Technical Remediation Advisory Committee Revised Agenda

Thursday, November 14, 2024
6:00 pm
Council Chambers - Hybrid with YouTube Recording
24 Church Street West, Elmira, ON, N3B 2Z6
Chair: Councillor Nathan Cadeau

Pages

1. Land Acknowledgement

2. Disclosures of Pecuniary Interest

3. Approval of Previous Minutes 1

4. Delegations

5. Updates

   5.1 Replacement of On-Site Containment Well PW5 with PW6

   5.2 Ontario Ministry of the Environment, Conservation and Parks (MECP)

      5.2.1 Receipt & Review of LANXESS Proposal to Amend ECA 0831-BX6JGD Biomonitoring Requirements

      5.2.2 MECP Comments on the LANXESS Elmira 2023 AMR

      5.2.3 MECP Creek Floodplain Soil Study

   5.3 LANXESS Canada Co.

      5.3.1 Canagagigue Creek Human Health & Ecological Risk Assessment (HHERA) Revisions

      5.3.2 GHD Comments to the Technical Remediation Advisory Committee

      5.3.3 2018 Technology Evaluation Update

      5.3.4 Updated Biological Monitoring Fish Tissue Study Design

6. Other Business

6.1 2028 Order Deadline Remediation Frameworks Discussion

6.2 TRAC Biannual Presentation to Council

6.3 2025 Meeting Schedule

7. Correspondence

8. Next Meeting - Dec 12, 2024

9. Adjournment

Township of Woolwich
Technical Remediation Advisory Committee
Meeting Minutes

Thursday, June 13, 2024
6:07 p.m. – 8:18 p.m.
Hybrid Meeting
Hosted in Council Chambers and on Zoom
24 Church Street West, Elmira

Present from TRAC:	Councillor Nathan Cadeau, TRAC Chair Mayor Sandy Shantz, Councillor Eric Schwindt *Tiffany Svensson, Technical Expert* Susan Bryant, TRAC Community Member Eric Hodgins, TRAC Community Member Bryan Broomfield, TRAC Community Member Linda Dickson, TRAC Community Member *Ryan Prosser, TRAC Community Member* David Hofbauer, TRAC Community Member Dr. Sebastian Siebel-Achenbach, TRAC Community Member Karl Belan, Region of Waterloo *Mari MacNeil, Region of Waterloo* *Geoff Moroz, Region of Waterloo*
Stakeholders:	*Chris Foster-Pengelly, GRCA* *Hadley Stamm, LANXESS Corporation* *Jason Rice, Ministry of the Environment, Conservation and Parks*
Special Guests:	*Sadie Payne, Former Conestoga College Student* *Nadia LeMoine, Former Conestoga College Student* *Dr. Ulysses Klee, Professor, Conestoga College*
Present from Staff:	Stacey Bruce, Committee Support Specialist Rae Ann Bauman, Executive Officer

Italics indicate a virtual participant.

1. Land Acknowledgement

Chair Councillor Nathan Cadeau read a Land Acknowledgement.

2. Disclosures of Pecuniary Interest

No pecuniary interests were declared.

3. Approval of Previous Minutes

Moved by Linda Dickson
Seconded by Susan Bryant

That the Technical Remediation Advisory Committee (TRAC) minutes of April 25, 2024, be adopted as presented

…Carried.

4. Delegations

None.

5. Electronic Dashboard – EngageWR Platform Discussion

Rae Ann Bauman, Executive Officer presented a draft TRAC page designed in partnership with Waterloo Region's EngageWR electronic dashboard to house information related to this community project and increase public engagement as described in the committee's new Terms of Reference. The draft page includes links to TRAC's Terms of Reference, Woolwich Township's Procedural By-law, agenda and minutes, a key timeline of events, correspondence, documents received, and related resources. Key widget features in the backend of the page for subscriptions, newsfeeds, and forums for registered or anonymous public polls and surveys were demonstrated. It was discussed that Stacey Bruce, Committee Support Specialist, will be the future administrator of the dashboard and capable of further modifying the page for the committee. The next steps in launching the platform live involve finalizing the posted timeline of events and training S. Bruce.

Discussion around this matter covered content requests from the committee, the current file upload size restriction of 100 MB, and further details about the direct electronic link to Wilfrid Laurier's Assuring Protection for Tomorrow's Environment Collection. It was noted that an RFP is currently underway to increase the file upload size restriction to 250 MB. It was also highlighted that links from this community page open in pop-up windows, allowing users to stay connected to the original content. Community members S. Bryant, Dr. Sebastian Siebel-Achenbach, and Eric Hodgins were identified as key contributors to developing project milestones to complete the timeline of events section on the draft page.

There were no further questions regarding this.

At this time in the meeting Rae Ann Bauman left.

6. Advancements in NDMA Remediation – Student Research Presentation

18:19 Bryan Broomfield entered the meeting.

Conestoga College Professor Dr. Ulysses Klee introduced former students Sadie Payne and Nadia LeMoine, who have recently successfully completed their studies and presented past project work from a professional research internship course on advancements in NDