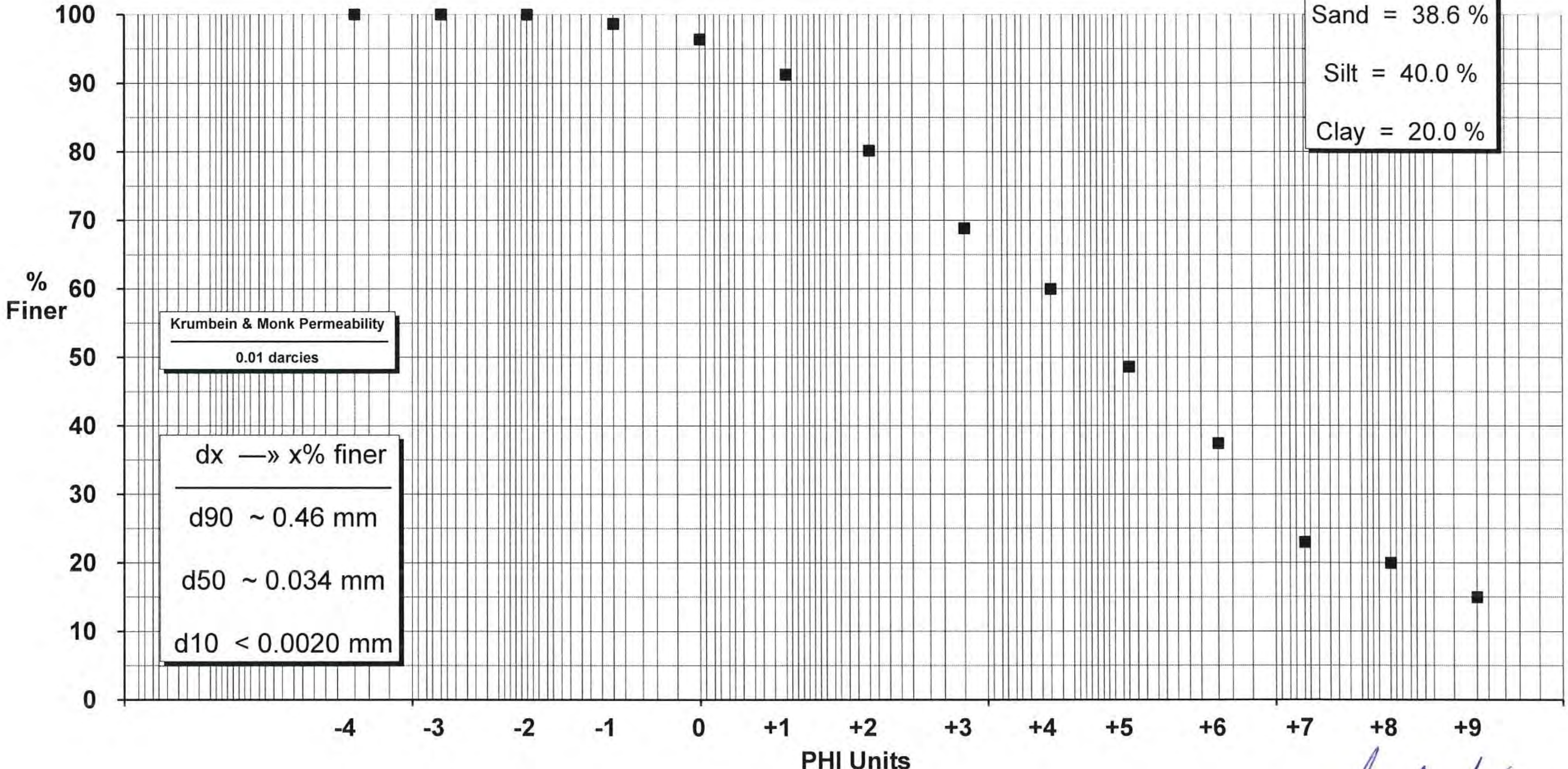
Approved

Maxxam ID: CXG669-01

SE-5-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
37.7 %	43.7 %

Wentworth
Gravel = 1.4 %
Sand = 38.6 %
Silt = 40.0 %
Clay = 20.0 %



Krumbein & Monk Permeability
0.01 darcies

dx —» x% finer
d90 ~ 0.46 mm
d50 ~ 0.034 mm
d10 < 0.0020 mm

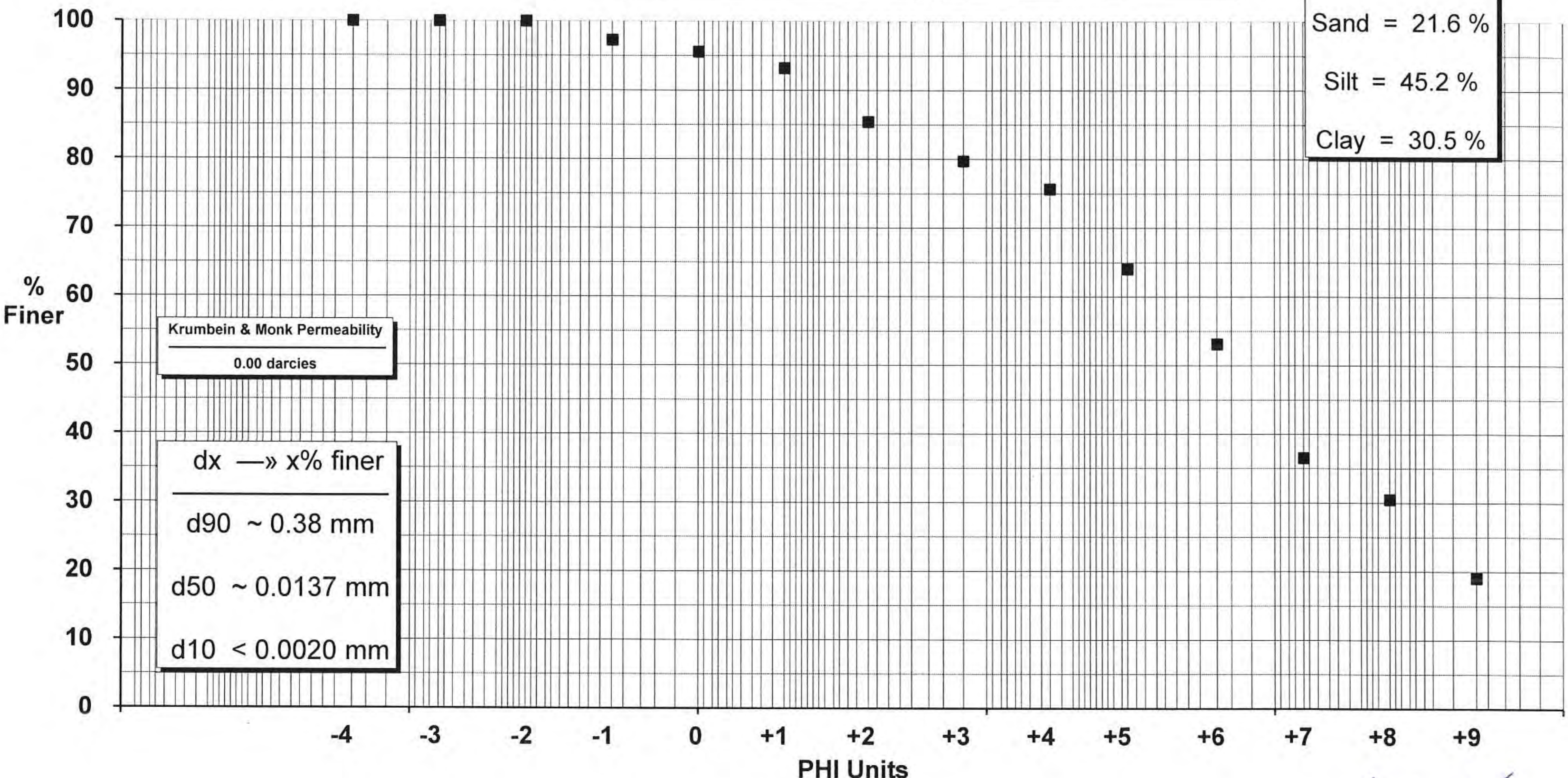
Approved

Maxxam ID: CXG670-01

SC-2-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
23.3 %	28.1 %

Wentworth	
Gravel	2.7 %
Sand	21.6 %
Silt	45.2 %
Clay	30.5 %



Krumbein & Monk Permeability: 0.00 darcies

dx —» x% finer	
d90	~ 0.38 mm
d50	~ 0.0137 mm
d10	< 0.0020 mm

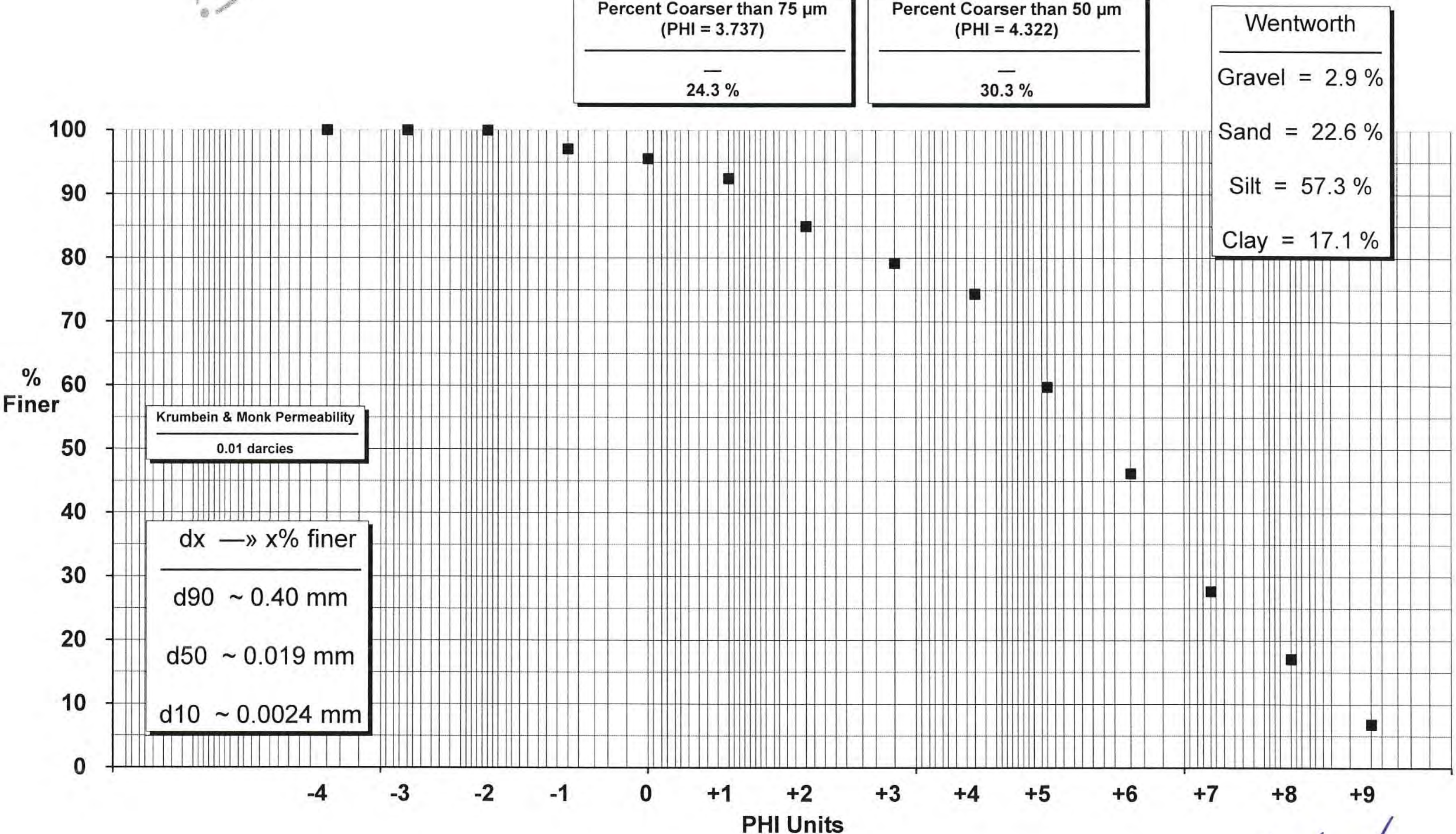
Approved

Maxxam

Maxxam ID: CXG671-01

SC-2-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
24.3 %	30.3 %



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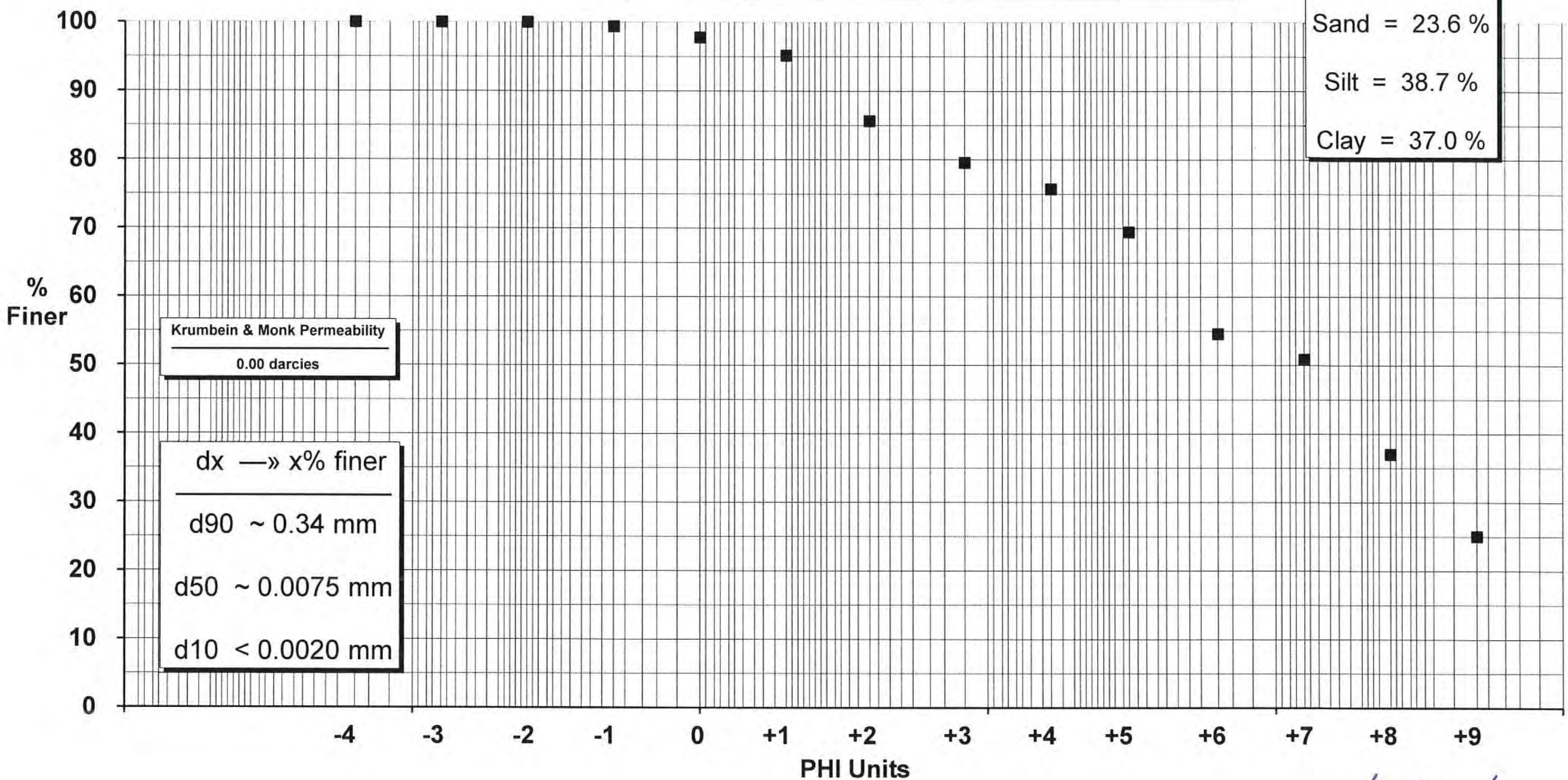
Maxxam

Maxxam ID: CXG672-01

SC-2-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
23.2 %	26.3 %

Wentworth
Gravel = 0.6 %
Sand = 23.6 %
Silt = 38.7 %
Clay = 37.0 %



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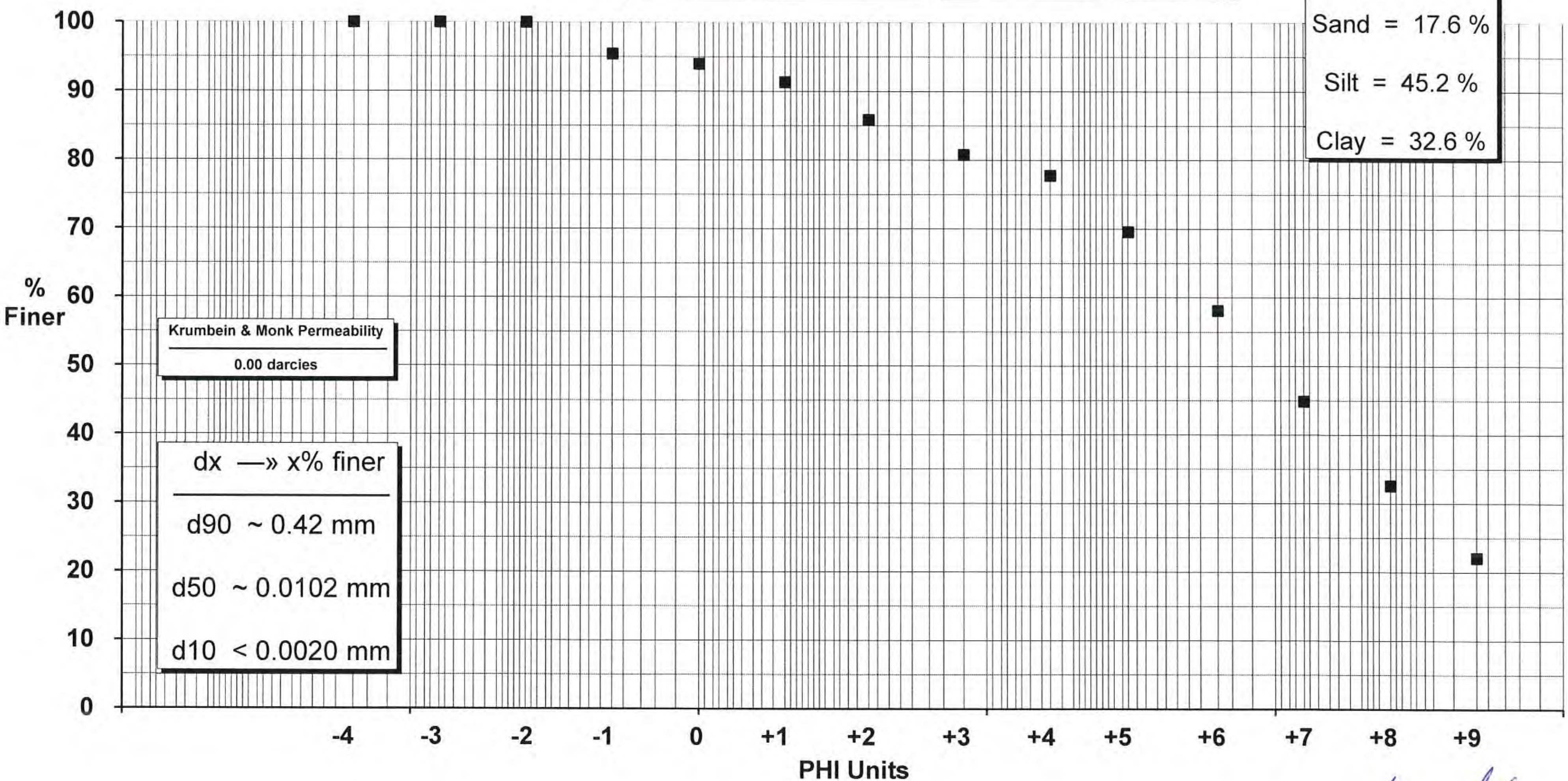
Maxxam ID: CXG673-01

SC-3-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
21.4 %	24.8 %

Wentworth	
Gravel = 4.6 %	
Sand = 17.6 %	
Silt = 45.2 %	
Clay = 32.6 %	



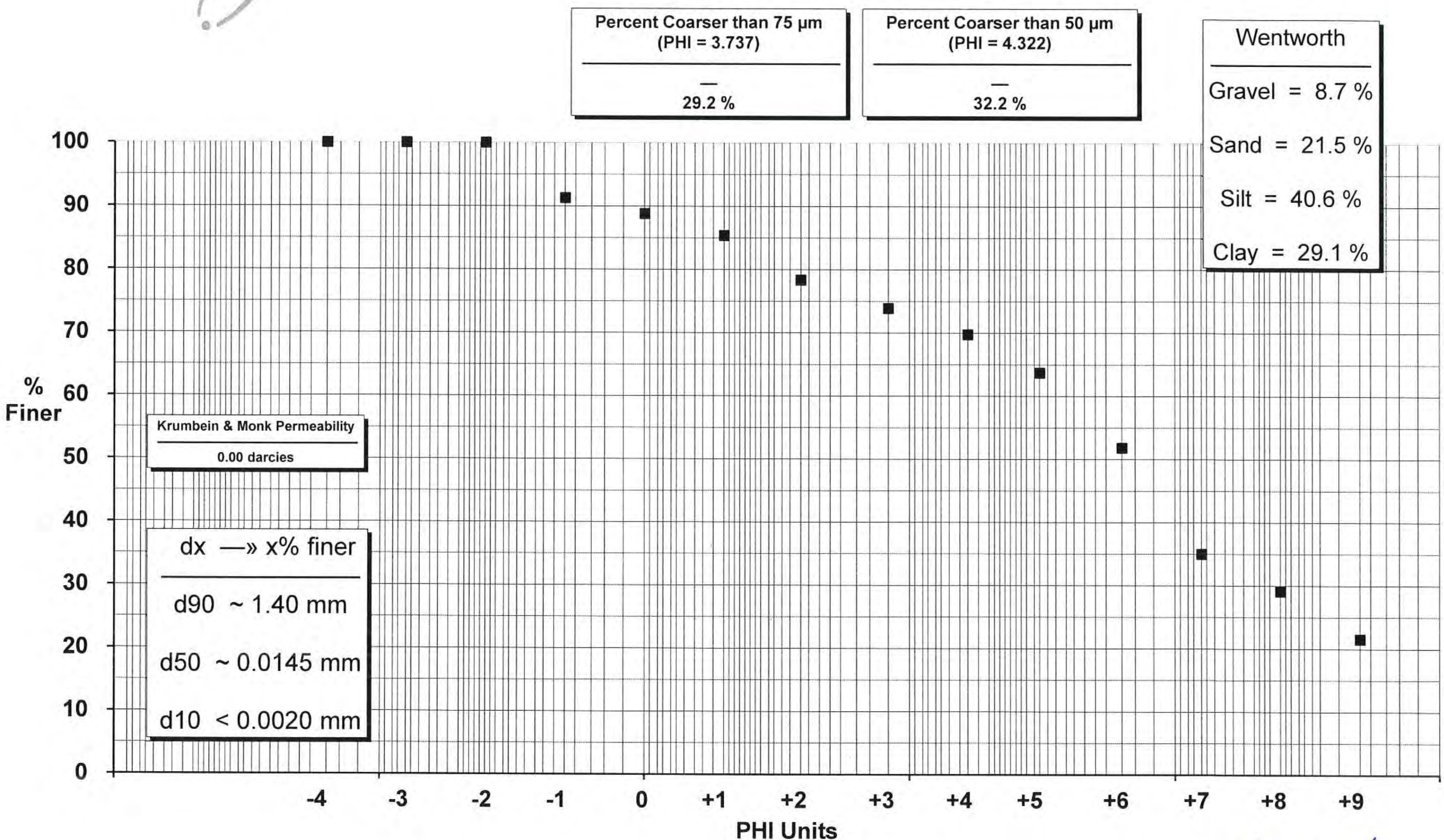
Krumbein & Monk Permeability
0.00 darcies

dx —» x% finer
d90 ~ 0.42 mm
d50 ~ 0.0102 mm
d10 < 0.0020 mm

Approved

Maxxam ID: CXG674-01

SC-3-2



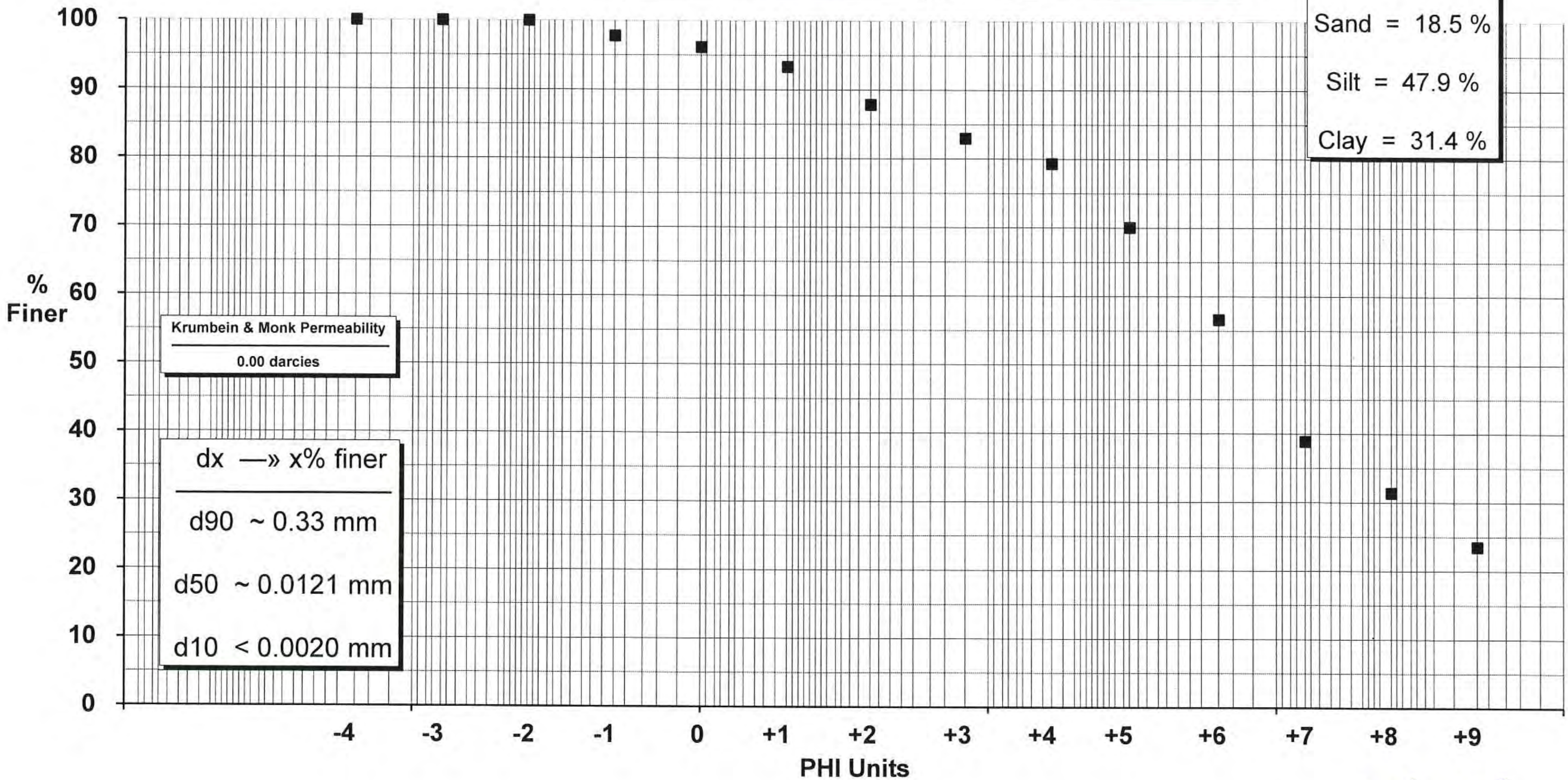
Approved

Maxxam

Maxxam ID: CXG694-01

SC-3-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
19.7 %	23.6 %



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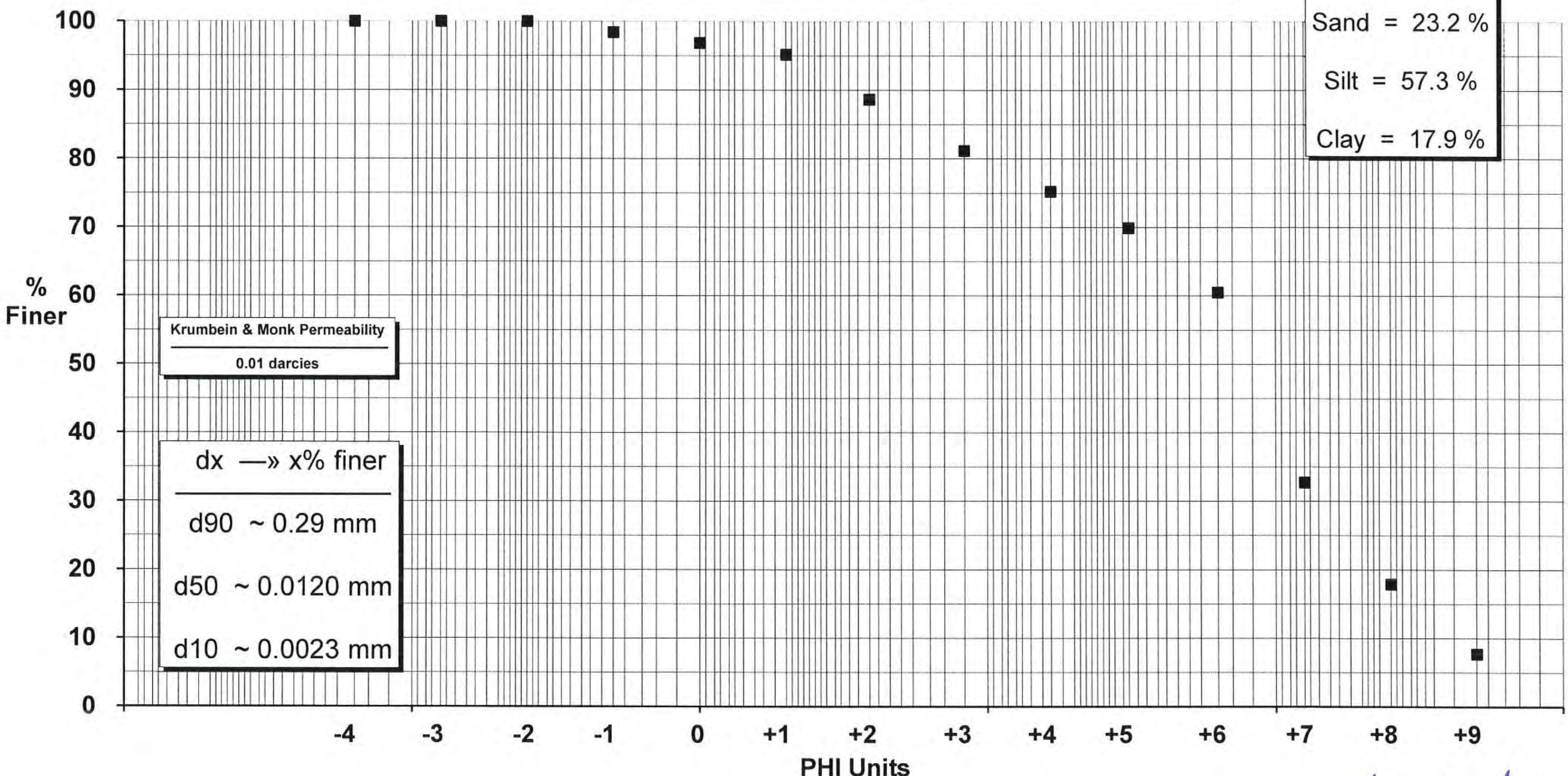
Maxxam ID: CXG695-01

SC-4-1

Percent Coarser than 75 µm (PHI = 3.737)
23.2 %

Percent Coarser than 50 µm (PHI = 4.322)
26.5 %

Wentworth
Gravel = 1.6 %
Sand = 23.2 %
Silt = 57.3 %
Clay = 17.9 %



Approved

Maxxam

Maxxam ID: CXG696-01

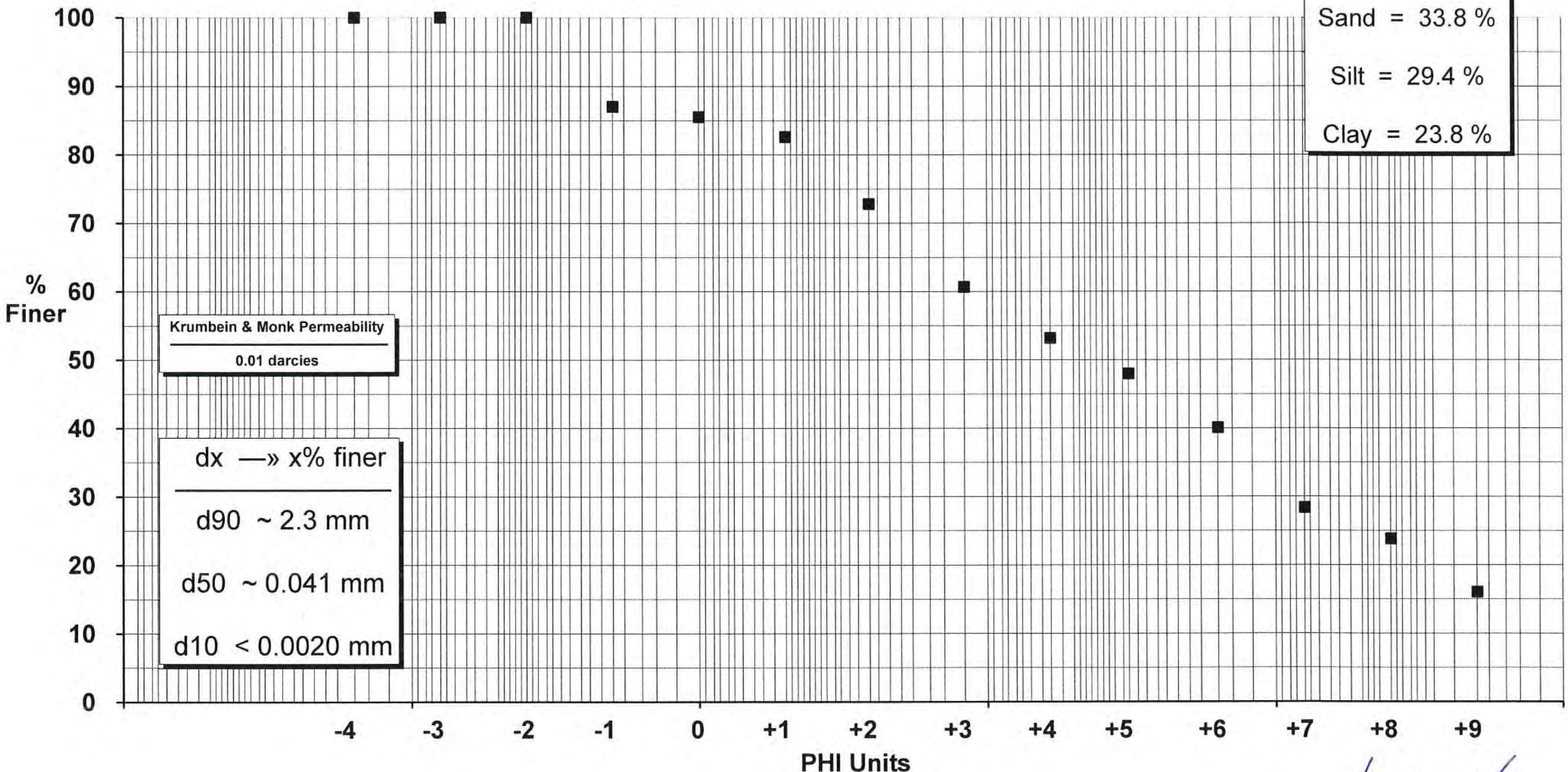
SC-4-2

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
44.8 %	48.5 %

Wentworth
Gravel = 13.0 %
Sand = 33.8 %
Silt = 29.4 %
Clay = 23.8 %

Krumbein & Monk Permeability
0.01 darcies

dx —» x% finer
d90 ~ 2.3 mm
d50 ~ 0.041 mm
d10 < 0.0020 mm



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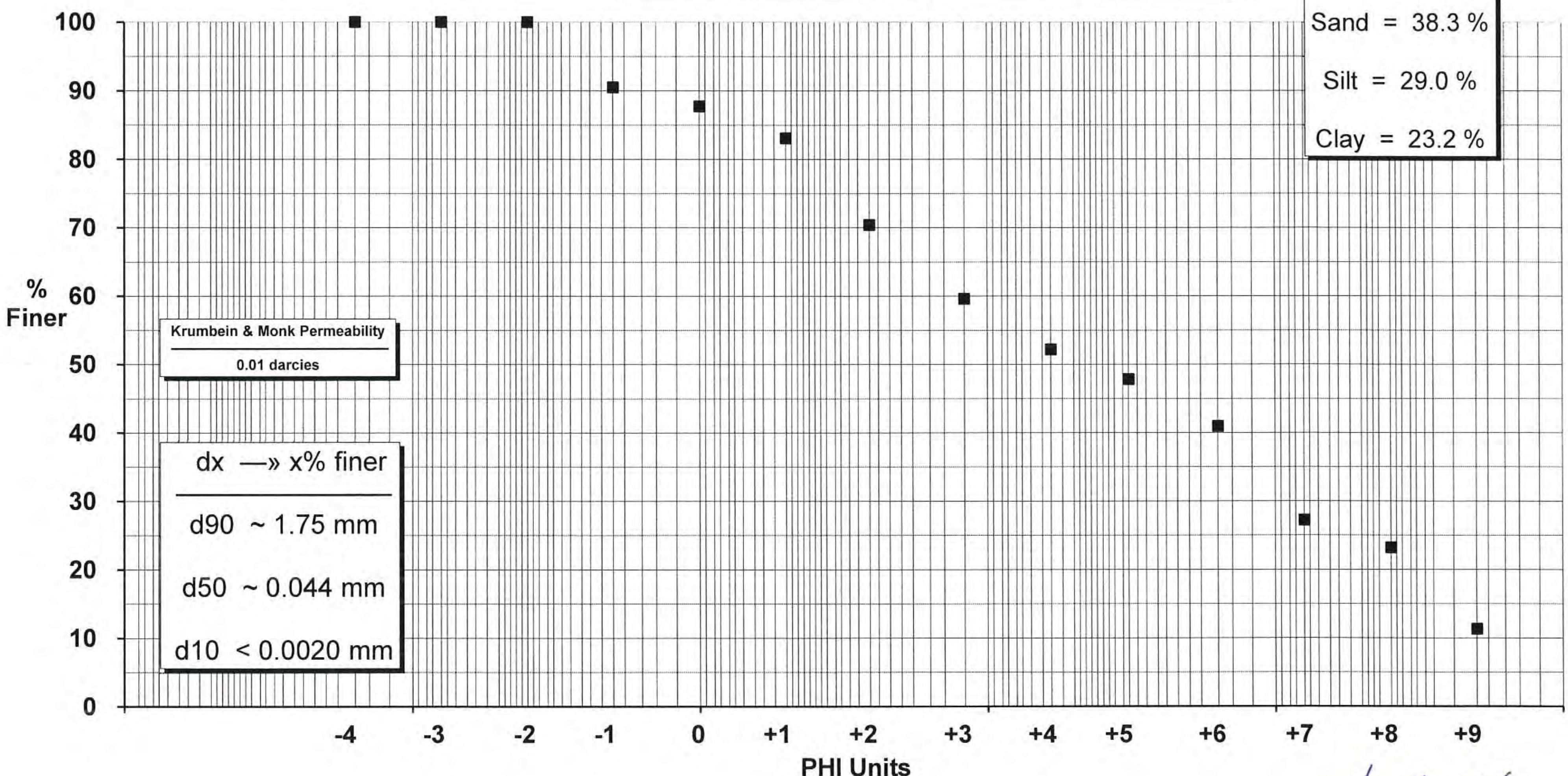
Maxxam ID: CXG697-01

SC-4-3

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
45.9 %	49.2 %

Wentworth
Gravel = 9.5 %
Sand = 38.3 %
Silt = 29.0 %
Clay = 23.2 %



Krumbein & Monk Permeability
0.01 darcies

dx —» x% finer
d90 ~ 1.75 mm
d50 ~ 0.044 mm
d10 < 0.0020 mm

Approved

Maxxam ID: CXG698-01

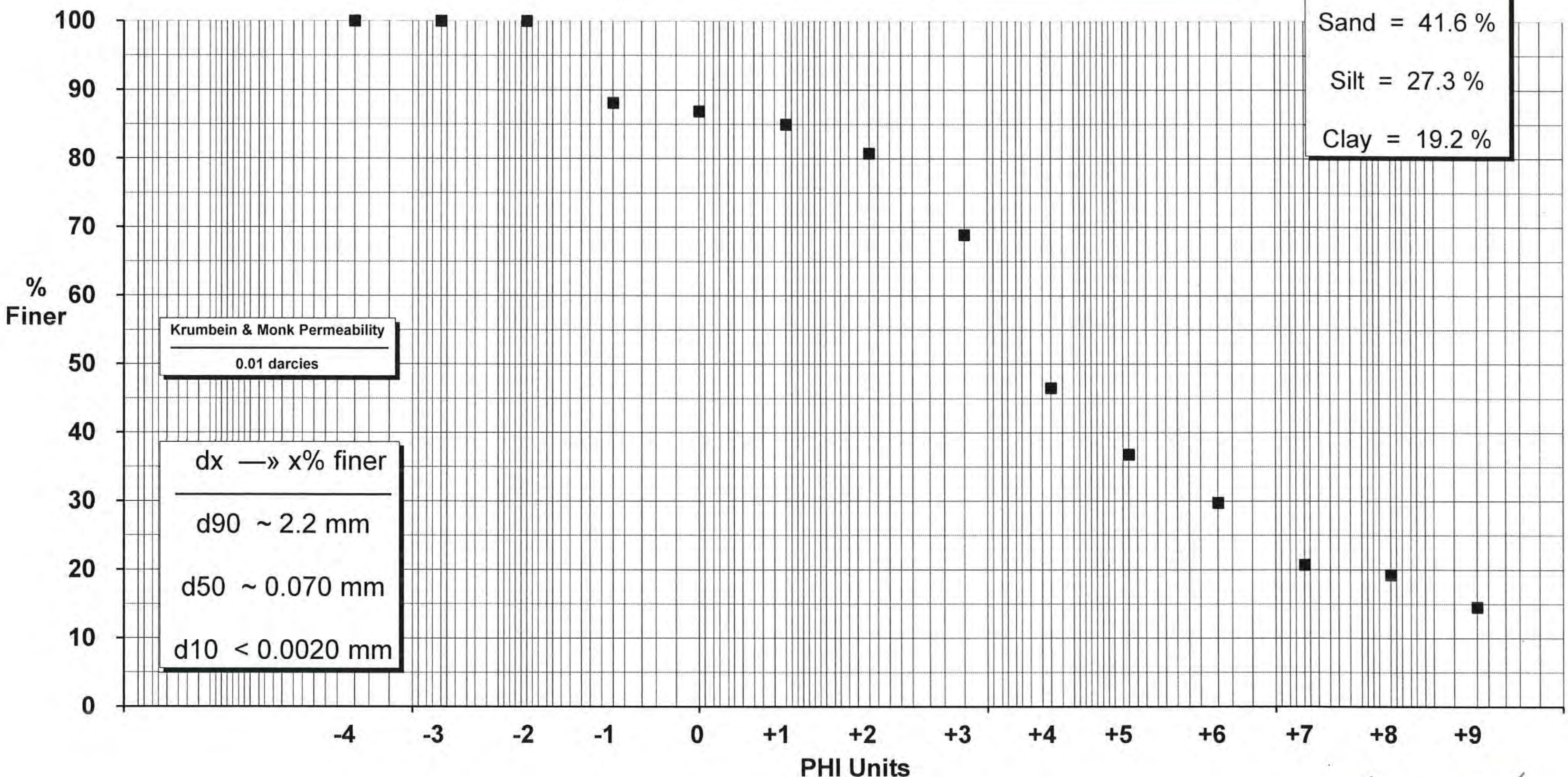
SC-5-1

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
47.6 %	56.6 %

Wentworth
Gravel = 11.9 %
Sand = 41.6 %
Silt = 27.3 %
Clay = 19.2 %

Krumbein & Monk Permeability
0.01 darcies

dx —» x% finer
d90 ~ 2.2 mm
d50 ~ 0.070 mm
d10 < 0.0020 mm



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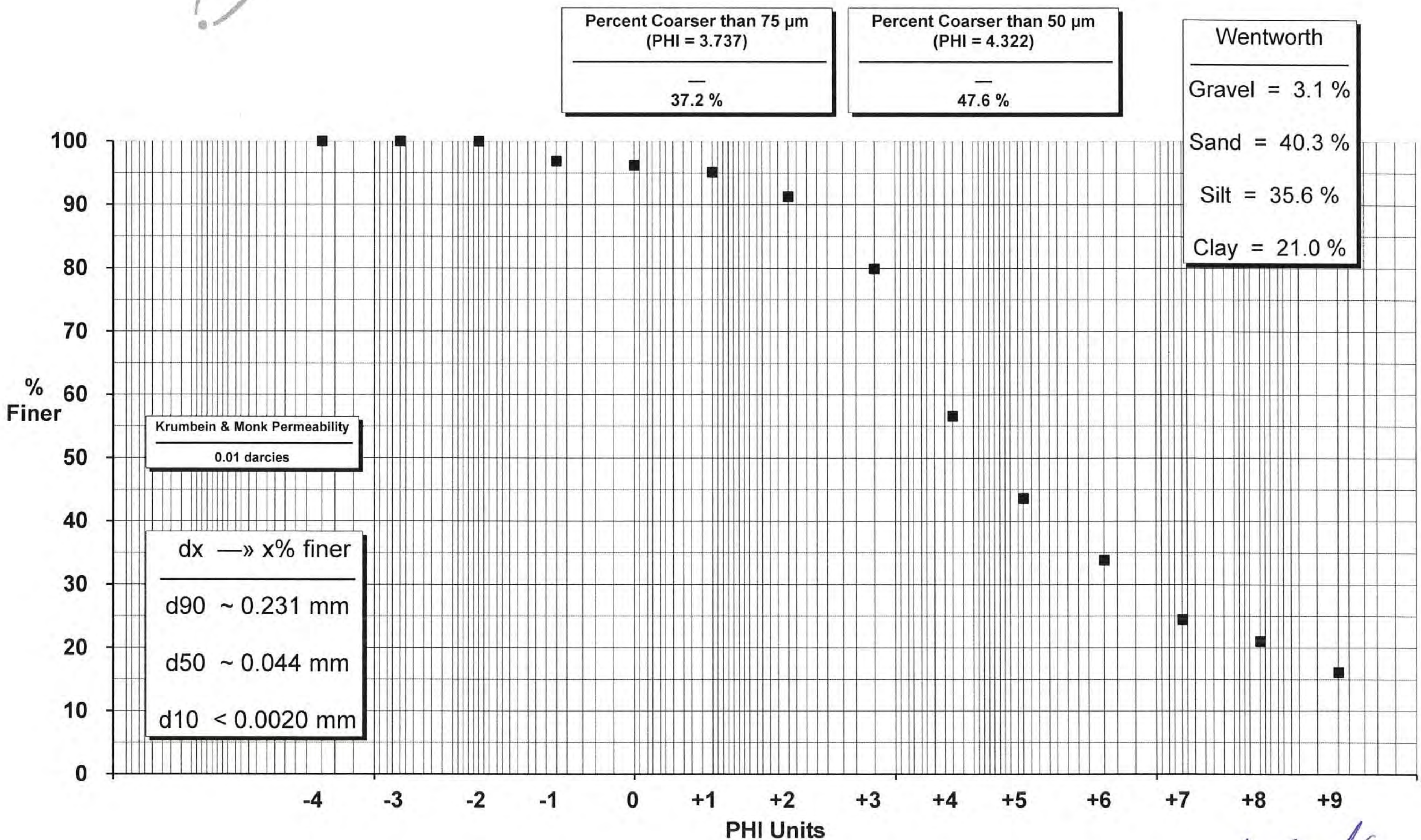
Maxxam ID: CXG699-01

SC-5-2



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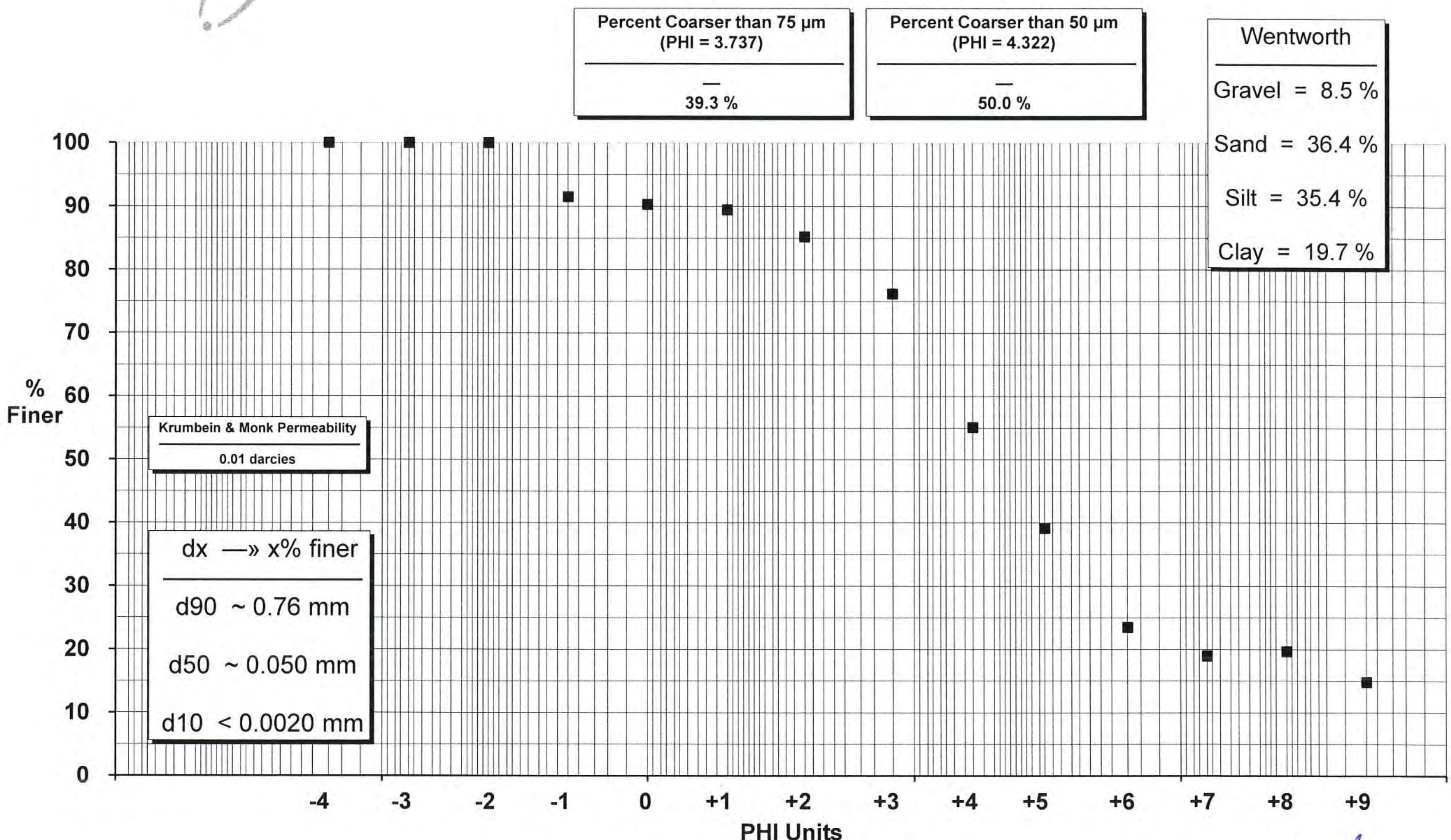
Maxxam ID: CXG700-01

SC-5-3



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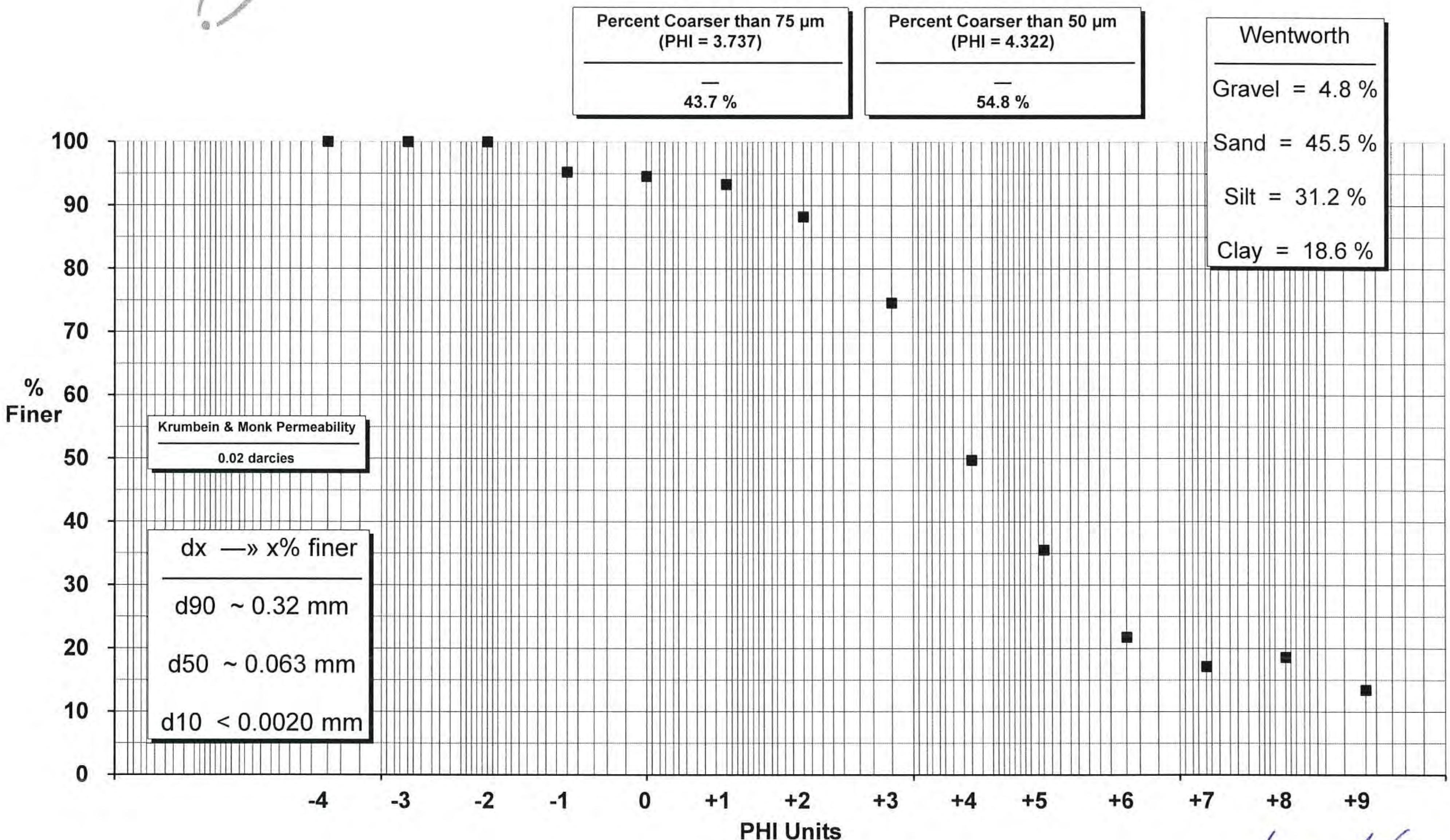
Maxxam ID: CXG700-01:D1

SC-5-3 :D1

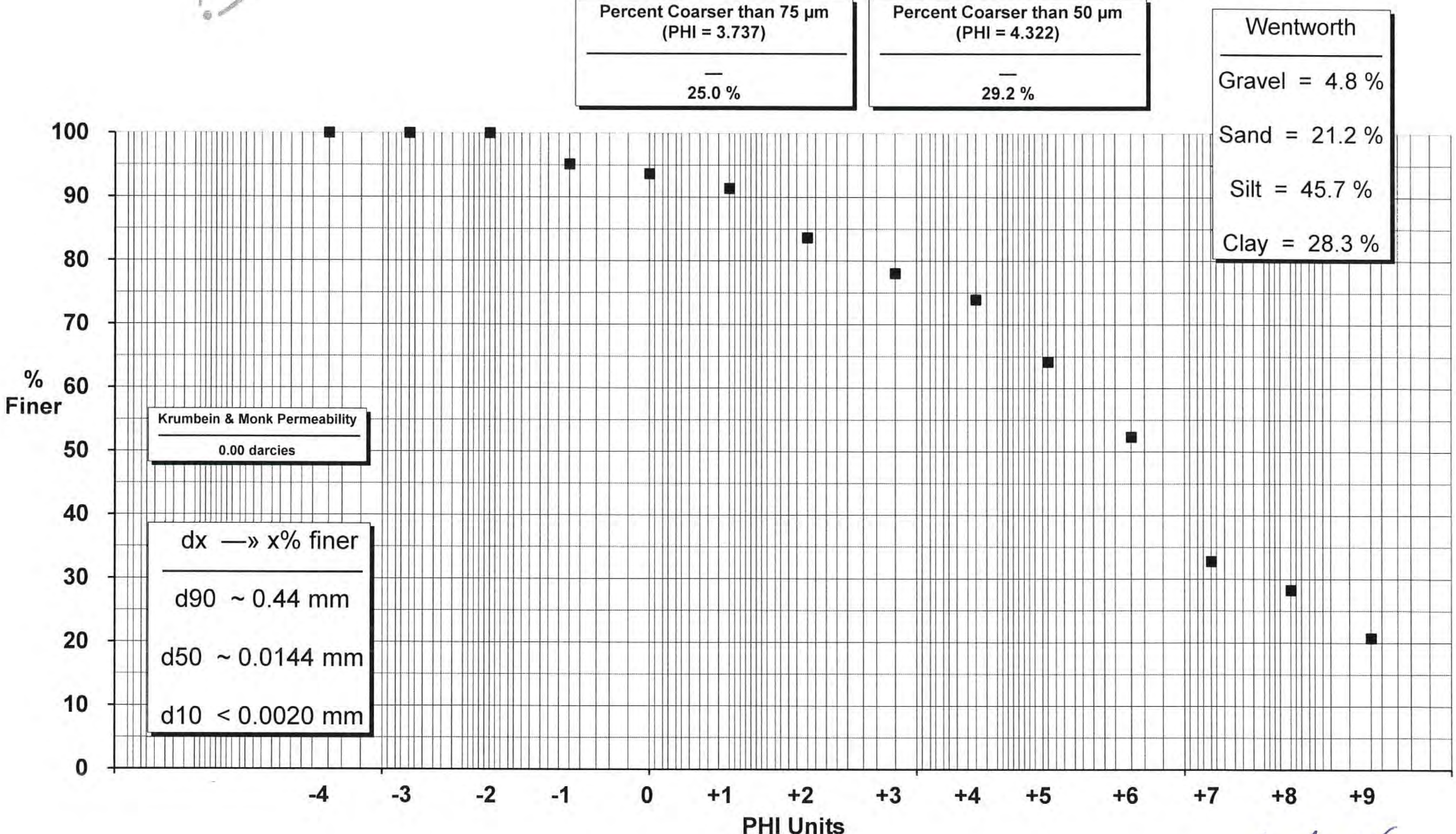


Approved

Maxxam ID: CXG701-01

SC-2-1Q

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
25.0 %	29.2 %



Approved

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A Bureau Veritas Group Company

Success Through Science®

Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Your C.O.C. #: 560250-01-01

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2016/08/17
Report #: R4118790
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6G8628
Received: 2016/08/09, 10:34

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide	6	N/A	2016/08/12	N/A	SM 22 4500-CO2 D
Alkalinity	6	N/A	2016/08/15	ATL SOP 00013	EPA 310.2 R1974 m
Chloride	6	N/A	2016/08/16	ATL SOP 00014	SM 22 4500-Cl- E m
Colour	6	N/A	2016/08/15	ATL SOP 00020	SM 22 2120C m
Conductance - water	5	N/A	2016/08/12	ATL SOP 00004	SM 22 2510B m
Conductance - water	1	N/A	2016/08/16	ATL SOP 00004	SM 22 2510B m
TEH in Water (PIRI)	6	2016/08/11	2016/08/12	ATL SOP 00113	Atl. RBCA v3 m
Hardness (calculated as CaCO3)	6	N/A	2016/08/16	ATL SOP 00048	SM 22 2340 B
Mercury - Total (CVAA,LL)	6	2016/08/11	2016/08/12	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS	5	2016/08/15	2016/08/15	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS	1	2016/08/15	2016/08/16	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference)	5	N/A	2016/08/16		Auto Calc.
Ion Balance (% Difference)	1	N/A	2016/08/17		Auto Calc.
Anion and Cation Sum	5	N/A	2016/08/16		Auto Calc.
Anion and Cation Sum	1	N/A	2016/08/17		Auto Calc.
Nitrogen Ammonia - water	6	N/A	2016/08/15	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	6	N/A	2016/08/16	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite	6	N/A	2016/08/15	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N)	6	N/A	2016/08/16	ATL SOP 00018	ASTM D3867
pH (1)	6	N/A	2016/08/12	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho	6	N/A	2016/08/15	ATL SOP 00021	EPA 365.2 m
VPH in Water (PIRI)	6	N/A	2016/08/12	ATL SOP 00118	Atl. RBCA v3 m
Sat. pH and Langelier Index (@ 20C)	5	N/A	2016/08/16	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C)	1	N/A	2016/08/17	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	5	N/A	2016/08/16	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	1	N/A	2016/08/17	ATL SOP 00049	Auto Calc.
Reactive Silica	6	N/A	2016/08/15	ATL SOP 00022	EPA 366.0 m
Sulphate	6	N/A	2016/08/16	ATL SOP 00023	ASTMD516-11 m
Total Dissolved Solids (TDS calc)	5	N/A	2016/08/16		Auto Calc.

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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Your C.O.C. #: 560250-01-01

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2016/08/17
Report #: R4118790
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6G8628
Received: 2016/08/09, 10:34

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Total Dissolved Solids (TDS calc)	1	N/A	2016/08/17		Auto Calc.
Organic carbon - Total (TOC) (2)	6	N/A	2016/08/12	ATL SOP 00037	SM 22 5310C m
ModTPH (T1) Calc. for Water	6	N/A	2016/08/12	N/A	Atl. RBCA v3 m
Total Suspended Solids	1	2016/08/11	2016/08/12	ATL SOP 00007	SM 22 2540D m
Turbidity	6	N/A	2016/08/14	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Maxxam
17 Aug 2016 12:57:02 -03:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B6G8628
Report Date: 2016/08/17

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Sampler Initials: LW

RESULTS OF ANALYSES OF WATER

Maxxam ID		CWB182	CWB182		CWB183	CWB184	CWB185		
Sampling Date		2016/08/01 14:06	2016/08/01 14:06		2016/08/01 14:25	2016/08/01 14:40	2016/08/01 14:50		
COC Number		560250-01-01	560250-01-01		560250-01-01	560250-01-01	560250-01-01		
	UNITS	W-1	W-1 Lab-Dup	QC Batch	W-2	W-3	W-4	RDL	QC Batch
Calculated Parameters									
Anion Sum	me/L	502		4615038	529	508	506	N/A	4615038
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	99		4615035	98	98	99	1.0	4615035
Calculated TDS	mg/L	29000		4615043	30000	29000	29000	1.0	4615043
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		4615035	ND	ND	ND	1.0	4615035
Cation Sum	me/L	512		4615038	517	514	520	N/A	4615038
Hardness (CaCO3)	mg/L	5500		4615036	5500	5500	5600	1.0	4615036
Ion Balance (% Difference)	%	1.00		4615037	1.15	0.580	1.37	N/A	4615037
Langelier Index (@ 20C)	N/A	0.652		4615041	0.684	0.612	0.698		4615041
Langelier Index (@ 4C)	N/A	0.413		4615042	0.445	0.373	0.459		4615042
Nitrate (N)	mg/L	ND		4615039	ND	ND	ND	0.050	4615039
Saturation pH (@ 20C)	N/A	7.27		4615041	7.26	7.27	7.26		4615041
Saturation pH (@ 4C)	N/A	7.51		4615042	7.50	7.51	7.50		4615042
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	100	99	4615169	99	99	100	5.0	4615169
Dissolved Chloride (Cl)	mg/L	17000	16000	4615172	17000	17000	17000	120	4615172
Colour	TCU	ND	ND	4615179	ND	ND	ND	5.0	4615179
Nitrate + Nitrite (N)	mg/L	ND	ND	4615182	ND	ND	ND	0.050	4615182
Nitrite (N)	mg/L	ND	ND	4615184	ND	ND	ND	0.010	4615184
Nitrogen (Ammonia Nitrogen)	mg/L	0.082		4615253	0.11	0.21	0.19	0.050	4615253
Total Organic Carbon (C)	mg/L	ND (1)		4616939	ND (1)	ND (1)	ND (1)	5.0	4617020
Orthophosphate (P)	mg/L	0.020	0.019	4615181	0.018	0.016	0.017	0.010	4615181
pH	pH	7.92		4616762	7.94	7.88	7.96	N/A	4616762
Reactive Silica (SiO2)	mg/L	ND	ND	4615178	ND	ND	ND	0.50	4615178
Total Suspended Solids	mg/L				ND			2.0	4615130
Dissolved Sulphate (SO4)	mg/L	1500	1700	4615177	1900	1800	1800	240	4615177
Turbidity	NTU	0.49	0.48	4619059	0.78	0.32	0.17	0.10	4619060
Conductivity	uS/cm	47000		4616764	47000	47000	47000	1.0	4616764

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.

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Maxxam Job #: B6G8628
Report Date: 2016/08/17

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Sampler Initials: LW

RESULTS OF ANALYSES OF WATER

Maxxam ID		CWB186			CWB187		
Sampling Date		2016/08/01 15:00			2016/08/01 15:15		
COC Number		560250-01-01			560250-01-01		
	UNITS	W-5	RDL	QC Batch	W-6	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L	486	N/A	4615038	0.00	N/A	4615038
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	99	1.0	4615035	ND	1.0	4615035
Calculated TDS	mg/L	29000	1.0	4615043	1.0	1.0	4615043
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4615035	ND	1.0	4615035
Cation Sum	me/L	514	N/A	4615038	0.0200	N/A	4615038
Hardness (CaCO3)	mg/L	5500	1.0	4615036	ND	1.0	4615036
Ion Balance (% Difference)	%	2.83	N/A	4615037	100	N/A	4615037
Langelier Index (@ 20C)	N/A	0.669		4615041	NC		4615041
Langelier Index (@ 4C)	N/A	0.430		4615042	NC		4615042
Nitrate (N)	mg/L	0.058	0.050	4615039	ND	0.050	4615039
Saturation pH (@ 20C)	N/A	7.27		4615041	NC		4615041
Saturation pH (@ 4C)	N/A	7.51		4615042	NC		4615042
Inorganics							
Total Alkalinity (Total as CaCO3)	mg/L	99	5.0	4615169	ND	5.0	4615197
Dissolved Chloride (Cl)	mg/L	16000	120	4615172	ND	1.0	4615198
Colour	TCU	ND	5.0	4615179	ND	5.0	4615203
Nitrate + Nitrite (N)	mg/L	0.058	0.050	4615182	ND	0.050	4615205
Nitrite (N)	mg/L	ND	0.010	4615184	ND	0.010	4615208
Nitrogen (Ammonia Nitrogen)	mg/L	0.16	0.050	4615253	ND	0.050	4615253
Total Organic Carbon (C)	mg/L	ND (1)	5.0	4617020	ND	0.50	4617020
Orthophosphate (P)	mg/L	0.018	0.010	4615181	ND	0.010	4615204
pH	pH	7.94	N/A	4616762	7.66	N/A	4616762
Reactive Silica (SiO2)	mg/L	ND	0.50	4615178	0.73	0.50	4615200
Dissolved Sulphate (SO4)	mg/L	1800	240	4615177	ND	2.0	4615199
Turbidity	NTU	0.32	0.10	4619060	0.55	0.10	4619059
Conductivity	uS/cm	46000	1.0	4616764	2.8	1.0	4620855

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
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ND = Not detected
(1) Elevated reporting limit due to sample matrix.

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Maxxam Job #: B6G8628
Report Date: 2016/08/17

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Sampler Initials: LW

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		CWB182	CWB182	CWB183	CWB184	CWB185	CWB186		
Sampling Date		2016/08/01 14:06	2016/08/01 14:06	2016/08/01 14:25	2016/08/01 14:40	2016/08/01 14:50	2016/08/01 15:00		
COC Number		560250-01-01	560250-01-01	560250-01-01	560250-01-01	560250-01-01	560250-01-01		
	UNITS	**W-1**	**W-1 Lab-Dup**	**W-2**	**W-3**	**W-4**	**W-5**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	4615481

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

Maxxam ID		CWB187		
Sampling Date		2016/08/01 15:15		
COC Number		560250-01-01		
	UNITS	**W-6**	**RDL**	**QC Batch**
Metals				
Total Mercury (Hg)	ug/L	ND	0.013	4615481

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B6G8628
Report Date: 2016/08/17

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Sampler Initials: LW

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		CWB182	CWB183	CWB184	CWB185	CWB186		CWB187		
Sampling Date		2016/08/01 14:06	2016/08/01 14:25	2016/08/01 14:40	2016/08/01 14:50	2016/08/01 15:00		2016/08/01 15:15		
COC Number		560250-01-01	560250-01-01	560250-01-01	560250-01-01	560250-01-01		560250-01-01		
	UNITS	**W-1**	**W-2**	**W-3**	**W-4**	**W-5**	**RDL**	**W-6**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	ND	ND	ND	ND	ND	50	16	5.0	4619290
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	10	ND	1.0	4619290
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	10	ND	1.0	4619290
Total Barium (Ba)	ug/L	ND	ND	ND	10	ND	10	1.8	1.0	4619290
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	10	ND	1.0	4619290
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Boron (B)	ug/L	4300	4300	4300	4400	4400	500	ND	50	4619290
Total Cadmium (Cd)	ug/L	ND	ND	ND	0.14	ND	0.10	ND	0.010	4619290
Total Calcium (Ca)	ug/L	370000	370000	380000	380000	380000	1000	120	100	4619290
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	10	ND	1.0	4619290
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	4.0	ND	0.40	4619290
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Iron (Fe)	ug/L	ND	ND	ND	ND	ND	500	ND	50	4619290
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	5.0	ND	0.50	4619290
Total Magnesium (Mg)	ug/L	1100000	1100000	1100000	1100000	1100000	1000	ND	100	4619290
Total Manganese (Mn)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	1000	ND	100	4619290
Total Potassium (K)	ug/L	350000	350000	350000	360000	350000	1000	ND	100	4619290
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	10	ND	1.0	4619290
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	1.0	ND	0.10	4619290
Total Sodium (Na)	ug/L	9000000	9100000	9100000	9200000	9100000	1000	300	100	4619290
Total Strontium (Sr)	ug/L	7000	7000	6900	7000	6900	20	ND	2.0	4619290
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	1.0	ND	0.10	4619290
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Uranium (U)	ug/L	2.9	3.2	3.0	3.1	3.2	1.0	ND	0.10	4619290
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	20	ND	2.0	4619290
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	50	7.4	5.0	4619290

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B6G8628
Report Date: 2016/08/17

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Sampler Initials: LW

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		CWB182		CWB183		CWB184		CWB185		
Sampling Date		2016/08/01 14:06		2016/08/01 14:25		2016/08/01 14:40		2016/08/01 14:50		
COC Number		560250-01-01		560250-01-01		560250-01-01		560250-01-01		
	UNITS	**W-1**	**RDL**	**W-2**	**RDL**	**W-3**	**RDL**	**W-4**	**RDL**	**QC Batch**
Petroleum Hydrocarbons										
Benzene	mg/L	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	4615120
Toluene	mg/L	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	4615120
Ethylbenzene	mg/L	ND	0.0010	ND	0.0010	ND	0.0010	ND	0.0010	4615120
Total Xylenes	mg/L	ND	0.0020	ND	0.0020	ND	0.0020	ND	0.0020	4615120
C6 - C10 (less BTEX)	mg/L	ND	0.010	ND	0.010	ND	0.010	ND	0.010	4615120
>C10-C16 Hydrocarbons	mg/L	ND (1)	0.054	ND (1)	0.060	ND (1)	0.061	ND (1)	0.069	4615147
>C16-C21 Hydrocarbons	mg/L	ND (1)	0.054	ND (1)	0.060	ND (1)	0.061	ND (1)	0.069	4615147
>C21-<C32 Hydrocarbons	mg/L	ND (1)	0.11	ND (1)	0.12	ND (1)	0.12	ND (1)	0.14	4615147
Modified TPH (Tier1)	mg/L	ND	0.11	ND	0.12	ND	0.12	ND	0.14	4613379
Reached Baseline at C32	mg/L	NA	N/A	NA	N/A	NA	N/A	NA	N/A	4615147
Hydrocarbon Resemblance	mg/L	NA	N/A	NA	N/A	NA	N/A	NA	N/A	4615147
Surrogate Recovery (%)										
Isobutylbenzene - Extractable	%	98		99		100		101		4615147
n-Dotriacontane - Extractable	%	95		117		124		129		4615147
Isobutylbenzene - Volatile	%	90		94		91		92		4615120

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to limited sample.

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Maxxam Job #: B6G8628
Report Date: 2016/08/17

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Sampler Initials: LW

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		CWB186		CWB187		
Sampling Date		2016/08/01 15:00		2016/08/01 15:15		
COC Number		560250-01-01		560250-01-01		
	UNITS	**W-5**	**RDL**	**W-6**	**RDL**	**QC Batch**
Petroleum Hydrocarbons						
Benzene	mg/L	ND	0.0010	ND	0.0010	4615120
Toluene	mg/L	ND	0.0010	ND	0.0010	4615120
Ethylbenzene	mg/L	ND	0.0010	ND	0.0010	4615120
Total Xylenes	mg/L	ND	0.0020	ND	0.0020	4615120
C6 - C10 (less BTEX)	mg/L	ND	0.010	ND	0.010	4615120
>C10-C16 Hydrocarbons	mg/L	ND (1)	0.060	ND (1)	0.053	4615147
>C16-C21 Hydrocarbons	mg/L	ND (1)	0.060	ND (1)	0.053	4615147
>C21-<C32 Hydrocarbons	mg/L	ND (1)	0.12	ND (1)	0.11	4615147
Modified TPH (Tier1)	mg/L	ND	0.12	ND	0.11	4613379
Reached Baseline at C32	mg/L	NA	N/A	NA	N/A	4615147
Hydrocarbon Resemblance	mg/L	NA	N/A	NA	N/A	4615147
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	100		92		4615147
n-Dotriacontane - Extractable	%	123		116		4615147
Isobutylbenzene - Volatile	%	89		100		4615120

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to limited sample.

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.7°C

Sample CWB182-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample CWB183-01 : Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. Used all of the sample provided, DL raised.

Elevated reporting limits for trace metals due to sample matrix.

Sample CWB184-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample CWB185-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample CWB186-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample CWB187-01 : Elevated reporting limits for trace metals due to sample matrix. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4615120	ASL	Matrix Spike	Isobutylbenzene - Volatile	2016/08/12		100	%	70 - 130
			Benzene	2016/08/12		109	%	70 - 130
			Toluene	2016/08/12		107	%	70 - 130
			Ethylbenzene	2016/08/12		108	%	70 - 130
			Total Xylenes	2016/08/12		107	%	70 - 130
4615120	ASL	Spiked Blank	Isobutylbenzene - Volatile	2016/08/12		104	%	70 - 130
			Benzene	2016/08/12		103	%	70 - 130
			Toluene	2016/08/12		100	%	70 - 130
			Ethylbenzene	2016/08/12		101	%	70 - 130
			Total Xylenes	2016/08/12		102	%	70 - 130
4615120	ASL	Method Blank	Isobutylbenzene - Volatile	2016/08/12		101	%	70 - 130
			Benzene	2016/08/12	ND, RDL=0.0010		mg/L	
			Toluene	2016/08/12	ND, RDL=0.0010		mg/L	
			Ethylbenzene	2016/08/12	ND, RDL=0.0010		mg/L	
			Total Xylenes	2016/08/12	ND, RDL=0.0020		mg/L	
			C6 - C10 (less BTEX)	2016/08/12	ND, RDL=0.010		mg/L	
4615120	ASL	RPD	Benzene	2016/08/12	NC		%	40
			Toluene	2016/08/12	NC		%	40
			Ethylbenzene	2016/08/12	NC		%	40
			Total Xylenes	2016/08/12	NC		%	40
			C6 - C10 (less BTEX)	2016/08/12	NC		%	40
4615130	MM9	QC Standard	Total Suspended Solids	2016/08/12		97	%	80 - 120
4615130	MM9	Method Blank	Total Suspended Solids	2016/08/12	ND, RDL=1.0		mg/L	
4615130	MM9	RPD	Total Suspended Solids	2016/08/12	12		%	25
4615147	KCR	Matrix Spike	Isobutylbenzene - Extractable	2016/08/12		101	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/12		85	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/12		115	%	70 - 130
			>C16-C21 Hydrocarbons	2016/08/12		94	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/12		NC	%	70 - 130
4615147	KCR	Spiked Blank	Isobutylbenzene - Extractable	2016/08/12		100	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/12		110	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/12		101	%	70 - 130
			>C16-C21 Hydrocarbons	2016/08/12		96	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/12		121	%	70 - 130
4615147	KCR	Method Blank	Isobutylbenzene - Extractable	2016/08/12		99	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/12		94	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/12	ND, RDL=0.050		mg/L	
			>C16-C21 Hydrocarbons	2016/08/12	ND, RDL=0.050		mg/L	
			>C21-<C32 Hydrocarbons	2016/08/12	ND, RDL=0.10		mg/L	
4615147	KCR	RPD	>C10-C16 Hydrocarbons	2016/08/12	NC		%	40
			>C16-C21 Hydrocarbons	2016/08/12	NC		%	40
			>C21-<C32 Hydrocarbons	2016/08/12	NC		%	40

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4615169	NRG	Matrix Spike [CWB182-01]	Total Alkalinity (Total as CaCO3)	2016/08/15		NC	%	80 - 120
4615169	NRG	Spiked Blank	Total Alkalinity (Total as CaCO3)	2016/08/15		111	%	80 - 120
4615169	NRG	Method Blank	Total Alkalinity (Total as CaCO3)	2016/08/15	ND, RDL=5.0		mg/L	
4615169	NRG	RPD [CWB182-01]	Total Alkalinity (Total as CaCO3)	2016/08/15	0.67		%	25
4615172	KBT	Matrix Spike [CWB182-01]	Dissolved Chloride (Cl)	2016/08/16		NC	%	80 - 120
4615172	KBT	QC Standard	Dissolved Chloride (Cl)	2016/08/16		110	%	N/A
4615172	KBT	Spiked Blank	Dissolved Chloride (Cl)	2016/08/16		106	%	80 - 120
4615172	KBT	Method Blank	Dissolved Chloride (Cl)	2016/08/16	ND, RDL=1.0		mg/L	
4615172	KBT	RPD [CWB182-01]	Dissolved Chloride (Cl)	2016/08/16	2.1		%	25
4615177	MCN	Matrix Spike [CWB182-01]	Dissolved Sulphate (SO4)	2016/08/16		NC	%	80 - 120
4615177	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2016/08/16		113	%	80 - 120
4615177	MCN	Method Blank	Dissolved Sulphate (SO4)	2016/08/16	ND, RDL=2.0		mg/L	
4615177	MCN	RPD [CWB182-01]	Dissolved Sulphate (SO4)	2016/08/16	14		%	25
4615178	MCN	Matrix Spike [CWB182-01]	Reactive Silica (SiO2)	2016/08/15		92	%	80 - 120
4615178	MCN	Spiked Blank	Reactive Silica (SiO2)	2016/08/15		98	%	80 - 120
4615178	MCN	Method Blank	Reactive Silica (SiO2)	2016/08/15	ND, RDL=0.50		mg/L	
4615178	MCN	RPD [CWB182-01]	Reactive Silica (SiO2)	2016/08/15	NC		%	25
4615179	MCN	Spiked Blank	Colour	2016/08/15		95	%	80 - 120
4615179	MCN	Method Blank	Colour	2016/08/15	ND, RDL=5.0		TCU	
4615179	MCN	RPD [CWB182-01]	Colour	2016/08/15	NC		%	20
4615181	MCN	Matrix Spike [CWB182-01]	Orthophosphate (P)	2016/08/15		90	%	80 - 120
4615181	MCN	Spiked Blank	Orthophosphate (P)	2016/08/15		98	%	80 - 120
4615181	MCN	Method Blank	Orthophosphate (P)	2016/08/15	ND, RDL=0.010		mg/L	
4615181	MCN	RPD [CWB182-01]	Orthophosphate (P)	2016/08/15	NC		%	25
4615182	MCN	Matrix Spike [CWB182-01]	Nitrate + Nitrite (N)	2016/08/16		98	%	80 - 120
4615182	MCN	Spiked Blank	Nitrate + Nitrite (N)	2016/08/16		94	%	80 - 120
4615182	MCN	Method Blank	Nitrate + Nitrite (N)	2016/08/16	ND, RDL=0.050		mg/L	
4615182	MCN	RPD [CWB182-01]	Nitrate + Nitrite (N)	2016/08/16	NC		%	25
4615184	MCN	Matrix Spike [CWB182-01]	Nitrite (N)	2016/08/15		100	%	80 - 120
4615184	MCN	Spiked Blank	Nitrite (N)	2016/08/15		99	%	80 - 120
4615184	MCN	Method Blank	Nitrite (N)	2016/08/15	ND, RDL=0.010		mg/L	
4615184	MCN	RPD [CWB182-01]	Nitrite (N)	2016/08/15	NC		%	25
4615197	NRG	Matrix Spike	Total Alkalinity (Total as CaCO3)	2016/08/15		NC	%	80 - 120
4615197	NRG	Spiked Blank	Total Alkalinity (Total as CaCO3)	2016/08/15		111	%	80 - 120

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4615197	NRG	Method Blank	Total Alkalinity (Total as CaCO3)	2016/08/15	ND, RDL=5.0		mg/L	
4615197	NRG	RPD	Total Alkalinity (Total as CaCO3)	2016/08/15	0.25		%	25
4615198	KBT	Matrix Spike	Dissolved Chloride (Cl)	2016/08/16		NC	%	80 - 120
4615198	KBT	QC Standard	Dissolved Chloride (Cl)	2016/08/16		107	%	80 - 120
4615198	KBT	Spiked Blank	Dissolved Chloride (Cl)	2016/08/16		107	%	80 - 120
4615198	KBT	Method Blank	Dissolved Chloride (Cl)	2016/08/16	ND, RDL=1.0		mg/L	
4615198	KBT	RPD	Dissolved Chloride (Cl)	2016/08/16	5.0		%	25
4615199	MCN	Matrix Spike	Dissolved Sulphate (SO4)	2016/08/16		107	%	80 - 120
4615199	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2016/08/16		109	%	80 - 120
4615199	MCN	Method Blank	Dissolved Sulphate (SO4)	2016/08/16	ND, RDL=2.0		mg/L	
4615199	MCN	RPD	Dissolved Sulphate (SO4)	2016/08/16	NC		%	25
4615200	MCN	Matrix Spike	Reactive Silica (SiO2)	2016/08/15		NC	%	80 - 120
4615200	MCN	Spiked Blank	Reactive Silica (SiO2)	2016/08/15		98	%	80 - 120
4615200	MCN	Method Blank	Reactive Silica (SiO2)	2016/08/15	ND, RDL=0.50		mg/L	
4615200	MCN	RPD	Reactive Silica (SiO2)	2016/08/15	0.086		%	25
4615203	MCN	Spiked Blank	Colour	2016/08/15		89	%	80 - 120
4615203	MCN	Method Blank	Colour	2016/08/15	ND, RDL=5.0		TCU	
4615203	MCN	RPD	Colour	2016/08/15	NC		%	20
4615204	MCN	Matrix Spike	Orthophosphate (P)	2016/08/15		92	%	80 - 120
4615204	MCN	Spiked Blank	Orthophosphate (P)	2016/08/15		92	%	80 - 120
4615204	MCN	Method Blank	Orthophosphate (P)	2016/08/15	ND, RDL=0.010		mg/L	
4615204	MCN	RPD	Orthophosphate (P)	2016/08/15	NC		%	25
4615205	MCN	Matrix Spike	Nitrate + Nitrite (N)	2016/08/16		94	%	80 - 120
4615205	MCN	Spiked Blank	Nitrate + Nitrite (N)	2016/08/16		98	%	80 - 120
4615205	MCN	Method Blank	Nitrate + Nitrite (N)	2016/08/16	ND, RDL=0.050		mg/L	
4615205	MCN	RPD	Nitrate + Nitrite (N)	2016/08/16	NC		%	25
4615208	MCN	Matrix Spike	Nitrite (N)	2016/08/15		94	%	80 - 120
4615208	MCN	Spiked Blank	Nitrite (N)	2016/08/15		97	%	80 - 120
4615208	MCN	Method Blank	Nitrite (N)	2016/08/15	ND, RDL=0.010		mg/L	
4615208	MCN	RPD	Nitrite (N)	2016/08/15	NC		%	25
4615253	NRG	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2016/08/15		92	%	80 - 120
4615253	NRG	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2016/08/15		96	%	80 - 120
4615253	NRG	Method Blank	Nitrogen (Ammonia Nitrogen)	2016/08/15	0.061, RDL=0.050		mg/L	
4615253	NRG	RPD	Nitrogen (Ammonia Nitrogen)	2016/08/15	NC		%	20
4615481	ARS	Matrix Spike [CWB183-06]	Total Mercury (Hg)	2016/08/12		98	%	80 - 120
4615481	ARS	Spiked Blank	Total Mercury (Hg)	2016/08/12		102	%	80 - 120
4615481	ARS	Method Blank	Total Mercury (Hg)	2016/08/12	ND, RDL=0.013		ug/L	
4615481	ARS	RPD [CWB182-06]	Total Mercury (Hg)	2016/08/12	NC		%	20
4616762	KMC	QC Standard	pH	2016/08/12		100	%	97 - 103
4616762	KMC	RPD	pH	2016/08/12	0.11		%	N/A

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4616764	KMC	Spiked Blank	Conductivity	2016/08/12		99	%	80 - 120
4616764	KMC	Method Blank	Conductivity	2016/08/12	2.9, RDL=1.0		uS/cm	
4616764	KMC	RPD	Conductivity	2016/08/12	1.1		%	25
4616939	SMT	Matrix Spike	Total Organic Carbon (C)	2016/08/12		100	%	80 - 120
4616939	SMT	Spiked Blank	Total Organic Carbon (C)	2016/08/12		105	%	80 - 120
4616939	SMT	Method Blank	Total Organic Carbon (C)	2016/08/12	ND, RDL=0.50		mg/L	
4616939	SMT	RPD	Total Organic Carbon (C)	2016/08/12	NC		%	20
4617020	SMT	Matrix Spike	Total Organic Carbon (C)	2016/08/12		104	%	80 - 120
4617020	SMT	Spiked Blank	Total Organic Carbon (C)	2016/08/12		112	%	80 - 120
4617020	SMT	Method Blank	Total Organic Carbon (C)	2016/08/12	ND, RDL=0.50		mg/L	
4617020	SMT	RPD	Total Organic Carbon (C)	2016/08/12	NC		%	20
4619059	KMC	QC Standard	Turbidity	2016/08/14		102	%	80 - 120
4619059	KMC	Spiked Blank	Turbidity	2016/08/14		101	%	80 - 120
4619059	KMC	Method Blank	Turbidity	2016/08/14	ND, RDL=0.10		NTU	
4619059	KMC	RPD [CWB182-01]	Turbidity	2016/08/14	NC		%	20
4619060	KMC	QC Standard	Turbidity	2016/08/14		102	%	80 - 120
4619060	KMC	Spiked Blank	Turbidity	2016/08/14		101	%	80 - 120
4619060	KMC	Method Blank	Turbidity	2016/08/14	ND, RDL=0.10		NTU	
4619060	KMC	RPD	Turbidity	2016/08/14	1.8		%	20
4619290	BAN	Matrix Spike	Total Aluminum (Al)	2016/08/15		105	%	80 - 120
			Total Antimony (Sb)	2016/08/15		106	%	80 - 120
			Total Arsenic (As)	2016/08/15		101	%	80 - 120
			Total Barium (Ba)	2016/08/15		98	%	80 - 120
			Total Beryllium (Be)	2016/08/15		106	%	80 - 120
			Total Bismuth (Bi)	2016/08/15		100	%	80 - 120
			Total Boron (B)	2016/08/15		107	%	80 - 120
			Total Cadmium (Cd)	2016/08/15		100	%	80 - 120
			Total Calcium (Ca)	2016/08/15		NC	%	80 - 120
			Total Chromium (Cr)	2016/08/15		98	%	80 - 120
			Total Cobalt (Co)	2016/08/15		100	%	80 - 120
			Total Copper (Cu)	2016/08/15		96	%	80 - 120
			Total Iron (Fe)	2016/08/15		100	%	80 - 120
			Total Lead (Pb)	2016/08/15		101	%	80 - 120
			Total Magnesium (Mg)	2016/08/15		NC	%	80 - 120
			Total Manganese (Mn)	2016/08/15		NC	%	80 - 120
			Total Molybdenum (Mo)	2016/08/15		108	%	80 - 120
			Total Nickel (Ni)	2016/08/15		97	%	80 - 120
			Total Phosphorus (P)	2016/08/15		109	%	80 - 120
			Total Potassium (K)	2016/08/15		104	%	80 - 120
			Total Selenium (Se)	2016/08/15		102	%	80 - 120
			Total Silver (Ag)	2016/08/15		101	%	80 - 120
			Total Sodium (Na)	2016/08/15		NC	%	80 - 120
			Total Strontium (Sr)	2016/08/15		NC	%	80 - 120
			Total Thallium (Tl)	2016/08/15		101	%	80 - 120
			Total Tin (Sn)	2016/08/15		107	%	80 - 120
			Total Titanium (Ti)	2016/08/15		108	%	80 - 120
			Total Uranium (U)	2016/08/15		106	%	80 - 120

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			Total Vanadium (V)	2016/08/15		103	%	80 - 120
			Total Zinc (Zn)	2016/08/15		95	%	80 - 120
4619290	BAN	Spiked Blank	Total Aluminum (Al)	2016/08/15		103	%	80 - 120
			Total Antimony (Sb)	2016/08/15		100	%	80 - 120
			Total Arsenic (As)	2016/08/15		98	%	80 - 120
			Total Barium (Ba)	2016/08/15		100	%	80 - 120
			Total Beryllium (Be)	2016/08/15		102	%	80 - 120
			Total Bismuth (Bi)	2016/08/15		102	%	80 - 120
			Total Boron (B)	2016/08/15		107	%	80 - 120
			Total Cadmium (Cd)	2016/08/15		98	%	80 - 120
			Total Calcium (Ca)	2016/08/15		102	%	80 - 120
			Total Chromium (Cr)	2016/08/15		100	%	80 - 120
			Total Cobalt (Co)	2016/08/15		101	%	80 - 120
			Total Copper (Cu)	2016/08/15		99	%	80 - 120
			Total Iron (Fe)	2016/08/15		100	%	80 - 120
			Total Lead (Pb)	2016/08/15		102	%	80 - 120
			Total Magnesium (Mg)	2016/08/15		103	%	80 - 120
			Total Manganese (Mn)	2016/08/15		100	%	80 - 120
			Total Molybdenum (Mo)	2016/08/15		103	%	80 - 120
			Total Nickel (Ni)	2016/08/15		100	%	80 - 120
			Total Phosphorus (P)	2016/08/15		106	%	80 - 120
			Total Potassium (K)	2016/08/15		103	%	80 - 120
			Total Selenium (Se)	2016/08/15		100	%	80 - 120
			Total Silver (Ag)	2016/08/15		99	%	80 - 120
			Total Sodium (Na)	2016/08/15		101	%	80 - 120
			Total Strontium (Sr)	2016/08/15		100	%	80 - 120
			Total Thallium (Tl)	2016/08/15		103	%	80 - 120
			Total Tin (Sn)	2016/08/15		103	%	80 - 120
			Total Titanium (Ti)	2016/08/15		106	%	80 - 120
			Total Uranium (U)	2016/08/15		105	%	80 - 120
			Total Vanadium (V)	2016/08/15		102	%	80 - 120
			Total Zinc (Zn)	2016/08/15		97	%	80 - 120
4619290	BAN	Method Blank	Total Aluminum (Al)	2016/08/15	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/08/15	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/08/15	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/08/15	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/08/15	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/08/15	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/08/15	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/08/15	ND, RDL=100		ug/L	

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			Total Chromium (Cr)	2016/08/15	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2016/08/15	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/08/15	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/08/15	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/08/15	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/08/15	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/08/15	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/08/15	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/08/15	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/08/15	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/08/15	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/08/15	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/08/15	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/08/15	ND, RDL=5.0		ug/L	
4619290	BAN	RPD	Total Aluminum (Al)	2016/08/15	NC		%	20
			Total Antimony (Sb)	2016/08/15	NC		%	20
			Total Arsenic (As)	2016/08/15	NC		%	20
			Total Barium (Ba)	2016/08/15	NC		%	20
			Total Beryllium (Be)	2016/08/15	NC		%	20
			Total Bismuth (Bi)	2016/08/15	NC		%	20
			Total Boron (B)	2016/08/15	NC		%	20
			Total Cadmium (Cd)	2016/08/15	NC		%	20

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			Total Calcium (Ca)	2016/08/15	NC		%	20
			Total Chromium (Cr)	2016/08/15	NC		%	20
			Total Cobalt (Co)	2016/08/15	NC		%	20
			Total Copper (Cu)	2016/08/15	NC		%	20
			Total Iron (Fe)	2016/08/15	NC		%	20
			Total Lead (Pb)	2016/08/15	NC		%	20
			Total Magnesium (Mg)	2016/08/15	NC		%	20
			Total Manganese (Mn)	2016/08/15	NC		%	20
			Total Molybdenum (Mo)	2016/08/15	NC		%	20
			Total Nickel (Ni)	2016/08/15	NC		%	20
			Total Phosphorus (P)	2016/08/15	NC		%	20
			Total Potassium (K)	2016/08/15	NC		%	20
			Total Selenium (Se)	2016/08/15	NC		%	20
			Total Silver (Ag)	2016/08/15	NC		%	20
			Total Sodium (Na)	2016/08/15	2.2		%	20
			Total Strontium (Sr)	2016/08/15	NC		%	20
			Total Thallium (Tl)	2016/08/15	NC		%	20
			Total Tin (Sn)	2016/08/15	NC		%	20
			Total Titanium (Ti)	2016/08/15	NC		%	20
			Total Uranium (U)	2016/08/15	NC		%	20
			Total Vanadium (V)	2016/08/15	NC		%	20
			Total Zinc (Zn)	2016/08/15	NC		%	20
4620855	JMV	Spiked Blank	Conductivity	2016/08/16		101	%	80 - 120
4620855	JMV	Method Blank	Conductivity	2016/08/16	1.1, RDL=1.0		uS/cm	
4620855	JMV	RPD	Conductivity	2016/08/16	0.89		%	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

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Maxxam Job #: B6G8628
Report Date: 2016/08/17

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Sampler Initials: LW

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Eric Dearman, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

Rosemarie MacDonald, Scientific Specialist (Organics)

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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

Attention:Claire Moore-Gibbons
SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560250-01-01, 560250-02-01, 560250-03-01

Report Date: 2016/08/25
Report #: R4133589
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H2785
Received: 2016/08/16, 10:40

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide (1)	5	N/A	2016/08/18	N/A	SM 22 4500-CO2 D
Alkalinity (1)	5	N/A	2016/08/22	ATL SOP 00013	EPA 310.2 R1974 m
Chloride (1)	5	N/A	2016/08/23	ATL SOP 00014	SM 22 4500-Cl- E m
Colour (1)	5	N/A	2016/08/23	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	5	N/A	2016/08/18	ATL SOP 00004	SM 22 2510B m
TEH in Water (PIRI) (1)	2	2016/08/18	2016/08/18	ATL SOP 00113	Atl. RBCA v3 m
TEH in Water (PIRI) (1)	3	2016/08/18	2016/08/19	ATL SOP 00113	Atl. RBCA v3 m
Hardness (calculated as CaCO3) (1)	2	N/A	2016/08/19	ATL SOP 00048	SM 22 2340 B
Hardness (calculated as CaCO3) (1)	3	N/A	2016/08/22	ATL SOP 00048	SM 22 2340 B
Mercury - Total (CVAA,LL) (1)	5	2016/08/17	2016/08/18	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS (1)	2	2016/08/17	2016/08/18	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS (1)	3	2016/08/18	2016/08/22	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	5	N/A	2016/08/25		Auto Calc.
Anion and Cation Sum (1)	5	N/A	2016/08/25		Auto Calc.
Total Ammonia-N (2)	5	N/A	2016/08/25	CAM SOP-00441	EPA GS I-2522-90 m
Nitrogen - Nitrate + Nitrite (1)	5	N/A	2016/08/23	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite (1)	5	N/A	2016/08/23	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N) (1)	5	N/A	2016/08/23	ATL SOP 00018	ASTM D3867
pH (1, 3)	5	N/A	2016/08/18	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho (1)	5	N/A	2016/08/23	ATL SOP 00021	EPA 365.2 m
VPH in Water (PIRI) (1)	5	N/A	2016/08/19	ATL SOP 00118	Atl. RBCA v3 m
Sat. pH and Langelier Index (@ 20C) (1)	5	N/A	2016/08/25	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	5	N/A	2016/08/25	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	5	N/A	2016/08/22	ATL SOP 00022	EPA 366.0 m
Sulphate (1)	5	N/A	2016/08/23	ATL SOP 00023	ASTMD516-11 m
Total Dissolved Solids (TDS calc) (1)	5	N/A	2016/08/25		Auto Calc.
Organic carbon - Total (TOC) (1, 4)	5	N/A	2016/08/22	ATL SOP 00037	SM 22 5310C m

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A Bureau Veritas Group Company

Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560250-01-01, 560250-02-01, 560250-03-01

Report Date: 2016/08/25
Report #: R4133589
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H2785
Received: 2016/08/16, 10:40

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
ModTPH (T1) Calc. for Water (1)	5	N/A	2016/08/19	N/A	Atl. RBCA v3 m
Total Suspended Solids (1)	5	2016/08/16	2016/08/17	ATL SOP 00007	SM 22 2540D m
Turbidity (1)	5	N/A	2016/08/18	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford
(2) This test was performed by Maxxam Analytics Mississauga
(3) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(4) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Maxxam
25 Aug 2016 18:08:05 -02:30

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
==
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Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

RBCA HYDROCARBONS IN WATER (WATER)

Maxxam ID		CWV310	CWV316	CWV317	CWV317	CWV326	CWV327		
Sampling Date		2016/08/09 16:20	2016/08/09 15:50	2016/08/09 14:45	2016/08/09 14:45	2016/08/09 16:40	2016/08/09 15:56		
COC Number		560250-01-01	560250-02-01	560250-02-01	560250-02-01	560250-03-01	560250-03-01		
	UNITS	**W-8**	**W-14**	**W-20**	**W-20 Lab-Dup**	**W-21**	**W-28**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	ND	ND	ND		ND	ND	0.0010	4623034
Toluene	mg/L	ND	ND	ND		ND	ND	0.0010	4623034
Ethylbenzene	mg/L	ND	ND	ND		ND	ND	0.0010	4623034
Total Xylenes	mg/L	ND	ND	ND		ND	ND	0.0020	4623034
C6 - C10 (less BTEX)	mg/L	ND	ND	ND		ND	ND	0.010	4623034
>C10-C16 Hydrocarbons	mg/L	ND	ND	ND	ND	ND	ND	0.050	4624663
>C16-C21 Hydrocarbons	mg/L	ND	ND	ND	ND	ND	ND	0.050	4624663
>C21-<C32 Hydrocarbons	mg/L	ND	ND	ND	ND	ND	ND	0.10	4624663
Modified TPH (Tier1)	mg/L	ND	ND	ND		ND	ND	0.10	4621575
Reached Baseline at C32	mg/L	NA	NA	NA		NA	NA	N/A	4624663
Hydrocarbon Resemblance	mg/L	NA	NA	NA		NA	NA	N/A	4624663
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	105	106	111	106	107	108		4624663
n-Dotriacontane - Extractable	%	115	114	128	126	124	117		4624663
Isobutylbenzene - Volatile	%	101	101	101		102	102		4623034

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected
N/A = Not Applicable

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Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CWV310			CWV316		CWV317		
Sampling Date		2016/08/09 16:20			2016/08/09 15:50		2016/08/09 14:45		
COC Number		560250-01-01			560250-02-01		560250-02-01		
	UNITS	W-8	RDL	QC Batch	W-14	RDL	W-20	RDL	QC Batch
Calculated Parameters									
Anion Sum	me/L	157	N/A	4621002	138	N/A	151	N/A	4621002
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	84	1.0	4621009	85	1.0	86	1.0	4621009
Calculated TDS	mg/L	9000	1.0	4621007	8200	1.0	9100	1.0	4621007
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4621009	ND	1.0	ND	1.0	4621009
Cation Sum	me/L	153	N/A	4621002	149	N/A	169	N/A	4621002
Hardness (CaCO3)	mg/L	1700	1.0	4621000	1600	1.0	1800	1.0	4621000
Ion Balance (% Difference)	%	1.27	N/A	4621001	3.65	N/A	5.82	N/A	4621001
Langelier Index (@ 20C)	N/A	0.0480		4621005	0.0700		-0.0290		4621005
Langelier Index (@ 4C)	N/A	-0.190		4621006	-0.168		-0.267		4621006
Nitrate (N)	mg/L	0.053	0.050	4621003	0.052	0.050	0.052	0.050	4621003
Saturation pH (@ 20C)	N/A	7.86		4621005	7.87		7.83		4621005
Saturation pH (@ 4C)	N/A	8.10		4621006	8.11		8.07		4621006
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	85	5.0	4629202	86	5.0	87	5.0	4629139
Dissolved Chloride (Cl)	mg/L	5000	100	4629206	4400	50	4700	100	4629144
Colour	TCU	ND	5.0	4629210	ND	5.0	ND	5.0	4629148
Nitrate + Nitrite (N)	mg/L	0.053	0.050	4629213	0.052	0.050	0.052	0.050	4629151
Nitrite (N)	mg/L	ND	0.010	4629214	ND	0.010	ND	0.010	4629152
Total Organic Carbon (C)	mg/L	0.92	0.50	4629324	0.74	0.50	ND (1)	5.0	4629324
Orthophosphate (P)	mg/L	0.011	0.010	4629212	0.011	0.010	ND	0.010	4629149
pH	pH	7.91	N/A	4624655	7.94	N/A	7.80	N/A	4624655
Reactive Silica (SiO2)	mg/L	0.70	0.50	4629209	0.70	0.50	0.67	0.50	4629147
Dissolved Sulphate (SO4)	mg/L	720	40	4629208	650	40	760	40	4629146
Turbidity	NTU	0.99	0.10	4624677	0.86	0.10	0.64	0.10	4624677
Conductivity	uS/cm	15000	1.0	4624656	14000	1.0	16000	1.0	4624656
Metals									
Total Aluminum (Al)	ug/L	21	5.0	4622989	24	5.0	25	5.0	4624681
Total Antimony (Sb)	ug/L	ND	1.0	4622989	ND	1.0	ND	1.0	4624681
Total Arsenic (As)	ug/L	ND	1.0	4622989	ND	1.0	ND	1.0	4624681
Total Barium (Ba)	ug/L	6.0	1.0	4622989	5.9	1.0	6.7	1.0	4624681
Total Beryllium (Be)	ug/L	ND	1.0	4622989	ND	1.0	ND	1.0	4624681
Total Bismuth (Bi)	ug/L	ND	2.0	4622989	ND	2.0	ND	2.0	4624681

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.

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Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CWV310			CWV316		CWV317		
Sampling Date		2016/08/09 16:20			2016/08/09 15:50		2016/08/09 14:45		
COC Number		560250-01-01			560250-02-01		560250-02-01		
	UNITS	W-8	RDL	QC Batch	W-14	RDL	W-20	RDL	QC Batch
Total Boron (B)	ug/L	1200	50	4622989	1100	50	1200	50	4624681
Total Cadmium (Cd)	ug/L	ND	0.010	4622989	0.017	0.010	0.018	0.010	4624681
Total Calcium (Ca)	ug/L	120000	100	4622989	110000	100	130000	100	4624681
Total Chromium (Cr)	ug/L	ND	1.0	4622989	ND	1.0	ND	1.0	4624681
Total Cobalt (Co)	ug/L	ND	0.40	4622989	ND	0.40	ND	0.40	4624681
Total Copper (Cu)	ug/L	ND	2.0	4622989	ND	2.0	ND	2.0	4624681
Total Iron (Fe)	ug/L	ND	50	4622989	ND	50	ND	50	4624681
Total Lead (Pb)	ug/L	ND	0.50	4622989	ND	0.50	ND	0.50	4624681
Total Magnesium (Mg)	ug/L	330000	1000	4622989	320000	1000	360000	1000	4624681
Total Manganese (Mn)	ug/L	ND	2.0	4622989	ND	2.0	ND	2.0	4624681
Total Molybdenum (Mo)	ug/L	3.1	2.0	4622989	3.1	2.0	3.3	2.0	4624681
Total Nickel (Ni)	ug/L	ND	2.0	4622989	ND	2.0	ND	2.0	4624681
Total Phosphorus (P)	ug/L	ND	100	4622989	ND	100	ND	100	4624681
Total Potassium (K)	ug/L	97000	100	4622989	90000	100	100000	100	4624681
Total Selenium (Se)	ug/L	ND	1.0	4622989	ND	1.0	ND	1.0	4624681
Total Silver (Ag)	ug/L	ND	0.10	4622989	ND	0.10	ND	0.10	4624681
Total Sodium (Na)	ug/L	2700000	1000	4622989	2600000	1000	3000000	1000	4624681
Total Strontium (Sr)	ug/L	2000	2.0	4622989	1800	2.0	2100	2.0	4624681
Total Thallium (Tl)	ug/L	ND	0.10	4622989	ND	0.10	ND	0.10	4624681
Total Tin (Sn)	ug/L	ND	2.0	4622989	ND	2.0	ND	2.0	4624681
Total Titanium (Ti)	ug/L	ND	2.0	4622989	ND	2.0	ND	2.0	4624681
Total Uranium (U)	ug/L	1.9	0.10	4622989	1.6	0.10	1.7	0.10	4624681
Total Vanadium (V)	ug/L	ND	2.0	4622989	ND	2.0	ND	2.0	4624681
Total Zinc (Zn)	ug/L	ND	5.0	4622989	5.3	5.0	25	5.0	4624681

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CWV326	CWV326			CWV327		
Sampling Date		2016/08/09 16:40	2016/08/09 16:40			2016/08/09 15:56		
COC Number		560250-03-01	560250-03-01			560250-03-01		
	UNITS	**W-21**	**W-21 Lab-Dup**	**RDL**	**QC Batch**	**W-28**	**RDL**	**QC Batch**
Calculated Parameters								
Anion Sum	me/L	161		N/A	4621002	138	N/A	4621002
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	85		1.0	4621009	87	1.0	4621009
Calculated TDS	mg/L	9700		1.0	4621007	8000	1.0	4621007
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		1.0	4621009	ND	1.0	4621009
Cation Sum	me/L	180		N/A	4621002	138	N/A	4621002
Hardness (CaCO3)	mg/L	1900		1.0	4621000	1500	1.0	4621000
Ion Balance (% Difference)	%	5.55		N/A	4621001	0.0600	N/A	4621001
Langelier Index (@ 20C)	N/A	0.0790			4621005	-0.0710		4621005
Langelier Index (@ 4C)	N/A	-0.159			4621006	-0.310		4621006
Nitrate (N)	mg/L	0.052		0.050	4621003	0.055	0.050	4621003
Saturation pH (@ 20C)	N/A	7.81			4621005	7.88		4621005
Saturation pH (@ 4C)	N/A	8.05			4621006	8.11		4621006
Inorganics								
Total Alkalinity (Total as CaCO3)	mg/L	85	86	5.0	4629139	87	5.0	4629139
Dissolved Chloride (Cl)	mg/L	5100	5300	100	4629144	4400	100	4629144
Colour	TCU	ND	ND	5.0	4629148	ND	5.0	4629148
Nitrate + Nitrite (N)	mg/L	0.052	0.060	0.050	4629151	0.055	0.050	4629151
Nitrite (N)	mg/L	ND	ND	0.010	4629152	ND	0.010	4629152
Total Organic Carbon (C)	mg/L	ND (1)		5.0	4629324	ND	0.50	4629324
Orthophosphate (P)	mg/L	0.012	0.012	0.010	4629149	ND	0.010	4629149
pH	pH	7.89		N/A	4624655	7.80	N/A	4624655
Reactive Silica (SiO2)	mg/L	0.60	0.60	0.50	4629147	0.73	0.50	4629147
Dissolved Sulphate (SO4)	mg/L	810	810	60	4629146	610	40	4629146
Turbidity	NTU	0.82		0.10	4624677	0.59	0.10	4624677
Conductivity	uS/cm	17000		1.0	4624656	13000	1.0	4624656
Metals								
Total Aluminum (Al)	ug/L	22		5.0	4622989	26	5.0	4624681
Total Antimony (Sb)	ug/L	ND		1.0	4622989	ND	1.0	4624681
Total Arsenic (As)	ug/L	ND		1.0	4622989	ND	1.0	4624681
Total Barium (Ba)	ug/L	6.1		1.0	4622989	6.1	1.0	4624681
Total Beryllium (Be)	ug/L	ND		1.0	4622989	ND	1.0	4624681

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CWV326	CWV326			CWV327		
Sampling Date		2016/08/09 16:40	2016/08/09 16:40			2016/08/09 15:56		
COC Number		560250-03-01	560250-03-01			560250-03-01		
	UNITS	W-21	W-21 Lab-Dup	RDL	QC Batch	W-28	RDL	QC Batch
Total Bismuth (Bi)	ug/L	ND		2.0	4622989	ND	2.0	4624681
Total Boron (B)	ug/L	1400		50	4622989	1000	50	4624681
Total Cadmium (Cd)	ug/L	0.013		0.010	4622989	0.011	0.010	4624681
Total Calcium (Ca)	ug/L	140000		100	4622989	110000	100	4624681
Total Chromium (Cr)	ug/L	ND		1.0	4622989	ND	1.0	4624681
Total Cobalt (Co)	ug/L	ND		0.40	4622989	ND	0.40	4624681
Total Copper (Cu)	ug/L	ND		2.0	4622989	ND	2.0	4624681
Total Iron (Fe)	ug/L	ND		50	4622989	ND	50	4624681
Total Lead (Pb)	ug/L	ND		0.50	4622989	ND	0.50	4624681
Total Magnesium (Mg)	ug/L	390000		1000	4622989	290000	1000	4624681
Total Manganese (Mn)	ug/L	ND		2.0	4622989	ND	2.0	4624681
Total Molybdenum (Mo)	ug/L	3.6		2.0	4622989	2.8	2.0	4624681
Total Nickel (Ni)	ug/L	ND		2.0	4622989	ND	2.0	4624681
Total Phosphorus (P)	ug/L	ND		100	4622989	ND	100	4624681
Total Potassium (K)	ug/L	120000		1000	4622989	86000	100	4624681
Total Selenium (Se)	ug/L	ND		1.0	4622989	ND	1.0	4624681
Total Silver (Ag)	ug/L	ND		0.10	4622989	ND	0.10	4624681
Total Sodium (Na)	ug/L	3200000		1000	4622989	2400000	1000	4624681
Total Strontium (Sr)	ug/L	2400		2.0	4622989	1700	2.0	4624681
Total Thallium (Tl)	ug/L	ND		0.10	4622989	ND	0.10	4624681
Total Tin (Sn)	ug/L	ND		2.0	4622989	ND	2.0	4624681
Total Titanium (Ti)	ug/L	2.6		2.0	4622989	ND	2.0	4624681
Total Uranium (U)	ug/L	1.8		0.10	4622989	1.7	0.10	4624681
Total Vanadium (V)	ug/L	ND		2.0	4622989	ND	2.0	4624681
Total Zinc (Zn)	ug/L	ND		5.0	4622989	ND	5.0	4624681

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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RESULTS OF ANALYSES OF WATER

Maxxam ID		CWV310		CWV316	CWV316	CWV317		CWV326		
Sampling Date		2016/08/09 16:20		2016/08/09 15:50	2016/08/09 15:50	2016/08/09 14:45		2016/08/09 16:40		
COC Number		560250-01-01		560250-02-01	560250-02-01	560250-02-01		560250-03-01		
	UNITS	W-8	QC Batch	W-14	W-14 Lab-Dup	W-20	QC Batch	W-21	RDL	QC Batch
Inorganics										
Total Ammonia-N	mg/L	0.11	4633484	0.18	0.17	0.16	4632559	0.19	0.050	4633484
Total Suspended Solids	mg/L	ND	4621534	1.2		1.2	4621534	ND	1.0	4621534

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

Maxxam ID		CWV327		
Sampling Date		2016/08/09 15:56		
COC Number		560250-03-01		
	UNITS	W-28	RDL	QC Batch
Inorganics				
Total Ammonia-N	mg/L	0.095	0.050	4633484
Total Suspended Solids	mg/L	1.2	1.0	4621534

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		CWV310	CWV316	CWV317	CWV326	CWV327		
Sampling Date		2016/08/09 16:20	2016/08/09 15:50	2016/08/09 14:45	2016/08/09 16:40	2016/08/09 15:56		
COC Number		560250-01-01	560250-02-01	560250-02-01	560250-03-01	560250-03-01		
	UNITS	W-8	W-14	W-20	W-21	W-28	RDL	QC Batch
Metals								
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	0.013	4623382

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.7°C

Sample CWV317-01 : Poor RCAp Ion Balance due to sample matrix.

Sample CWV326-01 : Poor RCAp Ion Balance due to sample matrix.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4621534	MM9	QC Standard	Total Suspended Solids	2016/08/17		97	%	80 - 120
4621534	MM9	Method Blank	Total Suspended Solids	2016/08/17	ND, RDL=1.0		mg/L	
4621534	MM9	RPD	Total Suspended Solids	2016/08/17	35 (1)		%	25
4622989	MLB	Matrix Spike	Total Aluminum (Al)	2016/08/17		100	%	80 - 120
			Total Antimony (Sb)	2016/08/17		99	%	80 - 120
			Total Arsenic (As)	2016/08/17		98	%	80 - 120
			Total Barium (Ba)	2016/08/17		97	%	80 - 120
			Total Beryllium (Be)	2016/08/17		100	%	80 - 120
			Total Bismuth (Bi)	2016/08/17		98	%	80 - 120
			Total Boron (B)	2016/08/17		101	%	80 - 120
			Total Cadmium (Cd)	2016/08/17		100	%	80 - 120
			Total Calcium (Ca)	2016/08/17		99	%	80 - 120
			Total Chromium (Cr)	2016/08/17		98	%	80 - 120
			Total Cobalt (Co)	2016/08/17		100	%	80 - 120
			Total Copper (Cu)	2016/08/17		99	%	80 - 120
			Total Iron (Fe)	2016/08/17		98	%	80 - 120
			Total Lead (Pb)	2016/08/17		98	%	80 - 120
			Total Magnesium (Mg)	2016/08/17		102	%	80 - 120
			Total Manganese (Mn)	2016/08/17		99	%	80 - 120
			Total Molybdenum (Mo)	2016/08/17		102	%	80 - 120
			Total Nickel (Ni)	2016/08/17		100	%	80 - 120
			Total Phosphorus (P)	2016/08/17		103	%	80 - 120
			Total Potassium (K)	2016/08/17		99	%	80 - 120
			Total Selenium (Se)	2016/08/17		99	%	80 - 120
			Total Silver (Ag)	2016/08/17		99	%	80 - 120
			Total Sodium (Na)	2016/08/17		NC	%	80 - 120
			Total Strontium (Sr)	2016/08/17		97	%	80 - 120
			Total Thallium (Tl)	2016/08/17		98	%	80 - 120
			Total Tin (Sn)	2016/08/17		102	%	80 - 120
			Total Titanium (Ti)	2016/08/17		98	%	80 - 120
			Total Uranium (U)	2016/08/17		102	%	80 - 120
			Total Vanadium (V)	2016/08/17		101	%	80 - 120
			Total Zinc (Zn)	2016/08/17		99	%	80 - 120
4622989	MLB	Spiked Blank	Total Aluminum (Al)	2016/08/17		100	%	80 - 120
			Total Antimony (Sb)	2016/08/17		97	%	80 - 120
			Total Arsenic (As)	2016/08/17		96	%	80 - 120
			Total Barium (Ba)	2016/08/17		97	%	80 - 120
			Total Beryllium (Be)	2016/08/17		97	%	80 - 120
			Total Bismuth (Bi)	2016/08/17		97	%	80 - 120
			Total Boron (B)	2016/08/17		98	%	80 - 120
			Total Cadmium (Cd)	2016/08/17		100	%	80 - 120
			Total Calcium (Ca)	2016/08/17		98	%	80 - 120
			Total Chromium (Cr)	2016/08/17		99	%	80 - 120
			Total Cobalt (Co)	2016/08/17		100	%	80 - 120
			Total Copper (Cu)	2016/08/17		99	%	80 - 120
			Total Iron (Fe)	2016/08/17		99	%	80 - 120
			Total Lead (Pb)	2016/08/17		97	%	80 - 120
			Total Magnesium (Mg)	2016/08/17		102	%	80 - 120
			Total Manganese (Mn)	2016/08/17		98	%	80 - 120
			Total Molybdenum (Mo)	2016/08/17		100	%	80 - 120
			Total Nickel (Ni)	2016/08/17		100	%	80 - 120
			Total Phosphorus (P)	2016/08/17		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Potassium (K)	2016/08/17		99	%	80 - 120
			Total Selenium (Se)	2016/08/17		97	%	80 - 120
			Total Silver (Ag)	2016/08/17		97	%	80 - 120
			Total Sodium (Na)	2016/08/17		100	%	80 - 120
			Total Strontium (Sr)	2016/08/17		95	%	80 - 120
			Total Thallium (Tl)	2016/08/17		97	%	80 - 120
			Total Tin (Sn)	2016/08/17		101	%	80 - 120
			Total Titanium (Ti)	2016/08/17		98	%	80 - 120
			Total Uranium (U)	2016/08/17		100	%	80 - 120
			Total Vanadium (V)	2016/08/17		100	%	80 - 120
			Total Zinc (Zn)	2016/08/17		99	%	80 - 120
4622989	MLB	Method Blank	Total Aluminum (Al)	2016/08/17	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/08/17	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/08/17	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/08/17	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/08/17	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/08/17	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/08/17	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/08/17	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/08/17	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2016/08/17	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/08/17	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/08/17	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/08/17	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/08/17	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/08/17	ND, RDL=100		ug/L	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Selenium (Se)	2016/08/17	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/08/17	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/08/17	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/08/17	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/08/17	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/08/17	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/08/17	ND, RDL=5.0		ug/L	
4622989	MLB	RPD	Total Aluminum (Al)	2016/08/17	NC		%	20
			Total Antimony (Sb)	2016/08/17	NC		%	20
			Total Arsenic (As)	2016/08/17	NC		%	20
			Total Barium (Ba)	2016/08/17	0.95		%	20
			Total Beryllium (Be)	2016/08/17	NC		%	20
			Total Bismuth (Bi)	2016/08/17	NC		%	20
			Total Boron (B)	2016/08/17	NC		%	20
			Total Cadmium (Cd)	2016/08/17	NC		%	20
			Total Calcium (Ca)	2016/08/17	0.66		%	20
			Total Chromium (Cr)	2016/08/17	NC		%	20
			Total Cobalt (Co)	2016/08/17	NC		%	20
			Total Copper (Cu)	2016/08/17	NC		%	20
			Total Iron (Fe)	2016/08/17	NC		%	20
			Total Lead (Pb)	2016/08/17	NC		%	20
			Total Magnesium (Mg)	2016/08/17	1.0		%	20
			Total Manganese (Mn)	2016/08/17	0.87		%	20
			Total Molybdenum (Mo)	2016/08/17	NC		%	20
			Total Nickel (Ni)	2016/08/17	NC		%	20
			Total Phosphorus (P)	2016/08/17	NC		%	20
			Total Potassium (K)	2016/08/17	0.51		%	20
			Total Selenium (Se)	2016/08/17	NC		%	20
			Total Silver (Ag)	2016/08/17	NC		%	20
			Total Sodium (Na)	2016/08/17	1.2		%	20
			Total Strontium (Sr)	2016/08/17	0.17		%	20
			Total Thallium (Tl)	2016/08/17	NC		%	20
			Total Tin (Sn)	2016/08/17	NC		%	20
			Total Titanium (Ti)	2016/08/17	NC		%	20
			Total Uranium (U)	2016/08/17	NC		%	20
			Total Vanadium (V)	2016/08/17	NC		%	20
			Total Zinc (Zn)	2016/08/17	NC		%	20
4623034	MSK	Matrix Spike	Isobutylbenzene - Volatile	2016/08/18		94 (2)	%	70 - 130
			Benzene	2016/08/18		122	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Toluene	2016/08/18		119	%	70 - 130
			Ethylbenzene	2016/08/18		118	%	70 - 130
			Total Xylenes	2016/08/18		117	%	70 - 130
4623034	MSK	Spiked Blank	Isobutylbenzene - Volatile	2016/08/18		101	%	70 - 130
			Benzene	2016/08/18		110	%	70 - 130
			Toluene	2016/08/18		111	%	70 - 130
			Ethylbenzene	2016/08/18		111	%	70 - 130
			Total Xylenes	2016/08/18		111	%	70 - 130
4623034	MSK	Method Blank	Isobutylbenzene - Volatile	2016/08/18		103	%	70 - 130
			Benzene	2016/08/18	ND, RDL=0.0010		mg/L	
			Toluene	2016/08/18	ND, RDL=0.0010		mg/L	
			Ethylbenzene	2016/08/18	ND, RDL=0.0010		mg/L	
			Total Xylenes	2016/08/18	ND, RDL=0.0020		mg/L	
			C6 - C10 (less BTEX)	2016/08/18	ND, RDL=0.010		mg/L	
4623034	MSK	RPD	Benzene	2016/08/18	NC		%	40
			Toluene	2016/08/18	NC		%	40
			Ethylbenzene	2016/08/18	NC		%	40
			Total Xylenes	2016/08/18	NC		%	40
			C6 - C10 (less BTEX)	2016/08/18	NC		%	40
4623382	ARS	Matrix Spike	Total Mercury (Hg)	2016/08/18		103	%	80 - 120
4623382	ARS	Spiked Blank	Total Mercury (Hg)	2016/08/18		104	%	80 - 120
4623382	ARS	Method Blank	Total Mercury (Hg)	2016/08/18	ND, RDL=0.013		ug/L	
4623382	ARS	RPD	Total Mercury (Hg)	2016/08/18	NC		%	20
4624655	JMV	QC Standard	pH	2016/08/18		100	%	97 - 103
4624655	JMV	RPD	pH	2016/08/18	0.73		%	N/A
4624656	JMV	Spiked Blank	Conductivity	2016/08/18		103	%	80 - 120
4624656	JMV	Method Blank	Conductivity	2016/08/18	1.2, RDL=1.0		uS/cm	
4624656	JMV	RPD	Conductivity	2016/08/18	0.43		%	25
4624663	BHR	Matrix Spike [CWV326-06]	Isobutylbenzene - Extractable	2016/08/18		107	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/18		118	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/18		104	%	70 - 130
			>C16-C21 Hydrocarbons	2016/08/18		99	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/18		94	%	70 - 130
4624663	BHR	Spiked Blank	Isobutylbenzene - Extractable	2016/08/18		99	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/18		119	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/18		99	%	70 - 130
			>C16-C21 Hydrocarbons	2016/08/18		96	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/18		95	%	70 - 130
4624663	BHR	Method Blank	Isobutylbenzene - Extractable	2016/08/18		102	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/18		118	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/18	ND, RDL=0.050		mg/L	
			>C16-C21 Hydrocarbons	2016/08/18	ND, RDL=0.050		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			>C21-<C32 Hydrocarbons	2016/08/18	ND, RDL=0.10		mg/L	
4624663	BHR	RPD [CWV317-06]	>C10-C16 Hydrocarbons	2016/08/18	NC		%	40
			>C16-C21 Hydrocarbons	2016/08/18	NC		%	40
			>C21-<C32 Hydrocarbons	2016/08/18	NC		%	40
4624677	JMV	QC Standard	Turbidity	2016/08/18		101	%	80 - 120
4624677	JMV	Spiked Blank	Turbidity	2016/08/18		97	%	80 - 120
4624677	JMV	Method Blank	Turbidity	2016/08/18	ND, RDL=0.10		NTU	
4624677	JMV	RPD	Turbidity	2016/08/18	16		%	20
4624681	MLB	Matrix Spike	Total Aluminum (Al)	2016/08/19		102	%	80 - 120
			Total Antimony (Sb)	2016/08/19		103	%	80 - 120
			Total Arsenic (As)	2016/08/19		101	%	80 - 120
			Total Barium (Ba)	2016/08/19		98	%	80 - 120
			Total Beryllium (Be)	2016/08/19		103	%	80 - 120
			Total Bismuth (Bi)	2016/08/19		99	%	80 - 120
			Total Boron (B)	2016/08/19		105	%	80 - 120
			Total Cadmium (Cd)	2016/08/19		102	%	80 - 120
			Total Calcium (Ca)	2016/08/19		NC	%	80 - 120
			Total Chromium (Cr)	2016/08/19		101	%	80 - 120
			Total Cobalt (Co)	2016/08/19		104	%	80 - 120
			Total Copper (Cu)	2016/08/19		102	%	80 - 120
			Total Iron (Fe)	2016/08/19		102	%	80 - 120
			Total Lead (Pb)	2016/08/19		102	%	80 - 120
			Total Magnesium (Mg)	2016/08/19		NC	%	80 - 120
			Total Manganese (Mn)	2016/08/19		101	%	80 - 120
			Total Molybdenum (Mo)	2016/08/19		106	%	80 - 120
			Total Nickel (Ni)	2016/08/19		103	%	80 - 120
			Total Phosphorus (P)	2016/08/19		106	%	80 - 120
			Total Potassium (K)	2016/08/19		102	%	80 - 120
			Total Selenium (Se)	2016/08/19		100	%	80 - 120
			Total Silver (Ag)	2016/08/19		103	%	80 - 120
			Total Sodium (Na)	2016/08/19		NC	%	80 - 120
			Total Strontium (Sr)	2016/08/19		NC	%	80 - 120
			Total Thallium (Tl)	2016/08/19		100	%	80 - 120
			Total Tin (Sn)	2016/08/19		107	%	80 - 120
			Total Titanium (Ti)	2016/08/19		106	%	80 - 120
			Total Uranium (U)	2016/08/19		106	%	80 - 120
			Total Vanadium (V)	2016/08/19		104	%	80 - 120
			Total Zinc (Zn)	2016/08/19		99	%	80 - 120
4624681	MLB	Spiked Blank	Total Aluminum (Al)	2016/08/19		103	%	80 - 120
			Total Antimony (Sb)	2016/08/19		99	%	80 - 120
			Total Arsenic (As)	2016/08/19		98	%	80 - 120
			Total Barium (Ba)	2016/08/19		99	%	80 - 120
			Total Beryllium (Be)	2016/08/19		100	%	80 - 120
			Total Bismuth (Bi)	2016/08/19		100	%	80 - 120
			Total Boron (B)	2016/08/19		104	%	80 - 120
			Total Cadmium (Cd)	2016/08/19		100	%	80 - 120
			Total Calcium (Ca)	2016/08/19		100	%	80 - 120
			Total Chromium (Cr)	2016/08/19		100	%	80 - 120
			Total Cobalt (Co)	2016/08/19		104	%	80 - 120
			Total Copper (Cu)	2016/08/19		103	%	80 - 120
			Total Iron (Fe)	2016/08/19		102	%	80 - 120

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Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Lead (Pb)	2016/08/19		102	%	80 - 120
			Total Magnesium (Mg)	2016/08/19		104	%	80 - 120
			Total Manganese (Mn)	2016/08/19		102	%	80 - 120
			Total Molybdenum (Mo)	2016/08/19		102	%	80 - 120
			Total Nickel (Ni)	2016/08/19		103	%	80 - 120
			Total Phosphorus (P)	2016/08/19		104	%	80 - 120
			Total Potassium (K)	2016/08/19		103	%	80 - 120
			Total Selenium (Se)	2016/08/19		97	%	80 - 120
			Total Silver (Ag)	2016/08/19		98	%	80 - 120
			Total Sodium (Na)	2016/08/19		102	%	80 - 120
			Total Strontium (Sr)	2016/08/19		101	%	80 - 120
			Total Thallium (Tl)	2016/08/19		101	%	80 - 120
			Total Tin (Sn)	2016/08/19		106	%	80 - 120
			Total Titanium (Ti)	2016/08/19		106	%	80 - 120
			Total Uranium (U)	2016/08/19		104	%	80 - 120
			Total Vanadium (V)	2016/08/19		103	%	80 - 120
			Total Zinc (Zn)	2016/08/19		99	%	80 - 120
4624681	MLB	Method Blank	Total Aluminum (Al)	2016/08/19	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/08/19	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/08/19	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/08/19	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/08/19	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/08/19	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/08/19	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/08/19	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/08/19	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2016/08/19	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/08/19	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/08/19	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/08/19	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/08/19	ND, RDL=2.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Nickel (Ni)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/08/19	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/08/19	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/08/19	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/08/19	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/08/19	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/08/19	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/08/19	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/08/19	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/08/19	ND, RDL=5.0		ug/L	
4624681	MLB	RPD	Total Aluminum (Al)	2016/08/19	NC		%	20
			Total Antimony (Sb)	2016/08/19	NC		%	20
			Total Arsenic (As)	2016/08/19	NC		%	20
			Total Barium (Ba)	2016/08/19	1.5		%	20
			Total Boron (B)	2016/08/19	NC		%	20
			Total Cadmium (Cd)	2016/08/19	NC		%	20
			Total Calcium (Ca)	2016/08/19	3.3		%	20
			Total Chromium (Cr)	2016/08/19	NC		%	20
			Total Copper (Cu)	2016/08/19	5.1		%	20
			Total Iron (Fe)	2016/08/19	NC		%	20
			Total Lead (Pb)	2016/08/19	NC		%	20
			Total Magnesium (Mg)	2016/08/19	2.0		%	20
			Total Manganese (Mn)	2016/08/19	NC		%	20
			Total Nickel (Ni)	2016/08/19	NC		%	20
			Total Potassium (K)	2016/08/19	NC		%	20
			Total Selenium (Se)	2016/08/19	NC		%	20
			Total Sodium (Na)	2016/08/19	1.8		%	20
			Total Strontium (Sr)	2016/08/19	3.2		%	20
			Total Uranium (U)	2016/08/19	NC		%	20
			Total Zinc (Zn)	2016/08/19	NC		%	20
4629139	NRG	Matrix Spike [CWV326-02]	Total Alkalinity (Total as CaCO3)	2016/08/22		NC	%	80 - 120
4629139	NRG	Spiked Blank	Total Alkalinity (Total as CaCO3)	2016/08/22		106	%	80 - 120
4629139	NRG	Method Blank	Total Alkalinity (Total as CaCO3)	2016/08/22	ND, RDL=5.0		mg/L	

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Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4629139	NRG	RPD [CWV326-02]	Total Alkalinity (Total as CaCO3)	2016/08/22	0.24		%	25
4629144	NRG	Matrix Spike [CWV326-02]	Dissolved Chloride (Cl)	2016/08/23		NC	%	80 - 120
4629144	NRG	QC Standard	Dissolved Chloride (Cl)	2016/08/23		110	%	80 - 120
4629144	NRG	Spiked Blank	Dissolved Chloride (Cl)	2016/08/23		101	%	80 - 120
4629144	NRG	Method Blank	Dissolved Chloride (Cl)	2016/08/23	ND, RDL=1.0		mg/L	
4629144	NRG	RPD [CWV326-02]	Dissolved Chloride (Cl)	2016/08/23	5.4		%	25
4629146	NRG	Matrix Spike [CWV326-02]	Dissolved Sulphate (SO4)	2016/08/23		NC	%	80 - 120
4629146	NRG	Spiked Blank	Dissolved Sulphate (SO4)	2016/08/23		93	%	80 - 120
4629146	NRG	Method Blank	Dissolved Sulphate (SO4)	2016/08/23	ND, RDL=2.0		mg/L	
4629146	NRG	RPD [CWV326-02]	Dissolved Sulphate (SO4)	2016/08/23	0.53		%	25
4629147	NRG	Matrix Spike [CWV326-02]	Reactive Silica (SiO2)	2016/08/22		95	%	80 - 120
4629147	NRG	Spiked Blank	Reactive Silica (SiO2)	2016/08/22		98	%	80 - 120
4629147	NRG	Method Blank	Reactive Silica (SiO2)	2016/08/22	ND, RDL=0.50		mg/L	
4629147	NRG	RPD [CWV326-02]	Reactive Silica (SiO2)	2016/08/22	NC		%	25
4629148	MCN	Spiked Blank	Colour	2016/08/23		96	%	80 - 120
4629148	MCN	Method Blank	Colour	2016/08/23	ND, RDL=5.0		TCU	
4629148	MCN	RPD [CWV326-02]	Colour	2016/08/23	NC		%	20
4629149	NRG	Matrix Spike [CWV326-02]	Orthophosphate (P)	2016/08/23		90	%	80 - 120
4629149	NRG	Spiked Blank	Orthophosphate (P)	2016/08/23		93	%	80 - 120
4629149	NRG	Method Blank	Orthophosphate (P)	2016/08/23	ND, RDL=0.010		mg/L	
4629149	NRG	RPD [CWV326-02]	Orthophosphate (P)	2016/08/23	NC		%	25
4629151	NRG	Matrix Spike [CWV326-02]	Nitrate + Nitrite (N)	2016/08/23		93	%	80 - 120
4629151	NRG	Spiked Blank	Nitrate + Nitrite (N)	2016/08/23		95	%	80 - 120
4629151	NRG	Method Blank	Nitrate + Nitrite (N)	2016/08/23	ND, RDL=0.050		mg/L	
4629151	NRG	RPD [CWV326-02]	Nitrate + Nitrite (N)	2016/08/23	NC		%	25
4629152	KBT	Matrix Spike [CWV326-02]	Nitrite (N)	2016/08/23		100	%	80 - 120
4629152	KBT	Spiked Blank	Nitrite (N)	2016/08/23		96	%	80 - 120
4629152	KBT	Method Blank	Nitrite (N)	2016/08/23	ND, RDL=0.010		mg/L	
4629152	KBT	RPD [CWV326-02]	Nitrite (N)	2016/08/23	NC		%	25
4629202	NRG	Matrix Spike	Total Alkalinity (Total as CaCO3)	2016/08/22		NC	%	80 - 120
4629202	NRG	Spiked Blank	Total Alkalinity (Total as CaCO3)	2016/08/22		101	%	80 - 120
4629202	NRG	Method Blank	Total Alkalinity (Total as CaCO3)	2016/08/22	ND, RDL=5.0		mg/L	
4629202	NRG	RPD	Total Alkalinity (Total as CaCO3)	2016/08/22	3.1		%	25
4629206	NRG	Matrix Spike	Dissolved Chloride (Cl)	2016/08/23		NC	%	80 - 120
4629206	NRG	QC Standard	Dissolved Chloride (Cl)	2016/08/23		110	%	80 - 120
4629206	NRG	Spiked Blank	Dissolved Chloride (Cl)	2016/08/23		108	%	80 - 120

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Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4629206	NRG	Method Blank	Dissolved Chloride (Cl)	2016/08/23	ND, RDL=1.0		mg/L	
4629206	NRG	RPD	Dissolved Chloride (Cl)	2016/08/23	6.5		%	25
4629208	NRG	Matrix Spike	Dissolved Sulphate (SO4)	2016/08/23		101	%	80 - 120
4629208	NRG	Spiked Blank	Dissolved Sulphate (SO4)	2016/08/23		98	%	80 - 120
4629208	NRG	Method Blank	Dissolved Sulphate (SO4)	2016/08/23	ND, RDL=2.0		mg/L	
4629208	NRG	RPD	Dissolved Sulphate (SO4)	2016/08/23	NC		%	25
4629209	NRG	Matrix Spike	Reactive Silica (SiO2)	2016/08/22		NC	%	80 - 120
4629209	NRG	Spiked Blank	Reactive Silica (SiO2)	2016/08/22		96	%	80 - 120
4629209	NRG	Method Blank	Reactive Silica (SiO2)	2016/08/22	ND, RDL=0.50		mg/L	
4629210	MCN	Spiked Blank	Colour	2016/08/23		98	%	80 - 120
4629210	MCN	Method Blank	Colour	2016/08/23	ND, RDL=5.0		TCU	
4629210	MCN	RPD	Colour	2016/08/23	NC		%	20
4629212	NRG	Matrix Spike	Orthophosphate (P)	2016/08/23		87	%	80 - 120
4629212	NRG	Spiked Blank	Orthophosphate (P)	2016/08/23		95	%	80 - 120
4629212	NRG	Method Blank	Orthophosphate (P)	2016/08/23	ND, RDL=0.010		mg/L	
4629213	NRG	Matrix Spike	Nitrate + Nitrite (N)	2016/08/23		90	%	80 - 120
4629213	NRG	Spiked Blank	Nitrate + Nitrite (N)	2016/08/23		94	%	80 - 120
4629213	NRG	Method Blank	Nitrate + Nitrite (N)	2016/08/23	0.060, RDL=0.050		mg/L	
4629214	KBT	Matrix Spike	Nitrite (N)	2016/08/23		95	%	80 - 120
4629214	KBT	Spiked Blank	Nitrite (N)	2016/08/23		96	%	80 - 120
4629214	KBT	Method Blank	Nitrite (N)	2016/08/23	ND, RDL=0.010		mg/L	
4629214	KBT	RPD	Nitrite (N)	2016/08/23	NC		%	25
4629324	SMT	Matrix Spike	Total Organic Carbon (C)	2016/08/22		105	%	80 - 120
4629324	SMT	Spiked Blank	Total Organic Carbon (C)	2016/08/22		99	%	80 - 120
4629324	SMT	Method Blank	Total Organic Carbon (C)	2016/08/22	ND, RDL=0.50		mg/L	
4629324	SMT	RPD	Total Organic Carbon (C)	2016/08/22	0.85		%	20
4632559	COP	Matrix Spike [CWV316-04]	Total Ammonia-N	2016/08/25		90	%	80 - 120
4632559	COP	Spiked Blank	Total Ammonia-N	2016/08/25		97	%	85 - 115
4632559	COP	Method Blank	Total Ammonia-N	2016/08/25	ND, RDL=0.050		mg/L	
4632559	COP	RPD [CWV316-04]	Total Ammonia-N	2016/08/25	NC		%	20
4633484	COP	Matrix Spike	Total Ammonia-N	2016/08/25		97	%	80 - 120
4633484	COP	Spiked Blank	Total Ammonia-N	2016/08/25		96	%	85 - 115
4633484	COP	Method Blank	Total Ammonia-N	2016/08/25	ND, RDL=0.050		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4633484	COP	RPD	Total Ammonia-N	2016/08/25	NC		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Duplicate: results are outside acceptance limit. Insufficient sample for repeat analysis.

(2) VPH sample contained sediment.

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Maxxam Job #: B6H2785
Report Date: 2016/08/25

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Kevin MacDonald, Inorganics Supervisor

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Your C.O.C. #: 560250-02-01

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2016/09/06
Report #: R4155681
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H7502
Received: 2016/08/22, 09:21

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide (1)	6	N/A	2016/08/23	N/A	SM 22 4500-CO2 D
Alkalinity (1)	4	N/A	2016/08/29	ATL SOP 00013	EPA 310.2 R1974 m
Alkalinity (1)	2	N/A	2016/08/30	ATL SOP 00013	EPA 310.2 R1974 m
Chloride by Automated Colourimetry (2)	6	N/A	2016/08/31	CAM SOP-00463	EPA 325.2 m
Colour (1)	6	N/A	2016/08/29	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	6	N/A	2016/08/23	ATL SOP 00004	SM 22 2510B m
TEH in Water (PIRI) (1)	5	2016/08/25	2016/08/25	ATL SOP 00113	Atl. RBCA v3 m
TEH in Water (PIRI) (1)	1	2016/08/25	2016/08/26	ATL SOP 00113	Atl. RBCA v3 m
Hardness (calculated as CaCO3) (1)	6	N/A	2016/08/26	ATL SOP 00048	SM 22 2340 B
Mercury - Total (CVAA,LL) (1)	6	2016/08/23	2016/08/24	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS (1)	6	2016/08/24	2016/08/25	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	6	N/A	2016/09/06		Auto Calc.
Anion and Cation Sum (1)	6	N/A	2016/09/06		Auto Calc.
Total Ammonia-N (2)	6	N/A	2016/09/06	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2, 3)	6	N/A	2016/08/31	CAM SOP-00440	SM 22 4500-NO3I/NO2B
pH (1, 4)	6	N/A	2016/08/23	ATL SOP 00003	SM 22 4500-H+ B m
Orthophosphate (2)	6	N/A	2016/08/31	CAM SOP-00461	EPA 365.1 m
VPH in Water (PIRI) (1)	6	N/A	2016/08/25	ATL SOP 00118	Atl. RBCA v3 m
Sat. pH and Langelier Index (@ 20C) (1)	1	N/A	2016/08/30	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C) (1)	5	N/A	2016/09/06	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	1	N/A	2016/08/30	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	5	N/A	2016/09/06	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	6	N/A	2016/08/30	ATL SOP 00022	EPA 366.0 m
Sulphate by Automated Colourimetry (2)	6	N/A	2016/08/31	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc) (1)	6	N/A	2016/09/06		Auto Calc.
Organic carbon - Total (TOC) (1, 5)	6	N/A	2016/08/25	ATL SOP 00037	SM 22 5310C m
ModTPH (T1) Calc. for Water (1)	6	N/A	2016/08/26	N/A	Atl. RBCA v3 m
Total Suspended Solids (1)	5	2016/08/22	2016/08/24	ATL SOP 00007	SM 22 2540D m
Total Suspended Solids (1)	1	2016/08/23	2016/08/23	ATL SOP 00007	SM 22 2540D m

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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM
Your C.O.C. #: 560250-02-01

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2016/09/06
Report #: R4155681
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H7502
Received: 2016/08/22, 09:21

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Turbidity (1)	6	N/A	2016/08/23	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford
(2) This test was performed by Maxxam Analytics Mississauga
(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(4) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(5) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Maxxam
06 Sep 2016 15:06:44 -02:30

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
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Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

RBCA HYDROCARBONS IN WATER (WATER)

Maxxam ID		CXS355	CXS356	CXS357	CXS358	CXS359	CXS360		
Sampling Date		2016/08/16 05:30	2016/08/14 12:05	2016/08/14 11:45	2016/08/14 11:00	2016/08/14 11:25	2016/08/14 10:45		
COC Number		560250-02-01	560250-02-01	560250-02-01	560250-02-01	560250-02-01	560250-02-01		
	UNITS	**W-11**	**W-16**	**W-27**	**W-32**	**W-37**	**W-38**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	ND	ND	ND	ND	ND	ND	0.0010	4632960
Toluene	mg/L	ND	ND	ND	ND	ND	ND	0.0010	4632960
Ethylbenzene	mg/L	ND	ND	ND	ND	ND	ND	0.0010	4632960
Total Xylenes	mg/L	ND	ND	ND	ND	ND	ND	0.0020	4632960
C6 - C10 (less BTEX)	mg/L	ND	ND	ND	ND	ND	ND	0.010	4632960
>C10-C16 Hydrocarbons	mg/L	ND	ND	ND	ND	ND	ND	0.050	4634172
>C16-C21 Hydrocarbons	mg/L	ND	ND	ND	ND	ND	ND	0.050	4634172
>C21-<C32 Hydrocarbons	mg/L	ND	ND	ND	ND	ND	ND	0.10	4634172
Modified TPH (Tier1)	mg/L	ND	ND	ND	ND	ND	ND	0.10	4629281
Reached Baseline at C32	mg/L	NA	NA	NA	NA	NA	NA	N/A	4634172
Hydrocarbon Resemblance	mg/L	NA	NA	NA	NA	NA	NA	N/A	4634172
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	101	107	112	112	117	113		4634172
n-Dotriacontane - Extractable	%	98	98	111	107	109	105		4634172
Isobutylbenzene - Volatile	%	100	98	99	99	99	99		4632960

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable

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Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CXS355	CXS355			CXS356		CXS357		
Sampling Date		2016/08/16 05:30	2016/08/16 05:30			2016/08/14 12:05		2016/08/14 11:45		
COC Number		560250-02-01	560250-02-01			560250-02-01		560250-02-01		
	UNITS	**W-11**	**W-11 Lab-Dup**	**RDL**	**QC Batch**	**W-16**	**RDL**	**W-27**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	0.00		N/A	4629226	102	N/A	110	N/A	4629226
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	ND		1.0	4629222	85	1.0	84	1.0	4629222
Calculated TDS	mg/L	1.0		1.0	4629220	5800	1.0	6300	1.0	4629220
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		1.0	4629222	ND	1.0	ND	1.0	4629222
Cation Sum	me/L	0.0200		N/A	4629226	97.7	N/A	108	N/A	4629226
Hardness (CaCO3)	mg/L	ND		1.0	4629224	1100	1.0	1200	1.0	4629224
Ion Balance (% Difference)	%	100		N/A	4629225	2.40	N/A	0.890	N/A	4629225
Langelier Index (@ 20C)	N/A	NC			4629218	-0.157		-0.114		4629218
Langelier Index (@ 4C)	N/A	NC			4629219	-0.396		-0.353		4629219
Saturation pH (@ 20C)	N/A	NC			4629218	7.96		7.94		4629218
Saturation pH (@ 4C)	N/A	NC			4629219	8.20		8.18		4629219
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	ND		5.0	4636157	86	5.0	85	5.0	4636157
Total Ammonia-N	mg/L	0.13		0.050	4642250	0.14	0.050	0.099	0.050	4642250
Colour	TCU	ND		5.0	4636167	ND	5.0	5.3	5.0	4636167
Total Organic Carbon (C)	mg/L	ND		0.50	4634575	0.55	0.50	0.66	0.50	4634575
Orthophosphate (P)	mg/L	ND		0.010	4640982	ND	0.010	ND	0.010	4640982
pH	pH	6.90		N/A	4630545	7.80	N/A	7.83	N/A	4630545
Reactive Silica (SiO2)	mg/L	0.69		0.50	4636166	0.67	0.50	0.59	0.50	4636166
Dissolved Sulphate (SO4)	mg/L	ND		1.0	4640976	410	2.0	470	5.0	4640976
Turbidity	NTU	ND	ND	0.10	4630587	0.28	0.10	0.35	0.10	4630588
Dissolved Chloride (Cl)	mg/L	ND		1.0	4640970	3300	30	3500	40	4640970
Conductivity	uS/cm	2.9		1.0	4630546	10000	1.0	12000	1.0	4630546
Nitrite (N)	mg/L	ND		0.010	4640996	ND	0.010	ND	0.010	4640996
Nitrate (N)	mg/L	ND		0.10	4640996	ND	0.10	ND	0.10	4640996
Nitrate + Nitrite (N)	mg/L	ND		0.10	4640996	ND	0.10	ND	0.10	4640996
Metals										
Total Aluminum (Al)	ug/L	11	11	5.0	4632569	10	5.0	10	5.0	4632420
Total Antimony (Sb)	ug/L	ND	ND	1.0	4632569	ND	1.0	ND	1.0	4632420
Total Arsenic (As)	ug/L	ND	ND	1.0	4632569	ND	1.0	ND	1.0	4632420
Total Barium (Ba)	ug/L	ND	ND	1.0	4632569	5.2	1.0	5.7	1.0	4632420
Total Beryllium (Be)	ug/L	ND	ND	1.0	4632569	ND	1.0	ND	1.0	4632420

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected

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Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CXS355	CXS355			CXS356		CXS357		
Sampling Date		2016/08/16 05:30	2016/08/16 05:30			2016/08/14 12:05		2016/08/14 11:45		
COC Number		560250-02-01	560250-02-01			560250-02-01		560250-02-01		
	UNITS	**W-11**	**W-11 Lab-Dup**	**RDL**	**QC Batch**	**W-16**	**RDL**	**W-27**	**RDL**	**QC Batch**
Total Bismuth (Bi)	ug/L	ND	ND	2.0	4632569	ND	2.0	ND	2.0	4632420
Total Boron (B)	ug/L	ND	ND	50	4632569	740	50	830	50	4632420
Total Cadmium (Cd)	ug/L	ND	ND	0.010	4632569	ND	0.010	ND	0.010	4632420
Total Calcium (Ca)	ug/L	ND	ND	100	4632569	84000	100	91000	100	4632420
Total Chromium (Cr)	ug/L	ND	ND	1.0	4632569	ND	1.0	ND	1.0	4632420
Total Cobalt (Co)	ug/L	ND	ND	0.40	4632569	ND	0.40	ND	0.40	4632420
Total Copper (Cu)	ug/L	ND	ND	2.0	4632569	ND	2.0	ND	2.0	4632420
Total Iron (Fe)	ug/L	ND	ND	50	4632569	ND	50	ND	50	4632420
Total Lead (Pb)	ug/L	ND	ND	0.50	4632569	ND	0.50	ND	0.50	4632420
Total Magnesium (Mg)	ug/L	ND	ND	100	4632569	210000	1000	230000	1000	4632420
Total Manganese (Mn)	ug/L	ND	ND	2.0	4632569	ND	2.0	ND	2.0	4632420
Total Molybdenum (Mo)	ug/L	ND	ND	2.0	4632569	ND	2.0	2.4	2.0	4632420
Total Nickel (Ni)	ug/L	ND	ND	2.0	4632569	ND	2.0	ND	2.0	4632420
Total Phosphorus (P)	ug/L	ND	ND	100	4632569	ND	100	ND	100	4632420
Total Potassium (K)	ug/L	ND	ND	100	4632569	62000	100	68000	100	4632420
Total Selenium (Se)	ug/L	ND	ND	1.0	4632569	ND	1.0	ND	1.0	4632420
Total Silver (Ag)	ug/L	ND	ND	0.10	4632569	ND	0.10	ND	0.10	4632420
Total Sodium (Na)	ug/L	260	260	100	4632569	1700000	1000	1900000	1000	4632420
Total Strontium (Sr)	ug/L	ND	ND	2.0	4632569	1300	2.0	1400	2.0	4632420
Total Thallium (Tl)	ug/L	ND	ND	0.10	4632569	ND	0.10	ND	0.10	4632420
Total Tin (Sn)	ug/L	ND	ND	2.0	4632569	ND	2.0	ND	2.0	4632420
Total Titanium (Ti)	ug/L	ND	ND	2.0	4632569	ND	2.0	ND	2.0	4632420
Total Uranium (U)	ug/L	ND	ND	0.10	4632569	1.4	0.10	1.5	0.10	4632420
Total Vanadium (V)	ug/L	ND	ND	2.0	4632569	ND	2.0	ND	2.0	4632420
Total Zinc (Zn)	ug/L	ND	ND	5.0	4632569	ND	5.0	ND	5.0	4632420

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CXS358			CXS359			CXS360		
Sampling Date		2016/08/14 11:00			2016/08/14 11:25			2016/08/14 10:45		
COC Number		560250-02-01			560250-02-01			560250-02-01		
	UNITS	W-32	RDL	QC Batch	W-37	RDL	QC Batch	W-38	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	90.9	N/A	4629226	99.7	N/A	4629226	86.5	N/A	4629226
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	85	1.0	4629222	82	1.0	4629222	83	1.0	4629222
Calculated TDS	mg/L	5000	1.0	4629220	5700	1.0	4629220	4900	1.0	4629220
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4629222	ND	1.0	4629222	ND	1.0	4629222
Cation Sum	me/L	80.0	N/A	4629226	98.0	N/A	4629226	83.0	N/A	4629226
Hardness (CaCO3)	mg/L	900	1.0	4629224	1100	1.0	4629224	930	1.0	4629224
Ion Balance (% Difference)	%	6.35	N/A	4629225	0.880	N/A	4629225	2.06	N/A	4629225
Langelier Index (@ 20C)	N/A	-0.165		4629218	-0.0960		4629218	-0.171		4629218
Langelier Index (@ 4C)	N/A	-0.405		4629219	-0.335		4629219	-0.411		4629219
Saturation pH (@ 20C)	N/A	8.00		4629218	7.97		4629218	7.99		4629218
Saturation pH (@ 4C)	N/A	8.24		4629219	8.21		4629219	8.23		4629219
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	86	5.0	4636157	83	5.0	4636157	83	5.0	4636157
Total Ammonia-N	mg/L	0.13	0.050	4642250	0.20	0.050	4642250	0.18	0.050	4642250
Colour	TCU	5.1	5.0	4636167	ND	5.0	4636167	ND	5.0	4636167
Total Organic Carbon (C)	mg/L	0.88	0.50	4634575	0.65	0.50	4634575	0.71	0.50	4634575
Orthophosphate (P)	mg/L	ND	0.010	4640982	ND	0.010	4640982	ND	0.010	4640982
pH	pH	7.83	N/A	4630545	7.87	N/A	4630545	7.82	N/A	4630545
Reactive Silica (SiO2)	mg/L	0.68	0.50	4636166	0.64	0.50	4636166	0.67	0.50	4636166
Dissolved Sulphate (SO4)	mg/L	370	2.0	4640976	410	2.0	4640976	340	2.0	4640976
Turbidity	NTU	0.18	0.10	4630588	0.34	0.10	4630588	0.34	0.10	4630587
Dissolved Chloride (Cl)	mg/L	2900	30	4640970	3200	30	4640970	2800	25	4640970
Conductivity	uS/cm	9400	1.0	4630546	10000	1.0	4630546	8800	1.0	4630546
Nitrite (N)	mg/L	ND	0.010	4640996	ND	0.010	4640996	ND	0.010	4640996
Nitrate (N)	mg/L	ND	0.10	4640996	ND	0.10	4640996	ND	0.10	4640996
Nitrate + Nitrite (N)	mg/L	ND	0.10	4640996	ND	0.10	4640996	ND	0.10	4640996
Metals										
Total Aluminum (Al)	ug/L	10	5.0	4632420	8.9	5.0	4632569	10	5.0	4632569
Total Antimony (Sb)	ug/L	ND	1.0	4632420	ND	1.0	4632569	ND	1.0	4632569
Total Arsenic (As)	ug/L	ND	1.0	4632420	ND	1.0	4632569	ND	1.0	4632569
Total Barium (Ba)	ug/L	4.9	1.0	4632420	5.3	1.0	4632569	5.5	1.0	4632569
Total Beryllium (Be)	ug/L	ND	1.0	4632420	ND	10	4632569	ND	1.0	4632569
Total Bismuth (Bi)	ug/L	ND	2.0	4632420	ND	2.0	4632569	ND	2.0	4632569

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

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SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CXS358			CXS359			CXS360		
Sampling Date		2016/08/14 11:00			2016/08/14 11:25			2016/08/14 10:45		
COC Number		560250-02-01			560250-02-01			560250-02-01		
	UNITS	**W-32**	**RDL**	**QC Batch**	**W-37**	**RDL**	**QC Batch**	**W-38**	**RDL**	**QC Batch**
Total Boron (B)	ug/L	600	50	4632420	780	500	4632569	660	50	4632569
Total Cadmium (Cd)	ug/L	ND	0.010	4632420	ND	0.010	4632569	ND	0.010	4632569
Total Calcium (Ca)	ug/L	73000	100	4632420	85000	100	4632569	76000	100	4632569
Total Chromium (Cr)	ug/L	ND	1.0	4632420	ND	1.0	4632569	ND	1.0	4632569
Total Cobalt (Co)	ug/L	ND	0.40	4632420	ND	0.40	4632569	ND	0.40	4632569
Total Copper (Cu)	ug/L	ND	2.0	4632420	ND	2.0	4632569	ND	2.0	4632569
Total Iron (Fe)	ug/L	ND	50	4632420	ND	50	4632569	ND	50	4632569
Total Lead (Pb)	ug/L	ND	0.50	4632420	ND	0.50	4632569	ND	0.50	4632569
Total Magnesium (Mg)	ug/L	170000	1000	4632420	210000	1000	4632569	180000	1000	4632569
Total Manganese (Mn)	ug/L	ND	2.0	4632420	ND	2.0	4632569	ND	2.0	4632569
Total Molybdenum (Mo)	ug/L	ND	2.0	4632420	2.1	2.0	4632569	ND	2.0	4632569
Total Nickel (Ni)	ug/L	ND	2.0	4632420	ND	2.0	4632569	ND	2.0	4632569
Total Phosphorus (P)	ug/L	ND	100	4632420	ND	100	4632569	ND	100	4632569
Total Potassium (K)	ug/L	51000	100	4632420	63000	100	4632569	54000	100	4632569
Total Selenium (Se)	ug/L	ND	1.0	4632420	ND	1.0	4632569	ND	1.0	4632569
Total Silver (Ag)	ug/L	ND	0.10	4632420	ND	0.10	4632569	ND	0.10	4632569
Total Sodium (Na)	ug/L	1400000	1000	4632420	1700000	1000	4632569	1500000	1000	4632569
Total Strontium (Sr)	ug/L	1000	2.0	4632420	1300	2.0	4632569	1200	2.0	4632569
Total Thallium (Tl)	ug/L	ND	0.10	4632420	ND	0.10	4632569	ND	0.10	4632569
Total Tin (Sn)	ug/L	ND	2.0	4632420	ND	2.0	4632569	ND	2.0	4632569
Total Titanium (Ti)	ug/L	ND	2.0	4632420	ND	2.0	4632569	ND	2.0	4632569
Total Uranium (U)	ug/L	1.7	0.10	4632420	1.4	0.10	4632569	1.6	0.10	4632569
Total Vanadium (V)	ug/L	ND	2.0	4632420	ND	2.0	4632569	ND	2.0	4632569
Total Zinc (Zn)	ug/L	ND	5.0	4632420	ND	5.0	4632569	ND	5.0	4632569

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CXS360		
Sampling Date		2016/08/14 10:45		
COC Number		560250-02-01		
	UNITS	**W-38 Lab-Dup**	**RDL**	**QC Batch**
Inorganics				
Total Alkalinity (Total as CaCO3)	mg/L	85	5.0	4636157
Colour	TCU	ND	5.0	4636167
Reactive Silica (SiO2)	mg/L	0.69	0.50	4636166

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not detected

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Maxxam Job #: B6H7502
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SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

RESULTS OF ANALYSES OF WATER

Maxxam ID		CXS355		CXS356	CXS357	CXS358	CXS359		
Sampling Date		2016/08/16 05:30		2016/08/14 12:05	2016/08/14 11:45	2016/08/14 11:00	2016/08/14 11:25		
COC Number		560250-02-01		560250-02-01	560250-02-01	560250-02-01	560250-02-01		
	UNITS	W-11	QC Batch	W-16	W-27	W-32	W-37	RDL	QC Batch
Inorganics									
Total Suspended Solids	mg/L	ND	4630573	ND	ND	ND	ND	1.0	4629602

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		CXS360		
Sampling Date		2016/08/14 10:45		
COC Number		560250-02-01		
	UNITS	W-38	RDL	QC Batch
Inorganics				
Total Suspended Solids	mg/L	ND	1.0	4629602

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		CXS355	CXS356	CXS357	CXS358	CXS359	CXS360		
Sampling Date		2016/08/16 05:30	2016/08/14 12:05	2016/08/14 11:45	2016/08/14 11:00	2016/08/14 11:25	2016/08/14 10:45		
COC Number		560250-02-01	560250-02-01	560250-02-01	560250-02-01	560250-02-01	560250-02-01		
	UNITS	**W-11**	**W-16**	**W-27**	**W-32**	**W-37**	**W-38**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	4630637

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.3°C

Samples received at an average temperature > 10°C. Samples W-16, W-27, W-32, W-37 & W-38 received past hold time for TSS.

Sample CXS355-01 : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample CXS358-01 : Poor RCAp Ion Balance due to sample matrix.

Results relate only to the items tested.

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Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4629602	MM9	QC Standard	Total Suspended Solids	2016/08/24		94	%	80 - 120
4629602	MM9	Method Blank	Total Suspended Solids	2016/08/24	ND, RDL=1.0		mg/L	
4629602	MM9	RPD	Total Suspended Solids	2016/08/24	21		%	25
4630545	JMV	QC Standard	pH	2016/08/23		100	%	97 - 103
4630545	JMV	RPD	pH	2016/08/23	0.70		%	N/A
4630546	JMV	Spiked Blank	Conductivity	2016/08/23		102	%	80 - 120
4630546	JMV	Method Blank	Conductivity	2016/08/23	1.5, RDL=1.0		uS/cm	
4630546	JMV	RPD	Conductivity	2016/08/23	0.27		%	25
4630573	MM9	QC Standard	Total Suspended Solids	2016/08/23		95	%	80 - 120
4630573	MM9	Method Blank	Total Suspended Solids	2016/08/23	ND, RDL=1.0		mg/L	
4630573	MM9	RPD	Total Suspended Solids	2016/08/23	NC		%	25
4630587	JMV	QC Standard	Turbidity	2016/08/23		100	%	80 - 120
4630587	JMV	Spiked Blank	Turbidity	2016/08/23		96	%	80 - 120
4630587	JMV	Method Blank	Turbidity	2016/08/23	ND, RDL=0.10		NTU	
4630587	JMV	RPD [CXS355-04]	Turbidity	2016/08/23	NC		%	20
4630588	JMV	QC Standard	Turbidity	2016/08/23		99	%	80 - 120
4630588	JMV	Spiked Blank	Turbidity	2016/08/23		95	%	80 - 120
4630588	JMV	Method Blank	Turbidity	2016/08/23	ND, RDL=0.10		NTU	
4630588	JMV	RPD	Turbidity	2016/08/23	NC		%	20
4630637	ARS	Matrix Spike	Total Mercury (Hg)	2016/08/24		102	%	80 - 120
4630637	ARS	Spiked Blank	Total Mercury (Hg)	2016/08/24		103	%	80 - 120
4630637	ARS	Method Blank	Total Mercury (Hg)	2016/08/24	ND, RDL=0.013		ug/L	
4630637	ARS	RPD	Total Mercury (Hg)	2016/08/24	4.3		%	20
4632420	BAN	Matrix Spike	Total Aluminum (Al)	2016/08/24		103	%	80 - 120
			Total Antimony (Sb)	2016/08/24		112	%	80 - 120
			Total Arsenic (As)	2016/08/24		98	%	80 - 120
			Total Barium (Ba)	2016/08/24		NC	%	80 - 120
			Total Beryllium (Be)	2016/08/24		103	%	80 - 120
			Total Bismuth (Bi)	2016/08/24		103	%	80 - 120
			Total Boron (B)	2016/08/24		98	%	80 - 120
			Total Cadmium (Cd)	2016/08/24		104	%	80 - 120
			Total Calcium (Ca)	2016/08/24		NC	%	80 - 120
			Total Chromium (Cr)	2016/08/24		98	%	80 - 120
			Total Cobalt (Co)	2016/08/24		100	%	80 - 120
			Total Copper (Cu)	2016/08/24		98	%	80 - 120
			Total Iron (Fe)	2016/08/24		100	%	80 - 120
			Total Lead (Pb)	2016/08/24		101	%	80 - 120
			Total Magnesium (Mg)	2016/08/24		NC	%	80 - 120
			Total Manganese (Mn)	2016/08/24		NC	%	80 - 120
			Total Molybdenum (Mo)	2016/08/24		112	%	80 - 120
			Total Nickel (Ni)	2016/08/24		98	%	80 - 120
			Total Phosphorus (P)	2016/08/24		112	%	80 - 120
			Total Potassium (K)	2016/08/24		NC	%	80 - 120
			Total Selenium (Se)	2016/08/24		97	%	80 - 120
			Total Silver (Ag)	2016/08/24		108	%	80 - 120
			Total Sodium (Na)	2016/08/24		NC	%	80 - 120
			Total Strontium (Sr)	2016/08/24		NC	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Thallium (Tl)	2016/08/24		102	%	80 - 120
			Total Tin (Sn)	2016/08/24		115	%	80 - 120
			Total Titanium (Ti)	2016/08/24		101	%	80 - 120
			Total Uranium (U)	2016/08/24		111	%	80 - 120
			Total Vanadium (V)	2016/08/24		99	%	80 - 120
			Total Zinc (Zn)	2016/08/24		98	%	80 - 120
4632420	BAN	Spiked Blank	Total Aluminum (Al)	2016/08/24		100	%	80 - 120
			Total Antimony (Sb)	2016/08/24		103	%	80 - 120
			Total Arsenic (As)	2016/08/24		93	%	80 - 120
			Total Barium (Ba)	2016/08/24		98	%	80 - 120
			Total Beryllium (Be)	2016/08/24		98	%	80 - 120
			Total Bismuth (Bi)	2016/08/24		104	%	80 - 120
			Total Boron (B)	2016/08/24		94	%	80 - 120
			Total Cadmium (Cd)	2016/08/24		102	%	80 - 120
			Total Calcium (Ca)	2016/08/24		98	%	80 - 120
			Total Chromium (Cr)	2016/08/24		95	%	80 - 120
			Total Cobalt (Co)	2016/08/24		98	%	80 - 120
			Total Copper (Cu)	2016/08/24		97	%	80 - 120
			Total Iron (Fe)	2016/08/24		99	%	80 - 120
			Total Lead (Pb)	2016/08/24		101	%	80 - 120
			Total Magnesium (Mg)	2016/08/24		100	%	80 - 120
			Total Manganese (Mn)	2016/08/24		99	%	80 - 120
			Total Molybdenum (Mo)	2016/08/24		103	%	80 - 120
			Total Nickel (Ni)	2016/08/24		97	%	80 - 120
			Total Phosphorus (P)	2016/08/24		105	%	80 - 120
			Total Potassium (K)	2016/08/24		104	%	80 - 120
			Total Selenium (Se)	2016/08/24		94	%	80 - 120
			Total Silver (Ag)	2016/08/24		101	%	80 - 120
			Total Sodium (Na)	2016/08/24		96	%	80 - 120
			Total Strontium (Sr)	2016/08/24		97	%	80 - 120
			Total Thallium (Tl)	2016/08/24		102	%	80 - 120
			Total Tin (Sn)	2016/08/24		102	%	80 - 120
			Total Titanium (Ti)	2016/08/24		98	%	80 - 120
			Total Uranium (U)	2016/08/24		108	%	80 - 120
			Total Vanadium (V)	2016/08/24		97	%	80 - 120
			Total Zinc (Zn)	2016/08/24		96	%	80 - 120
4632420	BAN	Method Blank	Total Aluminum (Al)	2016/08/24	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/08/24	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/08/24	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/08/24	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/08/24	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/08/24	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/08/24	ND, RDL=0.010		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Calcium (Ca)	2016/08/24	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/08/24	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2016/08/24	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/08/24	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/08/24	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/08/24	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/08/24	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/08/24	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/08/24	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/08/24	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/08/24	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/08/24	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/08/24	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/08/24	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/08/24	ND, RDL=5.0		ug/L	
4632420	BAN	RPD	Total Aluminum (Al)	2016/08/24	NC		%	20
			Total Antimony (Sb)	2016/08/24	NC		%	20
			Total Arsenic (As)	2016/08/24	NC		%	20
			Total Barium (Ba)	2016/08/24	1.7		%	20
			Total Beryllium (Be)	2016/08/24	NC		%	20
			Total Bismuth (Bi)	2016/08/24	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Boron (B)	2016/08/24	NC		%	20
			Total Cadmium (Cd)	2016/08/24	NC		%	20
			Total Calcium (Ca)	2016/08/24	1.2		%	20
			Total Chromium (Cr)	2016/08/24	NC		%	20
			Total Cobalt (Co)	2016/08/24	2.4		%	20
			Total Copper (Cu)	2016/08/24	NC		%	20
			Total Iron (Fe)	2016/08/24	NC		%	20
			Total Lead (Pb)	2016/08/24	NC		%	20
			Total Magnesium (Mg)	2016/08/24	1.2		%	20
			Total Manganese (Mn)	2016/08/24	1.0		%	20
			Total Molybdenum (Mo)	2016/08/24	1.0		%	20
			Total Nickel (Ni)	2016/08/24	NC		%	20
			Total Phosphorus (P)	2016/08/24	NC		%	20
			Total Potassium (K)	2016/08/24	3.2		%	20
			Total Selenium (Se)	2016/08/24	NC		%	20
			Total Silver (Ag)	2016/08/24	NC		%	20
			Total Sodium (Na)	2016/08/24	1.6		%	20
			Total Strontium (Sr)	2016/08/24	1.1		%	20
			Total Thallium (Tl)	2016/08/24	NC		%	20
			Total Tin (Sn)	2016/08/24	NC		%	20
			Total Titanium (Ti)	2016/08/24	NC		%	20
			Total Uranium (U)	2016/08/24	NC		%	20
			Total Vanadium (V)	2016/08/24	NC		%	20
			Total Zinc (Zn)	2016/08/24	NC		%	20
4632569	BAN	Matrix Spike [CXS359-05]	Total Aluminum (Al)	2016/08/26		100	%	80 - 120
			Total Antimony (Sb)	2016/08/26		115	%	80 - 120
			Total Arsenic (As)	2016/08/26		94	%	80 - 120
			Total Barium (Ba)	2016/08/26		110	%	80 - 120
			Total Beryllium (Be)	2016/08/26		106	%	80 - 120
			Total Bismuth (Bi)	2016/08/26		100	%	80 - 120
			Total Boron (B)	2016/08/26		NC	%	80 - 120
			Total Cadmium (Cd)	2016/08/26		100	%	80 - 120
			Total Calcium (Ca)	2016/08/26		NC	%	80 - 120
			Total Chromium (Cr)	2016/08/26		96	%	80 - 120
			Total Cobalt (Co)	2016/08/26		91	%	80 - 120
			Total Copper (Cu)	2016/08/26		86	%	80 - 120
			Total Iron (Fe)	2016/08/26		93	%	80 - 120
			Total Lead (Pb)	2016/08/26		103	%	80 - 120
			Total Magnesium (Mg)	2016/08/26		NC	%	80 - 120
			Total Manganese (Mn)	2016/08/26		97	%	80 - 120
			Total Molybdenum (Mo)	2016/08/26		114	%	80 - 120
			Total Nickel (Ni)	2016/08/26		87	%	80 - 120
			Total Phosphorus (P)	2016/08/26		102	%	80 - 120
			Total Potassium (K)	2016/08/26		NC	%	80 - 120
			Total Selenium (Se)	2016/08/26		88	%	80 - 120
			Total Silver (Ag)	2016/08/26		100	%	80 - 120
			Total Sodium (Na)	2016/08/26		NC	%	80 - 120
			Total Strontium (Sr)	2016/08/26		NC	%	80 - 120
			Total Thallium (Tl)	2016/08/26		103	%	80 - 120
			Total Tin (Sn)	2016/08/26		115	%	80 - 120
			Total Titanium (Ti)	2016/08/26		103	%	80 - 120
			Total Uranium (U)	2016/08/26		112	%	80 - 120
			Total Vanadium (V)	2016/08/26		102	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Zinc (Zn)	2016/08/26		90	%	80 - 120
4632569	BAN	Spiked Blank	Total Aluminum (Al)	2016/08/25		99	%	80 - 120
			Total Antimony (Sb)	2016/08/25		106	%	80 - 120
			Total Arsenic (As)	2016/08/25		91	%	80 - 120
			Total Barium (Ba)	2016/08/25		107	%	80 - 120
			Total Beryllium (Be)	2016/08/25		105	%	80 - 120
			Total Bismuth (Bi)	2016/08/25		105	%	80 - 120
			Total Boron (B)	2016/08/25		100	%	80 - 120
			Total Cadmium (Cd)	2016/08/25		100	%	80 - 120
			Total Calcium (Ca)	2016/08/25		99	%	80 - 120
			Total Chromium (Cr)	2016/08/25		95	%	80 - 120
			Total Cobalt (Co)	2016/08/25		95	%	80 - 120
			Total Copper (Cu)	2016/08/25		92	%	80 - 120
			Total Iron (Fe)	2016/08/25		94	%	80 - 120
			Total Lead (Pb)	2016/08/25		105	%	80 - 120
			Total Magnesium (Mg)	2016/08/25		95	%	80 - 120
			Total Manganese (Mn)	2016/08/25		98	%	80 - 120
			Total Molybdenum (Mo)	2016/08/25		104	%	80 - 120
			Total Nickel (Ni)	2016/08/25		93	%	80 - 120
			Total Phosphorus (P)	2016/08/25		98	%	80 - 120
			Total Potassium (K)	2016/08/25		101	%	80 - 120
			Total Selenium (Se)	2016/08/25		89	%	80 - 120
			Total Silver (Ag)	2016/08/25		100	%	80 - 120
			Total Sodium (Na)	2016/08/25		100	%	80 - 120
			Total Strontium (Sr)	2016/08/25		102	%	80 - 120
			Total Thallium (Tl)	2016/08/25		104	%	80 - 120
			Total Tin (Sn)	2016/08/25		105	%	80 - 120
			Total Titanium (Ti)	2016/08/25		99	%	80 - 120
			Total Uranium (U)	2016/08/25		107	%	80 - 120
			Total Vanadium (V)	2016/08/25		99	%	80 - 120
			Total Zinc (Zn)	2016/08/25		96	%	80 - 120
4632569	BAN	Method Blank	Total Aluminum (Al)	2016/08/25	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/08/25	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/08/25	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/08/25	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/08/25	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/08/25	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/08/25	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/08/25	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/08/25	ND, RDL=1.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Cobalt (Co)	2016/08/25	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/08/25	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/08/25	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/08/25	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/08/25	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/08/25	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/08/25	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/08/25	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/08/25	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/08/25	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/08/25	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/08/25	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/08/25	ND, RDL=5.0		ug/L	
4632569	BAN	RPD [CXS355-05]	Total Aluminum (Al)	2016/08/25	NC		%	20
			Total Antimony (Sb)	2016/08/25	NC		%	20
			Total Arsenic (As)	2016/08/25	NC		%	20
			Total Barium (Ba)	2016/08/25	NC		%	20
			Total Beryllium (Be)	2016/08/25	NC		%	20
			Total Bismuth (Bi)	2016/08/25	NC		%	20
			Total Boron (B)	2016/08/25	NC		%	20
			Total Cadmium (Cd)	2016/08/25	NC		%	20
			Total Calcium (Ca)	2016/08/25	NC		%	20
			Total Chromium (Cr)	2016/08/25	NC		%	20
			Total Cobalt (Co)	2016/08/25	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Copper (Cu)	2016/08/25	NC		%	20
			Total Iron (Fe)	2016/08/25	NC		%	20
			Total Lead (Pb)	2016/08/25	NC		%	20
			Total Magnesium (Mg)	2016/08/25	NC		%	20
			Total Manganese (Mn)	2016/08/25	NC		%	20
			Total Molybdenum (Mo)	2016/08/25	NC		%	20
			Total Nickel (Ni)	2016/08/25	NC		%	20
			Total Phosphorus (P)	2016/08/25	NC		%	20
			Total Potassium (K)	2016/08/25	NC		%	20
			Total Selenium (Se)	2016/08/25	NC		%	20
			Total Silver (Ag)	2016/08/25	NC		%	20
			Total Sodium (Na)	2016/08/25	NC		%	20
			Total Strontium (Sr)	2016/08/25	NC		%	20
			Total Thallium (Tl)	2016/08/25	NC		%	20
			Total Tin (Sn)	2016/08/25	NC		%	20
			Total Titanium (Ti)	2016/08/25	NC		%	20
			Total Uranium (U)	2016/08/25	NC		%	20
			Total Vanadium (V)	2016/08/25	NC		%	20
			Total Zinc (Zn)	2016/08/25	NC		%	20
4632960	ASL	Matrix Spike	Isobutylbenzene - Volatile	2016/08/25		100	%	70 - 130
			Benzene	2016/08/25		99	%	70 - 130
			Toluene	2016/08/25		100	%	70 - 130
			Ethylbenzene	2016/08/25		101	%	70 - 130
			Total Xylenes	2016/08/25		100	%	70 - 130
4632960	ASL	Spiked Blank	Isobutylbenzene - Volatile	2016/08/24		100	%	70 - 130
			Benzene	2016/08/24		84	%	70 - 130
			Toluene	2016/08/24		89	%	70 - 130
			Ethylbenzene	2016/08/24		91	%	70 - 130
			Total Xylenes	2016/08/24		92	%	70 - 130
4632960	ASL	Method Blank	Isobutylbenzene - Volatile	2016/08/24		95	%	70 - 130
			Benzene	2016/08/24	ND, RDL=0.0010		mg/L	
			Toluene	2016/08/24	ND, RDL=0.0010		mg/L	
			Ethylbenzene	2016/08/24	ND, RDL=0.0010		mg/L	
			Total Xylenes	2016/08/24	ND, RDL=0.0020		mg/L	
			C6 - C10 (less BTEX)	2016/08/24	ND, RDL=0.010		mg/L	
4632960	ASL	RPD	Benzene	2016/08/24	NC		%	40
			Toluene	2016/08/24	NC		%	40
			Ethylbenzene	2016/08/24	NC		%	40
			Total Xylenes	2016/08/24	NC		%	40
			C6 - C10 (less BTEX)	2016/08/24	NC		%	40
4634172	BHR	Matrix Spike	Isobutylbenzene - Extractable	2016/08/25		105	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/25		106	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/25		108	%	70 - 130
			>C16-C21 Hydrocarbons	2016/08/25		104	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/25		80	%	70 - 130
4634172	BHR	Spiked Blank	Isobutylbenzene - Extractable	2016/08/25		105	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/25		103	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/25		106	%	70 - 130

Maxxam
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Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			>C16-C21 Hydrocarbons	2016/08/25		101	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/25		80	%	70 - 130
4634172	BHR	Method Blank	Isobutylbenzene - Extractable	2016/08/25		104	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/25		100	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/25	ND, RDL=0.050		mg/L	
			>C16-C21 Hydrocarbons	2016/08/25	ND, RDL=0.050		mg/L	
			>C21-<C32 Hydrocarbons	2016/08/25	ND, RDL=0.10		mg/L	
4634172	BHR	RPD	>C10-C16 Hydrocarbons	2016/08/25	NC		%	40
			>C16-C21 Hydrocarbons	2016/08/25	NC		%	40
			>C21-<C32 Hydrocarbons	2016/08/25	NC		%	40
4634575	SMT	Matrix Spike	Total Organic Carbon (C)	2016/08/25		NC	%	80 - 120
4634575	SMT	Spiked Blank	Total Organic Carbon (C)	2016/08/25		94	%	80 - 120
4634575	SMT	Method Blank	Total Organic Carbon (C)	2016/08/25	ND, RDL=0.50		mg/L	
4634575	SMT	RPD	Total Organic Carbon (C)	2016/08/25	0.081		%	20
4636157	NRG	Matrix Spike [CXS360-04]	Total Alkalinity (Total as CaCO3)	2016/08/30		NC	%	80 - 120
4636157	NRG	Spiked Blank	Total Alkalinity (Total as CaCO3)	2016/08/29		102	%	80 - 120
4636157	NRG	Method Blank	Total Alkalinity (Total as CaCO3)	2016/08/29	ND, RDL=5.0		mg/L	
4636157	NRG	RPD [CXS360-04]	Total Alkalinity (Total as CaCO3)	2016/08/30	2.5		%	25
4636166	NRG	Matrix Spike [CXS360-04]	Reactive Silica (SiO2)	2016/08/30		94	%	80 - 120
4636166	NRG	Spiked Blank	Reactive Silica (SiO2)	2016/08/30		98	%	80 - 120
4636166	NRG	Method Blank	Reactive Silica (SiO2)	2016/08/30	ND, RDL=0.50		mg/L	
4636166	NRG	RPD [CXS360-04]	Reactive Silica (SiO2)	2016/08/30	NC		%	25
4636167	NRG	Spiked Blank	Colour	2016/08/29		101	%	80 - 120
4636167	NRG	Method Blank	Colour	2016/08/29	ND, RDL=5.0		TCU	
4636167	NRG	RPD [CXS360-04]	Colour	2016/08/29	NC		%	20
4640970	DRM	Matrix Spike	Dissolved Chloride (Cl)	2016/08/31		NC	%	80 - 120
4640970	DRM	Spiked Blank	Dissolved Chloride (Cl)	2016/08/31		102	%	80 - 120
4640970	DRM	Method Blank	Dissolved Chloride (Cl)	2016/08/31	ND, RDL=1.0		mg/L	
4640970	DRM	RPD	Dissolved Chloride (Cl)	2016/08/31	0.37		%	20
4640976	ADB	Matrix Spike	Dissolved Sulphate (SO4)	2016/08/31		NC	%	75 - 125
4640976	ADB	Spiked Blank	Dissolved Sulphate (SO4)	2016/08/31		103	%	80 - 120
4640976	ADB	Method Blank	Dissolved Sulphate (SO4)	2016/08/31	ND, RDL=1.0		mg/L	
4640976	ADB	RPD	Dissolved Sulphate (SO4)	2016/08/31	1.3		%	20
4640982	ADB	Matrix Spike	Orthophosphate (P)	2016/08/31		109	%	75 - 125
4640982	ADB	Spiked Blank	Orthophosphate (P)	2016/08/31		99	%	80 - 120
4640982	ADB	Method Blank	Orthophosphate (P)	2016/08/31	ND, RDL=0.010		mg/L	
4640982	ADB	RPD	Orthophosphate (P)	2016/08/31	NC		%	25
4640996	C_N	Matrix Spike	Nitrite (N)	2016/08/31		98	%	80 - 120
			Nitrate (N)	2016/08/31		NC	%	80 - 120
4640996	C_N	Spiked Blank	Nitrite (N)	2016/08/31		99	%	80 - 120
			Nitrate (N)	2016/08/31		96	%	80 - 120

Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4640996	C_N	Method Blank	Nitrite (N)	2016/08/31	ND, RDL=0.010		mg/L	
			Nitrate (N)	2016/08/31	ND, RDL=0.10		mg/L	
4640996	C_N	RPD	Nitrate (N)	2016/08/31	0.53		%	25
4642250	COP	Matrix Spike	Total Ammonia-N	2016/09/06		94	%	80 - 120
4642250	COP	Spiked Blank	Total Ammonia-N	2016/09/06		101	%	85 - 115
4642250	COP	Method Blank	Total Ammonia-N	2016/09/06	ND, RDL=0.050		mg/L	
4642250	COP	RPD	Total Ammonia-N	2016/09/06	NC		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Maxxam Job #: B6H7502
Report Date: 2016/09/06

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Services

Mike MacGillivray, Scientific Specialist (Inorganics)

Phil Deveau

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Maxxam
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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560250-02-01, 560250-03-01, 560250-04-01

Report Date: 2016/09/12
Report #: R4165019
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6I3064
Received: 2016/08/25, 11:00

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide (1)	5	N/A	2016/08/30	N/A	SM 22 4500-CO2 D
Alkalinity (1)	5	N/A	2016/09/01	ATL SOP 00013	EPA 310.2 R1974 m
Chloride (1)	5	N/A	2016/09/07	ATL SOP 00014	SM 22 4500-Cl- E m
Colour (1)	5	N/A	2016/09/01	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	5	N/A	2016/08/30	ATL SOP 00004	SM 22 2510B m
TEH in Water (PIRI) (1)	5	2016/08/29	2016/08/30	ATL SOP 00113	Atl. RBCA v3 m
Hardness (calculated as CaCO3) (1)	2	N/A	2016/08/30	ATL SOP 00048	SM 22 2340 B
Hardness (calculated as CaCO3) (1)	3	N/A	2016/08/31	ATL SOP 00048	SM 22 2340 B
Mercury - Total (CVAA,LL) (1)	5	2016/08/29	2016/08/30	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS (1)	3	2016/08/29	2016/08/30	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS (1)	2	2016/08/30	2016/08/31	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	5	N/A	2016/09/12		Auto Calc.
Anion and Cation Sum (1)	5	N/A	2016/09/12		Auto Calc.
Nitrogen Ammonia - water (1)	5	N/A	2016/09/12	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite (1)	5	N/A	2016/09/06	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite (1)	5	N/A	2016/09/07	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N) (1)	5	N/A	2016/09/07	ATL SOP 00018	ASTM D3867-16
pH (1, 2)	5	N/A	2016/08/30	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho (1)	5	N/A	2016/09/07	ATL SOP 00021	EPA 365.2 m
VPH in Water (PIRI) (1)	5	N/A	2016/09/01	ATL SOP 00118	Atl. RBCA v3 m
Sat. pH and Langelier Index (@ 20C) (1)	5	N/A	2016/09/12	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	5	N/A	2016/09/12	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	5	N/A	2016/09/01	ATL SOP 00022	EPA 366.0 m
Sulphate (1)	5	N/A	2016/09/06	ATL SOP 00023	ASTMD516-11 m
Total Dissolved Solids (TDS calc) (1)	5	N/A	2016/09/12		Auto Calc.
Organic carbon - Total (TOC) (1, 3)	5	N/A	2016/08/30	ATL SOP 00037	SM 22 5310C m
ModTPH (T1) Calc. for Water (1)	5	N/A	2016/09/01	N/A	Atl. RBCA v3 m

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Maxxam
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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560250-02-01, 560250-03-01, 560250-04-01

Report Date: 2016/09/12
Report #: R4165019
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6I3064
Received: 2016/08/25, 11:00

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Total Suspended Solids (1)	5	2016/08/29	2016/08/29	ATL SOP 00007	SM 22 2540D m
Turbidity (1)	5	N/A	2016/08/30	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford
(2) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(3) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Maxxam
12 Sep 2016 17:22:36 -02:30

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
==
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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam
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Maxxam Job #: B6I3064
Report Date: 2016/09/12

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

RBCA HYDROCARBONS IN WATER (WATER)

Maxxam ID		CYS387	CYS388	CYS389	CYS390		CYS391		
Sampling Date		2016/08/21 16:40	2016/08/21 15:00	2016/08/21 17:00	2016/08/21 16:40		2016/08/21 14:45		
COC Number		560250-02-01	560250-02-01	560250-03-01	560250-04-01		560250-04-01		
	UNITS	**W-12**	**W-18**	**W-26**	**W-33**	**RDL**	**W-36**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	ND	ND	ND	ND	0.0010	ND	0.0010	4640498
Toluene	mg/L	ND	ND	ND	ND	0.0010	ND	0.0010	4640498
Ethylbenzene	mg/L	ND	ND	ND	ND	0.0010	ND	0.0010	4640498
Total Xylenes	mg/L	ND	ND	ND	ND	0.0020	ND	0.0020	4640498
C6 - C10 (less BTEX)	mg/L	ND	ND	ND	ND	0.010	ND	0.010	4640498
>C10-C16 Hydrocarbons	mg/L	ND	ND	ND	ND	0.050	ND (1)	0.053	4638776
>C16-C21 Hydrocarbons	mg/L	ND	ND	ND	ND	0.050	ND (1)	0.053	4638776
>C21-<C32 Hydrocarbons	mg/L	ND	ND	ND	ND	0.10	ND (1)	0.11	4638776
Modified TPH (Tier1)	mg/L	ND	ND	ND	ND	0.10	ND	0.11	4637995
Reached Baseline at C32	mg/L	NA	NA	NA	NA	N/A	NA	N/A	4638776
Hydrocarbon Resemblance	mg/L	NA	NA	NA	NA	N/A	NA	N/A	4638776
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	106	100	106	106		88		4638776
n-Dotriacontane - Extractable	%	110	104	110	109		93		4638776
Isobutylbenzene - Volatile	%	99	99	99	100		100		4640498

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to limited sample.

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Maxxam Job #: B6I3064
Report Date: 2016/09/12

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CYS387		CYS388		CYS389	CYS390		
Sampling Date		2016/08/21 16:40		2016/08/21 15:00		2016/08/21 17:00	2016/08/21 16:40		
COC Number		560250-02-01		560250-02-01		560250-03-01	560250-04-01		
	UNITS	**W-12**	**QC Batch**	**W-18**	**QC Batch**	**W-26**	**W-33**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	332	4637958	277	4637958	350	321	N/A	4637958
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	89	4637954	90	4637954	87	89	1.0	4637954
Calculated TDS	mg/L	19000	4637962	16000	4637962	20000	16000	1.0	4637962
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	4637954	ND	4637954	ND	ND	1.0	4637954
Cation Sum	me/L	341	4637958	288	4637958	342	220	N/A	4637958
Hardness (CaCO3)	mg/L	3600	4637956	3100	4637956	3700	2400	1.0	4637956
Ion Balance (% Difference)	%	1.35	4637957	2.06	4637957	1.23	18.7	N/A	4637957
Langelier Index (@ 20C)	N/A	0.108	4637960	0.239	4637960	0.138	0.131		4637960
Langelier Index (@ 4C)	N/A	-0.129	4637961	0.00200	4637961	-0.0990	-0.106		4637961
Nitrate (N)	mg/L	ND	4637959	ND	4637959	ND	ND	0.050	4637959
Saturation pH (@ 20C)	N/A	7.56	4637960	7.63	4637960	7.56	7.73		4637960
Saturation pH (@ 4C)	N/A	7.80	4637961	7.86	4637961	7.79	7.97		4637961
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	90	4643901	91	4643901	88	89	5.0	4643901
Dissolved Chloride (Cl)	mg/L	11000	4648398	8800	4648398	11000	10000	120	4648398
Colour	TCU	ND	4643904	ND	4643904	ND	ND	5.0	4643904
Nitrate + Nitrite (N)	mg/L	ND	4648402	ND	4648402	ND	ND	0.050	4648402
Nitrite (N)	mg/L	ND	4648403	ND	4648403	ND	ND	0.010	4648403
Nitrogen (Ammonia Nitrogen)	mg/L	0.064	4656286	0.15	4656286	0.16	0.16	0.050	4656286
Total Organic Carbon (C)	mg/L	ND (1)	4640419	ND (1)	4640419	ND (1)	ND (1)	5.0	4640419
Orthophosphate (P)	mg/L	0.011	4648401	0.012	4648401	0.010	0.012	0.010	4648401
pH	pH	7.67	4640129	7.87	4640129	7.69	7.86	N/A	4640132
Reactive Silica (SiO2)	mg/L	ND	4643903	ND	4643903	ND	ND	0.50	4643903
Dissolved Sulphate (SO4)	mg/L	1500	4648400	1200	4648400	1500	1300	200	4648400
Turbidity	NTU	0.21	4640159	0.15	4640156	0.17	0.33	0.10	4640159
Conductivity	uS/cm	31000	4640130	26000	4640130	32000	29000	1.0	4640133
Metals									
Total Aluminum (Al)	ug/L	ND	4638971	ND	4640118	ND	ND	50	4638971
Total Antimony (Sb)	ug/L	ND	4638971	ND	4640118	ND	ND	10	4638971
Total Arsenic (As)	ug/L	ND	4638971	ND	4640118	ND	ND	10	4638971
Total Barium (Ba)	ug/L	ND	4638971	ND	4640118	ND	ND	10	4638971
Total Beryllium (Be)	ug/L	ND	4638971	ND	4640118	ND	ND	10	4638971

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.

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Maxxam Job #: B6I3064
Report Date: 2016/09/12

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CYS387		CYS388		CYS389	CYS390		
Sampling Date		2016/08/21 16:40		2016/08/21 15:00		2016/08/21 17:00	2016/08/21 16:40		
COC Number		560250-02-01		560250-02-01		560250-03-01	560250-04-01		
	UNITS	W-12	QC Batch	W-18	QC Batch	W-26	W-33	RDL	QC Batch
Total Bismuth (Bi)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Boron (B)	ug/L	2600	4638971	2200	4640118	2600	1700	500	4638971
Total Cadmium (Cd)	ug/L	ND	4638971	ND	4640118	ND	ND	0.10	4638971
Total Calcium (Ca)	ug/L	240000	4638971	210000	4640118	250000	170000	1000	4638971
Total Chromium (Cr)	ug/L	ND	4638971	ND	4640118	ND	ND	10	4638971
Total Cobalt (Co)	ug/L	ND	4638971	ND	4640118	ND	ND	4.0	4638971
Total Copper (Cu)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Iron (Fe)	ug/L	ND	4638971	ND	4640118	ND	ND	500	4638971
Total Lead (Pb)	ug/L	ND	4638971	ND	4640118	ND	ND	5.0	4638971
Total Magnesium (Mg)	ug/L	730000	4638971	630000	4640118	740000	480000	1000	4638971
Total Manganese (Mn)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Molybdenum (Mo)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Nickel (Ni)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Phosphorus (P)	ug/L	ND	4638971	ND	4640118	ND	ND	1000	4638971
Total Potassium (K)	ug/L	220000	4638971	180000	4640118	230000	150000	1000	4638971
Total Selenium (Se)	ug/L	ND	4638971	ND	4640118	ND	ND	10	4638971
Total Silver (Ag)	ug/L	ND	4638971	ND	4640118	ND	ND	1.0	4638971
Total Sodium (Na)	ug/L	6000000	4638971	5100000	4640118	6000000	3900000	1000	4638971
Total Strontium (Sr)	ug/L	4400	4638971	3600	4640118	4600	3000	20	4638971
Total Thallium (Tl)	ug/L	ND	4638971	ND	4640118	ND	ND	1.0	4638971
Total Tin (Sn)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Titanium (Ti)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Uranium (U)	ug/L	2.5	4638971	2.3	4640118	2.2	2.7	1.0	4638971
Total Vanadium (V)	ug/L	ND	4638971	ND	4640118	ND	ND	20	4638971
Total Zinc (Zn)	ug/L	ND	4638971	ND	4640118	ND	ND	50	4638971

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B6I3064
Report Date: 2016/09/12

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CYS391		
Sampling Date		2016/08/21 14:45		
COC Number		560250-04-01		
	UNITS	W-36	RDL	QC Batch
Calculated Parameters				
Anion Sum	me/L	358	N/A	4637958
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	87	1.0	4637954
Calculated TDS	mg/L	21000	1.0	4637962
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4637954
Cation Sum	me/L	365	N/A	4637958
Hardness (CaCO3)	mg/L	3900	1.0	4637956
Ion Balance (% Difference)	%	0.910	N/A	4637957
Langelier Index (@ 20C)	N/A	0.233		4637960
Langelier Index (@ 4C)	N/A	-0.00400		4637961
Nitrate (N)	mg/L	ND	0.050	4637959
Saturation pH (@ 20C)	N/A	7.55		4637960
Saturation pH (@ 4C)	N/A	7.78		4637961
Inorganics				
Total Alkalinity (Total as CaCO3)	mg/L	88	5.0	4643901
Dissolved Chloride (Cl)	mg/L	12000	120	4648398
Colour	TCU	ND	5.0	4643904
Nitrate + Nitrite (N)	mg/L	ND	0.050	4648402
Nitrite (N)	mg/L	ND	0.010	4648403
Nitrogen (Ammonia Nitrogen)	mg/L	0.15	0.050	4656286
Total Organic Carbon (C)	mg/L	ND (1)	5.0	4640419
Orthophosphate (P)	mg/L	0.017	0.010	4648401
pH	pH	7.78	N/A	4640129
Reactive Silica (SiO2)	mg/L	ND	0.50	4643903
Dissolved Sulphate (SO4)	mg/L	1500	200	4648400
Turbidity	NTU	0.11	0.10	4640156
Conductivity	uS/cm	32000	1.0	4640130
Metals				
Total Aluminum (Al)	ug/L	ND	50	4640118
Total Antimony (Sb)	ug/L	ND	10	4640118
Total Arsenic (As)	ug/L	ND	10	4640118
Total Barium (Ba)	ug/L	ND	10	4640118
Total Beryllium (Be)	ug/L	ND	10	4640118

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.

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ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		CYS391		
Sampling Date		2016/08/21 14:45		
COC Number		560250-04-01		
	UNITS	W-36	RDL	QC Batch
Total Bismuth (Bi)	ug/L	ND	20	4640118
Total Boron (B)	ug/L	2800	500	4640118
Total Cadmium (Cd)	ug/L	ND	0.10	4640118
Total Calcium (Ca)	ug/L	250000	1000	4640118
Total Chromium (Cr)	ug/L	ND	10	4640118
Total Cobalt (Co)	ug/L	ND	4.0	4640118
Total Copper (Cu)	ug/L	ND	20	4640118
Total Iron (Fe)	ug/L	ND	500	4640118
Total Lead (Pb)	ug/L	ND	5.0	4640118
Total Magnesium (Mg)	ug/L	790000	1000	4640118
Total Manganese (Mn)	ug/L	ND	20	4640118
Total Molybdenum (Mo)	ug/L	ND	20	4640118
Total Nickel (Ni)	ug/L	ND	20	4640118
Total Phosphorus (P)	ug/L	ND	1000	4640118
Total Potassium (K)	ug/L	230000	1000	4640118
Total Selenium (Se)	ug/L	ND	10	4640118
Total Silver (Ag)	ug/L	ND	1.0	4640118
Total Sodium (Na)	ug/L	6500000	1000	4640118
Total Strontium (Sr)	ug/L	4500	20	4640118
Total Thallium (Tl)	ug/L	ND	1.0	4640118
Total Tin (Sn)	ug/L	ND	20	4640118
Total Titanium (Ti)	ug/L	ND	20	4640118
Total Uranium (U)	ug/L	2.2	1.0	4640118
Total Vanadium (V)	ug/L	ND	20	4640118
Total Zinc (Zn)	ug/L	ND	50	4640118

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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RESULTS OF ANALYSES OF WATER

Maxxam ID		CYS387	CYS388	CYS389	CYS390	CYS391		
Sampling Date		2016/08/21 16:40	2016/08/21 15:00	2016/08/21 17:00	2016/08/21 16:40	2016/08/21 14:45		
COC Number		560250-02-01	560250-02-01	560250-03-01	560250-04-01	560250-04-01		
	UNITS	W-12	W-18	W-26	W-33	W-36	RDL	QC Batch
Inorganics								
Total Suspended Solids	mg/L	1.0	ND	ND	ND	ND	1.0	4638625

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		CYS387	CYS388	CYS389	CYS390	CYS391		
Sampling Date		2016/08/21 16:40	2016/08/21 15:00	2016/08/21 17:00	2016/08/21 16:40	2016/08/21 14:45		
COC Number		560250-02-01	560250-02-01	560250-03-01	560250-04-01	560250-04-01		
	UNITS	W-12	W-18	W-26	W-33	W-36	RDL	QC Batch
Metals								
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	0.013	4639187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.0°C
Package 2	12.0°C

TSS samples analyzed past the recommended holding time due to lab error.

Sample CYS387-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample CYS388-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample CYS389-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample CYS390-01 : Elevated reporting limits for trace metals due to sample matrix.

Poor RCAp Ion Balance due to sample matrix.

Sample CYS391-01 : Elevated reporting limits for trace metals due to sample matrix.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4638625	MM9	QC Standard	Total Suspended Solids	2016/08/29		94	%	80 - 120
4638625	MM9	Method Blank	Total Suspended Solids	2016/08/29	ND, RDL=1.0		mg/L	
4638625	MM9	RPD	Total Suspended Solids	2016/08/29	4.5		%	25
4638776	RDE	Matrix Spike	Isobutylbenzene - Extractable	2016/08/30		104	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/30		124	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/30		95	%	70 - 130
			>C16-C21 Hydrocarbons	2016/08/30		90	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/30		87	%	70 - 130
4638776	RDE	Spiked Blank	Isobutylbenzene - Extractable	2016/08/30		104	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/30		119	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/30		101	%	70 - 130
			>C16-C21 Hydrocarbons	2016/08/30		92	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/08/30		90	%	70 - 130
4638776	RDE	Method Blank	Isobutylbenzene - Extractable	2016/08/30		104	%	30 - 130
			n-Dotriacontane - Extractable	2016/08/30		109	%	30 - 130
			>C10-C16 Hydrocarbons	2016/08/30	ND, RDL=0.050		mg/L	
			>C16-C21 Hydrocarbons	2016/08/30	ND, RDL=0.050		mg/L	
			>C21-<C32 Hydrocarbons	2016/08/30	ND, RDL=0.10		mg/L	
4638776	RDE	RPD	>C10-C16 Hydrocarbons	2016/08/30	NC		%	40
			>C16-C21 Hydrocarbons	2016/08/30	NC		%	40
			>C21-<C32 Hydrocarbons	2016/08/30	NC		%	40
4638971	BAN	Matrix Spike	Total Aluminum (Al)	2016/08/30		102	%	80 - 120
			Total Antimony (Sb)	2016/08/30		106	%	80 - 120
			Total Arsenic (As)	2016/08/30		99	%	80 - 120
			Total Barium (Ba)	2016/08/30		NC	%	80 - 120
			Total Beryllium (Be)	2016/08/30		102	%	80 - 120
			Total Bismuth (Bi)	2016/08/30		102	%	80 - 120
			Total Boron (B)	2016/08/30		103	%	80 - 120
			Total Cadmium (Cd)	2016/08/30		101	%	80 - 120
			Total Calcium (Ca)	2016/08/30		NC	%	80 - 120
			Total Chromium (Cr)	2016/08/30		99	%	80 - 120
			Total Cobalt (Co)	2016/08/30		103	%	80 - 120
			Total Copper (Cu)	2016/08/30		99	%	80 - 120
			Total Iron (Fe)	2016/08/30		98	%	80 - 120
			Total Lead (Pb)	2016/08/30		103	%	80 - 120
			Total Magnesium (Mg)	2016/08/30		NC	%	80 - 120
			Total Manganese (Mn)	2016/08/30		100	%	80 - 120
			Total Molybdenum (Mo)	2016/08/30		103	%	80 - 120
			Total Nickel (Ni)	2016/08/30		99	%	80 - 120
			Total Phosphorus (P)	2016/08/30		106	%	80 - 120
			Total Potassium (K)	2016/08/30		102	%	80 - 120
			Total Selenium (Se)	2016/08/30		98	%	80 - 120
			Total Silver (Ag)	2016/08/30		101	%	80 - 120
			Total Sodium (Na)	2016/08/30		NC	%	80 - 120
			Total Strontium (Sr)	2016/08/30		NC	%	80 - 120
			Total Thallium (Tl)	2016/08/30		104	%	80 - 120
			Total Tin (Sn)	2016/08/30		109	%	80 - 120
			Total Titanium (Ti)	2016/08/30		102	%	80 - 120
			Total Uranium (U)	2016/08/30		111	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Vanadium (V)	2016/08/30		105	%	80 - 120
			Total Zinc (Zn)	2016/08/30		98	%	80 - 120
4638971	BAN	Spiked Blank	Total Aluminum (Al)	2016/08/29		106	%	80 - 120
			Total Antimony (Sb)	2016/08/29		106	%	80 - 120
			Total Arsenic (As)	2016/08/29		100	%	80 - 120
			Total Barium (Ba)	2016/08/29		102	%	80 - 120
			Total Beryllium (Be)	2016/08/29		102	%	80 - 120
			Total Bismuth (Bi)	2016/08/29		107	%	80 - 120
			Total Boron (B)	2016/08/29		99	%	80 - 120
			Total Cadmium (Cd)	2016/08/29		102	%	80 - 120
			Total Calcium (Ca)	2016/08/29		99	%	80 - 120
			Total Chromium (Cr)	2016/08/29		100	%	80 - 120
			Total Cobalt (Co)	2016/08/29		104	%	80 - 120
			Total Copper (Cu)	2016/08/29		104	%	80 - 120
			Total Iron (Fe)	2016/08/29		102	%	80 - 120
			Total Lead (Pb)	2016/08/29		108	%	80 - 120
			Total Magnesium (Mg)	2016/08/29		102	%	80 - 120
			Total Manganese (Mn)	2016/08/29		103	%	80 - 120
			Total Molybdenum (Mo)	2016/08/29		102	%	80 - 120
			Total Nickel (Ni)	2016/08/29		104	%	80 - 120
			Total Phosphorus (P)	2016/08/29		106	%	80 - 120
			Total Potassium (K)	2016/08/29		105	%	80 - 120
			Total Selenium (Se)	2016/08/29		97	%	80 - 120
			Total Silver (Ag)	2016/08/29		102	%	80 - 120
			Total Sodium (Na)	2016/08/29		100	%	80 - 120
			Total Strontium (Sr)	2016/08/29		105	%	80 - 120
			Total Thallium (Tl)	2016/08/29		106	%	80 - 120
			Total Tin (Sn)	2016/08/29		109	%	80 - 120
			Total Titanium (Ti)	2016/08/29		104	%	80 - 120
			Total Uranium (U)	2016/08/29		112	%	80 - 120
			Total Vanadium (V)	2016/08/29		108	%	80 - 120
			Total Zinc (Zn)	2016/08/29		101	%	80 - 120
4638971	BAN	Method Blank	Total Aluminum (Al)	2016/08/29	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/08/29	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/08/29	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/08/29	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/08/29	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/08/29	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/08/29	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/08/29	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/08/29	ND, RDL=1.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Cobalt (Co)	2016/08/29	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/08/29	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/08/29	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/08/29	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/08/29	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/08/29	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/08/29	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/08/29	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/08/29	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/08/29	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/08/29	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/08/29	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/08/29	ND, RDL=5.0		ug/L	
4638971	BAN	RPD	Total Aluminum (Al)	2016/08/30	NC		%	20
			Total Antimony (Sb)	2016/08/30	NC		%	20
			Total Arsenic (As)	2016/08/30	NC		%	20
			Total Barium (Ba)	2016/08/30	2.5		%	20
			Total Beryllium (Be)	2016/08/30	NC		%	20
			Total Bismuth (Bi)	2016/08/30	NC		%	20
			Total Boron (B)	2016/08/30	NC		%	20
			Total Cadmium (Cd)	2016/08/30	NC		%	20
			Total Calcium (Ca)	2016/08/30	3.1		%	20
			Total Chromium (Cr)	2016/08/30	NC		%	20
			Total Cobalt (Co)	2016/08/30	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Copper (Cu)	2016/08/30	5.1		%	20
			Total Iron (Fe)	2016/08/30	NC		%	20
			Total Lead (Pb)	2016/08/30	NC		%	20
			Total Magnesium (Mg)	2016/08/30	1.6		%	20
			Total Manganese (Mn)	2016/08/30	NC		%	20
			Total Molybdenum (Mo)	2016/08/30	NC		%	20
			Total Nickel (Ni)	2016/08/30	NC		%	20
			Total Phosphorus (P)	2016/08/30	NC		%	20
			Total Potassium (K)	2016/08/30	0.42		%	20
			Total Selenium (Se)	2016/08/30	NC		%	20
			Total Silver (Ag)	2016/08/30	NC		%	20
			Total Sodium (Na)	2016/08/30	1.5		%	20
			Total Strontium (Sr)	2016/08/30	3.2		%	20
			Total Thallium (Tl)	2016/08/30	NC		%	20
			Total Tin (Sn)	2016/08/30	NC		%	20
			Total Titanium (Ti)	2016/08/30	NC		%	20
			Total Uranium (U)	2016/08/30	0.93		%	20
			Total Vanadium (V)	2016/08/30	NC		%	20
			Total Zinc (Zn)	2016/08/30	NC		%	20
4639187	ARS	Matrix Spike	Total Mercury (Hg)	2016/08/30		93	%	80 - 120
4639187	ARS	Spiked Blank	Total Mercury (Hg)	2016/08/30		100	%	80 - 120
4639187	ARS	Method Blank	Total Mercury (Hg)	2016/08/30	ND, RDL=0.013		ug/L	
4639187	ARS	RPD	Total Mercury (Hg)	2016/08/30	NC		%	20
4640118	MLB	Matrix Spike	Total Aluminum (Al)	2016/08/30		108	%	80 - 120
			Total Antimony (Sb)	2016/08/30		117	%	80 - 120
			Total Arsenic (As)	2016/08/30		99	%	80 - 120
			Total Barium (Ba)	2016/08/30		105	%	80 - 120
			Total Beryllium (Be)	2016/08/30		103	%	80 - 120
			Total Bismuth (Bi)	2016/08/30		109	%	80 - 120
			Total Boron (B)	2016/08/30		100	%	80 - 120
			Total Cadmium (Cd)	2016/08/30		103	%	80 - 120
			Total Calcium (Ca)	2016/08/30		104	%	80 - 120
			Total Chromium (Cr)	2016/08/30		99	%	80 - 120
			Total Cobalt (Co)	2016/08/30		101	%	80 - 120
			Total Copper (Cu)	2016/08/30		NC	%	80 - 120
			Total Iron (Fe)	2016/08/30		100	%	80 - 120
			Total Lead (Pb)	2016/08/30		105	%	80 - 120
			Total Magnesium (Mg)	2016/08/30		106	%	80 - 120
			Total Manganese (Mn)	2016/08/30		104	%	80 - 120
			Total Molybdenum (Mo)	2016/08/30		111	%	80 - 120
			Total Nickel (Ni)	2016/08/30		100	%	80 - 120
			Total Phosphorus (P)	2016/08/30		109	%	80 - 120
			Total Potassium (K)	2016/08/30		105	%	80 - 120
			Total Selenium (Se)	2016/08/30		97	%	80 - 120
			Total Silver (Ag)	2016/08/30		108	%	80 - 120
			Total Sodium (Na)	2016/08/30		100	%	80 - 120
			Total Strontium (Sr)	2016/08/30		105	%	80 - 120
			Total Thallium (Tl)	2016/08/30		107	%	80 - 120
			Total Tin (Sn)	2016/08/30		118	%	80 - 120
			Total Titanium (Ti)	2016/08/30		107	%	80 - 120
			Total Uranium (U)	2016/08/30		115	%	80 - 120
			Total Vanadium (V)	2016/08/30		101	%	80 - 120

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Maxxam Job #: B6I3064
Report Date: 2016/09/12

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Zinc (Zn)	2016/08/30		97	%	80 - 120
4640118	MLB	Spiked Blank	Total Aluminum (Al)	2016/08/30		108	%	80 - 120
			Total Antimony (Sb)	2016/08/30		114	%	80 - 120
			Total Arsenic (As)	2016/08/30		97	%	80 - 120
			Total Barium (Ba)	2016/08/30		103	%	80 - 120
			Total Beryllium (Be)	2016/08/30		100	%	80 - 120
			Total Bismuth (Bi)	2016/08/30		106	%	80 - 120
			Total Boron (B)	2016/08/30		97	%	80 - 120
			Total Cadmium (Cd)	2016/08/30		101	%	80 - 120
			Total Calcium (Ca)	2016/08/30		103	%	80 - 120
			Total Chromium (Cr)	2016/08/30		97	%	80 - 120
			Total Cobalt (Co)	2016/08/30		99	%	80 - 120
			Total Copper (Cu)	2016/08/30		97	%	80 - 120
			Total Iron (Fe)	2016/08/30		99	%	80 - 120
			Total Lead (Pb)	2016/08/30		104	%	80 - 120
			Total Magnesium (Mg)	2016/08/30		104	%	80 - 120
			Total Manganese (Mn)	2016/08/30		104	%	80 - 120
			Total Molybdenum (Mo)	2016/08/30		109	%	80 - 120
			Total Nickel (Ni)	2016/08/30		99	%	80 - 120
			Total Phosphorus (P)	2016/08/30		106	%	80 - 120
			Total Potassium (K)	2016/08/30		102	%	80 - 120
			Total Selenium (Se)	2016/08/30		94	%	80 - 120
			Total Silver (Ag)	2016/08/30		105	%	80 - 120
			Total Sodium (Na)	2016/08/30		100	%	80 - 120
			Total Strontium (Sr)	2016/08/30		105	%	80 - 120
			Total Thallium (Tl)	2016/08/30		105	%	80 - 120
			Total Tin (Sn)	2016/08/30		117	%	80 - 120
			Total Titanium (Ti)	2016/08/30		102	%	80 - 120
			Total Uranium (U)	2016/08/30		114	%	80 - 120
			Total Vanadium (V)	2016/08/30		99	%	80 - 120
			Total Zinc (Zn)	2016/08/30		96	%	80 - 120
4640118	MLB	Method Blank	Total Aluminum (Al)	2016/08/30	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/08/30	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/08/30	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/08/30	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/08/30	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/08/30	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/08/30	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/08/30	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/08/30	ND, RDL=1.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Cobalt (Co)	2016/08/30	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/08/30	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/08/30	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/08/30	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/08/30	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/08/30	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/08/30	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/08/30	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/08/30	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/08/30	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/08/30	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/08/30	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/08/30	ND, RDL=5.0		ug/L	
4640118	MLB	RPD	Total Aluminum (Al)	2016/08/30	NC		%	20
4640129	JMV	QC Standard	pH	2016/08/30		100	%	97 - 103
4640129	JMV	RPD	pH	2016/08/30	1.1		%	N/A
4640130	JMV	Spiked Blank	Conductivity	2016/08/30		102	%	80 - 120
4640130	JMV	Method Blank	Conductivity	2016/08/30	1.4, RDL=1.0		uS/cm	
4640130	JMV	RPD	Conductivity	2016/08/30	0.0025		%	25
4640132	JMV	QC Standard	pH	2016/08/30		100	%	97 - 103
4640132	JMV	RPD	pH	2016/08/30	0.072		%	N/A
4640133	JMV	Spiked Blank	Conductivity	2016/08/30		103	%	80 - 120

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Maxxam Job #: B6I3064
Report Date: 2016/09/12

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4640133	JMV	Method Blank	Conductivity	2016/08/30	1.4, RDL=1.0		uS/cm	
4640133	JMV	RPD	Conductivity	2016/08/30	0.22		%	25
4640156	JMV	QC Standard	Turbidity	2016/08/30		90	%	80 - 120
4640156	JMV	Spiked Blank	Turbidity	2016/08/30		93	%	80 - 120
4640156	JMV	Method Blank	Turbidity	2016/08/30	ND, RDL=0.10		NTU	
4640156	JMV	RPD	Turbidity	2016/08/30	2.8		%	20
4640159	JMV	QC Standard	Turbidity	2016/08/30		91	%	80 - 120
4640159	JMV	Spiked Blank	Turbidity	2016/08/30		92	%	80 - 120
4640159	JMV	Method Blank	Turbidity	2016/08/30	ND, RDL=0.10		NTU	
4640159	JMV	RPD	Turbidity	2016/08/30	8.6		%	20
4640419	SMT	Matrix Spike	Total Organic Carbon (C)	2016/08/30		NC	%	80 - 120
4640419	SMT	Spiked Blank	Total Organic Carbon (C)	2016/08/30		105	%	80 - 120
4640419	SMT	Method Blank	Total Organic Carbon (C)	2016/08/30	ND, RDL=0.50		mg/L	
4640419	SMT	RPD	Total Organic Carbon (C)	2016/08/30	0.17		%	20
4640498	ASL	Matrix Spike	Isobutylbenzene - Volatile	2016/09/01		101	%	70 - 130
			Benzene	2016/09/01		116	%	70 - 130
			Toluene	2016/09/01		113	%	70 - 130
			Ethylbenzene	2016/09/01		114	%	70 - 130
			Total Xylenes	2016/09/01		113	%	70 - 130
4640498	ASL	Spiked Blank	Isobutylbenzene - Volatile	2016/08/31		102	%	70 - 130
			Benzene	2016/08/31		114	%	70 - 130
			Toluene	2016/08/31		111	%	70 - 130
			Ethylbenzene	2016/08/31		111	%	70 - 130
			Total Xylenes	2016/08/31		112	%	70 - 130
4640498	ASL	Method Blank	Isobutylbenzene - Volatile	2016/08/31		99	%	70 - 130
			Benzene	2016/08/31	ND, RDL=0.0010		mg/L	
			Toluene	2016/08/31	ND, RDL=0.0010		mg/L	
			Ethylbenzene	2016/08/31	ND, RDL=0.0010		mg/L	
			Total Xylenes	2016/08/31	ND, RDL=0.0020		mg/L	
			C6 - C10 (less BTEX)	2016/08/31	ND, RDL=0.010		mg/L	
4640498	ASL	RPD	Benzene	2016/09/01	NC		%	40
			Toluene	2016/09/01	NC		%	40
			Ethylbenzene	2016/09/01	NC		%	40
			Total Xylenes	2016/09/01	NC		%	40
			C6 - C10 (less BTEX)	2016/09/01	NC		%	40
4643901	NRG	Matrix Spike	Total Alkalinity (Total as CaCO3)	2016/09/02		NC	%	80 - 120
4643901	NRG	Spiked Blank	Total Alkalinity (Total as CaCO3)	2016/09/01		108	%	80 - 120
4643901	NRG	Method Blank	Total Alkalinity (Total as CaCO3)	2016/09/01	ND, RDL=5.0		mg/L	
4643901	NRG	RPD	Total Alkalinity (Total as CaCO3)	2016/09/02	0.68		%	25
4643903	NRG	Matrix Spike	Reactive Silica (SiO2)	2016/09/01		NC	%	80 - 120
4643903	NRG	Spiked Blank	Reactive Silica (SiO2)	2016/09/01		98	%	80 - 120

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Maxxam Job #: B6I3064
Report Date: 2016/09/12

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4643903	NRG	Method Blank	Reactive Silica (SiO2)	2016/09/01	ND, RDL=0.50		mg/L	
4643903	NRG	RPD	Reactive Silica (SiO2)	2016/09/01	1.4		%	25
4643904	NRG	Spiked Blank	Colour	2016/09/01		105	%	80 - 120
4643904	NRG	Method Blank	Colour	2016/09/01	ND, RDL=5.0		TCU	
4643904	NRG	RPD	Colour	2016/09/01	NC		%	20
4648398	NRG	Matrix Spike	Dissolved Chloride (Cl)	2016/09/07		NC	%	80 - 120
4648398	NRG	QC Standard	Dissolved Chloride (Cl)	2016/09/07		107	%	80 - 120
4648398	NRG	Spiked Blank	Dissolved Chloride (Cl)	2016/09/07		97	%	80 - 120
4648398	NRG	Method Blank	Dissolved Chloride (Cl)	2016/09/07	ND, RDL=1.0		mg/L	
4648398	NRG	RPD	Dissolved Chloride (Cl)	2016/09/07	1.3		%	25
4648400	NRG	Matrix Spike	Dissolved Sulphate (SO4)	2016/09/06		102	%	80 - 120
4648400	NRG	Spiked Blank	Dissolved Sulphate (SO4)	2016/09/06		102	%	80 - 120
4648400	NRG	Method Blank	Dissolved Sulphate (SO4)	2016/09/06	ND, RDL=2.0		mg/L	
4648400	NRG	RPD	Dissolved Sulphate (SO4)	2016/09/06	NC		%	25
4648401	NRG	Matrix Spike	Orthophosphate (P)	2016/09/07		88	%	80 - 120
4648401	NRG	Spiked Blank	Orthophosphate (P)	2016/09/07		96	%	80 - 120
4648401	NRG	Method Blank	Orthophosphate (P)	2016/09/07	ND, RDL=0.010		mg/L	
4648401	NRG	RPD	Orthophosphate (P)	2016/09/07	NC		%	25
4648402	NRG	Matrix Spike	Nitrate + Nitrite (N)	2016/09/06		98	%	80 - 120
4648402	NRG	Spiked Blank	Nitrate + Nitrite (N)	2016/09/06		99	%	80 - 120
4648402	NRG	Method Blank	Nitrate + Nitrite (N)	2016/09/06	ND, RDL=0.050		mg/L	
4648402	NRG	RPD	Nitrate + Nitrite (N)	2016/09/06	NC		%	25
4648403	NRG	Matrix Spike	Nitrite (N)	2016/09/07		102	%	80 - 120
4648403	NRG	Spiked Blank	Nitrite (N)	2016/09/07		98	%	80 - 120
4648403	NRG	Method Blank	Nitrite (N)	2016/09/07	ND, RDL=0.010		mg/L	
4648403	NRG	RPD	Nitrite (N)	2016/09/07	NC		%	25
4656286	MCN	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2016/09/12		NC	%	80 - 120
4656286	MCN	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2016/09/12		101	%	80 - 120
4656286	MCN	Method Blank	Nitrogen (Ammonia Nitrogen)	2016/09/12	ND, RDL=0.050		mg/L	

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SEM Ltd.
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Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4656286	MCN	RPD	Nitrogen (Ammonia Nitrogen)	2016/09/12	0.35		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Kevin G. MacDonald

Kevin MacDonald, Inorganics Supervisor

Mike MacGillivray

Mike MacGillivray, Scientific Specialist (Inorganics)

RoseMarie MacDonald

Rosemarie MacDonald, Scientific Specialist (Organics)

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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

Attention:Claire Moore-Gibbons
SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560250-01-01, 560250-02-01, 560250-03-01, 560250-04-01

Report Date: 2016/09/27
Report #: R4181766
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6K1033
Received: 2016/09/20, 10:42

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide (1)	4	N/A	2016/09/21	N/A	SM 22 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide (1)	2	N/A	2016/09/23	N/A	SM 22 4500-CO2 D
Alkalinity (1)	6	N/A	2016/09/26	ATL SOP 00013	EPA 310.2 R1974 m
Chloride (1)	6	N/A	2016/09/26	ATL SOP 00014	SM 22 4500-Cl- E m
Colour (1)	6	N/A	2016/09/26	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	4	N/A	2016/09/21	ATL SOP 00004	SM 22 2510B m
Conductance - water (1)	2	N/A	2016/09/22	ATL SOP 00004	SM 22 2510B m
TEH in Water (PIRI) (1)	6	2016/09/21	2016/09/21	ATL SOP 00113	Atl. RBCA v3 m
Hardness (calculated as CaCO3) (1)	1	N/A	2016/09/22	ATL SOP 00048	SM 22 2340 B
Hardness (calculated as CaCO3) (1)	5	N/A	2016/09/23	ATL SOP 00048	SM 22 2340 B
Mercury - Total (CVAA,LL) (1)	6	2016/09/22	2016/09/23	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS (1)	5	2016/09/21	2016/09/22	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS (1)	1	2016/09/21	2016/09/23	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	6	N/A	2016/09/27		Auto Calc.
Anion and Cation Sum (1)	2	N/A	2016/09/26		Auto Calc.
Anion and Cation Sum (1)	4	N/A	2016/09/27		Auto Calc.
Nitrogen Ammonia - water (1)	2	N/A	2016/09/23	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen Ammonia - water (1)	4	N/A	2016/09/26	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite (1)	6	N/A	2016/09/26	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite (1)	6	N/A	2016/09/26	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N) (1)	6	N/A	2016/09/27	ATL SOP 00018	ASTM D3867-16
pH (1, 2)	4	N/A	2016/09/21	ATL SOP 00003	SM 22 4500-H+ B m
pH (1, 2)	2	N/A	2016/09/22	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho (1)	6	N/A	2016/09/26	ATL SOP 00021	EPA 365.2 m
VPH in Water (PIRI) (1)	6	N/A	2016/09/22	ATL SOP 00118	Atl. RBCA v3 m
Sat. pH and Langelier Index (@ 20C) (1)	6	N/A	2016/09/27	ATL SOP 00049	Auto Calc.

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Your Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

Attention:Claire Moore-Gibbons

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Your C.O.C. #: 560250-01-01, 560250-02-01, 560250-03-01, 560250-04-01

Report Date: 2016/09/27
Report #: R4181766
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6K1033
Received: 2016/09/20, 10:42

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Sat. pH and Langelier Index (@ 4C) (1)	6	N/A	2016/09/27	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	6	N/A	2016/09/26	ATL SOP 00022	EPA 366.0 m
Sulphate (1)	6	N/A	2016/09/26	ATL SOP 00023	ASTMD516-11 m
Total Dissolved Solids (TDS calc) (1)	6	N/A	2016/09/27		Auto Calc.
Organic carbon - Total (TOC) (1, 3)	6	N/A	2016/09/26	ATL SOP 00037	SM 22 5310C m
ModTPH (T1) Calc. for Water (1)	6	N/A	2016/09/26	N/A	Atl. RBCA v3 m
Total Suspended Solids (1)	6	2016/09/21	2016/09/22	ATL SOP 00007	SM 22 2540D m
Turbidity (1)	6	N/A	2016/09/22	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford
(2) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(3) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

AUTHORIZED REPORT Maxxam RAPPORT AUTORISÉ

Maxxam
27 Sep 2016 16:37:26 -02:30

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

RBCA HYDROCARBONS IN WATER (WATER)

Maxxam ID		DCE947	DCE947		DCE948		DCE949		
Sampling Date		2016/09/12 15:59	2016/09/12 15:59		2016/09/12 15:10		2016/09/12 15:10		
COC Number		560250-01-01	560250-01-01		560250-02-01		560250-02-01		
	UNITS	**W-7**	**W-7 Lab-Dup**	**RDL**	**W-13**	**RDL**	**W-17**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	ND	ND	0.0010	ND	0.0010	ND	0.0010	4669777
Toluene	mg/L	ND	ND	0.0010	ND	0.0010	ND	0.0010	4669777
Ethylbenzene	mg/L	ND	ND	0.0010	ND	0.0010	ND	0.0010	4669777
Total Xylenes	mg/L	ND	ND	0.0020	ND	0.0020	ND	0.0020	4669777
C6 - C10 (less BTEX)	mg/L	ND	ND	0.010	ND	0.010	ND	0.010	4669777
>C10-C16 Hydrocarbons	mg/L	ND		0.050	ND (1)	0.057	ND (1)	0.056	4669537
>C16-C21 Hydrocarbons	mg/L	ND		0.050	ND (1)	0.057	ND (1)	0.056	4669537
>C21-<C32 Hydrocarbons	mg/L	ND		0.10	ND (1)	0.11	ND (1)	0.11	4669537
Modified TPH (Tier1)	mg/L	ND		0.10	ND	0.11	ND	0.11	4667668
Reached Baseline at C32	mg/L	NA		N/A	NA	N/A	NA	N/A	4669537
Hydrocarbon Resemblance	mg/L	NA		N/A	NA	N/A	NA	N/A	4669537
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	89			105		97		4669537
n-Dotriacontane - Extractable	%	98			112		106		4669537
Isobutylbenzene - Volatile	%	101	99		100		98		4669777

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to limited sample.

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

RBCA HYDROCARBONS IN WATER (WATER)

Maxxam ID		DCE950		DCE951		DCE952		
Sampling Date		2016/09/12 16:24		2016/09/12 15:59		2016/09/12 10:35		
COC Number		560250-03-01		560250-03-01		560250-04-01		
	UNITS	**W-22**	**RDL**	**W-24**	**RDL**	**W-34**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/L	ND	0.0010	ND	0.0010	ND	0.0010	4669777
Toluene	mg/L	ND	0.0010	ND	0.0010	ND	0.0010	4669777
Ethylbenzene	mg/L	ND	0.0010	ND	0.0010	ND	0.0010	4669777
Total Xylenes	mg/L	ND	0.0020	ND	0.0020	ND	0.0020	4669777
C6 - C10 (less BTEX)	mg/L	ND	0.010	ND	0.010	ND	0.010	4669777
>C10-C16 Hydrocarbons	mg/L	ND	0.050	ND (1)	0.053	ND	0.050	4669537
>C16-C21 Hydrocarbons	mg/L	ND	0.050	ND (1)	0.053	ND	0.050	4669537
>C21-<C32 Hydrocarbons	mg/L	ND	0.10	ND (1)	0.11	ND	0.10	4669537
Modified TPH (Tier1)	mg/L	ND	0.10	ND	0.11	ND	0.10	4667668
Reached Baseline at C32	mg/L	NA	N/A	NA	N/A	NA	N/A	4669537
Hydrocarbon Resemblance	mg/L	NA	N/A	NA	N/A	NA	N/A	4669537
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	95		94		97		4669537
n-Dotriacontane - Extractable	%	98		102		93		4669537
Isobutylbenzene - Volatile	%	99		99		97		4669777

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to limited sample.

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		DCE947			DCE948	DCE948		DCE949		
Sampling Date		2016/09/12 15:59			2016/09/12 15:10	2016/09/12 15:10		2016/09/12 15:10		
COC Number		560250-01-01			560250-02-01	560250-02-01		560250-02-01		
	UNITS	W-7	RDL	QC Batch	W-13	W-13 Lab-Dup	QC Batch	W-17	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	0.00	N/A	4667406	444		4667406	449	N/A	4667406
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4667402	92		4667402	94	1.0	4667402
Calculated TDS	mg/L	1.0	1.0	4667411	27000		4667411	27000	1.0	4667411
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4667402	ND		4667402	ND	1.0	4667402
Cation Sum	me/L	0.0200	N/A	4667406	499		4667406	501	N/A	4667406
Hardness (CaCO3)	mg/L	ND	1.0	4667404	5200		4667404	5300	1.0	4667404
Ion Balance (% Difference)	%	100	N/A	4667405	5.82		4667405	5.51	N/A	4667405
Langelier Index (@ 20C)	N/A	NC		4667409	0.584		4667409	0.522		4667409
Langelier Index (@ 4C)	N/A	NC		4667410	0.346		4667410	0.284		4667410
Nitrate (N)	mg/L	ND	0.050	4667407	ND		4667407	ND	0.050	4667407
Saturation pH (@ 20C)	N/A	NC		4667409	7.36		4667409	7.34		4667409
Saturation pH (@ 4C)	N/A	NC		4667410	7.60		4667410	7.58		4667410
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	ND	5.0	4671995	93		4671995	94	5.0	4671995
Dissolved Chloride (Cl)	mg/L	ND	1.0	4671998	15000		4671998	15000	120	4671998
Colour	TCU	ND	5.0	4672002	ND		4672002	ND	5.0	4672002
Nitrate + Nitrite (N)	mg/L	ND	0.050	4672004	ND		4672004	ND	0.050	4672004
Nitrite (N)	mg/L	ND	0.010	4672005	ND		4672005	ND	0.010	4672005
Nitrogen (Ammonia Nitrogen)	mg/L	0.13	0.050	4670059	0.16		4670059	0.090	0.050	4673327
Total Organic Carbon (C)	mg/L	ND	0.50	4675769	ND (1)		4675769	ND (1)	5.0	4675769
Orthophosphate (P)	mg/L	ND	0.010	4672003	0.015		4672003	0.015	0.010	4672003
pH	pH	7.08	N/A	4671233	7.95		4669321	7.86	N/A	4669321
Reactive Silica (SiO2)	mg/L	0.56	0.50	4672001	ND		4672001	ND	0.50	4672001
Dissolved Sulphate (SO4)	mg/L	ND	2.0	4672000	1400		4672000	1200	240	4672000
Turbidity	NTU	ND	0.10	4671265	0.17	0.21	4669420	0.23	0.10	4671265
Conductivity	uS/cm	3.1	1.0	4671234	44000		4669323	44000	1.0	4669323
Metals										
Total Aluminum (Al)	ug/L	9.3	5.0	4669498	ND		4669498	ND	50	4669498
Total Antimony (Sb)	ug/L	ND	1.0	4669498	ND		4669498	ND	10	4669498
Total Arsenic (As)	ug/L	ND	1.0	4669498	ND		4669498	ND	10	4669498
Total Barium (Ba)	ug/L	ND	1.0	4669498	ND		4669498	ND	10	4669498

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		DCE947			DCE948	DCE948		DCE949		
Sampling Date		2016/09/12 15:59			2016/09/12 15:10	2016/09/12 15:10		2016/09/12 15:10		
COC Number		560250-01-01			560250-02-01	560250-02-01		560250-02-01		
	UNITS	W-7	RDL	QC Batch	W-13	W-13 Lab-Dup	QC Batch	W-17	RDL	QC Batch
Total Beryllium (Be)	ug/L	ND	1.0	4669498	ND		4669498	ND	10	4669498
Total Bismuth (Bi)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Boron (B)	ug/L	ND	50	4669498	3600		4669498	3600	500	4669498
Total Cadmium (Cd)	ug/L	ND	0.010	4669498	ND		4669498	ND	0.10	4669498
Total Calcium (Ca)	ug/L	ND	100	4669498	340000		4669498	350000	1000	4669498
Total Chromium (Cr)	ug/L	ND	1.0	4669498	ND		4669498	ND	10	4669498
Total Cobalt (Co)	ug/L	ND	0.40	4669498	ND		4669498	ND	4.0	4669498
Total Copper (Cu)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Iron (Fe)	ug/L	ND	50	4669498	ND		4669498	ND	500	4669498
Total Lead (Pb)	ug/L	ND	0.50	4669498	ND		4669498	ND	5.0	4669498
Total Magnesium (Mg)	ug/L	ND	100	4669498	1100000		4669498	1100000	1000	4669498
Total Manganese (Mn)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Molybdenum (Mo)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Nickel (Ni)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Phosphorus (P)	ug/L	ND	100	4669498	ND		4669498	ND	1000	4669498
Total Potassium (K)	ug/L	ND	100	4669498	310000		4669498	310000	1000	4669498
Total Selenium (Se)	ug/L	ND	1.0	4669498	ND		4669498	ND	10	4669498
Total Silver (Ag)	ug/L	ND	0.10	4669498	ND		4669498	ND	1.0	4669498
Total Sodium (Na)	ug/L	310	100	4669498	8900000		4669498	8900000	1000	4669498
Total Strontium (Sr)	ug/L	ND	2.0	4669498	6400		4669498	6400	20	4669498
Total Thallium (Tl)	ug/L	ND	0.10	4669498	ND		4669498	ND	1.0	4669498
Total Tin (Sn)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Titanium (Ti)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Uranium (U)	ug/L	ND	0.10	4669498	2.8		4669498	2.9	1.0	4669498
Total Vanadium (V)	ug/L	ND	2.0	4669498	ND		4669498	ND	20	4669498
Total Zinc (Zn)	ug/L	ND	5.0	4669498	ND		4669498	ND	50	4669498

RDL = Reportable Detection Limit
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Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		DCE950		DCE951	DCE951		DCE952		
Sampling Date		2016/09/12 16:24		2016/09/12 15:59	2016/09/12 15:59		2016/09/12 10:35		
COC Number		560250-03-01		560250-03-01	560250-03-01		560250-04-01		
	UNITS	**W-22**	**QC Batch**	**W-24**	**W-24 Lab-Dup**	**QC Batch**	**W-34**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	462	4667406	444		4667406	428	N/A	4667406
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	93	4667402	95		4667402	93	1.0	4667402
Calculated TDS	mg/L	27000	4667411	27000		4667411	26000	1.0	4667411
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	4667402	ND		4667402	ND	1.0	4667402
Cation Sum	me/L	481	4667406	496		4667406	488	N/A	4667406
Hardness (CaCO3)	mg/L	5100	4667404	5200		4667404	5100	1.0	4667404
Ion Balance (% Difference)	%	2.03	4667405	5.50		4667405	6.53	N/A	4667405
Langelier Index (@ 20C)	N/A	0.477	4667409	0.457		4667409	0.551		4667409
Langelier Index (@ 4C)	N/A	0.239	4667410	0.219		4667410	0.313		4667410
Nitrate (N)	mg/L	ND	4667407	ND		4667407	0.34	0.050	4667407
Saturation pH (@ 20C)	N/A	7.36	4667409	7.34		4667409	7.36		4667409
Saturation pH (@ 4C)	N/A	7.60	4667410	7.58		4667410	7.60		4667410
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	93	4671995	95		4671995	94	5.0	4671995
Dissolved Chloride (Cl)	mg/L	15000	4671998	15000		4671998	14000	120	4671998
Colour	TCU	ND	4672002	ND		4672002	ND	5.0	4672002
Nitrate + Nitrite (N)	mg/L	ND	4672004	ND		4672004	0.34	0.050	4672004
Nitrite (N)	mg/L	ND	4672005	ND		4672005	ND	0.010	4672005
Nitrogen (Ammonia Nitrogen)	mg/L	0.080	4673327	0.23	0.24	4673327	0.21	0.050	4673327
Total Organic Carbon (C)	mg/L	ND (1)	4675769	ND (1)		4675769	ND (1)	5.0	4675769
Orthophosphate (P)	mg/L	0.015	4672003	0.015		4672003	0.036	0.010	4672003
pH	pH	7.84	4669321	7.80		4671233	7.91	N/A	4669321
Reactive Silica (SiO2)	mg/L	ND	4672001	ND		4672001	ND	0.50	4672001
Dissolved Sulphate (SO4)	mg/L	1400	4672000	1200		4672000	1200	240	4672000
Turbidity	NTU	0.41	4671265	0.43		4671265	0.10	0.10	4671265
Conductivity	uS/cm	44000	4669323	43000		4671234	43000	1.0	4669323
Metals									
Total Aluminum (Al)	ug/L	ND	4669498	ND		4669504	ND	50	4669498
Total Antimony (Sb)	ug/L	ND	4669498	ND		4669504	ND	10	4669498
Total Arsenic (As)	ug/L	ND	4669498	ND		4669504	ND	10	4669498
Total Barium (Ba)	ug/L	ND	4669498	ND		4669504	ND	10	4669498

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.

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ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		DCE950		DCE951	DCE951		DCE952		
Sampling Date		2016/09/12 16:24		2016/09/12 15:59	2016/09/12 15:59		2016/09/12 10:35		
COC Number		560250-03-01		560250-03-01	560250-03-01		560250-04-01		
	UNITS	**W-22**	**QC Batch**	**W-24**	**W-24 Lab-Dup**	**QC Batch**	**W-34**	**RDL**	**QC Batch**
Total Beryllium (Be)	ug/L	ND	4669498	ND		4669504	ND	10	4669498
Total Bismuth (Bi)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Boron (B)	ug/L	3600	4669498	4200		4669504	3700	500	4669498
Total Cadmium (Cd)	ug/L	ND	4669498	ND		4669504	0.41	0.10	4669498
Total Calcium (Ca)	ug/L	330000	4669498	340000		4669504	340000	1000	4669498
Total Chromium (Cr)	ug/L	ND	4669498	ND		4669504	ND	10	4669498
Total Cobalt (Co)	ug/L	ND	4669498	ND		4669504	ND	4.0	4669498
Total Copper (Cu)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Iron (Fe)	ug/L	ND	4669498	ND		4669504	ND	500	4669498
Total Lead (Pb)	ug/L	ND	4669498	ND		4669504	ND	5.0	4669498
Total Magnesium (Mg)	ug/L	1000000	4669498	1000000		4669504	1000000	1000	4669498
Total Manganese (Mn)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Molybdenum (Mo)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Nickel (Ni)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Phosphorus (P)	ug/L	ND	4669498	ND		4669504	ND	1000	4669498
Total Potassium (K)	ug/L	310000	4669498	320000		4669504	310000	1000	4669498
Total Selenium (Se)	ug/L	ND	4669498	ND		4669504	ND	10	4669498
Total Silver (Ag)	ug/L	ND	4669498	ND		4669504	ND	1.0	4669498
Total Sodium (Na)	ug/L	8500000	4669498	8800000		4669504	8700000	1000	4669498
Total Strontium (Sr)	ug/L	6200	4669498	6300		4669504	6400	20	4669498
Total Thallium (Tl)	ug/L	ND	4669498	ND		4669504	ND	1.0	4669498
Total Tin (Sn)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Titanium (Ti)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Uranium (U)	ug/L	2.7	4669498	2.9		4669504	3.2	1.0	4669498
Total Vanadium (V)	ug/L	ND	4669498	ND		4669504	ND	20	4669498
Total Zinc (Zn)	ug/L	ND	4669498	ND		4669504	ND	50	4669498

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

RESULTS OF ANALYSES OF WATER

Maxxam ID		DCE947	DCE948	DCE949		DCE950		DCE951		
Sampling Date		2016/09/12 15:59	2016/09/12 15:10	2016/09/12 15:10		2016/09/12 16:24		2016/09/12 15:59		
COC Number		560250-01-01	560250-02-01	560250-02-01		560250-03-01		560250-03-01		
	UNITS	**W-7**	**W-13**	**W-17**	**RDL**	**W-22**	**RDL**	**W-24**	**RDL**	**QC Batch**
Inorganics										
Total Suspended Solids	mg/L	ND	1.2	1.2	1.0	2.3	2.0	1.8	1.0	4669542

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		DCE952		
Sampling Date		2016/09/12 10:35		
COC Number		560250-04-01		
	UNITS	**W-34**	**RDL**	**QC Batch**
Inorganics				
Total Suspended Solids	mg/L	3.0	1.0	4669542

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		DCE947	DCE948	DCE949	DCE950	DCE951	DCE952		
Sampling Date		2016/09/12 15:59	2016/09/12 15:10	2016/09/12 15:10	2016/09/12 16:24	2016/09/12 15:59	2016/09/12 10:35		
COC Number		560250-01-01	560250-02-01	560250-02-01	560250-03-01	560250-03-01	560250-04-01		
	UNITS	W-7	W-13	W-17	W-22	W-24	W-34	RDL	QC Batch
Metals									
Total Mercury (Hg)	ug/L	ND	0.013	0.013	ND	ND	ND	0.013	4671685

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.3°C

All samples received past hold time for TSS.

Sample DCE947-01 : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample DCE948-01 : Elevated reporting limits for trace metals due to sample matrix.

Poor RCAp Ion Balance due to sample matrix.

Sample DCE949-01 : Elevated reporting limits for trace metals due to sample matrix.

Poor RCAp Ion Balance due to sample matrix.

Sample DCE950-01 : Elevated reporting limits for trace metals due to sample matrix.

Sample DCE951-01 : Elevated reporting limits for trace metals due to sample matrix.

Poor RCAp Ion Balance due to sample matrix.

Sample DCE952-01 : Elevated reporting limits for trace metals due to sample matrix.

Poor RCAp Ion Balance due to sample matrix.

Results relate only to the items tested.

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4669321	JMV	QC Standard	pH	2016/09/21		100	%	97 - 103
4669321	JMV	RPD	pH	2016/09/21	1.1		%	N/A
4669323	JMV	Spiked Blank	Conductivity	2016/09/21		101	%	80 - 120
4669323	JMV	Method Blank	Conductivity	2016/09/21	1.2, RDL=1.0		uS/cm	
4669323	JMV	RPD	Conductivity	2016/09/21	0.23		%	25
4669420	JMV	QC Standard	Turbidity	2016/09/22		102	%	80 - 120
4669420	JMV	Spiked Blank	Turbidity	2016/09/22		96	%	80 - 120
4669420	JMV	Method Blank	Turbidity	2016/09/22	ND, RDL=0.10		NTU	
4669420	JMV	RPD [DCE948-03]	Turbidity	2016/09/22	NC		%	20
4669498	BAN	Matrix Spike	Total Aluminum (Al)	2016/09/22		99	%	80 - 120
			Total Antimony (Sb)	2016/09/22		105	%	80 - 120
			Total Arsenic (As)	2016/09/22		96	%	80 - 120
			Total Barium (Ba)	2016/09/22		102	%	80 - 120
			Total Beryllium (Be)	2016/09/22		108	%	80 - 120
			Total Bismuth (Bi)	2016/09/22		102	%	80 - 120
			Total Boron (B)	2016/09/22		106	%	80 - 120
			Total Cadmium (Cd)	2016/09/22		99	%	80 - 120
			Total Calcium (Ca)	2016/09/22		NC	%	80 - 120
			Total Chromium (Cr)	2016/09/22		98	%	80 - 120
			Total Cobalt (Co)	2016/09/22		100	%	80 - 120
			Total Copper (Cu)	2016/09/22		98	%	80 - 120
			Total Iron (Fe)	2016/09/22		100	%	80 - 120
			Total Lead (Pb)	2016/09/22		101	%	80 - 120
			Total Magnesium (Mg)	2016/09/22		100	%	80 - 120
			Total Manganese (Mn)	2016/09/22		NC	%	80 - 120
			Total Molybdenum (Mo)	2016/09/22		104	%	80 - 120
			Total Nickel (Ni)	2016/09/22		97	%	80 - 120
			Total Phosphorus (P)	2016/09/22		104	%	80 - 120
			Total Potassium (K)	2016/09/22		103	%	80 - 120
			Total Selenium (Se)	2016/09/22		92	%	80 - 120
			Total Silver (Ag)	2016/09/22		95	%	80 - 120
			Total Sodium (Na)	2016/09/22		NC	%	80 - 120
			Total Strontium (Sr)	2016/09/22		NC	%	80 - 120
			Total Thallium (Tl)	2016/09/22		101	%	80 - 120
			Total Tin (Sn)	2016/09/22		106	%	80 - 120
			Total Titanium (Ti)	2016/09/22		100	%	80 - 120
			Total Uranium (U)	2016/09/22		106	%	80 - 120
			Total Vanadium (V)	2016/09/22		100	%	80 - 120
			Total Zinc (Zn)	2016/09/22		99	%	80 - 120
4669498	BAN	Spiked Blank	Total Aluminum (Al)	2016/09/22		99	%	80 - 120
			Total Antimony (Sb)	2016/09/22		101	%	80 - 120
			Total Arsenic (As)	2016/09/22		93	%	80 - 120
			Total Barium (Ba)	2016/09/22		103	%	80 - 120
			Total Beryllium (Be)	2016/09/22		104	%	80 - 120
			Total Bismuth (Bi)	2016/09/22		103	%	80 - 120
			Total Boron (B)	2016/09/22		102	%	80 - 120
			Total Cadmium (Cd)	2016/09/22		99	%	80 - 120
			Total Calcium (Ca)	2016/09/22		99	%	80 - 120
			Total Chromium (Cr)	2016/09/22		97	%	80 - 120
			Total Cobalt (Co)	2016/09/22		100	%	80 - 120
			Total Copper (Cu)	2016/09/22		98	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Iron (Fe)	2016/09/22		99	%	80 - 120
			Total Lead (Pb)	2016/09/22		101	%	80 - 120
			Total Magnesium (Mg)	2016/09/22		100	%	80 - 120
			Total Manganese (Mn)	2016/09/22		98	%	80 - 120
			Total Molybdenum (Mo)	2016/09/22		101	%	80 - 120
			Total Nickel (Ni)	2016/09/22		98	%	80 - 120
			Total Phosphorus (P)	2016/09/22		100	%	80 - 120
			Total Potassium (K)	2016/09/22		104	%	80 - 120
			Total Selenium (Se)	2016/09/22		90	%	80 - 120
			Total Silver (Ag)	2016/09/22		96	%	80 - 120
			Total Sodium (Na)	2016/09/22		95	%	80 - 120
			Total Strontium (Sr)	2016/09/22		101	%	80 - 120
			Total Thallium (Tl)	2016/09/22		102	%	80 - 120
			Total Tin (Sn)	2016/09/22		105	%	80 - 120
			Total Titanium (Ti)	2016/09/22		103	%	80 - 120
			Total Uranium (U)	2016/09/22		105	%	80 - 120
			Total Vanadium (V)	2016/09/22		98	%	80 - 120
			Total Zinc (Zn)	2016/09/22		100	%	80 - 120
4669498	BAN	Method Blank	Total Aluminum (Al)	2016/09/22	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/09/22	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/09/22	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/09/22	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2016/09/22	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/09/22	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/09/22	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/09/22	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/09/22	ND, RDL=2.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Molybdenum (Mo)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/09/22	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/09/22	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/09/22	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/09/22	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/09/22	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/09/22	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/09/22	ND, RDL=5.0		ug/L	
4669498	BAN	RPD	Total Aluminum (Al)	2016/09/22	NC		%	20
			Total Antimony (Sb)	2016/09/22	NC		%	20
			Total Arsenic (As)	2016/09/22	NC		%	20
			Total Barium (Ba)	2016/09/22	NC		%	20
			Total Boron (B)	2016/09/22	NC		%	20
			Total Cadmium (Cd)	2016/09/22	NC		%	20
			Total Calcium (Ca)	2016/09/22	NC		%	20
			Total Chromium (Cr)	2016/09/22	NC		%	20
			Total Copper (Cu)	2016/09/22	2.4		%	20
			Total Iron (Fe)	2016/09/22	NC		%	20
			Total Lead (Pb)	2016/09/22	NC		%	20
			Total Magnesium (Mg)	2016/09/22	NC		%	20
			Total Manganese (Mn)	2016/09/22	NC		%	20
			Total Nickel (Ni)	2016/09/22	NC		%	20
			Total Potassium (K)	2016/09/22	NC		%	20
			Total Selenium (Se)	2016/09/22	NC		%	20
			Total Sodium (Na)	2016/09/22	NC		%	20
			Total Strontium (Sr)	2016/09/22	NC		%	20
			Total Uranium (U)	2016/09/22	NC		%	20
			Total Zinc (Zn)	2016/09/22	NC		%	20
4669504	MLB	Matrix Spike [DCE951-04]	Total Aluminum (Al)	2016/09/23		108	%	80 - 120
			Total Antimony (Sb)	2016/09/23		108	%	80 - 120
			Total Arsenic (As)	2016/09/23		91	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Barium (Ba)	2016/09/23		92	%	80 - 120
			Total Beryllium (Be)	2016/09/23		99	%	80 - 120
			Total Bismuth (Bi)	2016/09/23		97	%	80 - 120
			Total Boron (B)	2016/09/23		NC	%	80 - 120
			Total Cadmium (Cd)	2016/09/23		91	%	80 - 120
			Total Calcium (Ca)	2016/09/23		NC	%	80 - 120
			Total Chromium (Cr)	2016/09/23		88	%	80 - 120
			Total Cobalt (Co)	2016/09/23		90	%	80 - 120
			Total Copper (Cu)	2016/09/23		86	%	80 - 120
			Total Iron (Fe)	2016/09/23		107	%	80 - 120
			Total Lead (Pb)	2016/09/23		86	%	80 - 120
			Total Magnesium (Mg)	2016/09/23		NC	%	80 - 120
			Total Manganese (Mn)	2016/09/23		91	%	80 - 120
			Total Molybdenum (Mo)	2016/09/23		104	%	80 - 120
			Total Nickel (Ni)	2016/09/23		89	%	80 - 120
			Total Phosphorus (P)	2016/09/23		111	%	80 - 120
			Total Potassium (K)	2016/09/23		NC	%	80 - 120
			Total Selenium (Se)	2016/09/23		87	%	80 - 120
			Total Silver (Ag)	2016/09/23		91	%	80 - 120
			Total Sodium (Na)	2016/09/23		NC	%	80 - 120
			Total Strontium (Sr)	2016/09/23		NC	%	80 - 120
			Total Thallium (Tl)	2016/09/23		100	%	80 - 120
			Total Tin (Sn)	2016/09/23		105	%	80 - 120
			Total Titanium (Ti)	2016/09/23		97	%	80 - 120
			Total Uranium (U)	2016/09/23		93	%	80 - 120
			Total Vanadium (V)	2016/09/23		97	%	80 - 120
			Total Zinc (Zn)	2016/09/23		94	%	80 - 120
4669504	MLB	Spiked Blank	Total Aluminum (Al)	2016/09/22		102	%	80 - 120
			Total Antimony (Sb)	2016/09/22		97	%	80 - 120
			Total Arsenic (As)	2016/09/22		94	%	80 - 120
			Total Barium (Ba)	2016/09/22		94	%	80 - 120
			Total Beryllium (Be)	2016/09/22		96	%	80 - 120
			Total Bismuth (Bi)	2016/09/22		97	%	80 - 120
			Total Boron (B)	2016/09/22		95	%	80 - 120
			Total Cadmium (Cd)	2016/09/22		99	%	80 - 120
			Total Calcium (Ca)	2016/09/22		99	%	80 - 120
			Total Chromium (Cr)	2016/09/22		93	%	80 - 120
			Total Cobalt (Co)	2016/09/22		95	%	80 - 120
			Total Copper (Cu)	2016/09/22		96	%	80 - 120
			Total Iron (Fe)	2016/09/22		100	%	80 - 120
			Total Lead (Pb)	2016/09/22		97	%	80 - 120
			Total Magnesium (Mg)	2016/09/22		102	%	80 - 120
			Total Manganese (Mn)	2016/09/22		97	%	80 - 120
			Total Molybdenum (Mo)	2016/09/22		97	%	80 - 120
			Total Nickel (Ni)	2016/09/22		97	%	80 - 120
			Total Phosphorus (P)	2016/09/22		101	%	80 - 120
			Total Potassium (K)	2016/09/22		103	%	80 - 120
			Total Selenium (Se)	2016/09/22		95	%	80 - 120
			Total Silver (Ag)	2016/09/22		97	%	80 - 120
			Total Sodium (Na)	2016/09/22		99	%	80 - 120
			Total Strontium (Sr)	2016/09/22		97	%	80 - 120
			Total Thallium (Tl)	2016/09/22		96	%	80 - 120
			Total Tin (Sn)	2016/09/22		99	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Titanium (Ti)	2016/09/22		98	%	80 - 120
			Total Uranium (U)	2016/09/22		101	%	80 - 120
			Total Vanadium (V)	2016/09/22		97	%	80 - 120
			Total Zinc (Zn)	2016/09/22		95	%	80 - 120
4669504	MLB	Method Blank	Total Aluminum (Al)	2016/09/22	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Boron (B)	2016/09/22	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2016/09/22	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2016/09/22	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2016/09/22	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2016/09/22	ND, RDL=50		ug/L	
			Total Lead (Pb)	2016/09/22	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2016/09/22	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2016/09/22	ND, RDL=100		ug/L	
			Total Potassium (K)	2016/09/22	ND, RDL=100		ug/L	
			Total Selenium (Se)	2016/09/22	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2016/09/22	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2016/09/22	ND, RDL=100		ug/L	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Strontium (Sr)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2016/09/22	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2016/09/22	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2016/09/22	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2016/09/22	5.4, RDL=5.0		ug/L	
4669504	MLB	RPD	Total Copper (Cu)	2016/09/22	0.58		%	20
			Total Iron (Fe)	2016/09/22	0.78		%	20
			Total Lead (Pb)	2016/09/22	NC		%	20
			Total Manganese (Mn)	2016/09/22	1.1		%	20
4669537	RDE	Matrix Spike	Isobutylbenzene - Extractable	2016/09/21		100	%	30 - 130
			n-Dotriacontane - Extractable	2016/09/21		104	%	30 - 130
			>C10-C16 Hydrocarbons	2016/09/21		108	%	70 - 130
			>C16-C21 Hydrocarbons	2016/09/21		104	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/09/21		74	%	70 - 130
4669537	RDE	Spiked Blank	Isobutylbenzene - Extractable	2016/09/21		96	%	30 - 130
			n-Dotriacontane - Extractable	2016/09/21		99	%	30 - 130
			>C10-C16 Hydrocarbons	2016/09/21		108	%	70 - 130
			>C16-C21 Hydrocarbons	2016/09/21		102	%	70 - 130
			>C21-<C32 Hydrocarbons	2016/09/21		74	%	70 - 130
4669537	RDE	Method Blank	Isobutylbenzene - Extractable	2016/09/21		100	%	30 - 130
			n-Dotriacontane - Extractable	2016/09/21		104	%	30 - 130
			>C10-C16 Hydrocarbons	2016/09/21	ND, RDL=0.050		mg/L	
			>C16-C21 Hydrocarbons	2016/09/21	ND, RDL=0.050		mg/L	
			>C21-<C32 Hydrocarbons	2016/09/21	ND, RDL=0.10		mg/L	
4669537	RDE	RPD	>C10-C16 Hydrocarbons	2016/09/21	NC		%	40
			>C16-C21 Hydrocarbons	2016/09/21	NC		%	40
			>C21-<C32 Hydrocarbons	2016/09/21	NC		%	40
4669542	MM9	QC Standard	Total Suspended Solids	2016/09/22		97	%	80 - 120
4669542	MM9	Method Blank	Total Suspended Solids	2016/09/22	ND, RDL=1.0		mg/L	
4669542	MM9	RPD	Total Suspended Solids	2016/09/22	8.8		%	25
4669777	ASL	Matrix Spike [DCE949-07]	Isobutylbenzene - Volatile	2016/09/22		99	%	70 - 130
			Benzene	2016/09/22		104	%	70 - 130
			Toluene	2016/09/22		103	%	70 - 130
			Ethylbenzene	2016/09/22		103	%	70 - 130
			Total Xylenes	2016/09/22		103	%	70 - 130
4669777	ASL	Spiked Blank	Isobutylbenzene - Volatile	2016/09/22		101	%	70 - 130
			Benzene	2016/09/22		97	%	70 - 130
			Toluene	2016/09/22		99	%	70 - 130
			Ethylbenzene	2016/09/22		99	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Xylenes	2016/09/22		99	%	70 - 130
4669777	ASL	Method Blank	Isobutylbenzene - Volatile	2016/09/21		101	%	70 - 130
			Benzene	2016/09/21	ND, RDL=0.0010		mg/L	
			Toluene	2016/09/21	ND, RDL=0.0010		mg/L	
			Ethylbenzene	2016/09/21	ND, RDL=0.0010		mg/L	
			Total Xylenes	2016/09/21	ND, RDL=0.0020		mg/L	
			C6 - C10 (less BTEX)	2016/09/21	ND, RDL=0.010		mg/L	
4669777	ASL	RPD [DCE947-07]	Benzene	2016/09/22	NC		%	40
			Toluene	2016/09/22	NC		%	40
			Ethylbenzene	2016/09/22	NC		%	40
			Total Xylenes	2016/09/22	NC		%	40
			C6 - C10 (less BTEX)	2016/09/22	NC		%	40
4670059	MCN	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2016/09/23		99	%	80 - 120
4670059	MCN	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2016/09/23		99	%	80 - 120
4670059	MCN	Method Blank	Nitrogen (Ammonia Nitrogen)	2016/09/23	ND, RDL=0.050		mg/L	
4670059	MCN	RPD	Nitrogen (Ammonia Nitrogen)	2016/09/23	NC		%	20
4671233	JMV	QC Standard	pH	2016/09/22		101	%	97 - 103
4671233	JMV	RPD	pH	2016/09/22	1.9		%	N/A
4671234	JMV	Spiked Blank	Conductivity	2016/09/22		104	%	80 - 120
4671234	JMV	Method Blank	Conductivity	2016/09/22	1.2, RDL=1.0		uS/cm	
4671234	JMV	RPD	Conductivity	2016/09/22	1.1		%	25
4671265	JMV	QC Standard	Turbidity	2016/09/22		101	%	80 - 120
4671265	JMV	Spiked Blank	Turbidity	2016/09/22		96	%	80 - 120
4671265	JMV	Method Blank	Turbidity	2016/09/22	ND, RDL=0.10		NTU	
4671265	JMV	RPD	Turbidity	2016/09/22	0.81		%	20
4671685	ARS	Matrix Spike	Total Mercury (Hg)	2016/09/23		98	%	80 - 120
4671685	ARS	Spiked Blank	Total Mercury (Hg)	2016/09/23		100	%	80 - 120
4671685	ARS	Method Blank	Total Mercury (Hg)	2016/09/23	ND, RDL=0.013		ug/L	
4671685	ARS	RPD	Total Mercury (Hg)	2016/09/23	NC		%	20
4671995	MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	2016/09/26		92	%	80 - 120
4671995	MCN	Spiked Blank	Total Alkalinity (Total as CaCO3)	2016/09/26		114	%	80 - 120
4671995	MCN	Method Blank	Total Alkalinity (Total as CaCO3)	2016/09/26	ND, RDL=5.0		mg/L	
4671995	MCN	RPD	Total Alkalinity (Total as CaCO3)	2016/09/26	NC		%	25
4671998	MCN	Matrix Spike	Dissolved Chloride (Cl)	2016/09/26		NC	%	80 - 120
4671998	MCN	QC Standard	Dissolved Chloride (Cl)	2016/09/26		107	%	80 - 120
4671998	MCN	Spiked Blank	Dissolved Chloride (Cl)	2016/09/26		96	%	80 - 120
4671998	MCN	Method Blank	Dissolved Chloride (Cl)	2016/09/26	ND, RDL=1.0		mg/L	
4671998	MCN	RPD	Dissolved Chloride (Cl)	2016/09/26	0.17		%	25
4672000	MCN	Matrix Spike	Dissolved Sulphate (SO4)	2016/09/26		114	%	80 - 120
4672000	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2016/09/26		101	%	80 - 120

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Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4672000	MCN	Method Blank	Dissolved Sulphate (SO4)	2016/09/26	ND, RDL=2.0		mg/L	
4672000	MCN	RPD	Dissolved Sulphate (SO4)	2016/09/26	NC		%	25
4672001	MCN	Matrix Spike	Reactive Silica (SiO2)	2016/09/26		98	%	80 - 120
4672001	MCN	Spiked Blank	Reactive Silica (SiO2)	2016/09/26		98	%	80 - 120
4672001	MCN	Method Blank	Reactive Silica (SiO2)	2016/09/26	ND, RDL=0.50		mg/L	
4672001	MCN	RPD	Reactive Silica (SiO2)	2016/09/26	NC		%	25
4672002	MCN	Spiked Blank	Colour	2016/09/26		101	%	80 - 120
4672002	MCN	Method Blank	Colour	2016/09/26	ND, RDL=5.0		TCU	
4672002	MCN	RPD	Colour	2016/09/26	NC		%	20
4672003	MCN	Matrix Spike	Orthophosphate (P)	2016/09/26		NC	%	80 - 120
4672003	MCN	Spiked Blank	Orthophosphate (P)	2016/09/26		92	%	80 - 120
4672003	MCN	Method Blank	Orthophosphate (P)	2016/09/26	ND, RDL=0.010		mg/L	
4672003	MCN	RPD	Orthophosphate (P)	2016/09/26	2.5		%	25
4672004	MCN	Matrix Spike	Nitrate + Nitrite (N)	2016/09/26		99	%	80 - 120
4672004	MCN	Spiked Blank	Nitrate + Nitrite (N)	2016/09/26		102	%	80 - 120
4672004	MCN	Method Blank	Nitrate + Nitrite (N)	2016/09/26	ND, RDL=0.050		mg/L	
4672004	MCN	RPD	Nitrate + Nitrite (N)	2016/09/26	NC		%	25
4672005	KBT	Matrix Spike	Nitrite (N)	2016/09/26		25 (1)	%	80 - 120
4672005	KBT	Spiked Blank	Nitrite (N)	2016/09/26		99	%	80 - 120
4672005	KBT	Method Blank	Nitrite (N)	2016/09/26	ND, RDL=0.010		mg/L	
4672005	KBT	RPD	Nitrite (N)	2016/09/26	NC		%	25
4673327	MCN	Matrix Spike [DCE951-05]	Nitrogen (Ammonia Nitrogen)	2016/09/26		109	%	80 - 120
4673327	MCN	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2016/09/26		101	%	80 - 120
4673327	MCN	Method Blank	Nitrogen (Ammonia Nitrogen)	2016/09/26	0.050, RDL=0.050		mg/L	
4673327	MCN	RPD [DCE951-05]	Nitrogen (Ammonia Nitrogen)	2016/09/26	NC		%	20
4675769	SMT	Matrix Spike	Total Organic Carbon (C)	2016/09/26		113	%	80 - 120
4675769	SMT	Spiked Blank	Total Organic Carbon (C)	2016/09/26		111	%	80 - 120
4675769	SMT	Method Blank	Total Organic Carbon (C)	2016/09/26	ND, RDL=0.50		mg/L	

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Maxxam Job #: B6K1033
Report Date: 2016/09/27

SEM Ltd.
Client Project #: 070-025
Site Location: Bafflinland 2016-Milne EEM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4675769	SMT	RPD	Total Organic Carbon (C)	2016/09/26	1.5		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Poor spike recovery due to sample matrix. Recovery confirmed with repeat analysis.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Mike MacGillivray, Scientific Specialist (Inorganics)

Phil Deveau

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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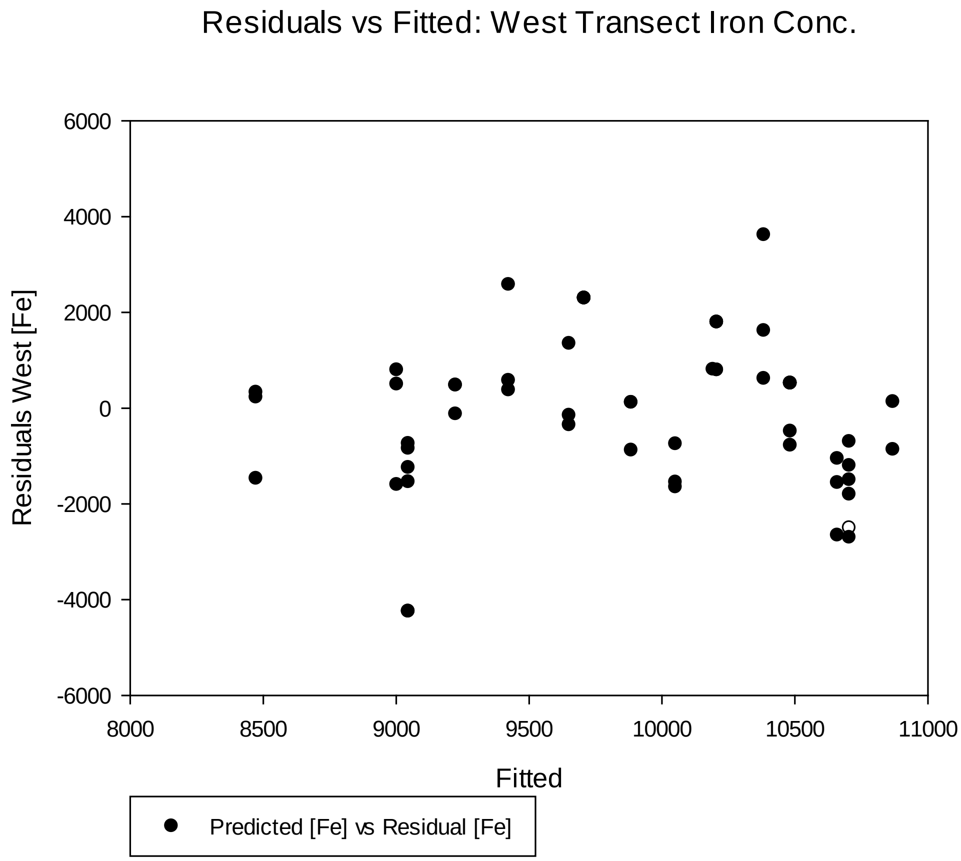
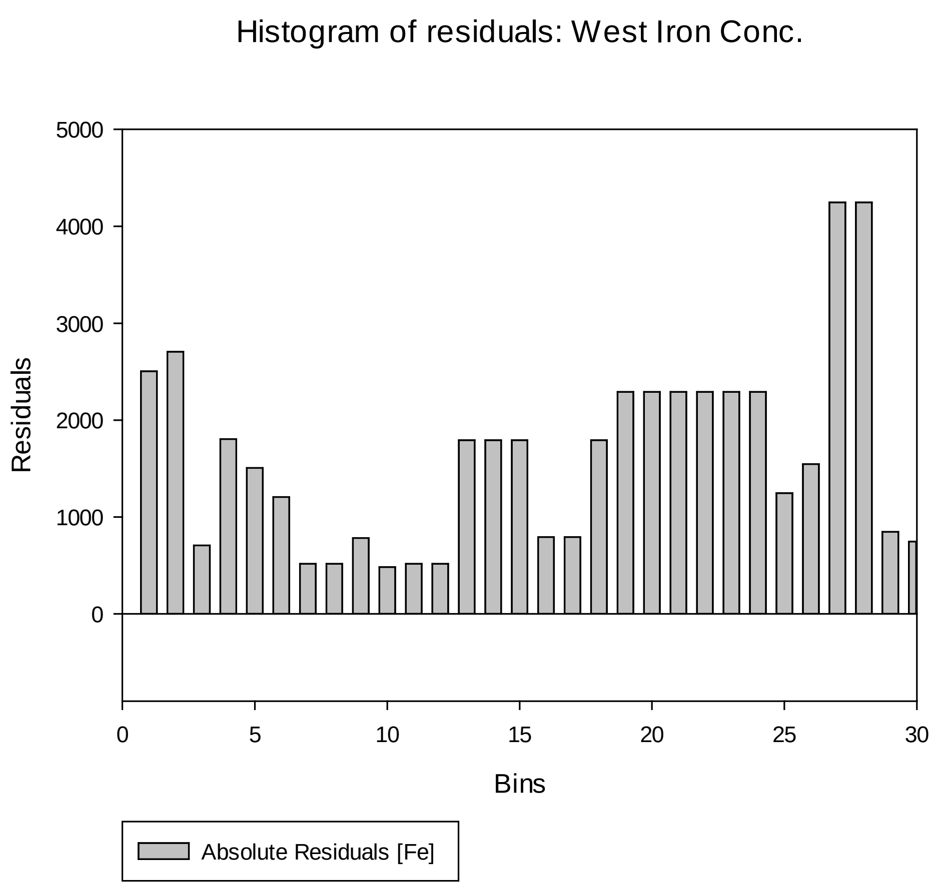
APPENDIX C

SigmaPlot Reports for Statistical Analyses

Plots of Residuals for ANCOVA of Iron Concentration and Distance from Ore Dock
West, East, North and Coastal Transects





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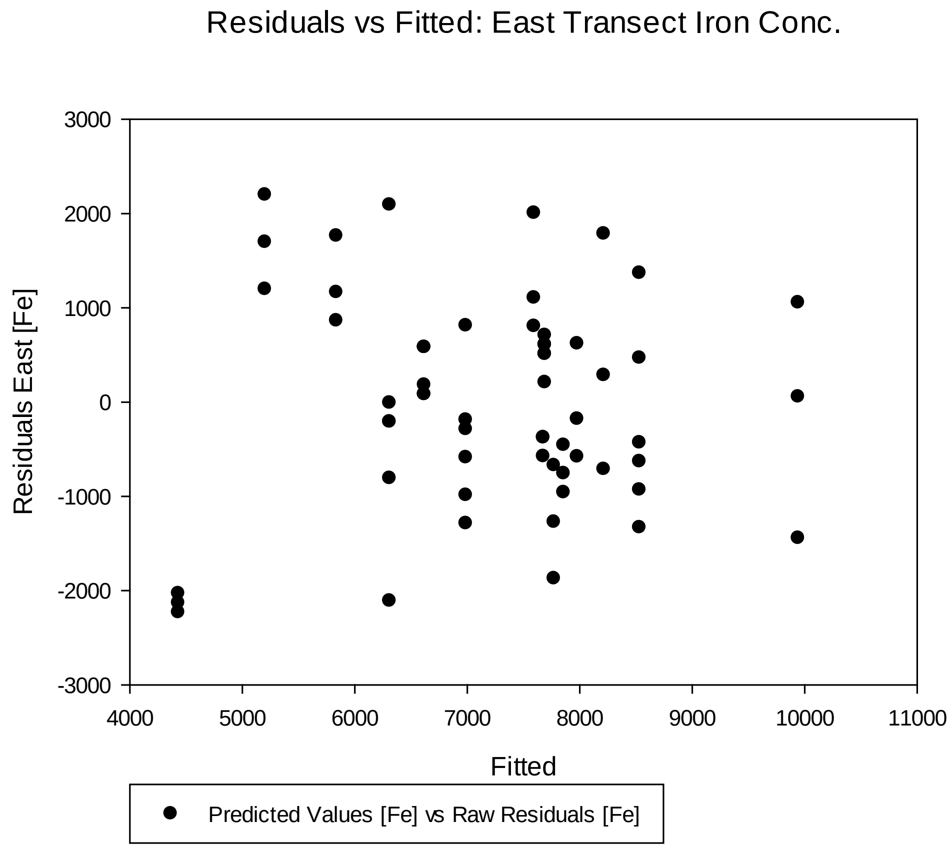
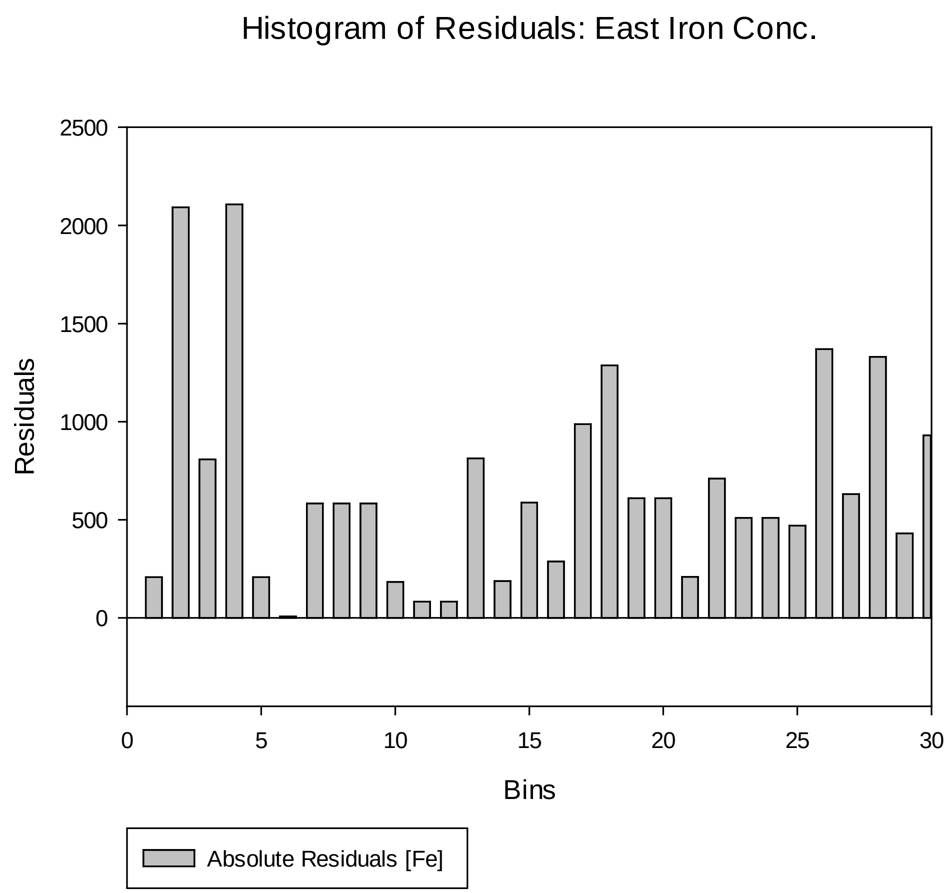
West, East, North and Coastal Transects





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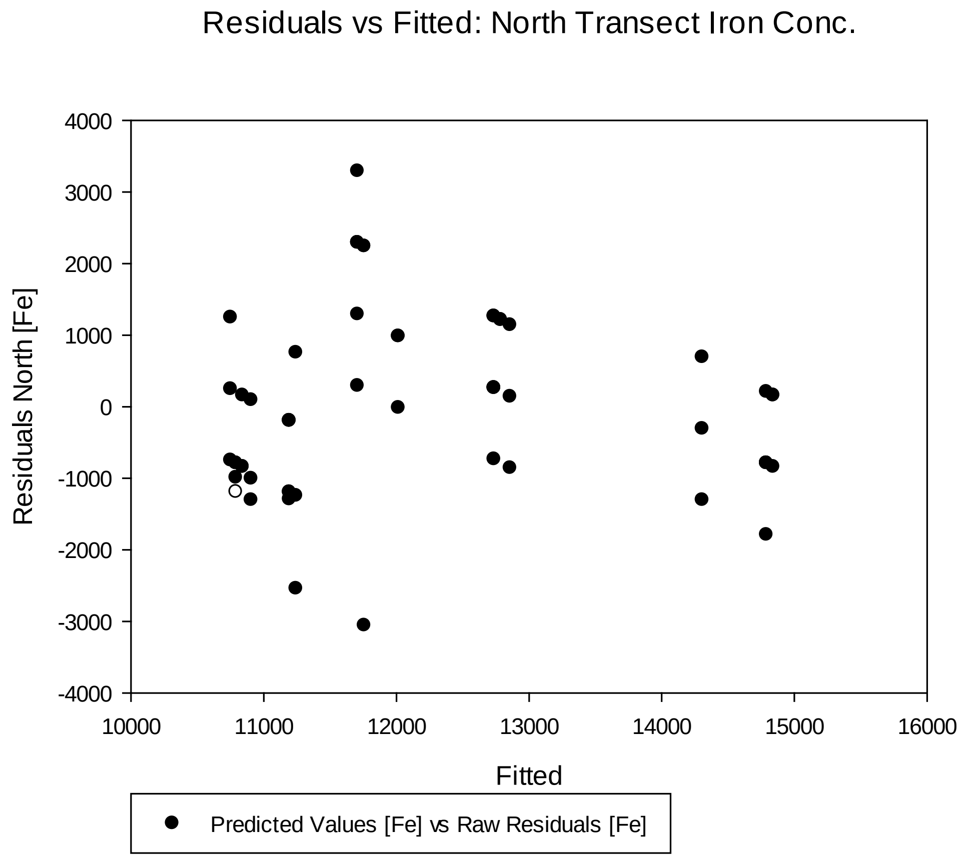
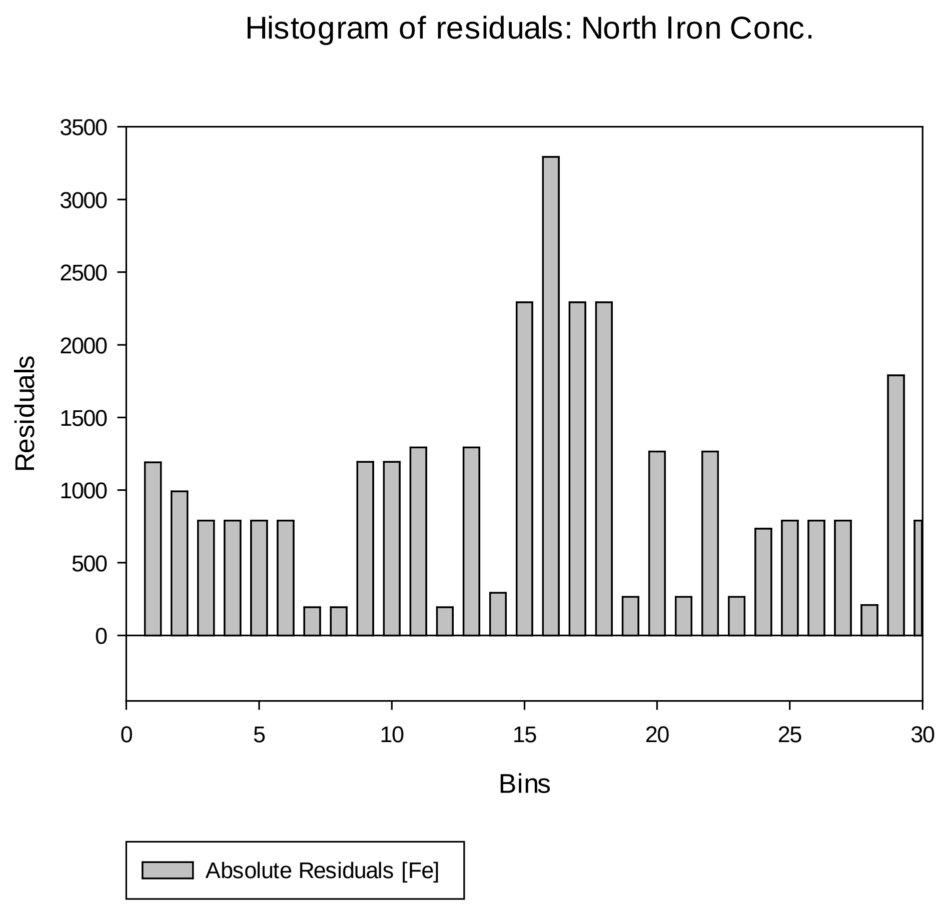
West, East, North and Coastal Transects





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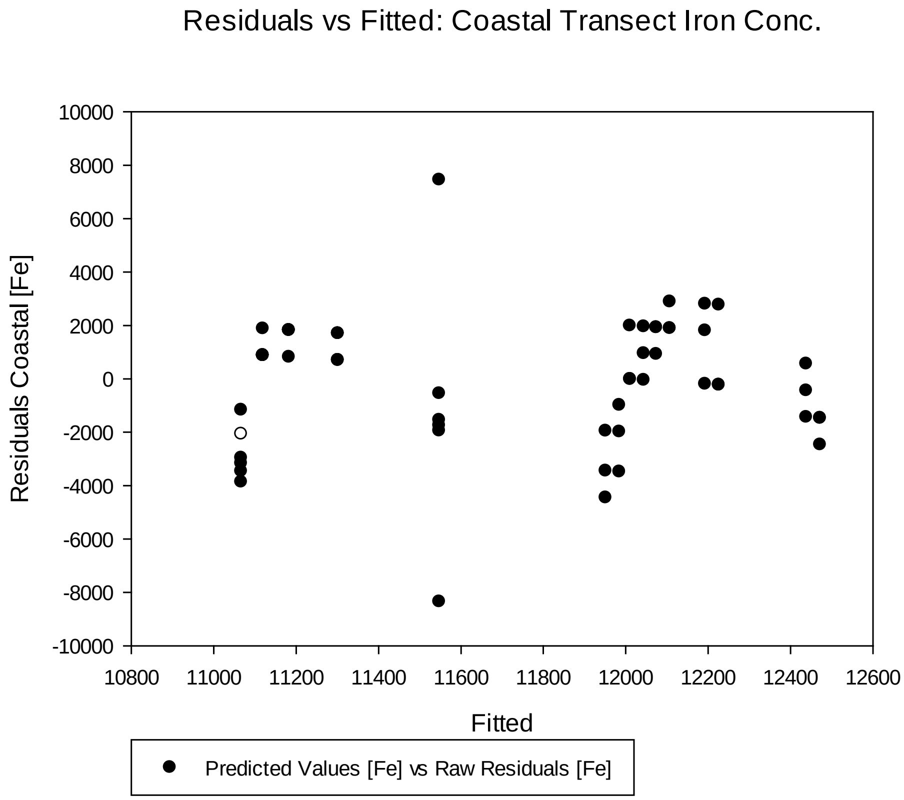
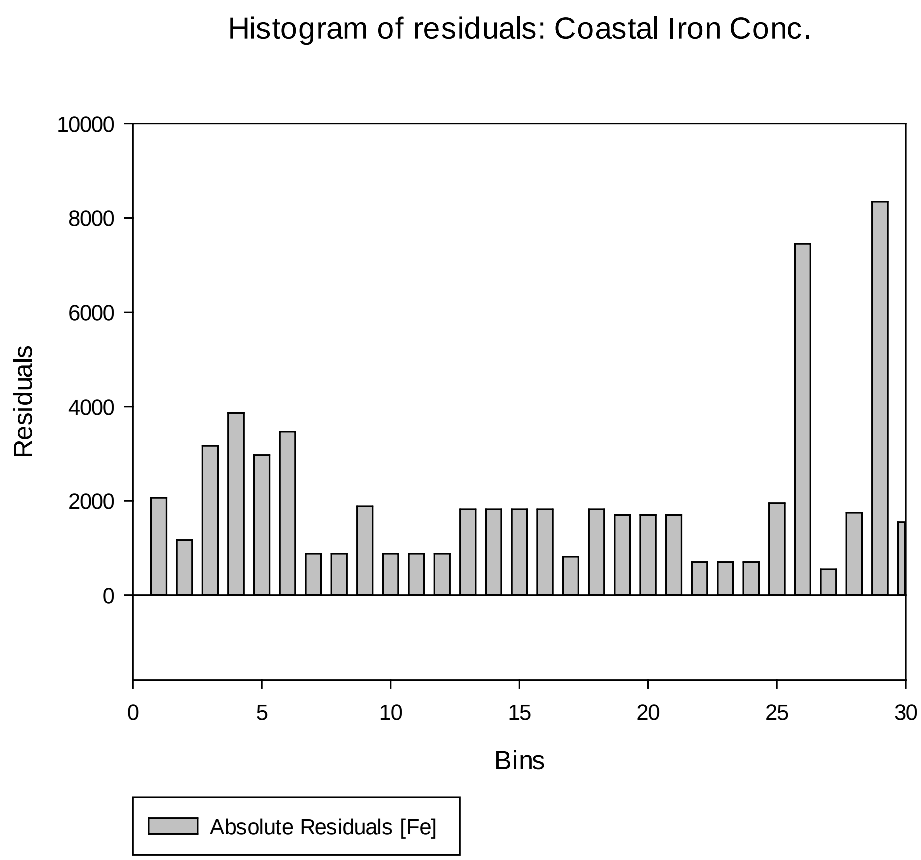
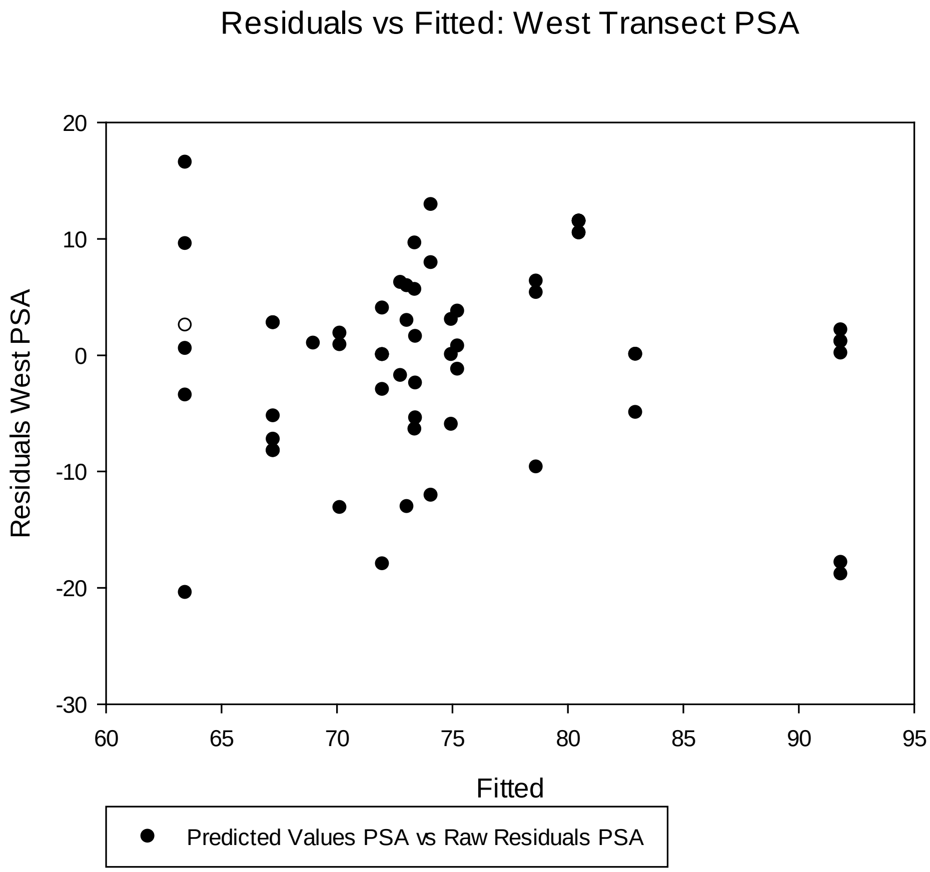
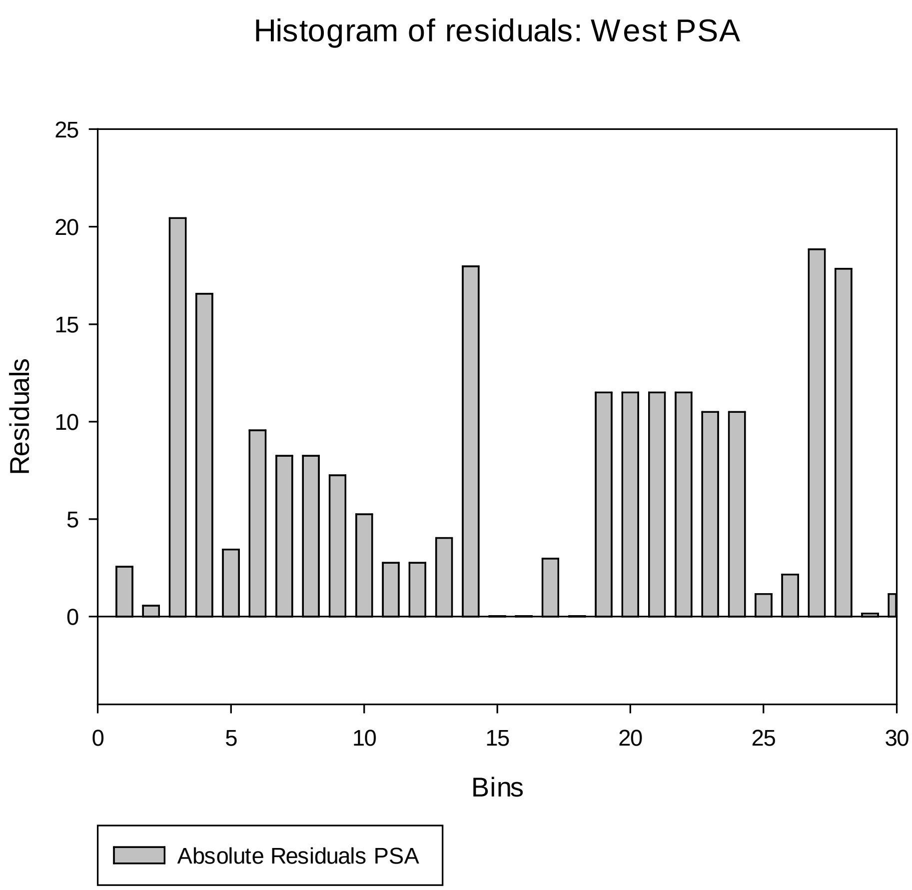


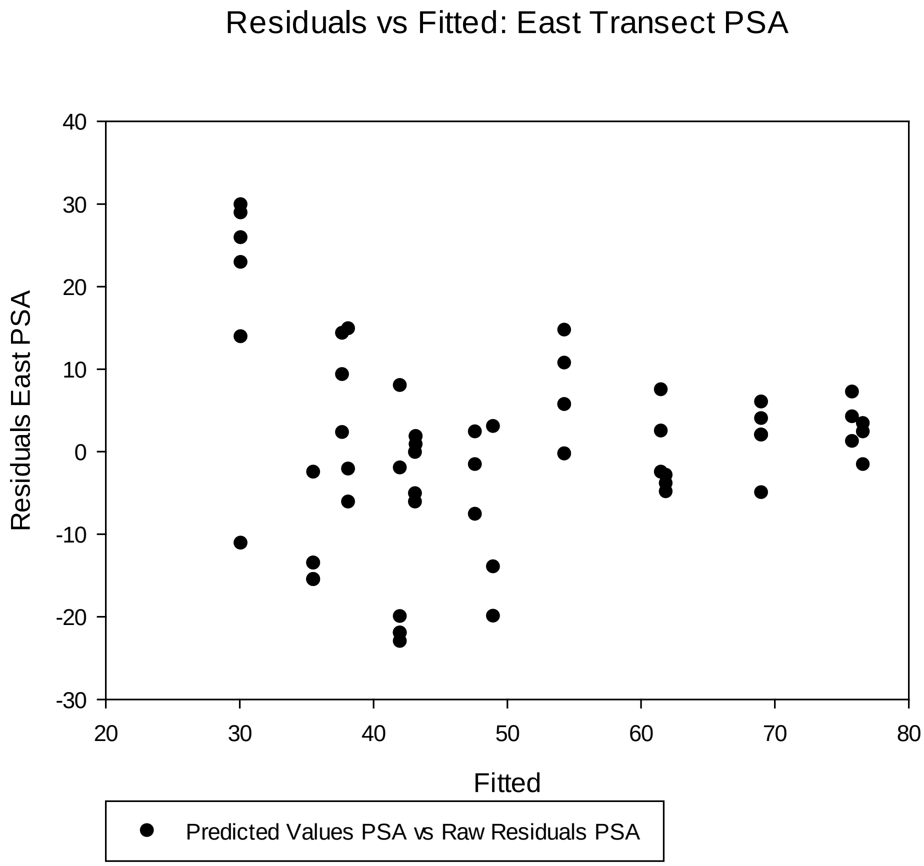


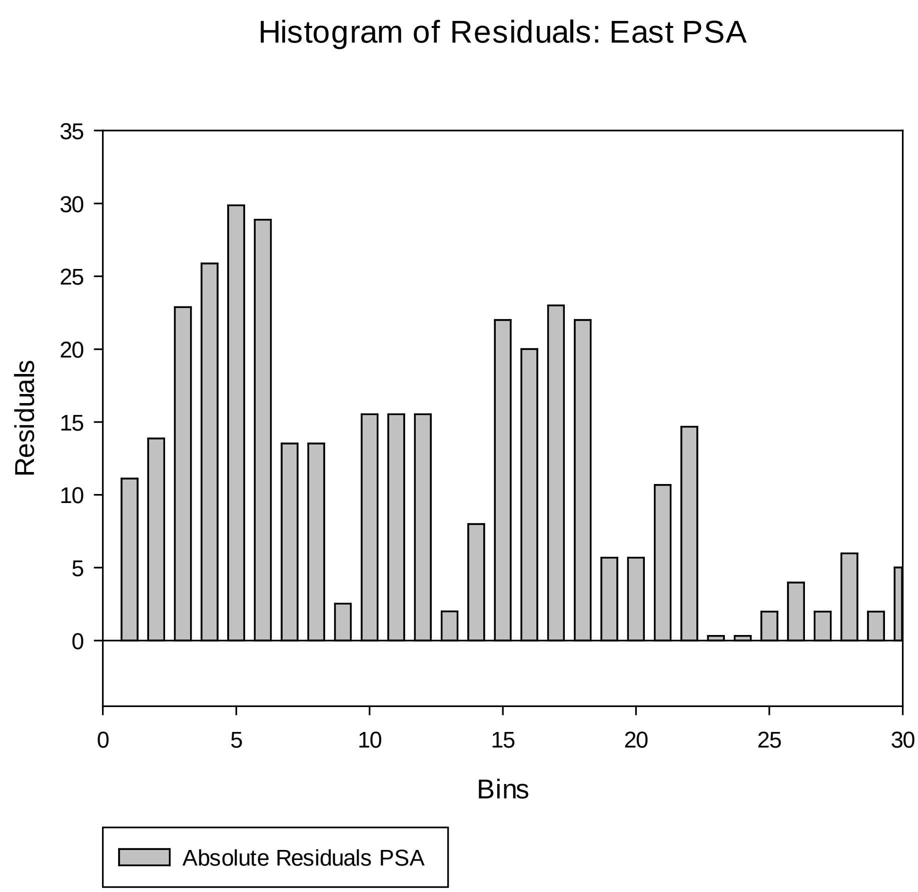
Plots of Residuals for ANCOVA of Particle Size Analysis and Distance from Ore Dock
West, East, North and Coastal Transects



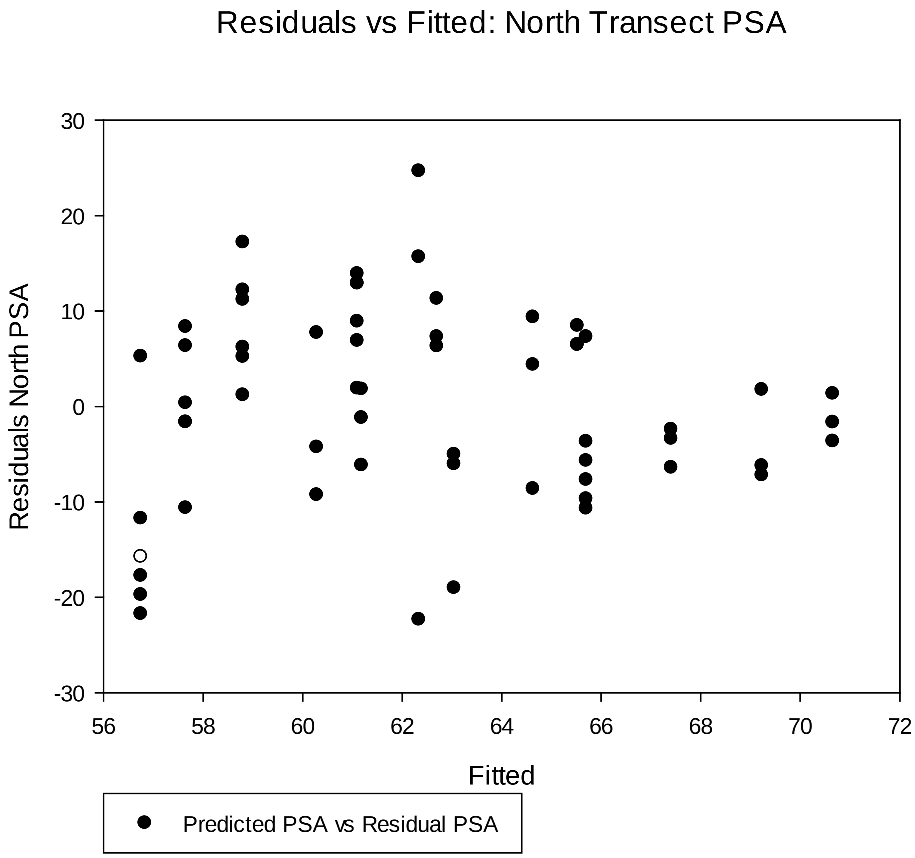


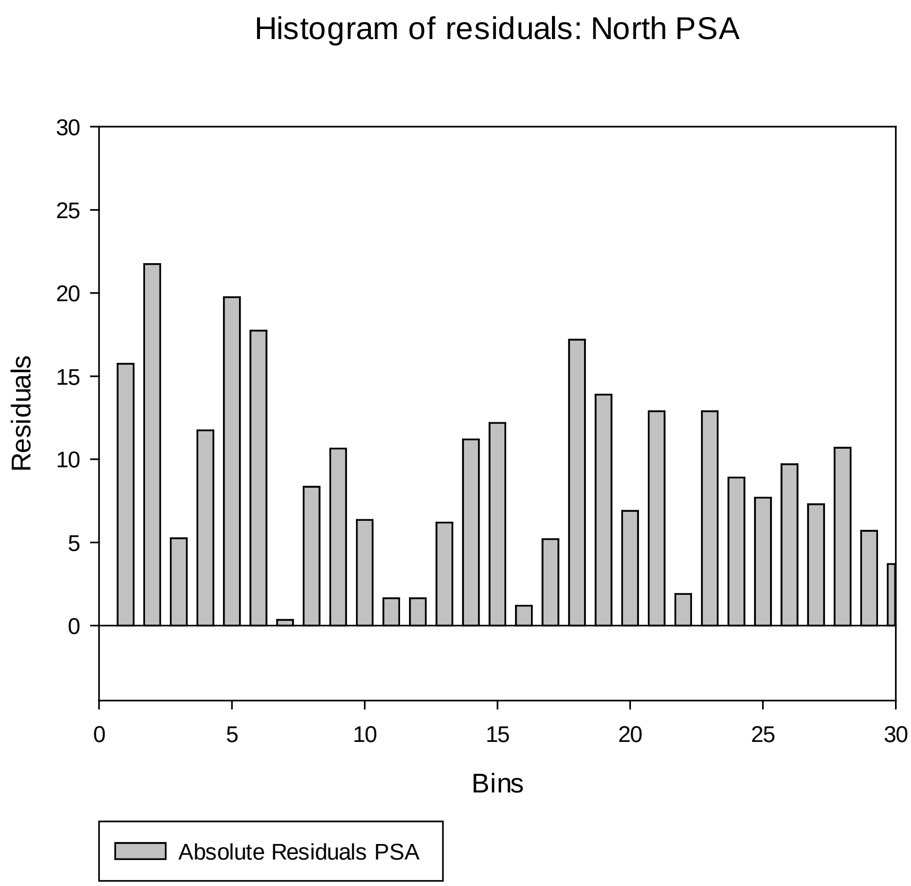
Plots of Residuals for ANCOVA of Particle Size Analysis and Distance from Ore Dock
West, East, North and Coastal Transects



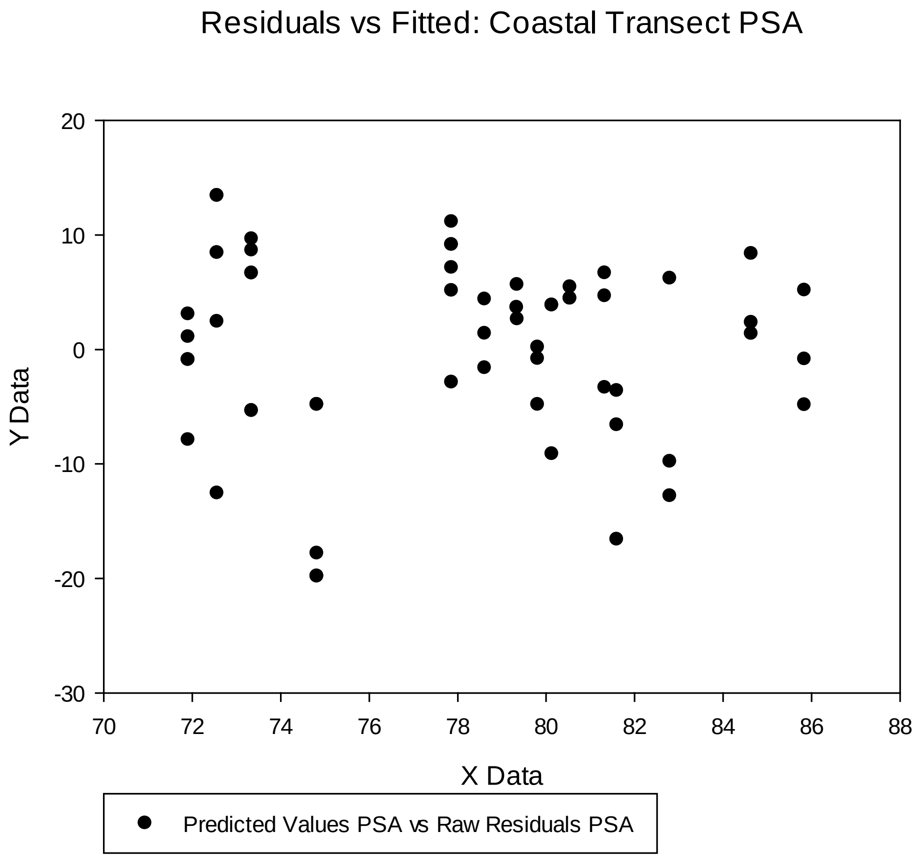


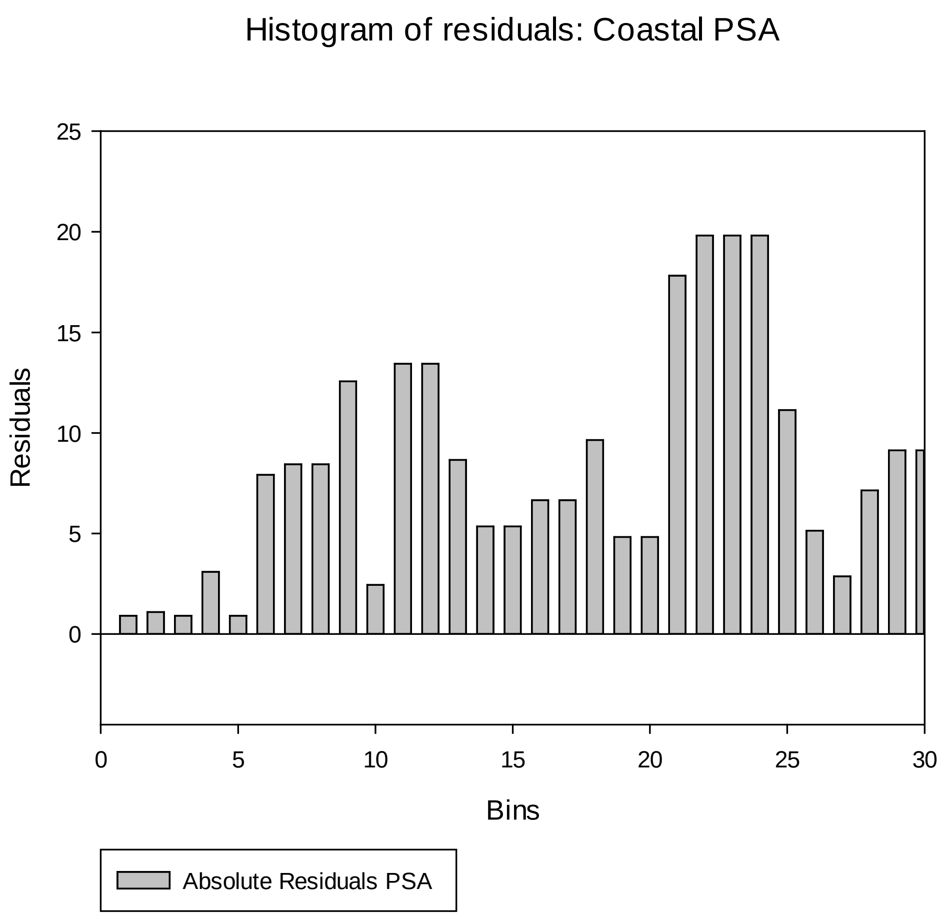
Plots of Residuals for ANCOVA of Particle Size Analysis and Distance from Ore Dock
West, East, North and Coastal Transects





Plots of Residuals for ANCOVA of Particle Size Analysis and Distance from Ore Dock
West, East, North and Coastal Transects





One Way Analysis of Covariance Thursday, February 16, 2017, 4:04:22 PM

Dependent Variable: Sum of Fauna

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	197	0	5.919	8.128	0.579
2015.000	169	0	15.189	14.190	1.092
2014.000	119	0	29.395	29.215	2.678
Total	485	0	14.909	19.730	0.896

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Passed (P = 0.412)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	2	19359.909	9679.954	32.675	<0.001
Distance along Coastal Transec	1	4683.795	4683.795	15.810	<0.001
Year x Distance alon	2	526.522	263.261	0.889	0.412
Residual	479	141905.676	296.254	--	--
Total	484	188400.008	389.256	--	--

The effect of the different treatment groups does not depend upon the value of covariate Distance along Coastal Transec, averaging over the values of the remaining covariates. There is not a significant interaction between the factor Year and the covariate Distance along Coastal Transec (P = 0.412).

There are no significant interactions between the factor and the covariates. The equal slopes assumption passes and the equal slopes model is analyzed below.

Analysis of Equal Slopes Model:

R = 0.494 Rsqr = 0.244 Adj Rsqr = 0.239

Analysis of Variance for the Equal Slopes Model:

Source of Variation	DF	SS	MS	F	P
Year	2	37622.952	18811.476	63.527	<0.001
Distance along Coastal Transec	1	5060.880	5060.880	17.091	<0.001
Residual	481	142432.199	296.117	--	--
Total	484	188400.008	389.256	--	--

The differences in the adjusted means among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = <0.001). To isolate which group(s) differ most from the others use a multiple comparison procedure. The adjusted means and their statistics are given in the table below.

The coefficient of covariate Distance along Coastal Transec in the equal slopes regression model is significantly different from zero (P = <0.001). The covariate significantly affects the values of the dependent variable.

Adjusted Means of the Groups:

Group Name	Adjusted Mean	Std. Error	95%Conf-L	95%Conf-U
2016.000	6.098	1.227	3.687	8.508
2015.000	15.464	1.325	12.859	18.068
2014.000	28.709	1.586	25.593	31.826

The adjusted means are the predicted values of the dependent variable Sum of Fauna for each group where each covariate variable is evaluated at the average of its data values.

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):

Comparisons for factor: **Year**

Comparison	Diff of Means	t	P	P<0.050
2014.000 vs. 2016.000	22.612	11.256	<0.001	Yes
2014.000 vs. 2015.000	13.246	6.392	<0.001	Yes
2015.000 vs. 2016.000	9.366	5.191	<0.001	Yes

Regression Equations for the Equal Slopes Model:
There is a significant difference in the intercepts of the dependent variable for these equations since there is a significant difference in the adjusted means of the factor groups (P = <0.001).

Group: 2016.000
Sum of Fauna = 2.426 + (0.00220 * Distance along Coastal Transec)

Group: 2015.000
Sum of Fauna = 11.792 + (0.00220 * Distance along Coastal Transec)

Group: 2014.000
Sum of Fauna = 25.038 + (0.00220 * Distance along Coastal Transec)

Regression Diagnostics:

Row	Predicted	Residual
1	2.470	1.530
2	2.481	5.519
3	2.492	2.508
4	2.503	2.497
5	2.514	0.486
6	2.525	-1.525
7	2.536	0.464
8	2.547	6.453
9	2.558	1.442
10	2.569	-1.569
11	2.591	3.409
12	2.602	10.398
13	2.613	3.387
14	2.624	6.376
15	2.635	10.365
16	2.646	7.354
17	2.657	-0.657
18	2.668	3.332
19	2.679	-1.679
20	2.690	0.310
21	2.701	13.299
22	2.712	6.288

23	2.723	3.277
24	2.735	15.265
25	2.746	10.254
26	2.757	9.243
27	2.768	5.232
28	2.779	5.221
29	2.790	9.210
30	2.801	4.199
31	2.812	7.188
32	2.823	6.177
33	2.834	-0.834
34	2.845	4.155
35	2.856	2.144
36	2.867	0.133
37	2.878	-2.878
38	2.889	-2.889
39	2.900	6.100
40	2.911	4.089
41	2.922	4.078
42	2.933	5.067
43	2.944	1.056
44	2.955	4.045
45	2.966	3.034
46	2.977	2.023
47	2.988	6.012
48	2.999	17.001
49	3.010	16.990
50	3.021	2.979
51	3.032	-2.032
52	3.956	-3.956
53	3.967	5.033
54	3.978	5.022
55	3.989	-1.989
56	4.000	-2.000
57	4.011	3.989
58	4.022	-2.022
59	4.033	-0.0328
60	4.044	-4.044
61	4.055	-4.055
62	4.066	-4.066
63	4.077	-4.077
64	4.088	-4.088
65	4.099	-4.099
66	4.110	-3.110
67	4.121	-3.121
68	4.132	-4.132
69	4.143	-4.143
70	4.154	-4.154
71	4.165	-4.165
72	4.176	-4.176
73	4.187	-4.187
74	4.198	-4.198
75	4.209	-4.209
76	4.220	-4.220
77	4.231	-4.231
78	4.242	-4.242

79	4.253	-4.253
80	4.264	-4.264
81	4.275	-4.275
82	4.286	-4.286
83	4.297	-4.297
84	4.308	-4.308
85	4.319	-4.319
86	4.330	-4.330
87	4.341	-3.341
88	4.352	-4.352
89	4.363	-4.363
90	4.374	-4.374
91	4.385	-3.385
92	4.396	-4.396
93	4.407	-4.407
94	4.418	-4.418
95	4.429	-4.429
96	4.440	-4.440
97	4.451	-4.451
98	4.462	-4.462
99	4.473	-4.473
100	4.484	-4.484
101	4.495	-4.495
102	4.506	-4.506
103	5.804	-2.804
104	5.815	-3.815
105	5.826	-0.826
106	5.837	-3.837
107	5.848	-1.848
108	5.859	-4.859
109	5.870	-0.870
110	5.881	-2.881
111	5.892	-4.892
112	5.903	-3.903
113	5.914	-3.914
114	5.925	-1.925
115	5.936	-5.936
116	5.947	-4.947
117	5.958	-1.958
118	5.969	0.0307
119	5.980	-4.980
120	5.991	-5.991
121	6.002	-6.002
122	6.013	-5.013
123	6.024	-3.024
124	6.035	0.965
125	6.046	-2.046
126	6.057	-4.057
127	6.068	-5.068
128	6.079	-5.079
129	6.090	-6.090
130	6.101	-6.101
131	6.112	-5.112
132	6.123	-6.123
133	6.134	-6.134
134	6.145	-4.145

135	6.156	-4.156
136	6.167	-4.167
137	6.178	-2.178
138	6.189	-3.189
139	6.200	-6.200
140	6.211	-5.211
141	6.222	-2.222
142	6.233	-5.233
143	6.244	2.756
144	6.255	-1.255
145	6.266	-6.266
146	6.277	-2.277
147	6.288	5.712
148	6.299	-4.299
149	6.310	-0.310
150	6.321	-1.321
151	6.332	-3.332
152	6.343	-6.343
153	10.997	-2.997
154	11.008	-0.00847
155	11.019	-8.019
156	11.030	-3.030
157	11.041	-10.041
158	11.052	-11.052
159	11.063	-10.063
160	11.074	-9.074
161	11.085	-7.085
162	11.096	-10.096
163	11.107	-11.107
164	11.118	-5.118
165	11.129	-7.129
166	11.141	-7.141
167	11.152	-1.152
168	11.163	-7.163
169	11.174	-1.174
170	11.185	-8.185
171	11.196	-7.196
172	11.218	-9.218
173	11.229	-7.229
174	11.240	-0.240
175	11.251	9.749
176	11.262	8.738
177	11.273	19.727
178	11.284	35.716
179	11.295	30.705
180	11.306	23.694
181	11.317	6.683
182	11.328	-2.328
183	11.339	4.661
184	11.350	4.650
185	11.361	-3.361
186	11.372	22.628
187	11.383	14.617
188	11.394	26.606
189	11.405	9.595
190	11.416	5.584

191	11.427	4.573
192	11.438	9.562
193	11.449	1.551
194	11.460	7.540
195	11.471	10.529
196	11.482	10.518
197	11.493	4.507
198	11.814	-0.814
199	11.825	7.175
200	11.836	11.164
201	11.847	1.153
202	11.858	5.142
203	11.869	-5.869
204	11.880	-5.880
205	11.891	-2.891
206	11.902	1.098
207	11.913	-9.913
208	11.924	-6.924
209	11.935	-1.935
210	11.946	1.054
211	11.957	-2.957
212	11.968	4.032
213	11.979	5.021
214	11.990	13.010
215	12.001	10.999
216	12.012	-1.012
217	12.023	-10.023
218	12.034	-1.034
219	12.045	-5.045
220	12.056	-5.056
221	12.067	1.933
222	12.078	3.922
223	12.089	0.911
224	12.100	-4.100
225	12.111	-0.111
226	12.122	-3.122
227	12.133	-5.133
228	12.144	1.856
229	12.155	-9.155
230	12.166	16.834
231	12.177	-1.177
232	12.188	-9.188
233	12.199	1.801
234	12.210	-3.210
235	12.221	-5.221
236	12.232	0.768
237	12.243	-7.243
238	12.871	-5.871
239	12.882	-3.882
240	12.893	-6.893
241	12.904	4.096
242	12.915	43.085
243	12.926	21.074
244	12.937	19.063
245	12.948	-7.948
246	12.959	-8.959

247	12.970	-4.970
248	12.981	-4.981
249	12.992	6.008
250	13.003	-4.003
251	13.014	24.986
252	13.025	5.975
253	13.036	-5.036
254	13.047	1.953
255	13.058	-3.058
256	13.069	-4.069
257	13.080	0.920
258	13.091	15.909
259	13.102	10.898
260	13.113	24.887
261	13.124	10.876
262	13.135	17.865
263	13.146	21.854
264	13.157	11.843
265	13.168	6.832
266	13.179	0.821
267	13.190	4.810
268	13.201	-2.201
269	13.212	-5.212
270	13.223	5.777
271	13.234	11.766
272	13.245	18.755
273	13.256	1.744
274	13.267	-6.267
275	13.278	-5.278
276	13.289	-1.289
277	13.300	4.700
278	13.311	2.689
279	13.322	-12.322
280	13.333	-12.333
281	13.344	-6.344
282	15.159	-15.159
283	15.170	-13.170
284	15.181	-14.181
285	15.192	11.808
286	15.203	3.797
287	15.214	0.786
288	15.225	0.775
289	15.236	-7.236
290	15.247	-10.247
291	15.258	-9.258
292	15.269	-14.269
293	15.280	-15.280
294	15.291	-15.291
295	15.302	-14.302
296	15.313	-4.313
297	15.324	-0.324
298	15.335	-0.335
299	15.346	-5.346
300	15.357	-11.357
301	15.368	-4.368
302	15.379	15.621

303	15.390	13.610
304	15.401	-11.401
305	15.412	-1.412
306	15.423	-8.423
307	15.434	-14.434
308	15.445	-14.445
309	15.456	-12.456
310	15.467	-1.467
311	15.478	-8.478
312	15.489	-8.489
313	15.500	-4.500
314	15.511	-10.511
315	15.522	-10.522
316	15.533	-6.533
317	15.544	-14.544
318	15.555	-10.555
319	15.566	-11.566
320	15.577	-15.577
321	15.588	-15.588
322	15.599	-15.599
323	15.610	-15.610
324	15.621	-11.621
325	15.632	0.368
326	15.643	-3.643
327	20.187	9.813
328	20.198	-9.198
329	20.209	-5.209
330	20.220	-0.220
331	20.231	-1.231
332	20.242	0.758
333	20.253	20.747
334	20.264	4.736
335	20.275	3.725
336	20.286	27.714
337	20.297	-5.297
338	20.308	5.692
339	20.319	-1.319
340	20.330	-14.330
341	20.341	-11.341
342	20.352	-10.352
343	20.363	-15.363
344	20.374	-13.374
345	20.385	-15.385
346	20.396	0.604
347	20.407	9.593
348	20.418	15.582
349	20.429	-15.429
350	20.440	-9.440
351	20.451	-15.451
352	20.462	-3.462
353	20.473	2.527
354	20.484	1.516
355	20.495	-3.495
356	20.506	-9.506
357	20.517	3.483
358	20.528	32.472

359	20.539	-7.539
360	20.550	20.450
361	20.561	-5.561
362	20.572	83.428
363	20.583	12.417
364	20.594	64.406
365	20.605	30.395
366	20.616	-11.616
367	25.082	43.918
368	25.093	73.907
369	25.104	6.896
370	25.115	-21.115
371	25.126	-21.126
372	25.137	-21.137
373	25.148	-25.148
374	25.159	-20.159
375	25.170	-22.170
376	25.181	-22.181
377	25.192	-16.192
378	25.203	-23.203
379	25.214	-18.214
380	25.225	-17.225
381	25.236	-19.236
382	25.247	-22.247
383	25.258	-25.258
384	25.269	-21.269
385	25.280	-23.280
386	25.291	-19.291
387	25.302	-17.302
388	25.313	-17.313
389	25.324	-11.324
390	25.335	-19.335
391	25.346	-21.346
392	25.357	-23.357
393	25.368	-25.368
394	25.379	-21.379
395	25.390	-25.390
396	25.401	-23.401
397	25.412	-7.412
398	25.423	-19.423
399	25.434	-24.434
400	25.445	-23.445
401	25.456	-20.456
402	25.467	-20.467
403	25.478	-24.478
404	28.603	11.397
405	28.614	46.386
406	28.625	69.375
407	28.636	78.364
408	28.647	46.353
409	28.658	37.342
410	28.669	4.331
411	28.680	-13.680
412	28.691	-9.691
413	28.702	5.298
414	28.713	40.287

415	28.724	34.276
416	28.735	50.265
417	28.746	22.254
418	28.757	77.243
419	28.768	60.232
420	28.779	4.221
421	28.790	16.210
422	28.801	63.199
423	28.812	59.188
424	28.823	37.177
425	28.834	-1.834
426	28.845	4.155
427	28.856	21.144
428	28.867	27.133
429	28.878	16.122
430	28.889	94.111
431	28.900	54.100
432	28.911	52.089
433	28.922	37.078
434	28.933	9.067
435	28.944	25.056
436	28.955	25.045
437	28.966	22.034
438	28.977	41.023
439	28.988	30.012
440	28.999	3.001
441	29.010	-25.010
442	29.021	-21.021
443	29.032	-17.032
444	29.043	-4.043
445	29.054	-3.054
446	29.065	-17.065
447	33.708	-30.708
448	33.719	-31.719
449	33.730	-30.730
450	33.741	-30.741
451	33.752	-20.752
452	33.763	-18.763
453	33.774	-23.774
454	33.785	-5.785
455	33.796	-11.796
456	33.807	-15.807
457	33.818	-16.818
458	33.829	-32.829
459	33.840	-3.840
460	33.851	-20.851
461	33.862	-17.862
462	33.873	6.127
463	33.884	-24.884
464	33.895	-9.895
465	33.906	-2.906
466	33.917	-9.917
467	33.928	-6.928
468	33.939	-11.939
469	33.950	-12.950
470	33.961	-7.961

471	33.972	-16.972
472	33.983	-6.983
473	33.994	-8.994
474	34.005	-0.00524
475	34.016	-6.016
476	34.027	-17.027
477	34.038	-22.038
478	34.049	-10.049
479	34.060	-17.060
480	34.071	-0.0713
481	34.082	-21.082
482	34.093	34.907
483	34.104	-10.104
484	34.115	-20.115
485	34.126	-17.126

One Way Analysis of Covariance Thursday, February 16, 2017, 4:03:32 PM

Dependent Variable: Mean % Flora

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	197	0	42.060	28.462	2.028
2015.000	169	0	36.356	20.673	1.590
2014.000	119	0	61.782	15.721	1.441
Total	485	0	44.911	25.209	1.145

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Failed (P < 0.050)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	2	5386.570	2693.285	5.608	0.004
Distance along Coastal Transec	1	13556.340	13556.340	28.225	<0.001
Year x Distance alon	2	12781.286	6390.643	13.306	<0.001
Residual	479	230058.990	480.290	--	--
Total	484	307576.229	635.488	--	--

The effect of the different treatment groups depends upon the value of covariate Distance along Coastal Transec, averaging over the values of the remaining covariates. There is a significant interaction effect between the factor Year and the covariate Distance along Coastal Transec (P = <0.001).

There is at least one significant interaction between the factor and a covariate. The equal slopes assumption fails and the equal slopes model will not be analyzed. The regression equations for the treatment groups are given below. If you wish to continue with an analysis of the equal slopes model for this data, unselect the Equality of Slopes option in the Test Options dialog and rerun the test.

Regression Equations for the Interaction Model:
A significant interaction effect between the factor and a covariate is equivalent to a signifcant difference in the slope coefficients of that covariate in these equations.

Group: 2016.000
Mean % Flora = 52.388 - (0.00651 * Distance along Coastal Transec)

Group: 2015.000
Mean % Flora = 45.444 - (0.00589 * Distance along Coastal Transec)

Group: 2014.000
Mean % Flora = 58.791 + (0.00151 * Distance along Coastal Transec)

Regression Diagnostics:

Row	Predicted	Residual
1	52.258	-36.874
2	52.226	-26.869
3	52.193	-28.443
4	52.161	-37.518

5	52.128	-37.128
6	52.096	-19.133
7	52.063	-36.546
8	52.030	-40.780
9	51.998	-39.665
10	51.965	-42.122
11	51.900	-36.516
12	51.868	-22.408
13	51.835	-23.264
14	51.803	-28.918
15	51.770	-20.104
16	51.738	-21.738
17	51.705	-24.205
18	51.673	-27.826
19	51.640	-29.140
20	51.607	-10.838
21	51.575	-19.575
22	51.542	-26.185
23	51.510	-16.748
24	51.477	-17.999
25	51.445	-26.445
26	51.412	-28.212
27	51.380	-29.713
28	51.347	-35.547
29	51.315	-39.736
30	51.282	-30.321
31	51.250	-27.801
32	51.217	-27.513
33	51.184	-22.266
34	51.152	-18.460
35	51.119	-42.786
36	51.087	-41.642
37	51.054	-41.054
38	51.022	-41.022
39	50.989	-42.050
40	50.957	-34.745
41	50.924	-40.424
42	50.892	-36.064
43	50.859	-29.459
44	50.827	-34.859
45	50.794	-32.194
46	50.761	-32.561
47	50.729	-30.590
48	50.696	-21.946
49	50.664	-15.958
50	50.631	-24.268
51	50.599	-10.599
52	47.865	-17.865
53	47.833	3.417
54	47.800	9.628
55	47.768	14.301
56	47.735	17.104
57	47.703	4.869
58	47.670	-5.611
59	47.638	31.774
60	47.605	45.252

61	47.572	52.428
62	47.540	52.460
63	47.507	52.493
64	47.475	43.725
65	47.442	40.819
66	47.410	41.162
67	47.377	47.035
68	47.345	52.655
69	47.312	52.688
70	47.280	52.720
71	47.247	52.753
72	47.215	52.785
73	47.182	52.818
74	47.149	50.092
75	47.117	49.012
76	47.084	43.210
77	47.052	1.658
78	47.019	35.793
79	46.987	53.013
80	46.954	50.143
81	46.922	49.641
82	46.889	53.111
83	46.857	38.858
84	46.824	38.676
85	46.792	21.390
86	46.759	3.955
87	46.726	-6.726
88	46.694	9.845
89	46.661	8.187
90	46.629	31.085
91	46.596	37.752
92	46.564	46.293
93	46.531	40.031
94	46.499	25.901
95	46.466	11.276
96	46.434	0.603
97	46.401	0.399
98	46.368	-7.568
99	46.336	3.279
100	46.303	14.437
101	46.271	17.539
102	46.238	22.162
103	42.399	-3.351
104	42.366	-12.054
105	42.334	5.598
106	42.301	4.366
107	42.268	5.509
108	42.236	5.456
109	42.203	13.797
110	42.171	13.755
111	42.138	-5.842
112	42.106	-16.606
113	42.073	-20.823
114	42.041	-23.152
115	42.008	-23.732
116	41.976	-22.410

117	41.943	-9.721
118	41.910	6.840
119	41.878	18.557
120	41.845	13.988
121	41.813	7.687
122	41.780	-11.780
123	41.748	-20.081
124	41.715	-21.315
125	41.683	17.917
126	41.650	23.567
127	41.618	22.899
128	41.585	23.832
129	41.553	19.697
130	41.520	12.326
131	41.487	19.971
132	41.455	23.545
133	41.422	24.504
134	41.390	23.372
135	41.357	22.571
136	41.325	29.675
137	41.292	30.966
138	41.260	29.085
139	41.227	28.773
140	41.195	16.736
141	41.162	-9.549
142	41.130	4.013
143	41.097	14.800
144	41.064	18.936
145	41.032	18.968
146	40.999	19.001
147	40.967	19.033
148	40.934	19.066
149	40.902	19.098
150	40.869	19.131
151	40.837	19.163
152	40.804	19.196
153	27.040	-20.221
154	27.007	-19.398
155	26.975	-19.832
156	26.942	-5.513
157	26.909	1.424
158	26.877	0.169
159	26.844	0.0604
160	26.812	23.397
161	26.779	24.759
162	26.747	7.142
163	26.714	-6.188
164	26.682	-6.932
165	26.649	-6.876
166	26.617	-4.443
167	26.584	-14.679
168	26.551	-22.301
169	26.519	-19.246
170	26.486	-6.486
171	26.454	-1.944
172	26.389	-2.389

173	26.356	-0.972
174	26.324	-1.976
175	26.291	-10.041
176	26.259	-6.713
177	26.226	-7.605
178	26.194	-5.594
179	26.161	-7.525
180	26.128	-8.165
181	26.096	-4.429
182	26.063	-7.915
183	26.031	-18.304
184	25.998	-20.998
185	25.966	-19.577
186	25.933	-18.888
187	25.901	-21.128
188	25.868	-21.637
189	25.836	-19.314
190	25.803	-15.151
191	25.771	-18.271
192	25.738	-17.613
193	25.705	-15.348
194	25.673	-17.959
195	25.640	-17.192
196	25.608	-18.651
197	25.575	-18.194
198	45.385	-40.941
199	45.356	-40.356
200	45.326	-16.755
201	45.297	-24.274
202	45.267	-22.128
203	45.238	-20.819
204	45.208	-26.071
205	45.179	-27.179
206	45.150	-16.558
207	45.120	-15.328
208	45.091	-5.780
209	45.061	-4.905
210	45.032	-4.691
211	45.002	0.891
212	44.973	-10.606
213	44.944	5.125
214	44.914	-8.906
215	44.885	-7.779
216	44.855	-5.196
217	44.826	13.341
218	44.796	-2.562
219	44.767	-5.951
220	44.737	-4.321
221	44.708	-6.708
222	44.679	-0.604
223	44.649	-7.807
224	44.620	-14.185
225	44.590	-13.681
226	44.561	-17.894
227	44.531	-16.198
228	44.502	-9.047

229	44.473	5.170
230	44.443	-16.043
231	44.414	-4.221
232	44.384	-6.993
233	44.355	-6.736
234	44.325	-26.230
235	44.296	-20.546
236	44.267	-7.667
237	44.237	-32.570
238	42.559	-23.559
239	42.530	-8.780
240	42.500	26.833
241	42.471	-24.471
242	42.442	-16.817
243	42.412	3.042
244	42.383	6.117
245	42.353	39.692
246	42.324	34.134
247	42.294	16.753
248	42.265	16.735
249	42.236	-2.236
250	42.206	-9.706
251	42.177	-23.177
252	42.147	-18.686
253	42.118	-12.118
254	42.088	-8.088
255	42.059	-5.868
256	42.030	5.865
257	42.000	4.923
258	41.971	9.206
259	41.941	1.859
260	41.912	-5.712
261	41.882	6.964
262	41.853	14.769
263	41.823	-6.823
264	41.794	-15.961
265	41.765	-2.817
266	41.735	11.423
267	41.706	3.770
268	41.676	-1.676
269	41.647	22.564
270	41.617	9.687
271	41.588	10.079
272	41.559	-15.020
273	41.529	-16.529
274	41.500	7.072
275	41.470	1.655
276	41.441	15.226
277	41.411	1.981
278	41.382	2.818
279	41.353	40.821
280	41.323	30.677
281	41.294	15.979
282	36.437	43.563
283	36.408	36.092
284	36.378	29.122

285	36.349	31.866
286	36.319	37.252
287	36.290	-9.790
288	36.260	-18.165
289	36.231	-8.958
290	36.202	43.798
291	36.172	54.013
292	36.143	8.403
293	36.113	30.203
294	36.084	34.392
295	36.054	29.735
296	36.025	36.248
297	35.996	41.831
298	35.966	36.891
299	35.937	38.294
300	35.907	43.324
301	35.878	-0.878
302	35.848	41.473
303	35.819	40.848
304	35.790	31.483
305	35.760	-29.510
306	35.731	-27.035
307	35.701	-9.035
308	35.672	17.128
309	35.642	3.973
310	35.613	4.387
311	35.583	7.520
312	35.554	12.628
313	35.525	6.875
314	35.495	19.722
315	35.466	35.898
316	35.436	17.897
317	35.407	0.784
318	35.377	-6.059
319	35.348	-4.348
320	35.319	-25.319
321	35.289	-24.420
322	35.260	-1.331
323	35.230	-16.064
324	35.201	-13.349
325	35.171	1.192
326	35.142	-11.809
327	22.986	-15.486
328	22.956	-2.956
329	22.927	-0.927
330	22.897	-2.897
331	22.868	-2.127
332	22.839	-5.012
333	22.809	-4.340
334	22.780	-4.446
335	22.750	-3.540
336	22.721	-7.882
337	22.691	-11.091
338	22.662	-13.532
339	22.632	1.983
340	22.603	0.124

341	22.574	-2.139
342	22.544	-10.600
343	22.515	-9.333
344	22.485	-8.319
345	22.456	-10.856
346	22.426	-12.426
347	22.397	-15.440
348	22.368	-21.841
349	22.338	-11.052
350	22.309	-10.757
351	22.279	-10.105
352	22.250	-5.107
353	22.220	-12.220
354	22.191	-6.309
355	22.162	-1.050
356	22.132	7.216
357	22.103	-0.503
358	22.073	-18.740
359	22.044	-4.938
360	22.014	1.681
361	21.985	-5.556
362	21.955	-4.683
363	21.926	0.874
364	21.897	-7.241
365	21.867	-6.242
366	21.838	-1.838
367	58.822	-13.822
368	58.829	-13.829
369	58.837	-13.837
370	58.844	-13.844
371	58.852	-28.852
372	58.859	-14.859
373	58.867	-13.867
374	58.875	-22.875
375	58.882	-8.882
376	58.890	-8.890
377	58.897	-8.897
378	58.905	-8.905
379	58.912	-13.912
380	58.920	-1.920
381	58.927	4.073
382	58.935	4.065
383	58.942	4.058
384	58.950	6.050
385	58.958	4.042
386	58.965	4.035
387	58.973	11.027
388	58.980	16.020
389	58.988	15.012
390	58.995	6.005
391	59.003	-2.003
392	59.010	3.990
393	59.018	-59.018
394	59.026	8.974
395	59.033	-21.033
396	59.041	-1.041

397	59.048	1.952
398	59.056	6.944
399	59.063	13.937
400	59.071	6.929
401	59.078	-5.078
402	59.086	0.914
403	59.093	0.907
404	61.238	6.762
405	61.246	8.754
406	61.253	12.747
407	61.261	10.739
408	61.268	21.732
409	61.276	20.724
410	61.283	11.717
411	61.291	23.709
412	61.298	16.702
413	61.306	20.694
414	61.313	17.687
415	61.321	13.679
416	61.329	17.671
417	61.336	19.664
418	61.344	20.656
419	61.351	16.649
420	61.359	16.641
421	61.366	12.634
422	61.374	12.626
423	61.381	18.619
424	61.389	12.611
425	61.397	6.603
426	61.404	6.596
427	61.412	6.588
428	61.419	6.581
429	61.427	9.573
430	61.434	7.566
431	61.442	6.558
432	61.449	8.551
433	61.457	13.543
434	61.464	13.536
435	61.472	13.528
436	61.480	13.520
437	61.487	13.513
438	61.495	6.505
439	61.502	-1.502
440	61.510	-31.510
441	61.517	-1.517
442	61.525	-10.525
443	61.532	-31.532
444	61.540	-36.540
445	61.548	-47.548
446	61.555	-51.555
447	64.742	-4.742
448	64.749	-4.749
449	64.757	-4.757
450	64.764	-4.764
451	64.772	-1.772
452	64.779	5.221

453	64.787	5.213
454	64.794	-22.794
455	64.802	5.198
456	64.810	5.190
457	64.817	5.183
458	64.825	5.175
459	64.832	5.168
460	64.840	5.160
461	64.847	5.153
462	64.855	5.145
463	64.862	5.138
464	64.870	-1.870
465	64.878	-4.878
466	64.885	-4.885
467	64.893	-4.893
468	64.900	-4.900
469	64.908	-14.908
470	64.915	-14.915
471	64.923	-14.923
472	64.930	-14.930
473	64.938	10.062
474	64.946	10.054
475	64.953	10.047
476	64.961	10.039
477	64.968	10.032
478	64.976	10.024
479	64.983	-2.983
480	64.991	-4.991
481	64.998	-4.998
482	65.006	-5.006
483	65.013	-5.013
484	65.021	-32.021
485	65.029	-35.029

One Way Analysis of Covariance Thursday, February 16, 2017, 2:30:59 PM

Dependent Variable: Sum of Fauna

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	130	0	40.492	20.420	1.791
2015.000	118	0	25.958	18.289	1.684
2014.000	118	0	28.153	16.519	1.521
Total	366	0	31.828	19.604	1.025

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Failed (P < 0.050)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	2	9507.853	4753.926	15.681	<0.001
Distance Along East Transect (	1	11157.625	11157.625	36.803	<0.001
Year x Distance Alon	2	4252.088	2126.044	7.013	0.001
Residual	360	109142.247	303.173	--	--
Total	365	140270.156	384.302	--	--

The effect of the different treatment groups depends upon the value of covariate Distance Along East Transect (, averaging over the values of the remaining covariates. There is a significant interaction effect between the factor Year and the covariate Distance Along East Transect ((P = 0.001).

There is at least one significant interaction between the factor and a covariate. The equal slopes assumption fails and the equal slopes model will not be analyzed. The regression equations for the treatment groups are given below. If you wish to continue with an analysis of the equal slopes model for this data, unselect the Equality of Slopes option in the Test Options dialog and rerun the test.

Regression Equations for the Interaction Model:
A significant interaction effect between the factor and a covariate is equivalent to a signifcant difference in the slope coefficients of that covariate in these equations.

Group: 2016.000
Sum of Fauna = 56.634 - (0.0241 * Distance Along East Transect ()

Group: 2015.000
Sum of Fauna = 27.423 - (0.00219 * Distance Along East Transect ()

Group: 2014.000
Sum of Fauna = 46.023 - (0.0273 * Distance Along East Transect ()

Regression Diagnostics:

Row	Predicted	Residual
1	51.810	-45.810
2	51.690	16.310
3	51.569	48.431
4	51.448	22.552

5	51.328	-6.328
6	51.207	-26.207
7	51.087	-6.087
8	50.966	38.034
9	50.845	13.155
10	50.725	9.275
11	50.604	18.396
12	50.484	5.516
13	50.363	78.637
14	50.242	10.758
15	50.122	-22.122
16	50.001	-21.001
17	49.881	-11.881
18	49.760	-8.760
19	49.639	-22.639
20	49.519	10.481
21	49.398	45.602
22	49.278	19.722
23	49.157	4.843
24	49.036	-16.036
25	48.916	-14.916
26	48.795	-30.795
27	48.675	-14.675
28	48.554	-11.554
29	48.433	5.567
30	48.313	-18.313
31	48.192	-1.192
32	48.072	8.928
33	47.951	-3.951
34	47.830	-15.830
35	47.710	-20.710
36	47.589	-24.589
37	47.469	-31.469
38	47.348	-24.348
39	47.227	-24.227
40	47.107	-7.107
41	46.986	2.014
42	46.866	-4.866
43	46.745	2.255
44	46.624	-38.624
45	43.489	5.511
46	43.368	22.632
47	43.248	46.752
48	43.127	9.873
49	43.006	7.994
50	42.886	-9.886
51	42.765	-5.765
52	42.645	5.355
53	42.524	-3.524
54	42.403	8.597
55	42.283	-14.283
56	42.162	-13.162
57	42.042	-3.042
58	41.921	-6.921
59	41.800	27.200
60	41.680	18.320

61	41.559	14.441
62	41.439	1.561
63	41.318	9.682
64	41.197	21.803
65	41.077	3.923
66	40.956	-10.956
67	40.836	2.164
68	40.715	34.285
69	40.594	14.406
70	40.474	-1.474
71	40.353	0.647
72	40.233	8.767
73	40.112	31.888
74	39.991	-0.991
75	39.871	-1.871
76	39.750	-11.750
77	39.630	-27.630
78	39.509	-17.509
79	39.388	-19.388
80	39.268	-12.268
81	39.147	-6.147
82	39.027	-14.027
83	38.906	9.094
84	38.785	5.215
85	38.665	-24.665
86	34.082	-18.082
87	33.961	0.0386
88	33.841	15.159
89	33.720	9.280
90	33.600	4.400
91	33.479	-13.479
92	33.358	-6.358
93	33.238	2.762
94	33.117	-1.117
95	32.997	-20.997
96	32.876	-10.876
97	32.755	30.245
98	32.635	1.365
99	32.514	-10.514
100	32.394	-15.394
101	32.273	-16.273
102	32.152	5.848
103	32.032	-10.032
104	31.911	2.089
105	31.791	29.209
106	31.670	0.330
107	31.549	24.451
108	31.429	-15.429
109	31.308	13.692
110	31.188	8.812
111	31.067	-1.067
112	30.946	-15.946
113	30.826	15.174
114	30.705	-5.705
115	30.585	17.415
116	30.464	17.536

117	30.343	32.657
118	30.223	7.777
119	30.102	-3.102
120	29.982	20.018
121	29.861	16.139
122	29.740	3.260
123	29.620	-10.620
124	29.499	-0.499
125	29.379	-8.379
126	29.258	-11.258
127	29.137	-17.137
128	29.017	-15.017
129	28.896	-13.896
130	28.776	-27.776
131	26.962	0.0377
132	26.951	13.049
133	26.940	0.0597
134	26.929	-15.929
135	26.918	-16.918
136	26.907	95.093
137	26.896	65.104
138	26.885	-4.885
139	26.875	1.125
140	26.864	0.136
141	26.853	-10.853
142	26.842	-22.842
143	26.831	-12.831
144	26.820	-14.820
145	26.809	-7.809
146	26.798	-4.798
147	26.787	-5.787
148	26.776	-8.776
149	26.765	-16.765
150	26.754	-18.754
151	26.743	-17.743
152	26.732	-16.732
153	26.721	-16.721
154	26.710	-21.710
155	26.699	0.301
156	26.688	16.312
157	26.677	-6.677
158	26.666	-11.666
159	26.655	-0.655
160	26.644	71.356
161	26.633	10.367
162	26.622	-2.622
163	26.611	3.389
164	26.600	8.400
165	26.589	-16.589
166	26.578	-5.578
167	26.567	-2.567
168	26.556	11.444
169	26.545	3.455
170	26.227	-3.227
171	26.216	-5.216
172	26.205	-7.205

173	26.194	-12.194
174	26.183	-16.183
175	26.172	-9.172
176	26.161	-21.161
177	26.150	-8.150
178	26.139	2.861
179	26.128	2.872
180	26.117	26.883
181	26.106	-10.106
182	26.096	-8.096
183	26.085	19.915
184	26.074	-9.074
185	26.063	-3.063
186	26.052	-25.052
187	26.041	-14.041
188	26.030	3.970
189	26.019	-0.0187
190	26.008	11.992
191	25.997	27.003
192	25.986	29.014
193	25.975	11.025
194	25.964	15.036
195	25.953	4.047
196	25.942	6.058
197	25.931	13.069
198	25.920	-3.920
199	25.909	-1.909
200	25.898	-10.898
201	25.887	-14.887
202	25.876	-12.876
203	25.865	20.135
204	25.854	19.146
205	25.843	9.157
206	25.832	-2.832
207	25.821	-21.821
208	25.360	-18.360
209	25.349	-8.349
210	25.338	-6.338
211	25.327	-12.327
212	25.317	-10.317
213	25.306	-18.306
214	25.295	-15.295
215	25.284	-19.284
216	25.273	-10.273
217	25.262	1.738
218	25.251	-8.251
219	25.240	-11.240
220	25.229	-2.229
221	25.218	-11.218
222	25.207	-19.207
223	25.196	17.804
224	25.185	11.815
225	25.174	16.826
226	25.163	18.837
227	25.152	1.848
228	25.141	4.859

229	25.130	4.870
230	25.119	10.881
231	25.108	13.892
232	25.097	1.903
233	25.086	6.914
234	25.075	-12.075
235	25.064	3.936
236	25.053	31.947
237	25.042	4.958
238	25.031	3.969
239	25.020	42.980
240	24.998	-17.998
241	24.987	10.013
242	24.976	1.024
243	24.965	-3.965
244	24.954	3.046
245	24.943	10.057
246	24.933	-11.933
247	24.922	-5.922
248	24.911	-20.911
249	40.562	-20.562
250	40.426	6.574
251	40.289	-4.289
252	40.153	-11.153
253	40.016	-11.016
254	39.880	1.120
255	39.743	-10.743
256	39.607	-8.607
257	39.470	-5.470
258	39.334	19.666
259	39.197	10.803
260	39.061	42.939
261	38.924	-19.924
262	38.788	2.212
263	38.651	-18.651
264	38.515	1.485
265	38.378	14.622
266	38.242	-12.242
267	38.105	-11.105
268	37.969	-2.969
269	37.832	-23.832
270	37.696	0.304
271	37.559	0.441
272	37.423	12.577
273	37.286	-27.286
274	37.150	-30.150
275	37.013	-3.013
276	36.877	9.123
277	36.740	-2.740
278	36.604	-2.604
279	36.467	14.533
280	36.330	-2.330
281	36.194	-6.194
282	36.057	-20.057
283	35.921	28.079
284	35.784	29.216

285	35.648	16.352
286	35.511	7.489
287	35.375	-2.375
288	35.238	1.762
289	31.280	0.720
290	31.143	-8.143
291	31.007	-16.007
292	30.870	3.130
293	30.734	-13.734
294	30.597	-18.597
295	30.461	12.539
296	30.324	34.676
297	30.187	2.813
298	30.051	1.949
299	29.914	23.086
300	29.778	6.222
301	29.641	5.359
302	29.505	33.495
303	29.368	-8.368
304	29.232	8.768
305	29.095	8.905
306	28.959	3.041
307	28.822	-9.822
308	28.686	-8.686
309	28.549	5.451
310	28.413	24.587
311	28.276	-0.276
312	28.140	-0.140
313	28.003	2.997
314	27.867	6.133
315	27.730	36.270
316	27.594	0.406
317	27.457	3.543
318	27.321	-7.321
319	27.184	-17.184
320	27.048	-15.048
321	26.911	1.089
322	26.775	-3.775
323	26.638	9.362
324	26.502	15.498
325	26.365	-0.365
326	20.768	-20.768
327	20.632	-20.632
328	20.495	-20.495
329	20.359	-13.359
330	20.222	-18.222
331	20.086	-10.086
332	19.949	-3.949
333	19.813	-10.813
334	19.676	-8.676
335	19.540	-5.540
336	19.403	-11.403
337	19.267	-6.267
338	19.130	-7.130
339	18.994	-9.994
340	18.857	-8.857

341	18.721	-3.721
342	18.584	14.416
343	18.448	1.552
344	18.311	36.689
345	18.174	19.826
346	18.038	18.962
347	17.901	-11.901
348	17.765	-8.765
349	17.628	-1.628
350	17.492	-5.492
351	17.355	-0.355
352	17.219	-2.219
353	17.082	11.918
354	16.946	7.054
355	16.809	-0.809
356	16.673	4.327
357	16.536	-10.536
358	16.400	-11.400
359	16.263	19.737
360	16.127	-8.127
361	15.990	23.010
362	15.854	7.146
363	15.717	1.283
364	15.581	0.419
365	15.444	-8.444
366	15.308	-1.308

One Way Analysis of Covariance Thursday, February 16, 2017, 2:15:15 PM

Data source: East Transect - Video Data in 2016 EEM Video Stats 27-Jan-17.JNB

Dependent Variable: Mean % Flora

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	130	0	10.097	8.853	0.776
2015.000	118	0	17.878	14.853	1.367
2014.000	118	0	15.668	10.665	0.982
Total	366	0	14.402	12.079	0.631

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Failed (P < 0.050)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	2	5572.664	2786.332	25.495	<0.001
Distance Along East Transect (	1	5275.401	5275.401	48.269	<0.001
Year x Distance Alon	2	4592.962	2296.481	21.012	<0.001
Residual	360	39344.889	109.291	--	--
Total	365	53251.927	145.896	--	--

The effect of the different treatment groups depends upon the value of covariate Distance Along East Transect (, averaging over the values of the remaining covariates. There is a significant interaction effect between the factor Year and the covariate Distance Along East Transect ((P = <0.001).

There is at least one significant interaction between the factor and a covariate. The equal slopes assumption fails and the equal slopes model will not be analyzed. The regression equations for the treatment groups are given below. If you wish to continue with an analysis of the equal slopes model for this data, unselect the Equality of Slopes option in the Test Options dialog and rerun the test.

Regression Equations for the Interaction Model:
A significant interaction effect between the factor and a covariate is equivalent to a signifcant difference in the slope coefficients of that covariate in these equations.

Group: 2016.000
Mean % Flora = 1.015 + (0.0136 * Distance Along East Transect ()

Group: 2015.000
Mean % Flora = 19.628 - (0.00262 * Distance Along East Transect ()

Group: 2014.000
Mean % Flora = -1.296 + (0.0259 * Distance Along East Transect ()

Regression Diagnostics:

Row	Predicted	Residual
1	3.729	-2.062
2	3.797	8.703

3	3.865	14.992
4	3.933	17.292
5	4.001	9.333
6	4.068	10.932
7	4.136	8.007
8	4.204	7.939
9	4.272	3.036
10	4.340	-1.647
11	4.408	-2.150
12	4.475	-3.179
13	4.543	-4.038
14	4.611	-1.793
15	4.679	-3.701
16	4.747	-4.166
17	4.815	-3.839
18	4.883	-3.771
19	4.950	1.973
20	5.018	-3.254
21	5.086	-5.086
22	5.154	-4.300
23	5.222	-3.758
24	5.290	-3.861
25	5.358	-5.013
26	5.425	-2.794
27	5.493	-2.530
28	5.561	-3.561
29	5.629	-4.422
30	5.697	-0.0302
31	5.765	-0.0504
32	5.833	1.426
33	5.900	-1.079
34	5.968	-2.718
35	6.036	-4.161
36	6.104	-2.642
37	6.172	-6.172
38	6.240	-6.240
39	6.307	-6.307
40	6.375	-3.984
41	6.443	0.878
42	6.511	-5.059
43	6.579	-4.722
44	6.647	-4.147
45	8.411	1.589
46	8.479	-5.645
47	8.547	1.197
48	8.614	-4.290
49	8.682	-3.682
50	8.750	-2.981
51	8.818	-4.035
52	8.886	-5.923
53	8.954	-3.954
54	9.022	-1.630
55	9.089	-1.676
56	9.157	-2.157
57	9.225	10.418
58	9.293	11.616

59	9.361	-4.161
60	9.429	-7.255
61	9.497	-6.497
62	9.564	-7.183
63	9.632	-1.854
64	9.700	-0.794
65	9.768	-3.268
66	9.836	12.039
67	9.904	3.430
68	9.971	-0.596
69	10.039	-2.539
70	10.107	-3.441
71	10.175	-1.949
72	10.243	0.212
73	10.311	-0.851
74	10.379	1.496
75	10.446	1.623
76	10.514	0.319
77	10.582	4.245
78	10.650	-1.826
79	10.718	13.314
80	10.786	-0.577
81	10.854	-2.520
82	10.921	2.872
83	10.989	3.270
84	11.057	-0.901
85	11.125	-3.030
86	13.703	10.912
87	13.771	18.848
88	13.839	13.266
89	13.907	17.847
90	13.975	11.331
91	14.043	21.957
92	14.110	23.515
93	14.178	6.287
94	14.246	11.865
95	14.314	7.037
96	14.382	1.414
97	14.450	7.720
98	14.518	1.021
99	14.585	7.165
100	14.653	13.573
101	14.721	23.679
102	14.789	8.544
103	14.857	12.643
104	14.925	2.397
105	14.993	-5.846
106	15.060	-7.084
107	15.128	-1.156
108	15.196	-5.637
109	15.264	-4.919
110	15.332	-10.218
111	15.400	-7.953
112	15.467	-4.634
113	15.535	-7.678
114	15.603	-11.228

115	15.671	-12.171
116	15.739	-15.406
117	15.807	-12.235
118	15.875	-5.875
119	15.942	-4.942
120	16.010	-6.157
121	16.078	-5.364
122	16.146	14.780
123	16.214	-6.769
124	16.282	-6.004
125	16.350	-4.385
126	16.417	-3.751
127	16.485	-6.940
128	16.553	-9.331
129	16.621	-14.121
130	16.689	-6.689
131	19.078	-13.605
132	19.065	-11.665
133	19.052	-9.506
134	19.039	-9.720
135	19.026	-11.267
136	19.012	-8.596
137	18.999	-13.821
138	18.986	-13.986
139	18.973	-16.681
140	18.960	-16.579
141	18.947	-14.947
142	18.934	-14.172
143	18.921	-12.557
144	18.908	-13.908
145	18.895	-13.895
146	18.881	-0.997
147	18.868	-5.868
148	18.855	7.963
149	18.842	-10.747
150	18.829	-7.920
151	18.816	-12.149
152	18.803	-13.368
153	18.790	-3.628
154	18.777	24.473
155	18.764	15.611
156	18.750	23.557
157	18.737	38.584
158	18.724	36.083
159	18.711	35.178
160	18.698	32.263
161	18.685	13.039
162	18.672	10.032
163	18.659	-12.325
164	18.646	-13.069
165	18.633	-13.216
166	18.619	-12.419
167	18.606	-7.773
168	18.593	-13.593
169	18.580	-11.307
170	18.200	-11.141

171	18.187	-11.759
172	18.174	-13.174
173	18.161	20.969
174	18.148	37.852
175	18.135	35.665
176	18.122	45.340
177	18.109	38.743
178	18.095	23.780
179	18.082	14.610
180	18.069	7.385
181	18.056	24.444
182	18.043	-9.774
183	18.030	-8.956
184	18.017	-5.603
185	18.004	2.169
186	17.991	-5.491
187	17.978	-0.656
188	17.964	-4.164
189	17.951	-7.082
190	17.938	-0.338
191	17.925	-5.525
192	17.912	-6.431
193	17.899	-8.099
194	17.886	-5.803
195	17.873	-10.273
196	17.860	-3.032
197	17.847	5.038
198	17.833	-4.233
199	17.820	0.257
200	17.807	0.829
201	17.794	18.158
202	17.781	-6.042
203	17.768	-9.691
204	17.755	0.370
205	17.742	-2.934
206	17.729	9.194
207	17.716	56.173
208	17.165	-5.499
209	17.152	-9.652
210	17.139	-8.316
211	17.126	-2.959
212	17.113	2.262
213	17.100	-3.975
214	17.087	-8.024
215	17.074	-14.179
216	17.061	-3.965
217	17.047	-4.547
218	17.034	-0.719
219	17.021	7.070
220	17.008	5.492
221	16.995	9.255
222	16.982	3.018
223	16.969	-1.255
224	16.956	-1.003
225	16.943	-1.943
226	16.930	-4.430

227	16.917	-6.482
228	16.903	-8.267
229	16.890	-6.238
230	16.877	-9.496
231	16.864	-1.075
232	16.851	-1.325
233	16.838	-3.981
234	16.825	-14.533
235	16.812	-8.536
236	16.799	-5.746
237	16.786	-4.027
238	16.772	-7.272
239	16.759	2.652
240	16.733	13.267
241	16.720	3.080
242	16.707	-4.207
243	16.694	11.223
244	16.681	0.319
245	16.668	3.767
246	16.655	-1.446
247	16.641	-3.100
248	16.628	-9.485
249	3.888	1.112
250	4.017	1.983
251	4.147	-1.147
252	4.276	-0.276
253	4.406	0.594
254	4.536	-1.536
255	4.665	-1.665
256	4.795	-3.795
257	4.924	-3.924
258	5.054	-4.054
259	5.184	-2.184
260	5.313	-2.313
261	5.443	-0.443
262	5.572	-2.572
263	5.702	-5.302
264	5.831	-2.831
265	5.961	-2.961
266	6.091	-3.091
267	6.220	-1.220
268	6.350	-3.350
269	6.479	-1.479
270	6.609	-2.609
271	6.739	-3.739
272	6.868	-1.868
273	6.998	-1.998
274	7.127	0.873
275	7.257	1.743
276	7.386	0.614
277	7.516	-4.516
278	7.646	-4.646
279	7.775	-4.775
280	7.905	0.0952
281	8.034	4.966
282	8.164	1.836

283	8.294	0.706
284	8.423	-8.023
285	8.553	-4.553
286	8.682	-6.682
287	8.812	-3.812
288	8.942	-0.942
289	12.699	2.301
290	12.829	2.171
291	12.959	2.041
292	13.088	1.912
293	13.218	1.782
294	13.347	1.653
295	13.477	1.523
296	13.607	1.393
297	13.736	1.264
298	13.866	1.134
299	13.995	0.00472
300	14.125	3.875
301	14.254	3.746
302	14.384	3.616
303	14.514	-4.514
304	14.643	3.357
305	14.773	3.227
306	14.902	3.098
307	15.032	2.968
308	15.162	2.838
309	15.291	-0.291
310	15.421	0.579
311	15.550	9.450
312	15.680	9.320
313	15.809	9.191
314	15.939	7.061
315	16.069	6.931
316	16.198	9.802
317	16.328	11.672
318	16.457	11.543
319	16.587	11.413
320	16.717	11.283
321	16.846	10.154
322	16.976	11.024
323	17.105	10.895
324	17.235	10.765
325	17.364	10.636
326	22.677	-22.677
327	22.807	-22.807
328	22.937	-22.937
329	23.066	-10.066
330	23.196	-10.196
331	23.325	-10.325
332	23.455	-10.455
333	23.585	1.415
334	23.714	-10.714
335	23.844	-10.844
336	23.973	-10.973
337	24.103	-11.103
338	24.232	-11.232

339	24.362	-10.362
340	24.492	-9.492
341	24.621	-9.621
342	24.751	5.249
343	24.880	5.120
344	25.010	8.990
345	25.140	8.860
346	25.269	7.731
347	25.399	5.601
348	25.528	7.472
349	25.658	7.342
350	25.787	7.213
351	25.917	7.083
352	26.047	6.953
353	26.176	6.824
354	26.306	4.694
355	26.435	3.565
356	26.565	3.435
357	26.695	3.305
358	26.824	3.176
359	26.954	3.046
360	27.083	-7.083
361	27.213	2.787
362	27.342	-3.342
363	27.472	-4.472
364	27.602	-4.602
365	27.731	-4.731
366	27.861	-4.861

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Dependent Variable: Sum of Fauna

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	155	0	34.161	43.271	3.476
2015.000	129	0	3.442	3.727	0.328
Total	284	0	20.208	35.495	2.106

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Failed (P < 0.050)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	1	37373.986	37373.986	39.561	<0.001
Distance along North Transect	1	17686.407	17686.407	18.722	<0.001
Year x Distance alon	1	9746.461	9746.461	10.317	0.001
Residual	280	264517.777	944.706	--	--
Total	283	356558.743	1259.925	--	--

The effect of the different treatment groups depends upon the value of covariate Distance along North Transect , averaging over the values of the remaining covariates. There is a significant interaction effect between the factor Year and the covariate Distance along North Transect (P = 0.001).

There is at least one significant interaction between the factor and a covariate. The equal slopes assumption fails and the equal slopes model will not be analyzed. The regression equations for the treatment groups are given below. If you wish to continue with an analysis of the equal slopes model for this data, unselect the Equality of Slopes option in the Test Options dialog and rerun the test.

Regression Equations for the Interaction Model:
A significant interaction effect between the factor and a covariate is equivalent to a signifcant difference in the slope coefficients of that covariate in these equations.

Group: 2016.000
Sum of Fauna = 65.987 - (0.0297 * Distance along North Transect)

Group: 2015.000
Sum of Fauna = 8.140 - (0.00440 * Distance along North Transect)

Regression Diagnostics:

Row	Predicted	Residual
1	53.345	-32.345
2	53.197	115.803
3	53.048	52.952
4	52.899	68.101
5	52.750	28.250
6	52.602	148.398
7	52.453	46.547
8	52.304	118.696

9	52.156	34.844
10	52.007	12.993
11	51.858	-13.858
12	51.709	-11.709
13	51.561	-27.561
14	51.412	-28.412
15	51.263	-28.263
16	51.114	-27.114
17	50.966	-21.966
18	50.817	-17.817
19	50.668	-31.668
20	50.520	-4.520
21	50.371	21.629
22	50.222	-12.222
23	50.073	-9.073
24	49.925	-4.925
25	49.776	-29.776
26	49.627	-36.627
27	49.478	-26.478
28	49.330	-36.330
29	49.181	-26.181
30	49.032	14.968
31	48.883	-16.883
32	48.735	-13.735
33	48.586	-32.586
34	48.437	2.563
35	48.289	46.711
36	48.140	79.860
37	47.991	14.009
38	47.842	-14.842
39	47.694	-31.694
40	47.545	-27.545
41	47.396	-36.396
42	47.247	-41.247
43	47.099	-38.099
44	46.950	-40.950
45	46.801	-35.801
46	46.653	-36.653
47	46.504	-38.504
48	46.355	-16.355
49	46.206	-28.206
50	46.058	-29.058
51	45.909	-12.909
52	45.760	-33.760
53	45.611	-37.611
54	37.134	-31.134
55	36.985	-28.985
56	36.836	-5.836
57	36.688	-18.688
58	36.539	-17.539
59	36.390	-24.390
60	36.242	2.758
61	36.093	-4.093
62	35.944	-12.944
63	35.795	-3.795
64	35.647	-13.647

65	35.498	-26.498
66	35.349	-27.349
67	35.200	53.800
68	35.052	219.948
69	34.903	107.097
70	34.754	13.246
71	34.606	-8.606
72	34.457	251.543
73	34.308	-19.308
74	34.159	-20.159
75	34.011	20.989
76	33.862	43.138
77	33.713	-5.713
78	33.564	6.436
79	33.416	-17.416
80	33.267	0.733
81	33.118	-8.118
82	32.970	-20.970
83	32.821	-24.821
84	32.672	28.328
85	32.523	-10.523
86	32.375	-7.375
87	32.226	-20.226
88	32.077	-24.077
89	31.928	-25.928
90	31.780	-26.780
91	31.631	-21.631
92	31.482	-20.482
93	31.334	-23.334
94	31.185	-9.185
95	31.036	-11.036
96	30.887	-14.887
97	30.739	-9.739
98	30.590	-17.590
99	30.441	-18.441
100	30.292	-13.292
101	30.144	-11.144
102	29.995	-13.995
103	29.846	-5.846
104	29.698	-20.698
105	22.707	17.293
106	22.559	70.441
107	22.410	34.590
108	22.261	33.739
109	22.112	22.888
110	21.964	3.036
111	21.815	1.185
112	21.666	27.334
113	21.517	14.483
114	21.369	-0.369
115	21.220	-19.220
116	21.071	-1.071
117	20.923	-3.923
118	20.774	-14.774
119	20.625	-2.625
120	20.476	-10.476

121	20.328	-7.328
122	20.179	-10.179
123	20.030	-18.030
124	19.881	-8.881
125	19.733	9.267
126	19.584	-10.584
127	19.435	-8.435
128	19.287	-15.287
129	19.138	3.862
130	18.989	-4.989
131	18.840	-12.840
132	18.692	-15.692
133	18.543	-15.543
134	18.394	-12.394
135	18.245	-9.245
136	18.097	-16.097
137	17.948	16.052
138	17.799	52.201
139	17.651	1.349
140	17.502	5.498
141	17.353	43.647
142	17.204	35.796
143	17.056	6.944
144	16.907	16.093
145	16.758	-7.758
146	16.609	12.391
147	16.461	-4.461
148	16.312	-8.312
149	16.163	-8.163
150	16.014	-11.014
151	15.866	-15.866
152	15.717	-14.717
153	15.568	-12.568
154	15.420	-12.420
155	15.271	-13.271
156	6.798	-6.798
157	6.776	-5.776
158	6.754	2.246
159	6.732	6.268
160	6.710	6.290
161	6.688	6.312
162	6.666	1.334
163	6.644	4.356
164	6.622	5.378
165	6.600	1.400
166	6.578	2.422
167	6.556	7.444
168	6.534	8.466
169	6.512	2.488
170	6.490	3.510
171	6.468	6.532
172	6.446	2.554
173	6.424	1.576
174	6.402	-1.402
175	6.380	4.620
176	6.358	2.642

177	6.336	2.664
178	6.314	-6.314
179	6.292	-2.292
180	6.270	-0.270
181	6.248	-6.248
182	6.226	-5.226
183	6.204	4.796
184	6.182	0.818
185	6.160	-3.160
186	6.138	0.862
187	6.116	-1.116
188	6.094	0.906
189	6.072	-2.072
190	6.050	-1.050
191	6.006	-1.006
192	5.984	0.0157
193	5.962	3.038
194	5.940	-5.940
195	5.918	-5.918
196	3.807	-2.807
197	3.785	-3.785
198	3.763	-1.763
199	3.741	-2.741
200	3.697	-3.697
201	3.675	-0.675
202	3.653	0.347
203	3.631	-1.631
204	3.609	-3.609
205	3.587	-2.587
206	3.565	-1.565
207	3.543	-2.543
208	3.521	2.479
209	3.499	0.501
210	3.477	-0.477
211	3.455	0.545
212	3.433	-0.433
213	3.411	0.589
214	3.389	-0.389
215	3.367	-3.367
216	3.345	-2.345
217	3.323	-1.323
218	3.301	-3.301
219	3.279	-2.279
220	3.257	-2.257
221	3.235	-2.235
222	3.213	-2.213
223	3.191	-2.191
224	3.169	-2.169
225	3.147	-2.147
226	3.125	-3.125
227	3.103	-1.103
228	3.081	-3.081
229	3.059	-0.0591
230	3.037	-2.037
231	3.015	-3.015
232	2.993	-2.993

233	2.971	-2.971
234	2.949	-0.949
235	2.927	-2.927
236	2.905	-2.905
237	2.883	-2.883
238	2.861	-1.861
239	2.839	-0.839
240	2.817	-1.817
241	2.795	-2.795
242	1.344	1.656
243	1.322	1.678
244	1.300	2.700
245	1.278	-1.278
246	1.256	-1.256
247	1.234	-0.234
248	1.212	-1.212
249	1.190	1.810
250	1.168	-0.168
251	1.146	5.854
252	1.124	0.876
253	1.102	-0.102
254	1.080	-1.080
255	1.058	3.942
256	1.036	2.964
257	1.014	-1.014
258	0.992	0.00835
259	0.970	3.030
260	0.948	0.0523
261	0.926	3.074
262	0.904	1.096
263	0.882	2.118
264	0.860	1.140
265	0.838	0.162
266	0.816	-0.816
267	0.794	1.206
268	0.772	1.228
269	0.750	0.250
270	0.728	1.272
271	0.706	2.294
272	0.684	2.316
273	0.662	1.338
274	0.640	0.360
275	0.618	4.382
276	0.596	1.404
277	0.574	3.426
278	0.552	2.448
279	0.530	0.470
280	0.508	-0.508
281	0.486	0.514
282	0.464	1.536
283	0.442	1.558
284	0.420	0.580

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Dependent Variable: Mean % Flora

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	155	0	0.0581	0.406	0.0326
2015.000	129	0	0.00300	0.0242	0.00213
Total	284	0	0.0331	0.302	0.0179

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Passed (P = 0.233)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	1	0.0213	0.0213	0.236	0.628
Distance along North Transect	1	0.0923	0.0923	1.022	0.313
Year x Distance alon	1	0.129	0.129	1.430	0.233
Residual	280	25.314	0.0904	--	--
Total	283	25.734	0.0909	--	--

The effect of the different treatment groups does not depend upon the value of covariate Distance along North Transect , averaging over the values of the remaining covariates. There is not a significant interaction between the factor Year and the covariate Distance along North Transect (P = 0.233).

There are no significant interactions between the factor and the covariates. The equal slopes assumption passes and the equal slopes model is analyzed below.

Analysis of Equal Slopes Model:

R = 0.106 Rsqr = 0.0113 Adj Rsqr = 0.00426

Analysis of Variance for the Equal Slopes Model:

Source of Variation	DF	SS	MS	F	P
Year	1	0.213	0.213	2.353	0.126
Distance along North Transect	1	0.0771	0.0771	0.851	0.357
Residual	281	25.443	0.0905	--	--
Total	283	25.734	0.0909	--	--

The differences among the adjusted means of the treatment groups are not great enough to exclude the possibility that the differences are only due to random sample variability. There is not a significant difference between the adjusted means (P = 0.126).

The coefficient of covariate Distance along North Transect in the equal slopes regression model is not significantly different from zero (P = 0.357). There is no evidence that the covariate affects the values of dependent variable; you may want to consider removing it from the regression model.

No covariate significantly contributes to the values of the dependent variable. You may want to consider a single factor ANOVA design for your study.

Adjusted Means of the Groups:

Group Name	**Adjusted Mean**	**Std. Error**	**95%Conf-L**	**95%Conf-U**
2016.000	0.0581	0.0242	0.0105	0.106
2015.000	0.00304	0.0265	-0.0491	0.0552

The adjusted means are the predicted values of the dependent variable Mean % Flora for each group where each covariate variable is evaluated at the average of its data values.

Regression Equations for the Equal Slopes Model:
There is no significant difference in the intercepts of the dependent variable for these equations since there is no significant difference in the adjusted means of the factor groups (P = 0.126).

Group: 2016.000
Mean % Flora = 0.0201 + (0.0000355 * Distance along North Transect)

Group: 2015.000
Mean % Flora = -0.0350 + (0.0000355 * Distance along North Transect)

Regression Diagnostics:

Row	**Predicted**	**Residual**
1	0.0352	-0.0352
2	0.0353	-0.0353
3	0.0355	-0.0355
4	0.0357	-0.0357
5	0.0359	0.405
6	0.0361	-0.0361
7	0.0362	-0.0362
8	0.0364	-0.0364
9	0.0366	-0.0366
10	0.0368	-0.0368
11	0.0369	-0.0369
12	0.0371	-0.0371
13	0.0373	-0.0373
14	0.0375	-0.0375
15	0.0377	-0.0377
16	0.0378	-0.0378
17	0.0380	-0.0380
18	0.0382	-0.0382
19	0.0384	-0.0384
20	0.0385	-0.0385
21	0.0387	-0.0387
22	0.0389	-0.0389
23	0.0391	-0.0391
24	0.0393	-0.0393
25	0.0394	-0.0394
26	0.0396	-0.0396
27	0.0398	-0.0398
28	0.0400	-0.0400
29	0.0401	-0.0401
30	0.0403	-0.0403
31	0.0405	-0.0405
32	0.0407	-0.0407
33	0.0408	-0.0408
34	0.0410	-0.0410
35	0.0412	-0.0412

36	0.0414	-0.0414
37	0.0416	-0.0416
38	0.0417	-0.0417
39	0.0419	-0.0419
40	0.0421	-0.0421
41	0.0423	-0.0423
42	0.0424	-0.0424
43	0.0426	-0.0426
44	0.0428	-0.0428
45	0.0430	-0.0430
46	0.0432	0.595
47	0.0433	-0.0433
48	0.0435	-0.0435
49	0.0437	-0.0437
50	0.0439	0.259
51	0.0440	-0.0440
52	0.0442	-0.0442
53	0.0444	-0.0444
54	0.0545	-0.0545
55	0.0547	-0.0547
56	0.0549	-0.0549
57	0.0551	-0.0551
58	0.0552	-0.0552
59	0.0554	-0.0554
60	0.0556	-0.0556
61	0.0558	-0.0558
62	0.0560	-0.0560
63	0.0561	-0.0561
64	0.0563	-0.0563
65	0.0565	-0.0565
66	0.0567	-0.0567
67	0.0568	-0.0568
68	0.0570	-0.0570
69	0.0572	-0.0572
70	0.0574	-0.0574
71	0.0576	-0.0576
72	0.0577	-0.0577
73	0.0579	-0.0579
74	0.0581	-0.0581
75	0.0583	-0.0583
76	0.0584	-0.0584
77	0.0586	-0.0586
78	0.0588	-0.0588
79	0.0590	0.260
80	0.0592	-0.0592
81	0.0593	-0.0593
82	0.0595	-0.0595
83	0.0597	-0.0597
84	0.0599	-0.0599
85	0.0600	0.365
86	0.0602	-0.0602
87	0.0604	-0.0604
88	0.0606	-0.0606
89	0.0607	-0.0607
90	0.0609	-0.0609
91	0.0611	-0.0611

92	0.0613	-0.0613
93	0.0615	-0.0615
94	0.0616	-0.0616
95	0.0618	0.550
96	0.0620	-0.0620
97	0.0622	-0.0622
98	0.0623	-0.0623
99	0.0625	-0.0625
100	0.0627	-0.0627
101	0.0629	-0.0629
102	0.0631	-0.0631
103	0.0632	-0.0632
104	0.0634	-0.0634
105	0.0718	-0.0718
106	0.0719	-0.0719
107	0.0721	-0.0721
108	0.0723	-0.0723
109	0.0725	-0.0725
110	0.0727	-0.0727
111	0.0728	-0.0728
112	0.0730	-0.0730
113	0.0732	-0.0732
114	0.0734	-0.0734
115	0.0735	-0.0735
116	0.0737	-0.0737
117	0.0739	-0.0739
118	0.0741	-0.0741
119	0.0743	-0.0743
120	0.0744	-0.0744
121	0.0746	4.740
122	0.0748	-0.0748
123	0.0750	-0.0750
124	0.0751	-0.0751
125	0.0753	-0.0753
126	0.0755	-0.0755
127	0.0757	-0.0757
128	0.0759	-0.0759
129	0.0760	1.087
130	0.0762	0.210
131	0.0764	-0.0764
132	0.0766	-0.0766
133	0.0767	-0.0767
134	0.0769	-0.0769
135	0.0771	-0.0771
136	0.0773	-0.0773
137	0.0775	-0.0775
138	0.0776	-0.0776
139	0.0778	-0.0778
140	0.0780	-0.0780
141	0.0782	-0.0782
142	0.0783	-0.0783
143	0.0785	-0.0785
144	0.0787	-0.0787
145	0.0789	-0.0789
146	0.0791	-0.0791
147	0.0792	-0.0792

148	0.0794	-0.0794
149	0.0796	-0.0796
150	0.0798	-0.0798
151	0.0799	-0.0799
152	0.0801	-0.0801
153	0.0803	-0.0803
154	0.0805	-0.0805
155	0.0807	-0.0807
156	-0.0241	0.0241
157	-0.0239	0.0239
158	-0.0238	0.0238
159	-0.0236	0.0236
160	-0.0234	0.0234
161	-0.0232	0.0232
162	-0.0230	0.0230
163	-0.0229	0.0229
164	-0.0227	0.0227
165	-0.0225	0.0225
166	-0.0223	0.0223
167	-0.0222	0.0222
168	-0.0220	0.0220
169	-0.0218	0.0218
170	-0.0216	0.0216
171	-0.0215	0.0215
172	-0.0213	0.0213
173	-0.0211	0.0211
174	-0.0209	0.0209
175	-0.0207	0.0207
176	-0.0206	0.0206
177	-0.0204	0.0204
178	-0.0202	0.0202
179	-0.0200	0.0200
180	-0.0199	0.0199
181	-0.0197	0.0197
182	-0.0195	0.0195
183	-0.0193	0.0193
184	-0.0191	0.0191
185	-0.0190	0.0190
186	-0.0188	0.0188
187	-0.0186	0.238
188	-0.0184	0.186
189	-0.0183	0.0183
190	-0.0181	0.0181
191	-0.0177	0.0177
192	-0.0175	0.0175
193	-0.0174	0.0174
194	-0.0172	0.0172
195	-0.0170	0.0170
196	0.0000495	-0.0000495
197	0.000227	-0.000227
198	0.000405	-0.000405
199	0.000583	-0.000583
200	0.000938	-0.000938
201	0.00112	-0.00112
202	0.00129	-0.00129
203	0.00147	-0.00147

204	0.00165	-0.00165
205	0.00183	-0.00183
206	0.00200	-0.00200
207	0.00218	-0.00218
208	0.00236	-0.00236
209	0.00254	-0.00254
210	0.00271	-0.00271
211	0.00289	-0.00289
212	0.00307	-0.00307
213	0.00325	-0.00325
214	0.00343	-0.00343
215	0.00360	-0.00360
216	0.00378	-0.00378
217	0.00396	-0.00396
218	0.00414	-0.00414
219	0.00431	-0.00431
220	0.00449	-0.00449
221	0.00467	-0.00467
222	0.00485	-0.00485
223	0.00502	-0.00502
224	0.00520	-0.00520
225	0.00538	-0.00538
226	0.00556	-0.00556
227	0.00574	-0.00574
228	0.00591	-0.00591
229	0.00609	-0.00609
230	0.00627	-0.00627
231	0.00645	-0.00645
232	0.00662	-0.00662
233	0.00680	-0.00680
234	0.00698	-0.00698
235	0.00716	-0.00716
236	0.00733	-0.00733
237	0.00751	-0.00751
238	0.00769	-0.00769
239	0.00787	-0.00787
240	0.00805	-0.00805
241	0.00822	-0.00822
242	0.0199	-0.0199
243	0.0201	-0.0201
244	0.0203	-0.0203
245	0.0205	-0.0205
246	0.0207	-0.0207
247	0.0208	-0.0208
248	0.0210	-0.0210
249	0.0212	-0.0212
250	0.0214	-0.0214
251	0.0215	-0.0215
252	0.0217	-0.0217
253	0.0219	-0.0219
254	0.0221	-0.0221
255	0.0223	-0.0223
256	0.0224	-0.0224
257	0.0226	-0.0226
258	0.0228	-0.0228
259	0.0230	-0.0230

260	0.0231	-0.0231
261	0.0233	-0.0233
262	0.0235	-0.0235
263	0.0237	-0.0237
264	0.0239	-0.0239
265	0.0240	-0.0240
266	0.0242	-0.0242
267	0.0244	-0.0244
268	0.0246	-0.0246
269	0.0247	-0.0247
270	0.0249	-0.0249
271	0.0251	-0.0251
272	0.0253	-0.0253
273	0.0255	-0.0255
274	0.0256	-0.0256
275	0.0258	-0.0258
276	0.0260	-0.0260
277	0.0262	-0.0262
278	0.0263	-0.0263
279	0.0265	-0.0265
280	0.0267	-0.0267
281	0.0269	-0.0269
282	0.0271	-0.0271
283	0.0272	-0.0272
284	0.0274	-0.0274

One Way Analysis of Covariance Thursday, February 16, 2017, 3:52:26 PM

Dependent Variable: Sum of Fauna

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	176	0	22.017	19.971	1.505
2015.000	150	0	17.853	20.404	1.666
2014.000	114	0	13.658	19.849	1.859
Total	440	0	18.432	20.320	0.969

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Failed (P < 0.050)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	2	1394.538	697.269	3.716	0.025
Distance along West Transect (	1	90033.155	90033.155	479.772	<0.001
Year x Distance alon	2	1392.555	696.278	3.710	0.025
Residual	434	81443.579	187.658	--	--
Total	439	181257.955	412.888	--	--

The effect of the different treatment groups depends upon the value of covariate Distance along West Transect (, averaging over the values of the remaining covariates. There is a significant interaction effect between the factor Year and the covariate Distance along West Transect ((P = 0.025).

There is at least one significant interaction between the factor and a covariate. The equal slopes assumption fails and the equal slopes model will not be analyzed. The regression equations for the treatment groups are given below. If you wish to continue with an analysis of the equal slopes model for this data, unselect the Equality of Slopes option in the Test Options dialog and rerun the test.

Regression Equations for the Interaction Model:
A significant interaction effect between the factor and a covariate is equivalent to a signifcant difference in the slope coefficients of that covariate in these equations.

Group: 2016.000
Sum of Fauna = 44.413 - (0.0257 * Distance along West Transect ()

Group: 2015.000
Sum of Fauna = 50.690 - (0.0333 * Distance along West Transect ()

Group: 2014.000
Sum of Fauna = 40.628 - (0.0262 * Distance along West Transect ()

Regression Diagnostics:

Row	Predicted	Residual
1	42.356	-23.356
2	42.227	-24.227
3	42.099	-27.099
4	41.970	-31.970

5	41.842	-31.842
6	41.713	-21.713
7	41.585	-26.585
8	41.456	-15.456
9	41.327	-4.327
10	41.199	-20.199
11	41.070	-14.070
12	40.942	-20.942
13	40.813	-7.813
14	40.685	-15.685
15	40.556	3.444
16	40.428	17.572
17	40.299	25.701
18	40.171	-12.171
19	40.042	-2.042
20	39.913	-14.913
21	39.785	10.215
22	39.656	-3.656
23	39.528	-4.528
24	39.399	-0.399
25	39.271	14.729
26	39.142	-8.142
27	39.014	16.986
28	38.885	35.115
29	38.756	30.244
30	38.628	29.372
31	38.499	35.501
32	38.371	8.629
33	38.242	-10.242
34	38.114	15.886
35	37.985	7.015
36	37.857	6.143
37	37.728	18.272
38	37.600	-12.600
39	37.471	-8.471
40	37.342	13.658
41	37.214	-0.214
42	37.085	4.915
43	36.957	-16.957
44	36.828	-6.828
45	36.700	-16.700
46	36.571	1.429
47	36.443	1.557
48	36.314	29.686
49	36.057	28.943
50	35.928	13.072
51	35.800	-5.800
52	35.671	4.329
53	35.543	0.457
54	35.414	15.586
55	35.286	8.714
56	35.157	9.843
57	35.028	29.972
58	34.771	8.229
59	34.643	-19.643
60	34.514	-7.514

61	34.386	28.614
62	34.257	52.743
63	34.129	7.871
64	34.000	9.000
65	33.872	2.128
66	33.743	6.257
67	33.614	9.386
68	33.486	-14.486
69	33.357	5.643
70	33.229	8.771
71	33.100	7.900
72	32.972	6.028
73	32.843	-8.843
74	32.715	5.285
75	32.586	19.414
76	32.457	-29.457
77	17.546	-0.546
78	17.417	11.583
79	17.160	-13.160
80	17.031	-6.031
81	16.903	3.097
82	16.774	23.226
83	16.646	38.354
84	16.517	-6.517
85	16.389	-12.389
86	16.131	4.869
87	16.003	-6.003
88	15.874	-9.874
89	15.746	-6.746
90	15.617	-8.617
91	15.489	5.511
92	15.360	-0.360
93	15.232	-3.232
94	15.103	-9.103
95	14.974	-10.974
96	14.846	-7.846
97	14.717	-13.717
98	14.589	-8.589
99	14.460	-12.460
100	14.332	-13.332
101	14.203	-11.203
102	14.075	-13.075
103	13.946	-5.946
104	13.818	-9.818
105	13.689	-8.689
106	13.560	-2.560
107	13.432	-12.432
108	13.303	-13.303
109	13.175	-12.175
110	13.046	-12.046
111	12.918	-11.918
112	12.789	-9.789
113	12.661	-6.661
114	12.532	0.468
115	12.403	-7.403
116	12.275	-8.275

117	12.146	-10.146
118	12.018	-12.018
119	11.889	-10.889
120	11.761	-10.761
121	11.632	-8.632
122	11.504	-6.504
123	11.375	-8.375
124	11.246	-2.246
125	11.118	-11.118
126	9.704	-9.704
127	9.575	-6.575
128	9.447	-3.447
129	9.318	-3.318
130	9.190	-3.190
131	9.061	-8.061
132	8.933	-2.933
133	8.804	-7.804
134	8.675	-4.675
135	8.547	-5.547
136	8.418	-7.418
137	8.290	-7.290
138	8.161	0.839
139	8.033	-4.033
140	7.904	-2.904
141	7.776	-4.776
142	7.647	-2.647
143	7.519	-7.519
144	7.390	-7.390
145	7.261	-5.261
146	7.133	-3.133
147	7.004	-4.004
148	6.876	-0.876
149	6.747	-2.747
150	6.619	14.381
151	6.490	9.510
152	6.362	17.638
153	6.233	34.767
154	6.104	17.896
155	5.976	11.024
156	5.847	3.153
157	5.719	9.281
158	5.590	3.410
159	5.462	4.538
160	5.333	4.667
161	5.205	7.795
162	5.076	15.924
163	4.947	15.053
164	4.819	9.181
165	4.690	10.310
166	4.562	8.438
167	4.433	10.567
168	4.305	9.695
169	4.176	16.824
170	4.048	19.952
171	3.919	1.081
172	3.791	9.209

173	3.662	6.338
174	3.533	2.467
175	3.405	7.595
176	3.276	-3.276
177	43.856	-7.856
178	43.689	13.311
179	43.522	33.478
180	43.356	46.644
181	43.189	-0.189
182	43.022	-3.022
183	42.856	-7.856
184	42.689	7.311
185	42.522	9.478
186	42.356	-15.356
187	42.189	-17.189
188	42.022	-29.022
189	41.856	-19.856
190	41.689	-4.689
191	41.522	-16.522
192	41.355	-1.355
193	41.189	-2.189
194	41.022	17.978
195	40.855	40.145
196	40.689	30.311
197	40.522	21.478
198	40.355	0.645
199	40.189	22.811
200	40.022	22.978
201	39.855	5.145
202	39.689	15.311
203	39.522	1.478
204	39.355	2.645
205	39.188	7.812
206	39.022	7.978
207	38.855	20.145
208	38.688	12.312
209	38.522	0.478
210	38.355	-12.355
211	38.188	-9.188
212	38.022	-3.022
213	37.855	-7.855
214	37.688	-9.688
215	37.522	-13.522
216	37.355	-2.355
217	37.188	-9.188
218	37.022	-3.022
219	36.855	-3.855
220	36.688	-2.688
221	36.521	-16.521
222	36.355	-13.355
223	36.188	-1.188
224	36.021	-17.021
225	35.855	-18.855
226	35.688	-16.688
227	35.521	-27.521
228	15.852	-15.852

229	15.685	-10.685
230	15.519	-10.519
231	15.352	-11.352
232	15.185	-9.185
233	15.019	-11.019
234	14.852	-8.852
235	14.685	-9.685
236	14.352	1.648
237	14.185	-9.185
238	14.018	10.982
239	13.852	19.148
240	13.685	-1.685
241	13.518	21.482
242	13.352	7.648
243	13.185	-7.185
244	13.018	-6.018
245	12.852	3.148
246	12.685	44.315
247	12.518	17.482
248	12.351	0.649
249	12.185	-9.185
250	12.018	-2.018
251	11.851	-3.851
252	11.685	5.315
253	11.518	0.482
254	11.351	4.649
255	11.185	-1.185
256	11.018	-6.018
257	10.851	-8.851
258	10.685	-4.685
259	10.518	-7.518
260	10.351	-6.351
261	10.185	-3.185
262	10.018	-5.018
263	9.851	-9.851
264	9.684	-9.684
265	9.518	-6.518
266	9.351	-8.351
267	9.184	-8.184
268	9.018	-8.018
269	8.851	-8.851
270	8.684	-6.684
271	8.518	-7.518
272	8.351	-5.351
273	8.184	-6.184
274	8.018	-6.018
275	7.851	-7.851
276	7.684	-6.684
277	5.684	-5.684
278	5.517	-5.517
279	5.351	-5.351
280	5.184	-4.184
281	5.017	-5.017
282	4.850	-3.850
283	4.684	-4.684
284	4.517	-4.517

285	4.350	-4.350
286	4.184	-4.184
287	4.017	-2.017
288	3.850	4.150
289	3.684	-2.684
290	3.517	-2.517
291	3.350	3.650
292	3.184	-0.184
293	3.017	-1.017
294	2.850	-2.850
295	2.683	-2.683
296	2.517	-1.517
297	2.350	-2.350
298	2.183	-1.183
299	2.017	-0.0167
300	1.850	0.150
301	1.683	-1.683
302	1.517	-0.517
303	1.350	0.650
304	1.183	4.817
305	1.017	-0.0166
306	0.850	17.150
307	0.683	3.317
308	0.517	3.483
309	0.350	6.650
310	0.183	8.817
311	0.0165	4.984
312	-0.150	6.150
313	-0.317	13.317
314	-0.484	3.484
315	-0.650	5.650
316	-0.817	13.817
317	-0.984	15.984
318	-1.150	17.150
319	-1.317	7.317
320	-1.484	3.484
321	-1.650	4.650
322	-1.817	4.817
323	-1.984	7.984
324	-2.151	11.151
325	-2.317	3.317
326	-2.484	3.484
327	33.808	-25.808
328	33.677	-3.677
329	33.546	-24.546
330	33.414	7.586
331	33.283	6.717
332	33.152	-6.152
333	33.021	-5.021
334	32.890	42.110
335	32.759	54.241
336	32.627	6.373
337	32.496	21.504
338	32.365	0.635
339	32.234	-19.234
340	32.103	-19.103

341	31.972	-19.972
342	31.840	-7.840
343	31.709	-4.709
344	31.578	-13.578
345	31.447	-11.447
346	31.316	-13.316
347	31.185	-16.185
348	31.054	-20.054
349	30.922	-7.922
350	30.791	-24.791
351	30.660	-8.660
352	30.529	1.471
353	30.398	5.602
354	30.267	14.733
355	30.135	43.865
356	30.004	26.996
357	29.873	7.127
358	29.742	14.258
359	29.611	-12.611
360	29.480	1.520
361	29.348	4.652
362	29.217	82.783
363	29.086	-11.086
364	28.955	-0.955
365	28.824	-20.824
366	11.511	-10.511
367	11.380	5.620
368	11.249	12.751
369	11.118	24.882
370	10.986	1.014
371	10.855	-9.855
372	10.724	-5.724
373	10.593	15.407
374	10.462	-5.462
375	10.331	-6.331
376	10.199	-8.199
377	10.068	-10.068
378	9.937	-9.937
379	9.806	-9.806
380	9.675	-8.675
381	9.544	-9.544
382	9.413	-8.413
383	9.281	-9.281
384	9.150	-5.150
385	9.019	-9.019
386	8.888	-3.888
387	8.757	-2.757
388	8.626	-4.626
389	8.494	-7.494
390	8.363	21.637
391	8.232	-8.232
392	8.101	-5.101
393	7.970	-7.970
394	7.839	-7.839
395	7.707	-6.707
396	7.576	-7.576

397	7.445	-6.445
398	7.314	-7.314
399	7.183	-6.183
400	7.052	-7.052
401	6.921	-6.921
402	2.592	-1.592
403	2.461	-1.461
404	2.330	4.670
405	2.199	-0.199
406	2.068	-0.0677
407	1.937	1.063
408	1.805	0.195
409	1.674	4.326
410	1.543	2.457
411	1.412	5.588
412	1.281	3.719
413	1.150	-0.150
414	1.018	-0.0184
415	0.887	4.113
416	0.756	4.244
417	0.625	4.375
418	0.494	-0.494
419	0.363	0.637
420	0.231	1.769
421	0.100	-0.100
422	-0.0308	6.031
423	-0.162	2.162
424	-0.293	7.293
425	-0.424	2.424
426	-0.555	3.555
427	-0.687	0.687
428	-0.818	0.818
429	-0.949	3.949
430	-1.080	4.080
431	-1.211	4.211
432	-1.342	4.342
433	-1.474	1.474
434	-1.605	1.605
435	-1.736	1.736
436	-1.867	4.867
437	-1.998	1.998
438	-2.129	3.129
439	-2.260	5.260
440	-2.392	3.392

One Way Analysis of Covariance Thursday, February 16, 2017, 3:51:32 PM

Data source: Coastal Transect - Video Data in 2016 EEM Video Stats 16-Feb-17 4pm.JNB

Dependent Variable: Mean % Flora

Group Name	N	Missing	Mean	Std Dev	SEM
2016.000	176	0	9.349	10.275	0.775
2015.000	150	0	26.813	19.830	1.619
2014.000	114	0	4.855	7.209	0.675
Total	440	0	14.139	16.595	0.791

Normality Test (Shapiro-Wilk): Failed (P < 0.050)

Equal Variance Test (Levene): Failed (P < 0.050)

Equal Slopes Test: Failed (P < 0.050)

Analysis of Variance for the Interaction Model:

Source of Variation	DF	SS	MS	F	P
Year	2	3836.807	1918.403	15.890	<0.001
Distance along West Transect (	1	2289.170	2289.170	18.961	<0.001
Year x Distance alon	2	28200.287	14100.144	116.788	<0.001
Residual	434	52398.228	120.733	--	--
Total	439	120899.368	275.397	--	--

The effect of the different treatment groups depends upon the value of covariate Distance along West Transect (, averaging over the values of the remaining covariates. There is a significant interaction effect between the factor Year and the covariate Distance along West Transect ((P = <0.001).

There is at least one significant interaction between the factor and a covariate. The equal slopes assumption fails and the equal slopes model will not be analyzed. The regression equations for the treatment groups are given below. If you wish to continue with an analysis of the equal slopes model for this data, unselect the Equality of Slopes option in the Test Options dialog and rerun the test.

Regression Equations for the Interaction Model:
A significant interaction effect between the factor and a covariate is equivalent to a signifcant difference in the slope coefficients of that covariate in these equations.

Group: 2016.000
Mean % Flora = 11.623 - (0.00261 * Distance along West Transect ()

Group: 2015.000
Mean % Flora = 0.0847 + (0.0271 * Distance along West Transect ()

Group: 2014.000
Mean % Flora = 16.091 - (0.0109 * Distance along West Transect ()

Regression Diagnostics:

Row	Predicted	Residual
1	11.414	-11.414
2	11.401	-1.401

3	11.388	-6.944
4	11.375	-6.931
5	11.362	2.924
6	11.349	-1.349
7	11.336	-11.336
8	11.323	-11.323
9	11.310	-7.673
10	11.297	-6.297
11	11.284	7.050
12	11.271	-9.452
13	11.258	0.321
14	11.244	-9.578
15	11.231	-3.231
16	11.218	-9.790
17	11.205	-9.301
18	11.192	-9.654
19	11.179	3.821
20	11.166	2.167
21	11.153	7.180
22	11.140	4.245
23	11.127	1.373
24	11.114	-1.114
25	11.101	1.899
26	11.088	8.912
27	11.075	0.848
28	11.062	-6.478
29	11.049	-11.049
30	11.036	-5.843
31	11.023	-7.841
32	11.010	-8.282
33	10.997	-0.0874
34	10.983	-5.983
35	10.970	9.030
36	10.957	2.793
37	10.944	2.849
38	10.931	1.569
39	10.918	8.368
40	10.905	-2.155
41	10.892	-2.797
42	10.879	-9.140
43	10.866	-8.644
44	10.853	-10.853
45	10.840	-6.722
46	10.827	-2.827
47	10.814	3.317
48	10.801	7.124
49	10.775	-0.775
50	10.762	3.469
51	10.749	2.751
52	10.735	3.810
53	10.722	4.516
54	10.709	2.491
55	10.696	3.947
56	10.683	3.230
57	10.670	2.530
58	10.644	5.189

59	10.631	9.369
60	10.618	4.088
61	10.605	-0.342
62	10.592	-6.804
63	10.579	-8.079
64	10.566	-1.720
65	10.553	-0.553
66	10.540	-2.655
67	10.527	-1.955
68	10.514	0.201
69	10.501	1.422
70	10.488	1.735
71	10.474	8.097
72	10.461	9.346
73	10.448	-1.318
74	10.435	-0.243
75	10.422	0.487
76	10.409	9.591
77	8.895	9.888
78	8.882	9.539
79	8.856	8.287
80	8.843	9.675
81	8.830	15.109
82	8.817	17.754
83	8.804	14.053
84	8.791	7.091
85	8.778	16.395
86	8.752	11.248
87	8.739	-1.319
88	8.726	8.774
89	8.713	11.070
90	8.700	31.300
91	8.687	27.313
92	8.673	20.982
93	8.660	47.451
94	8.647	47.450
95	8.634	3.032
96	8.621	-8.621
97	8.608	-8.608
98	8.595	-6.928
99	8.582	-7.548
100	8.569	-8.569
101	8.556	-8.039
102	8.543	-8.543
103	8.530	8.613
104	8.517	26.220
105	8.504	14.519
106	8.491	12.650
107	8.478	-8.478
108	8.465	8.678
109	8.452	41.548
110	8.439	16.779
111	8.425	7.364
112	8.412	11.088
113	8.399	-5.807
114	8.386	-7.553

115	8.373	-8.373
116	8.360	-3.588
117	8.347	-7.912
118	8.334	-3.084
119	8.321	14.536
120	8.308	-6.364
121	8.295	-6.363
122	8.282	-8.282
123	8.269	-7.852
124	8.256	-8.256
125	8.243	-8.243
126	8.099	-6.849
127	8.086	-2.397
128	8.073	-5.687
129	8.060	-8.060
130	8.047	-8.047
131	8.034	-7.201
132	8.021	-7.231
133	8.008	-6.341
134	7.995	-5.687
135	7.982	-7.482
136	7.969	-7.135
137	7.956	-7.956
138	7.943	-6.726
139	7.930	-7.535
140	7.917	-0.0904
141	7.903	-5.221
142	7.890	-5.390
143	7.877	-2.877
144	7.864	-2.864
145	7.851	-4.518
146	7.838	-4.808
147	7.825	-5.968
148	7.812	-6.199
149	7.799	-7.404
150	7.786	-6.766
151	7.773	-5.978
152	7.760	-7.760
153	7.747	-7.747
154	7.734	-5.760
155	7.721	-7.721
156	7.708	-7.708
157	7.695	-7.695
158	7.682	-7.682
159	7.669	-7.669
160	7.655	-6.822
161	7.642	-7.267
162	7.629	-3.117
163	7.616	-5.759
164	7.603	-6.682
165	7.590	-5.166
166	7.577	-5.153
167	7.564	-6.012
168	7.551	-7.551
169	7.538	-5.423
170	7.525	-5.284

171	7.512	-0.481
172	7.499	2.257
173	7.486	8.228
174	7.473	15.286
175	7.460	1.350
176	7.447	-2.447
177	5.648	3.037
178	5.783	1.050
179	5.919	-4.086
180	6.055	-4.603
181	6.190	-2.690
182	6.326	-1.004
183	6.462	3.226
184	6.597	2.069
185	6.733	-0.443
186	6.869	-3.119
187	7.005	-4.277
188	7.140	-3.807
189	7.276	-3.995
190	7.412	-5.745
191	7.547	-3.641
192	7.683	-1.683
193	7.819	-1.152
194	7.954	0.212
195	8.090	-1.155
196	8.226	-5.226
197	8.361	-5.361
198	8.497	-4.497
199	8.633	-6.859
200	8.768	-6.935
201	8.904	-1.904
202	9.040	1.767
203	9.175	-2.724
204	9.311	-0.144
205	9.447	-1.280
206	9.583	-0.0513
207	9.718	0.448
208	9.854	-0.354
209	9.990	0.0104
210	10.125	0.0361
211	10.261	0.0724
212	10.397	-0.985
213	10.532	-3.758
214	10.668	-2.926
215	10.804	0.158
216	10.939	-4.773
217	11.075	-7.043
218	11.211	-6.211
219	11.346	-6.346
220	11.482	-7.934
221	11.618	-7.173
222	11.753	-5.420
223	11.889	-3.556
224	12.025	-4.122
225	12.160	2.006
226	12.296	-1.796

227	12.432	-1.523
228	28.442	-7.079
229	28.578	7.960
230	28.714	14.107
231	28.850	6.535
232	28.985	4.733
233	29.121	7.254
234	29.257	9.461
235	29.392	-1.497
236	29.664	-0.664
237	29.799	-7.924
238	29.935	-6.730
239	30.071	-7.876
240	30.206	-4.968
241	30.342	-9.123
242	30.478	-4.603
243	30.613	-7.793
244	30.749	-4.624
245	30.885	-0.641
246	31.020	3.980
247	31.156	2.844
248	31.292	8.586
249	31.427	11.265
250	31.563	1.514
251	31.699	-4.857
252	31.835	-4.030
253	31.970	1.876
254	32.106	9.433
255	32.242	-11.256
256	32.377	10.571
257	32.513	4.154
258	32.649	9.915
259	32.784	13.370
260	32.920	21.330
261	33.056	30.790
262	33.191	39.492
263	33.327	-0.0712
264	33.463	36.781
265	33.598	44.973
266	33.734	48.061
267	33.870	44.848
268	34.005	38.815
269	34.141	38.679
270	34.277	31.723
271	34.413	18.337
272	34.548	23.873
273	34.684	26.816
274	34.820	27.745
275	34.955	33.891
276	35.091	43.545
277	36.719	-16.719
278	36.855	-0.701
279	36.990	-1.615
280	37.126	-11.731
281	37.262	-3.287
282	37.398	-14.705

283	37.533	-20.610
284	37.669	-22.913
285	37.805	-24.984
286	37.940	-24.190
287	38.076	-20.457
288	38.212	-13.337
289	38.347	-7.347
290	38.483	-6.358
291	38.619	-11.183
292	38.754	-0.254
293	38.890	-3.036
294	39.026	16.912
295	39.161	3.659
296	39.297	-3.400
297	39.433	-7.125
298	39.568	-0.621
299	39.704	2.421
300	39.840	-5.498
301	39.976	-9.206
302	40.111	-6.427
303	40.247	-7.426
304	40.383	-3.277
305	40.518	2.732
306	40.654	-7.891
307	40.790	-5.405
308	40.925	-5.399
309	41.061	4.495
310	41.197	-0.670
311	41.332	-4.753
312	41.468	-4.843
313	41.604	-9.354
314	41.739	-5.842
315	41.875	-4.500
316	42.011	-6.889
317	42.146	-8.813
318	42.282	-11.769
319	42.418	-10.918
320	42.553	-19.428
321	42.689	-42.689
322	42.825	-26.415
323	42.961	-20.140
324	43.096	-17.515
325	43.232	-22.302
326	43.368	-15.590
327	13.250	1.750
328	13.195	-0.195
329	13.141	-0.141
330	13.086	-7.086
331	13.031	-8.031
332	12.977	-8.977
333	12.922	-11.922
334	12.867	-6.867
335	12.813	-6.813
336	12.758	-6.758
337	12.703	-6.703
338	12.649	-1.649

339	12.594	5.406
340	12.540	5.460
341	12.485	5.515
342	12.430	-0.430
343	12.376	-2.376
344	12.321	-2.321
345	12.266	-2.266
346	12.212	-4.212
347	12.157	-6.157
348	12.102	-7.102
349	12.048	1.952
350	11.993	8.007
351	11.938	8.062
352	11.884	10.116
353	11.829	13.171
354	11.775	13.225
355	11.720	11.280
356	11.665	11.335
357	11.611	9.389
358	11.556	6.444
359	11.501	6.499
360	11.447	6.553
361	11.392	3.608
362	11.337	2.663
363	11.283	-0.283
364	11.228	-8.228
365	11.173	-7.173
366	3.961	-0.961
367	3.906	-3.806
368	3.852	-2.852
369	3.797	-3.797
370	3.742	-3.742
371	3.688	-3.688
372	3.633	4.367
373	3.578	4.422
374	3.524	4.476
375	3.469	4.531
376	3.414	-2.414
377	3.360	-2.360
378	3.305	-3.305
379	3.251	-3.251
380	3.196	-2.196
381	3.141	-2.741
382	3.087	-2.087
383	3.032	-3.032
384	2.977	-2.977
385	2.923	-2.923
386	2.868	-2.868
387	2.813	-2.813
388	2.759	-2.759
389	2.704	-2.704
390	2.649	-2.649
391	2.595	-2.595
392	2.540	-2.540
393	2.486	-2.486
394	2.431	-2.431

395	2.376	-1.376
396	2.322	0.678
397	2.267	-2.267
398	2.212	-2.212
399	2.158	-2.158
400	2.103	-2.103
401	2.048	-2.048
402	0.245	-0.245
403	0.191	-0.191
404	0.136	-0.136
405	0.0814	-0.0814
406	0.0267	-0.0267
407	-0.0279	0.0279
408	-0.0826	0.0826
409	-0.137	0.137
410	-0.192	0.192
411	-0.246	0.246
412	-0.301	0.301
413	-0.356	0.356
414	-0.410	8.410
415	-0.465	0.465
416	-0.520	0.520
417	-0.574	0.574
418	-0.629	0.629
419	-0.684	0.684
420	-0.738	0.738
421	-0.793	0.793
422	-0.848	0.848
423	-0.902	0.902
424	-0.957	0.957
425	-1.011	1.011
426	-1.066	1.066
427	-1.121	1.121
428	-1.175	1.175
429	-1.230	1.230
430	-1.285	1.285
431	-1.339	1.339
432	-1.394	1.394
433	-1.449	1.449
434	-1.503	1.503
435	-1.558	1.558
436	-1.612	1.612
437	-1.667	1.667
438	-1.722	1.722
439	-1.776	1.776
440	-1.831	1.831

APPENDIX D

Transect Summaries for Underwater Video Survey

Table 1 Description of Transects for the Underwater Video Survey.

Location	Replicate ID	Segment ID	Video Start and End Time	Distance from Transect Origin Start and End (m)	Video Length Analyzed (m)	Total Video Length (m)	Percent Video Analyzed (%)	% Not Interpretable[1]
West Transect	R1	S1	0:00:01 – 0:12:29, 0:36:37 – 0:40:25	75 - 460	385	2,092	54	0.3
		S2	0:00:01 – 0:03:18, 0:33:36 – 0:39:52	1,040 – 1,290	250			
		S3	0:09:45 – 0:25:06	1,350 – 1,595	245			
	R2	S1	0:00;01 – 0:03:18, 0:33:36 – 0:39:52	190 - 460	270	2,093	48	5.6
		S2	0:04:52 – 0:13:53	1,040 – 1,290	250			
		S3	0:00:01 – 0:02:52, 0:09:17 – 0:19:11	1,350 – 1,595	245			
East Transect	R1	S1	0:00:01 – 0:01:12, 0:03:59 – 0:14:50	200 - 410	210	1,925	49	0.1
		S2	0:09:48 – 0:20:46	540 - 745	205			
		S3	0:28:16 – 0:41:29	930 – 1,150	220			
	R2	S1	0:05:45 – 0:15:46	200 - 410	210	2,044	46	-
		S2	0:21:39 – 0:30:10	540 - 745	205			
		S3	0:05:28 – 0:20:10	930 – 1,150	220			
Coastal Transect	R1	S1	0:00:01 – 0:09:34, 0:00:01 – 0:02:51	15 - 270	255	3,587	29	0.6
		S2	0:22:26 – 0:34:48	695 – 945	250			
		S3	0:13:43 – 0:24:53	1,530 – 1,780	250			
		S4	0:27:24 – 0:34:37	3890 - 4120	230			
	R2	S1	0:02:28 – 0:13:40	15 - 270	255	3,326	30	1.9
		S2	0:34:21 – 0:46:41	695 – 945	250			
		S3	0:26:02 – 0:38:29	1,530 – 1,780	250			
		S4	0:00:01 – 0:08:20, 0:27:26 – 0:29:31	3890 - 4120	230			
North Transect	R1	S1	0:00:00 – 0:14:25	420 - 685	265	2,453	39	-
		S2	0:00:00 – 0:02:48, 0:07:04 – 0:20:00	965 – 1,215	250			
		S3	0:00:01 – 0:09:15, 0:16:10 – 0:20:02	1,450 – 1,700	250			
	R2	S1	0:02:55 – 0:19:35	435 - 685	250	2,448	48	-
		S2	0:06:11 – 0:19:26	965 – 1,215	250			
		S3	0:00:01 – 0:03:51, 0:10:51 – 0:21:34	1,450 – 1,700	250			
Total	**8**	**26**			**6,400**	**19,968**	**31**	**8.5**

[1] Video length analyzed was uninterpretable due to camera being out of the water, camera being off the bottom, image being out of focus, camera image being black or blank and other similar reasons.

Table 2 **Transect Summaries for the Underwater Video Survey at the West Transect.**

Tape ID	Transect ID	Length (m)	Surveyed Area (m^2)	Substrate Type (% Coverage)	Predominant Substrate Group	Macrofauna (Observed)	Macroflora	Predominant Macrofloral Class
SW-L1-1	WT1-R1	255	1,020	Sand Gravel Shell Cobble	Medium	Brittle star Sea anemone Ctenophores Sand dollar Sea butterfly Mud star Sea scallop Sea star Sea urchin Cladoceran Cnidarian Whelk Sculpin sp.	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.,* *Chondrus crispus.*	Brown algae
SW-L1-2	WT2-R2	250	1,000	Sand Gravel Shell Cobble	Fine	Brittle star Sand dollar Ctenophores Sea lily Sea scallop Sea urchin Sea butterfly Cladoceran Cnidarian Sculpin Feather duster	*Desmarestia sp.*, *Laminaria sp.* *Chrondrus crispus*	Brown algae
SW-L1-3	WT-S2-R1	255	1,020	Sand Shell Gravel	Fine	Brittle star Cniadarian Ctenophores Sand dollar Sea Scallop Sea butterfly Cladoceran Sea anemone Mud star Whelk Hydrozoa Sea Urchin	*Chondrus crispus,* *Desmarestia sp.,*	Red algae
SW-L2-1	WT1-R2	275	1,100	Sand Shell Gravel Cobble Rubble	Medium	Brittle star Mud Star Sand Dollar Sea scallop Sea Urchin Cladoceran Cnidarian Sea butterfly	*Chondrus crispus,* *Desmarestia sp.,* *Laminaria sp.* *Agarum cribosum*	Brown algae

SW-L2-2	WT2- R2	255	1,020	Sand Gravel Shell Cobble	Fine	Brittle star Cnidarian Ctenophores Feather Duster Sea butterfly Cladoceran Mud star Sea urchin Sea Scallop	*Desmarestia sp.*, *Agarum cribosum,* *Chondrus crispus,* *Laminaria sp.*	Red algae
SW-L2-3	WT3-R2	250	1,000	Sand Shell Gravel Cobble	Medium/Fine	Brittle star Mud Star Sand Dollar Sea scallop Ctenophore Sea urchin Cladoceran Cnidarian Whelk Tunicate Feather Duster Sea butterfly Pandalus shrimp	*Desmarestia sp.*, *Fucus sp.,* *Chondrus crispus*	Red algae

*Note: All areas of West Transect were 15-18 m deep and habitat type classified as Shallow Subtidal Zone.

Table 3 Transect Summaries for the Underwater Video Survey at the East Transect.

Tape ID	Transect ID	Length (m)	Surveyed Area (m^2)	Substrate Type (% Coverage)	Predominant Substrate Group	Macrofauna (Observed)	Macroflora	Predominant Macrofloral Class
SE-L1-1	ET1-R1	182	728	Sand Gravel Shell Cobble Rubble Boulder	Medium/Fine	Brittle star Ctenophore Sand dollar Sea Butterfly Sea urchin Sea scallop Sea potato Sculpin	*Desmarestia sp.*, *Agarum cribosum*, *Laminaria sp.*	Brown algae
SE-L1-2	ET1- R1	230	920	Sand Shell Gravel Cobble Rubble Boulder	Medium	Brittle star Sea Urchin Sea Scallop Sea anemone Sea butterfly Sea cucumber	*Desmarestia sp.*, *Agarum cribosum*, *Laminaria sp.*, *Chondrus crispus*	Brown algae
SE-L1-3	ET3-R1	225	900	Sand (25%) Gravel (25%) Cobble (25%) Shell (25%) Rubble (<5%) Boulder	Medium	Brittle star Ctenophore Cladoceran Cnidarian Sea Clam Sea anemone Sea star Feather Duster Sea urchin Sea scallop Pandalus shrimp Sea butterfly Sculpin	*Desmarestia sp.*, *Agarum cribosum*, *Chondrus crispus*	Brown algae
SE-L2-1	ET1-R2	154	616	Sand Gravel Shell Cobble Rubble Boulder	Medium	Brittle star Sea butterfly Sea star Sea Urchin Sea Scallop Sea Clam Ctenophore Sea anemone Plankton Sculpin sp.	*Desmarestia sp.*, *Agarum cribosum*, *Laminaria sp.*, *Fucus.*	Brown algae
SE-L2-2	ET2-R2	205	820	Sand Cobble Gravel Shell Rubble Boulder	Medium	Brittle star Ctenophore Sea anemone Sea star Sea urchin Sea Clam Sea scallop Sea Potatoe Sea butterfly Plankton	*Desmarestia sp.*, *Agarum cribosum*, *Laminaria sp.* *Chondrus crispus*	Brown algae

SE-L2-3	ET3--R2	220	880	Sand Gravel Shell Cobble Rubble Boulder	Medium	Brittle star Sand dollar Ctenophore Sea anemone Sea star Sea urchin Sea Clam Sea Butterfly Sea scallop Common whelk Plankton	*Desmarestia sp.*, *Agarum cribosum,* *Chondrus crispus*	Brown algae

*Note: All areas of East Transect were 15-25 m deep and habitat type classified as Shallow Subtidal Zone.

Table 4 Transect Summaries for the Underwater Video Survey at the Coastal Transect.

Tape ID	Transect ID	Length (m)	Surveyed Area (m^2)	Substrate Type (% Coverage)	Predominant Substrate Group	Macrofauna (Observed)	Macroflora	Predominant Macrofloral Class
SC-L1-1	CT1-R1	260	1,040	Sand Gravel Cobble Shell Rubble	Medium	Brittle star Ctenophore Sea star Sun star Sea urchin Sea scallop Sea clam Sculpin	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.,* *Chondrus crispus*	Brown algae
SC-L1-2	CT2- R2	250	1,000	Sand Gravel Shell Cobble	Medium	Brittle star Sea star Sea urchin Sea scallop Ctnenophore Cnidarian Sculpin	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.,*	Brown algae
SC-L1-3	CT3-R1	250	1,000	Sand Shell Gravel Cobble Rubble Boulder	Medium	Brittle star Sea urchin Sea scallop Feather duster Cnidarian Ctenophores Sea cucumber	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.,* *Chondrus crispus* *Fucus*	Brown algae
SC-L1-4	CT4-R1	230	920	Gravel Sand Shell Cobble Rubble Boulder	Medium	Brittle star Ctenophore Sea anemone Cnidarian Sea urchin Sea scallop	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.,* *Fucus*	Brown algae
SC-L2-1	CT1-R2	250	1,000	Sand Gravel Shell Cobble Rubble Boulder	Medium	Brittle star Sea star Sea scallop Sea urchin Ctenephore Sea anemone Sea butterfly Cnidarian Whelk	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.*	Brown algae
SC-L2-2	CT2-R2	255	1,020	Sand Gravel Shell Cobble Rubble Boulder	Medium	Brittle star Sea star Sea urchin Sea scallop Ctenophore Sea butterfly Cnidarian	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.,*	Brown algae

SC-L2-3	CT3-R2	250	1,000	Sand Gravel Shell Cobble Rubble Boulder	Medium	Brittle star Sand dollar Cnidarian Ctenophore Sea anemone Sea scallop Sea urchin	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.*	Brown algae
SC-L2-4	CT4-R2	230	920	Sand Gravel Shell Cobble Rubble Boulder	Medium	Brittle star Sea urchin Sea scallop Ctenophore Cnidarian Sea butterfly	*Desmarestia sp.*, *Agarum cribosum,* *Laminaria sp.,*	Brown algae

*Note: All areas of Coastal Transect were 15-20 m deep and habitat type classified as Shallow Subtidal Zone.

Table 5 Transect Summaries for the Underwater Video Survey at the North Transect.

Tape ID	Transect ID	Length (m)	Surveyed Area (m^2)	Substrate Type (% Coverage)	Predominant Substrate Group	Macrofauna (Observed)	Macroflora	Predominant Macrofloral Class
SN-L1-1	NT1- R1	265	1,060	Sand Gravel Shell Cobble Rubble Boulder	Fine	Brittle star Sea anemone Cnidarian Sea star Cladoceran Eelpout Feather duster Crab sp. Sea urchin Sun star Sea lily Sea butterfly Whelk Sea potatoe Ctenophore Pandalus shrimp Mud star	*Chondrus crispus, Fucus*	Red Algae
SN-L1-2	NT2- R1	255	1,020	Sand Gravel Shell Cobble Rubble Boulder	Fine	Brittle star Sea anemone Ctenophore Sun star Whelk Sculpin Eelpout Sea urchin	*Chondrus crispus*	Red algae
SN-L1-3	NT3- R1	255	1,020	Sand Gravel Shell Cobble Rubble Boulder	Medium/fine	Brittle star Sea urchin Ctenophore Whelk Sun star	*Chondrus crispus*	Red algae
SN-L2-1	NT1- R2	250	1,000	Gravel Sand Cobble Shell Rubble Boulder	Fine	Brittle star Ctenophore Sea anemone Sea urchin Sea lily Sea butterfly Whelk Feather duster	*Chondrus crispus*	Red algae
SN-L2-2	NT2- R2	255	1,020	Sand Gravel Cobble Shell Rubble Boulder	Medium/fine	Brittle star Sea anemone Sun star Sea urchin Sea lily Whelk Sea scallop Ctenophore	*Chondrus crispus*	Red algae

SN-L2-3	NT3- R2	255	1,020	Sand Gravel Cobble Shell Rubble Boulder	Medium/fine	Brittle star Sea star Sea urchin Ctenophore Whelk Sculpin	*Chondrus crispus*	Red algae

*Note: All areas of Coastal Transect were 40-100 m deep and habitat type classified as Deep Subtidal Zone.

APPENDIX E

Biological Characteristics from Fish Sampling

Table 1 Fish Capture Data for Milne Inlet – 2016.

Gear ID	Date	Species	Length (mm)	Weight (g)
FT-1	05/08/2016	Shorthorn Sculpin	190	92
FT-1	05/08/2016	Fourhorn Sculpin	170	56
FT-2	05/08/2016	Shorthorn Sculpin	235	166
FT-2	05/08/2016	Shorthorn Sculpin	245	152
FT-2	05/08/2016	Shorthorn Sculpin	435	485
FT-2	05/08/2016	Shorthorn Sculpin	290	125
FT-3	05/08/2016	fishdoctor	130	22
FT-4	06/08/2016	Longhorn Sculpin	200	89
FT-4	06/08/2016	Shorthorn Sculpin	187	79
FT-4	06/08/2016	Shorthorn Sculpin	152	43
FT-4	06/08/2016	Shorthorn Sculpin	217	150
FT-4	06/08/2016	Shorthorn Sculpin	260	180
FT-4	06/08/2016	Fourhorn Sculpin	180	80
FT-5	13/08/2016	Shorthorn Sculpin	280	250
FT-5	13/08/2016	Shorthorn Sculpin	200	89
FT-5	13/08/2016	fishdoctor	210	27
FT-5	13/08/2016	Shorthorn Sculpin	210	110
FT-6	13/08/2016	Shorthorn Sculpin	215	100
FT-6	13/08/2016	Shorthorn Sculpin	200	100
FT-6	13/08/2016	Shorthorn Sculpin	150	49
FT-6	13/08/2016	Fourhorn Sculpin	-	-
FT-9	16/08/2016	Fourhorn Sculpin	210	72
FT-9	16/08/2016	Fourhorn Sculpin	190	63
FT-9	16/08/2016	Fourhorn Sculpin	175	49
FT-9	16/08/2016	Fourhorn Sculpin	200	107
FT-9	16/08/2016	Fourhorn Sculpin	150	36
FT-11	18/08/2016	Shorthorn Sculpin	195	96
FT-12	18/08/2016	Shorthorn Sculpin	305	472
FT-OD1	16/08/2016	Fourhorn Sculpin	220	111
FT-OD1	16/08/2016	Fourhorn Sculpin	185	53
FT-OD3	16/08/2016	Fourhorn Sculpin	225	93
FT-OD3	16/08/2016	Fourhorn Sculpin	155	27
FT-OD3	16/08/2016	Longhorn Sculpin	195	90
FT-OD3	16/08/2016	Fourhorn Sculpin	135	16
GN-1	10/08/2016	Arctic Char	590	1700
GN-1	10/08/2016	Arctic Char	445	1000
GN-1	10/08/2016	Arctic Char	585	2500
GN-1	10/08/2016	Arctic Char	405	1500
GN-1	10/08/2016	Arctic Char	405	700
GN-1	10/08/2016	Arctic Char	400	700
GN-1	10/08/2016	Arctic Char	555	1700
GN-1	10/08/2016	Arctic Char	440	1200
GN-1	10/08/2016	Arctic Char	890	2500
GN-1	10/08/2016	Arctic Char	870	2500
GN-1	10/08/2016	Arctic Char	365	700

Gear ID	Date	Species	Length (mm)	Weight (g)
GN-1	10/08/2016	Arctic Char	385	500
GN-1	10/08/2016	Arctic Char	400	600
GN-2	11/08/2016	Arctic Char	705	4000
GN-2	11/08/2016	Arctic Char	445	1200
GN-2	11/08/2016	Fourhorn Sculpin	285	250
GN-2	11/08/2016	Arctic Char	670	3800
GN-2	11/08/2016	Arctic Char	465	1000
GN-2	11/08/2016	Arctic Char	525	1300
GN-2	11/08/2016	Arctic Char	480	-
GN-2	11/08/2016	Arctic Char	450	800
GN-2	11/08/2016	Arctic Char	675	4000
GN-2	11/08/2016	Arctic Char	600	3800
GN-2	11/08/2016	Arctic Char	670	3800
GN-2	11/08/2016	Arctic Char	460	1000
GN-2	11/08/2016	Arctic Char	515	1300
GN-2	11/08/2016	Fourhorn Sculpin	250	300
GN-2	11/08/2016	Fourhorn Sculpin	240	300
GN-2	11/08/2016	Arctic Char	645	3300
GN-2	11/08/2016	Arctic Char	760	5300
GN-2	11/08/2016	Arctic Char	480	1300
GN-2	11/08/2016	Arctic Char	490	1300
GN-2	11/08/2016	Arctic Char	410	800
GN-2	11/08/2016	Arctic Char	365	500
GN-2	11/08/2016	Arctic Char	395	500
GN-2	11/08/2016	Fourhorn Sculpin	265	250
GN-2	11/08/2016	Arctic Char	390	500
GN-2	11/08/2016	Arctic Char	470	1300
GN-2	11/08/2016	Arctic Char	735	4300
GN-2	11/08/2016	Arctic Char	590	2300
GN-2	11/08/2016	Arctic Char	700	3400
GN-2	11/08/2016	Arctic Char	600	2400
GN-2	11/08/2016	Arctic Char	525	2300
GN-2	11/08/2016	Arctic Char	355	500
GN-2	11/08/2016	Arctic Char	435	2300
GN-2	11/08/2016	Arctic Char	630	3500
GN-2	11/08/2016	Arctic Char	390	500
GN-2	11/08/2016	Arctic Char	395	500
GN-2	11/08/2016	Arctic Char	780	7300
GN-2	11/08/2016	Arctic Char	645	5500
GN-2	11/08/2016	Arctic Char	525	1800
GN-2	11/08/2016	Arctic Char	640	4200
GN-2	11/08/2016	Arctic Char	570	2300
GN-2	11/08/2016	Arctic Char	675	1800
GN-2	11/08/2016	Arctic Char	390	500
GN-3	11/08/2016	Arctic Char	675	3500
GN-3	11/08/2016	Arctic Char	610	2500
GN-3	11/08/2016	Arctic Char	620	3000

Gear ID	Date	Species	Length (mm)	Weight (g)
GN-3	11/08/2016	Arctic Char	670	4000
GN-3	11/08/2016	Arctic Char	740	4500
GN-3	11/08/2016	Arctic Char	660	3500
GN-3	11/08/2016	Arctic Char	400	800
GN-3	11/08/2016	Shorthorn Sculpin	325	300
GN-3	11/08/2016	Arctic Char	760	5300
GN-3	11/08/2016	Arctic Char	580	2300
GN-3	11/08/2016	Arctic Char	525	1800
GN-3	11/08/2016	Arctic Char	665	2000
GN-3	11/08/2016	Arctic Char	375	700
GN-3	11/08/2016	Arctic Char	340	300
GN-3	11/08/2016	Arctic Char	375	500
GN-3	11/08/2016	Arctic Char	680	3800
GN-3	11/08/2016	Arctic Char	515	1800
GN-3	11/08/2016	Arctic Char	620	2500
GN-3	11/08/2016	Arctic Char	420	800
GN-3	11/08/2016	Arctic Char	430	1000
GN-3	11/08/2016	Arctic Char	470	1000
GN-3	11/08/2016	Arctic Char	370	300
GN-3	11/08/2016	Arctic Char	345	300
GN-3	11/08/2016	Arctic Char	355	400
GN-3	11/08/2016	Arctic Char	610	2800
GN-3	11/08/2016	Arctic Char	435	800
GN-3	11/08/2016	Arctic Char	515	2200
GN-3	11/08/2016	Arctic Char	410	1000
GN-3	11/08/2016	Arctic Char	465	1550
GN-4	12/08/2016	Fourhorn Sculpin	240	250
GN-5	12/08/2016	Arctic Char	700	5300
GN-5	12/08/2016	Arctic Char	570	2800
GN-5	12/08/2016	Arctic Char	690	5000
GN-5	12/08/2016	Arctic Char	605	4400
GN-5	12/08/2016	Arctic Char	590	2300
GN-5	12/08/2016	Arctic Char	660	4000
GN-5	12/08/2016	Arctic Char	510	1800
GN-5	12/08/2016	Arctic Char	580	2800
GN-5	12/08/2016	Arctic Char	545	2500
GN-5	12/08/2016	Arctic Char	465	1500
GN-5	12/08/2016	Arctic Char	605	3200
GN-5	12/08/2016	Arctic Char	395	1000
GN-5	12/08/2016	Arctic Char	670	3500
GN-6	12/08/2016	Arctic Char	665	3800
GN-6	12/08/2016	Arctic Char	680	4300
GN-6	12/08/2016	Arctic Char	620	3200
GN-6	12/08/2016	Arctic Char	660	3700
GN-6	12/08/2016	Arctic Char	615	2700
GN-6	12/08/2016	Arctic Char	415	1000
GN-6	12/08/2016	Arctic Char	570	3000

Gear ID	Date	Species	Length (mm)	Weight (g)
GN-6	12/08/2016	Arctic Char	715	5000
GN-6	12/08/2016	Arctic Char	800	6000
GN-6	12/08/2016	Arctic Char	545	2500
GN-6	12/08/2016	Arctic Char	455	1500
GN-6	12/08/2016	Arctic Char	570	2700
GN-6	12/08/2016	Arctic Char	490	1900
GN-6	12/08/2016	Arctic Char	485	1750
GN-7	13/08/2016	Arctic Char	555	2000
GN-7	13/08/2016	Arctic Char	535	1800
GN-7	13/08/2016	Arctic Char	710	5000
GN-7	13/08/2016	Arctic Char	560	2100
GN-7	13/08/2016	Arctic Char	560	2100
GN-7	13/08/2016	Arctic Char	565	2000
GN-7	13/08/2016	Arctic Char	600	3000
GN-7	13/08/2016	Arctic Char	560	1500
GN-7	13/08/2016	Arctic Char	530	2000
GN-7	13/08/2016	Arctic Char	600	2800
GN-7	13/08/2016	Arctic Char	705	4500
GN-7	13/08/2016	Arctic Char	680	4000
GN-7	13/08/2016	Arctic Char	530	2000
GN-7	13/08/2016	Arctic Char	640	3500
GN-7	13/08/2016	Arctic Char	650	3500
GN-7	13/08/2016	Arctic Char	655	3300
GN-7	13/08/2016	Arctic Char	640	3300
GN-7	13/08/2016	Arctic Char	670	3700
GN-7	13/08/2016	Arctic Char	670	2500
GN-7	13/08/2016	Arctic Char	620	3000
GN-7	13/08/2016	Arctic Char	650	4500
GN-8	16/08/2016	Arctic Char	650	3500
GN-8	16/08/2016	Arctic Char	720	4700
GN-9	17/08/2016	Arctic Char	725	5000
GN-9	17/08/2016	Arctic Char	630	3000
GN-9	17/08/2016	Arctic Char	550	3300
GN-9	17/08/2016	Arctic Char	630	3000
GN-9	17/08/2016	Arctic Char	700	4500
GN-10	17/08/2016	Arctic Char	660	2500
GN-10	17/08/2016	Arctic Char	710	4000
GN-10	17/08/2016	Arctic Char	570	2300
GN-10	17/08/2016	Arctic Char	610	3200
GN-10	17/08/2016	Arctic Char	300	2300
GN-10	17/08/2016	Arctic Char	705	4400
GN-10	17/08/2016	Arctic Char	410	800
GN-11	17/08/2016	Arctic Char	510	1500
GN-11	17/08/2016	Arctic Char	420	800
GN-11	17/08/2016	Arctic Char	485	1200
GN-11	17/08/2016	Arctic Char	505	1400
GN-12	21/08/2016	Arctic Char	460	1200

Gear ID	Date	Species	Length (mm)	Weight (g)
GN-12	21/08/2016	Arctic Char	435	900
GN-12	21/08/2016	Arctic Char	435	1000
GN-12	21/08/2016	Arctic Char	625	3000
GN-12	21/08/2016	Arctic Char	720	4200
GN-12	21/08/2016	Arctic Char	620	2800
GN-12	21/08/2016	Arctic Char	550	1700
GN-12	21/08/2016	Arctic Char	760	5000
GN-12	21/08/2016	Arctic Char	540	1800
GN-12	21/08/2016	Arctic Char	590	2500
GN-12	21/08/2016	Arctic Char	400	600
GN-12	21/08/2016	Arctic Char	520	1800

APPENDIX F

Zooplankton Taxonomy Collected for AIS Monitoring

Zooplankton Taxa List: 2008 to 2016

Phylum

- Annelida[1]
- Arthropoda[1]
- Chaetognatha[1]
- Chordata[1]
- Cnidaria[1]
- Ctenophora[3]
- Echinodermata[4]
- Mollusca[1]

Sub-Phylum

- Crustacea[1]
- Chelicerata[3]

Class

- Arachnida[3]
- Bivalvia[4]
- Cirripedia[1]
- Copepoda[1]
- Gastropoda[1]
- Hydrozoa[1]
- Larvacea[1]
- Malacostraca[1]
- Polychaeta[1]
- Sagittoidea[1]

Order

- Amphipoda[1]
- Anthoathecatae[1]
- Anthomedusae[3]
- Calanoida[1]
- Cladocera[2]
- Cyclopoida[1]
- Decapoda[1]
- Gymnosomata[1]
- Harpaticoida[1]
- Hydroidolina[1]
- Isopoda[1]
- Mysida[2]
- Narcomedusae[1]
- Thecosomata[1]
- Thoracica[1]
- Trombidiformes (Hydracarina)[3]

NOTES:
[1] Taxa List compiled from 2008 and 2010 data available from EIS (REF)
[2] Additions to Taxa List from 2014
[3] Additions to Taxa List from 2015
[4] Additions to Taxa List from 2016

Zooplankton Taxa List: 2008 to 2016

Family

- Acartiidae[1]
- Aeginidae[1]
- Balanidae[1]
- Calanidae[1]
- Clionidae[1]
- Crangonidae[1]
- Fritillariidae[1]
- Hyperiidae[1]
- Limacinidae[1]
- Oikopleuridae[1]
- Oithonidae[1]
- Oncaeidae[4]
- Pandeidae[1]
- Polynoidae[1]
- Pontellidae[3]
- Pseudocalanidae[1]
- Rathkeiidae[1]
- Rhopalonematidae[1]
- Sagittidae[1]
- Uristidae[1]

Genus/Species

- Acartia sp.[4]
- *Acartia hudsonica*[4]
- *Acartia longiremis*[1]
- *Aeginopsis laurenti*[1]
- *Aglantha* sp.[1]
- *Balanus* (unid cypris)[1]
- *Balanus* (unid nauplius)[1]
- *Beroe gracilis*[3]
- *Beroe cucumis*[4]
- *Bosmina longicornis*[3]
- *Bosmina* sp.[2]
- *C. hyperboreus*[1]
- *Calanus finmarichus*[1]
- *Calanus glacialis*[1]
- *Calanus hyperboreus*[4]
- *Catablema vesicarium*[1]
- *Centropages* sp. copepodite[3]
- *Chydorus sphaericus*[4]
- *Clione limacina*[1]

NOTES:
[1] Taxa List compiled from 2008 and 2010 data available from EIS (REF)
[2] Additions to Taxa List from 2014
[3] Additions to Taxa List from 2015
[4] Additions to Taxa List from 2016

Zooplankton Taxa List: 2008 to 2016

Genus/Species (Cont'd)

- *Clytemnestra scutellata*[2]
- Corycaeus sp.[3]
- Cyprid larvae[3]
- *Daphnia* sp.[3]
- *Eukrohnia hamata*[2]
- *Euphysa* juvenile[3]
- *Euterpina acutifrons*[3]
- *Euytemora herdmani*[3]
- *Fritillaria borealis*[1]
- Limacina sp.[4]
- *Limacina helicina*[1]
- *Lucicutia* sp.[2]
- *Lucicutia longicornis*[4]
- *Metridia longa*[3]
- *Metridia* sp. copepodite[3]
- *Microsetella norvegica*[4]
- *Oikopleura vanhoeffeni*[1]
- Oithona sp.[4]
- *Oithona atlantica*[4]
- *Oithona similis*[1]
- *Onisimus* sp.[1]
- *Parasagitta elegans*[2]
- *Pseudocalanus sp.*[4]
- *Pseudocalanus minutus*[1]
- *Rathkea octopunctata*[1]
- *Sabinea septemcarinata*[1]
- *Sagitta elegans*[1]
- *Sapphirina opalina*[3]
- Sapphirina sp.[3]
- *Synchaeta hyperborea*[4]
- *Themisto abyssorum*[1]
- *Themisto* sp. juvenile[2]
- *Tricornia borealis*[3]
- Unidentified Calanoida copepodites[1]
- Unidentified Cyclopoida[1]

NOTES:
[1] Taxa List compiled from 2008 and 2010 data available from EIS (REF)
[2] Additions to Taxa List from 2014
[3] Additions to Taxa List from 2015
[4] Additions to Taxa List from 2016

APPENDIX G

Benthic Invertebrate Taxonomy Collected for AIS Monitoring

Table D-1. Compiled Species List of Benthic Infauna From Surveys in Milne Inlet From 2010 to 2016.

TAXA	YEAR			
	2010	2013	2015	2016
FORAMINIFERA				
NEMATODA				
CHORDATA				
Ascidia callosa		X		
Molgula sp.		X		
Ascidian sp.		X	X	
Boltenia echinata			X	
Tunicate sp.				X
NEMERTEA				
Cerebratulus sp.		X	X	
Nemertean sp.				X
Nemertean unidentified		X	X	X
PRIAPULIDA				
Priapulus caudatus	X		X	X
Priapulid unidentified		X		
ANNELIDA				
Oligochaeta				
F. Enchytraeidae	X			
Oligochaete unidentified		X		
ARCHIANNELIDA				
Archiannelid unidentified		X		
Polychaeta				
F. Ampharetidae	X	X	X	X
F. Aphroditidae		X		
F. Cirratulidae	X	X	X	X
F. Maldanidae	X	X	X	X
F. Nereidae	X			
F. Opheliidae	X			
F. Oweniidae			X	X
F. Paraonidae		X	X	X
F. Phyllodocidae			X	X
F. Polychaete		X	X	X
F. Polynoidae	X	X	X	X
F. Sabellidae		X	X	X
F. Serpulidae	X			
F. Spionidae	X	X	X	X
F. Spirorbidae		X	X	X
F. Syllidae	X	X	X	X
F. Terebellidae		X	X	X
F. Trichobranchidae	X			
Ampharetid sp. B				X
Ampharetid sp. E				X
Amphicteris gunneri		X	X	X
Amphicteis sundevalli	X			
Anobothrus gracilis				X
Antinoella angusta	X			
Antinoella sarsi		X		

Aphelochaeta marioni		X		
Aricidea catherinae		X		
Aricidea nolani		X		
Aricidea sp.	X	X		X
Aricidea sp. A				X
Asabellides oculata			X	
Asabellides sp.		X		X
Axionice maculata	X			
Brada villosa		X		
Bylgides sarsi			X	X
Bylgides sp.A				X
Capitellidae				X
Capitella capitata complex	X	X		
Chaetozone setosa		X	X	X
Chone sp.	X			
Cirratulidae sp. A				X
Cossura longocirrata		X		
Cossura sp.	X		X	X
Cryptosclerocheilus baffinensis	X			
Diplocirrus hirsutus			X	X
Eteone barbata	X			
Eteone longa		X	X	X
Eteone sp.	X	X	X	X
Euchone incolor		X		
Euchone papillosa	X			
Euchone sp.			X	X
Exogone hebes		X		
Exogone verugera		X		
Exogone sp.	X	X		
Flabelligeridae			X	
Flabelligera affinis				X
Galathowenia oculata			X	
Gattyana cirrosa	X	X	X	
Harmothoe extenuata		X	X	X
Harmothoe fragilis		X		
Harmothoe imbricata	X	X	X	X
Harmothoe sp.	X	X	X	X
Hartmania sp.		X		
Heteroclymene robusta			X	
Laphania boecki?				X
Leitoscoloplos	X			
Lumbrineris fragilis	X		X	X
Lumbrineris impatiens				X
Lumbrineris tenuis		X		X
Lumbrineris sp.	X	X	X	X
Lysippe labiata			X	X
Maldane sarsi	X	X	X	X
Maldanidae sp. A				X
Maldanidae sp. B				X
Maldanidae sp. C				X
Marenzellaria? sp.				X
Mediomastus ambiseta		X		X
Mediomastus sp.	X			

Melinna elisabethae	X	X	X	X
Melinna sp.	X			
Neobylgides? sp.				X
Nephtys ciliata	X		X	X
Nephtys sp.	X	X	X	X
Nereimyra punctata				X
Nereis zonata		X	X	X
Nereis sp.				X
Nichomache lumbricalis			X	X
Nicolea venustula		X		
Nothria conchylega	X			
Ophelia limacina	X	X	X	X
Ophelina acuminata	X		X	X
Owenia fusiformis	X	X	X	X
Paraonis sp.	X			
Parougia caeca		X	X	
Pectinaria granulata	X	X	X	X
Pectinaria hyperborea	X			
Pectinaria sp.	X	X		
Pholoe longa	X	X		
Pholoe minuta			X	X
Pholoe sp.	X	X	X	X
Pholoe tecta	X	X	X	X
Phyllodoce groenlandica	X		X	X
Phyllodoce mucosa			X	X
Phyllodoce mucosa?				X
Pista crislata?				X
Pista maculata		X	X	X
Polychaete unidentified				X
Polycirrus sp.	X	X		X
Polydora sp.	X	X		
Potamilla neglecta			X	X
Praxilella sp.				X
Prionospio steenstrupi		X	X	X
Pseudopotamilla reniformis				X
Pygospio sp.		X		
Sabellid sp. A				X
Sabellid sp. B				X
Sabellid sp. F				X
Sabellid sp. G				X
Samytha? sp.				X
Scalibregma inflatum	X	X	X	X
Scoloplos acutus		X	X	X
Scoloplos armiger	X			
Scoloplos sp.		X	X	
Sphaerodoropsis minuta	X			
Spio filicornis	X	X	X	X
Terebellides stroemi	X	X	X	X
Terebellidae sp.		X	X	X
Tharyx/Aphelochaeta sp			X	X
Trichobranchus glacialis	X			
ARTHROPODA				
Insecta				

F. Chironomidae	X			
subF. Chironominae	X			
subF. Orthocladiinae	X			
Arachnida				
O. Acarina	X	X		
O. Pycnogonida	X		X	
Copepoda				
O. Harpacticoida	X	X		X
Ostracoda				
O. Myodocopa	X	X	X	X
Platyhelminthes				
Cirripedia				
F. Cirripedia			X	X
Balanus sp.	X			X
Semibalanus balanoides	X			
Malacostraca				
O. Amphipoda	X	X	X	X
O. Tanaidacea	X	X	X	X
F. Ampeliscidae				X
F. Corophiidae				X
F. Cumacean		X	X	X
F. Ischyroceridae	X			
F. Lampropidae			X	
F. Lysianassidae	X		X	
F. Oedicerotidae	X	X	X	X
F. Sipunculid			X	X
F. Stenothoidae	X			X
Achelia spinosa?				X
Ampelisca eschrichti			X	X
Ampelisca sp.			X	X
Anonyx nugax	X	X	X	X
Anonyx ochoticus				X
Anonyx pacificus				X
Anonyx sarsi			X	X
Anonyx sp.		X	X	X
Apherusa jurinii		X		
Apherusa megalops		X		
Atylus carinatus	X	X	X	X
Bathymedon? oblusifrons				X
Brachydiastylis resima	X	X	X	X
Byblis gaimardi	X			
Byblis sp.			X	X
Callisoma? crenata				X
Corophium bonelli		X		
Corophium insidiosum		X		
Corophium sp.	X	X		
Cumacean sp.		X		
Cyclaspis longicaudata	X			
Desmosoma sp.		X		
Diastylis goodsiri	X		X	
Diastylis echinata			X	X
Diastylis lucifera			X	
Diastylis rathkei	X	X	X	

Diastylis scorpiodes	X		X	X
Diastylis sculpta		X		
Diastylis spinulosa	X		X	
Diastylis sp.		X		X
Euthemisto? sp.				X
Eudorella emarginata			X	X
Eudorella truncatula			X	X
Eudorella sp.	X		X	X
Eudorellopsis sp.	X			
Eugerda sp.	X			
Guernea nordenskioldi		X		
Gammarus oceanicus		X		
Gammarus setosus				X
Gammarus sp.		X	X	X
Gnathia maxillaris				X
Gnathia sp.	X	X		
Guernea nordenskioldi	X		X	X
Haploops tubicola	X	X		X
Haploops sp.			X	X
Harpinia serrata	X		X	X
Harpinia sp.			X	X
Hippomedon holbolli			X	
Hippomedon serratus?				X
Ischyrocerus anguipes		X	X	
Ischyrocerus sp.			X	
Isopoda sp. A				X
Lamprops fuscata	X	X	X	X
Lamprops sp.			X	X
Lebbeus polaris	X			
Leucon nasicoides	X	X	X	X
Leucon sp.			X	
Metopa sp		X		
Monoculodes borealis			X	
Monoculodes kroyeri			X	X
Monoculodes latimanus		X		
Monoculodes tessellatus		X		
Monoculopsis longicornis		X		X
Monoculodes sp.	X	X	X	X
Mysis mixta		X		X
Mysis sp.		X		
Oediceros borealis		X	X	X
Onisimus litoralis			X	
Onisimus normani			X	
Onisimus plautus				X
Onisimus sp.	X			
Opisa eschrichti				X
Orchomene macroserrata	X			
Orchomenella groenlandica		X		X
Orchomenella minuta		X		X
Orchomenella? pinguis				X
Orchomenella sp.		X		X
Paratylus sp			X	
Paroediceros lynceus	X	X	X	X

Paroediceros sp.		X		
Phoxocephalus holbolli				X
Pleurogonium spinosissimum	X			
Pontoporeia affinis	X	X	X	X
Pontoporeia femorata	X	X	X	X
Protomedeia fasciata		X		X
Pseudosphyrapus anomalus	X			
Rhachotropis oculata		X		
Rhachotropus aculeata	X			
Sabinea septemcarinata	X		X	
Sclerocrangon boreas				X
Sphyrapus anomalus				X
Westwoodilla caecula			X	
Westwoodilla sp.		X		X
MOLLUSCA				
Gastropoda				
F. Trochidae	X			
F. Turridae	X			
Acmaea testudinalis		X	X	
Acteocina canaliculata	X			
Admete couthouyi				X
Boreocingula castanea		X		X
Bulbus sp.		X		
Cylichna alba	X		X	X
Cylichna gouldi			X	X
Cylichna occulta	X			
Lepeta caeca	X	X	X	X
Lunatia pallida	X			
Margarites groenlandicus		X	X	X
Margarites olivaceus	X			
Natica clausa			X	X
Naticidae juvenile			X	
Oenopota nobilis				X
Oenopota violacea		X	X	X
Oenopota sp.				X
Patellogastropoda (limpet) unid.		X	X	
Retusa obtusa		X		
Retusidae unidentified		X		
Skeneopsis planorbis		X		
Tectura testudinalis	X			
Trichotropis borealis			X	X
Gastropoda unidentified			X	
Gastropod sp. A				X
Bivalvia				
F. Mytilidae	X			
Astarte borealis	X	X	X	X
Astarte montagui	X		X	X
Astarte sp.	X	X	X	X
Chlamys islandicus			X	X
Clinocardium ciliatum	X		X	X

Crenella faba	X	X	X	X
Crenella sp.		X		
Cuspidaria sp.	X			
Cuspidaria arctica			X	
Dacrydium vitreum	X			
Delectopecten greenlandicus	X		X	X
Ennucula tenuis	X			
Hiatella arctica	X	X	X	X
Macoma balthica			X	X
Macoma calcarea	X	X	X	X
Musculus discors	X	X	X	X
Musculus niger		X		
Musculus sp.	X			
Mya arenaria			X	X
Mya truncata	X	X	X	X
Mytilus edulis		X		
Nucula tenuis		X	X	X
Nucula sp.			X	
Nuculana minuta		X	X	X
Nuculana pernula	X	X	X	X
Nuculana sp.			X	
Periploma abyssorum	X			
Portlandia arctica	X	X	X	X
Serripes groenlandicus		X	X	X
Serripes sp.		X		
Thracia myopsis			X	X
Thyasira flexuosa		X	X	X
Thyasira gouldii	X			
Yoldiella fraterna	X			
Yoldiella lenticula	X			
Bivalve sp. A				X
Bivalve unidentified		X	X	X
Polyplacophora				
Tonicella marmorea	X		X	X
APLACOPHORA				
Crystallophrisson sp			X	X
ECHINODERMATA				
Holothuroidea				
Asterias/Leptasterias			X	
Holothuroidea sp A				X
Ophiocten sericeum	X	X		
Ophiura robusta	X		X	X
Ophiura sarsi	X	X	X	X
Ophiura sp.			X	
Ophiuroidea			X	
Echinoidea				
Strongylocentrotus droebachiensis	X		X	X
Strongylocentrotus sp.		X		
TOTAL # Taxa	**139**	**154**	**162**	**191**

# ***Unique Taxa***	**56**	**59**	**57**	
F = family, subF = subfamily, O = order, C = class, X = present				

Attachment No. 3

Summary of Waste Rock Stockpile Facility Corrective Actions

November 21, 2017

Curtis Didham
Enforcement Officer
Environment and Climate Change Canada
933 Mivvik Street
Iqaluit, Nunavut
X0A 0H0

Dear Mr. Didham,

Re: Investigation under subsection 36(3) of the Fisheries Act in regards to an effluent seepage and controlled discharges from the Waste Rock Stockpile Sedimentation Pond (WRSSP) located at Baffinland's Mary River Project (the Project).

Please find below a summary response prepared by Baffinland Iron Mines Corporation (Baffinland) in response to the investigation under the Fisheries Act and Metal Mining Effluent Regulations (MMER) initiated by Environment and Climate Change Canada (ECCC) on September 13, 2017.

Project Development

Baffinland proposed to develop the Project in a phased approach, and began construction for the Early Revenue Phase (ERP) in 2013, followed by the initial mining of Deposit 1 in September 2014. Prior to the development of Deposit 1, Baffinland had retained AMEC in 2012 to conduct water quality modelling of runoff and seepage originating from the Deposit 1 waste rock stockpile. The report concluded that, with the exception of total suspended solids (TSS), the water quality of runoff and seepage would meet the MMER discharge requirements. To address the estimated solids loading from the runoff and seepage and facilitate the monitoring of discharges, sedimentation ponds downstream of the waste rock stockpile(s) were proposed. In 2014, Baffinland retained AMEC to investigate the metal leaching and acid rock drainage (ML/ARD) potential of waste rock generated from ERP operations on Deposit 1. Results from AMEC's investigation were presented in a technical memo titled "Mary River Deposit 1, 5-Year Pit ML/ARD Characterization". AMEC had determined that approximately 85% of waste rock samples had neutralization potential ratios (NPR) greater than 2 pH and were classified as non-potentially acid generating and were unlikely to generate acidic drainage. Approximately 10% of the samples had NPR values of less than 1 pH, and 5% of the samples were classified as having uncertain acid generating potential (1<NPR<2). Humidity cell testing for historical samples of the Waste Rock Stockpile has stayed relatively consistent previous to 2017, indicating stable conditions in the majority of cells

Construction of the current WRSSP commenced in September 2015 and became operational in May 2016. A Construction Summary Report (CSR) produced by Hatch Ltd. (Hatch) for the current sedimentation pond, which was included in the 2016 Qikiqtani Inuit Association (QIA) and Nunavut Water Board (NWB) Annual

Report for Operations, was signed off by Baffinland in January 2017 and provided to regulators and stakeholders on March 31, 2017.

Under Part D, Item 18, of Baffinland's Type "A" Water License 2AMMRY1325 Amendment No. 1 (Water License), two annual geotechnical inspections are performed on water and waste retention structures. Barry H. Martin Consulting Engineer and Architect conducted two inspections in 2017. The Aug 1-10th bi-annual inspection did not identify integrity or containment issues concerning the WRSSP. Additionally, inspections of the facility from ECCC and Indigenous and Northern Affairs Canada (INAC) in 2016 and spring/early summer 2017 also did not identify seepage from the WRSSP or identify water quality concerns associated with the system. Internal compliance inspections are completed bi-monthly during the open water season on this facility and daily monitoring is completed during discharge which focuses on monitoring water quality in accordance with Baffinland's Water License and Schedule 4 of the MMER, as well as overall WRSSP conditions and operations. There were no issues of compliance with water quality limits in 2016 or in the first half of 2017.

The following summarizes the four incidents that occurred in August and September and remediation measures undertaken.

Spill Report 17-289

A heavy rain event was experienced over a period of several days in late July increasing the runoff into the pond and led to the requirement to de-water and maintain suitable pond freeboard. The pH results leading up to August 1st, which were measured by both YSI meter field readings and the ALS laboratory analyses, were consistently greater than 6.40. In early August low pH water was discharged to the environment on August 1st and 3rd. On August 1st, water chemistry and toxicity testing occurred. Results received indicated the pH of the water was below 6.0 which resulted in a toxicity failure for both Daphnia Magna and Rainbow Trout. No discharge to the environment occurred after receiving official ALS laboratory results.

August 10th - 24th:

- pH adjustment treatment of the WRSSP was planned with Wood Group PLC (formally AMEC Foster Wheeler) to determine the most effective treatment of the WRSSP with resources on site. On August 22-24th, batch treatment of the WRSSP was completed using sodium carbonate to effectively raise the pH from approximately 4 to 7.
- Golder Associates Ltd. (Golder) was consulted to commence work on increasing the storage capacity of the WRSSP.

Spill Report 17-312

On August 23, 2017 during an inspection of the WRSSP with ECCC and INAC, seepage was observed originating from the central toe of the WRSSP in approximately four discrete but closely clustered locations. Water quality samples were taken from the seepages occurring at the toe of the WRSSP in concert with ECCC and INAC on August 23rd and 24th during their on-site inspection and external analytical results indicated that, aside from nickel and TSS, water quality was compliant under the MMER and Water License.

August 25th:

- Construction of an emergency containment ditch downstream of the seepage.

September 1st:

- Hatch was consulted to explore options to stop the seepage from the toe of the WRSSP and identify potential remedial activities to the facility.
- Hatch recommended the placement of a till blanket upstream of the WRSSP liner key-in to allow for proper re-grading in an effort to reduce pooling on the inlet, as well as constructing two sumps to tie into the emergency containment ditch downstream of the WRSSP seepage.

September 2nd:

- Baffinland submitted a notification to regulators detailing the plan to mitigate the ongoing seepage at the WRSSP.

September 7th - 17th

- Construction of the till blanket and sumps were completed to the design specifications provided by Hatch from September 7th to 17th.

On September 26th, during an inspection of the WRSSP and down gradient seepage area, discoloured water was observed outside of the emergency containment ditch under ice and snow. Water quality sampling was conducted, which included acute toxicity testing. Analytical results showed nickel and TSS above applicable guidelines, though the acute toxicity test passed.

October 4th - 24th:

- Golder and Le Groupe Desfor (LGD) consulted to assess the situation and provide expert advice on locating the source and identifying potential remedial solutions.
- LGD Director of Civil Works concluded that the origin of the seepage could not be determined at that time under the existing conditions.
- Principal Geochemist from Golder conducted a detailed hydrological assessment and concluded that the pond design appears appropriate for its intended use.

October 19th:

- Story Environmental was contacted to provide recommendations for the utilization and implementation of using rhodamine dye to determine whether the WRSSP was the potential source of the seepage.
- Monitoring of the seepage for the presence of rhodamine occurred using a YSI meter with a rhodamine sensor. Rhodamine was detected in seepage grab samples indicating that the WRSSP liner's integrity may have been compromised. Current conditions limit the ability to confirm this to be true and further investigations into the matter are required when conditions allow.

October 21st – November 06:

- Construction of a new berm was completed around the outside perimeter of the emergency containment ditch to increase the ditch's containment capacity.
- Water was pumped from the containment ditch back to the WRSSP in order to effectively place ¾ inch rock at the base of the ditch to arrest further seepage.

Spill Report 17-328 and 17-361

On August 27th, visual observations of the turbidity of the WRSSP prompted the discharge to be shut down. Samples later confirmed that the TSS exceeded the Water License and MMER guidelines for an approximate 14-hour period. Discharge resumed again on August 28th after the pond had settled and TSS criteria was found to be below guidelines.

August 24th – 28th

- An Environment Effects Monitoring (EEM) study was performed by Minnow Environmental (Minnow). No exceedances were observed or recorded under applicable guidelines in discharge exposed Tributary F or Mary River except for aluminum. The aluminum is not exposure-related as aluminum was found to be present in the reference sites and is related to known historical turbidity-related colloidal effects in Mary River. The discharge from the WRSSP travels approximately 2.2 km from the Final Discharge Point (FDP) to where Tributary F becomes a defined channel which is non-fish bearing. The confluence with Mary River is located approximately 3 kilometers in distance from that location.

Discharging to the environment continued from August 30th to September 6th and water samples analyzed using the on-site ALS laboratory equipment run by Baffinland personnel were found to be compliant up to September 6th under the MMER and Water License discharge criteria for pH. In addition to the on-site laboratory results, samples were also shipped offsite to ALS Waterloo. The pH results received from the ALS laboratory in Waterloo from September 1st to 6th were below the MMER and Water License criteria. In consultation with the ALS Environmental Technical Director, it was determined that the initial pH measurements from the on-site laboratory taken by Baffinland Staff (within one to four hours of sampling) should be the most reliable and defensible pH measurements representing the conditions of the samples at time of sampling, rather than test results measured by ALS Waterloo which represent the pH of the sample after several days of potential acid rock drainage related redox reactions. The discharge to the environment was stopped on September 6th.

September 1st:

- Aquatic Effects Monitoring Plan (AEMP) data for stations at the confluence of the tributary, (Tributary F) that receives WRSSP effluent and the nearest fish bearing waters, were examined and did not show readily detectable influence from the discharge, exhibiting pH of approximately 8.

Additional Mitigation Measures

Additional mitigation measures were taken to address deficiencies identified with internal environmental systems, protocols and procedures:

- An Emergency Response Plan has been revised for the WRSSP in accordance with MMER requirements outlined in Section 30.
- A Working Near Water Containment Facilities Procedure has been drafted to provide a set of operational standards to ensure work is conducted in a safe and environmentally-compliant manner.

- The Site Environment team reporting structure was changed to include a Site Environmental Manager that will provide leadership and oversight to all site activities.

Additional mitigation measures that are in progress or planned are:

- Initiate a geochemical review of the waste rock dump layout and materials to develop a better understanding of low pH conditions observed on site and, if necessary, develop supplemental mitigation measures to reduce or eliminate production of acidic water from entering the WRSP.
- Review on-site equipment and consider whether additional equipment could more efficiently treat and discharge water from the WRSSP.
- Revise Waste Rock Management Plan to incorporate discharge and ARD mitigation measures
- Resource additional certified ALS Technician(s) and testing equipment during the summer season
- Evaluate and source appropriate coagulants if treatment required.
- Long Term - Design and implement fit for purpose AMD containment and treatment technology for prevention, source control and remediation.

Overall no impacts were observed in the receiving water bodies as shown through Baffinland's EEM and AEMP studies. Engineered mitigation measures to address water quality, seepage and pond capacity issues are currently being reviewed. Through the rhodamine testing early indications are that the source of the seepage is related to the integrity of the WRSSP liner, although further investigations are required to confirm these findings and upon confirmation we will immediately act upon.

Regards,

Todd Burlingame | Vice-President, Sustainable Development
2275 Upper Middle Road East, Suite 300, Oakville, ON, Canada, L6H 0C3
T: +1 416 364 8820 x5010
C: +1 416 553 0062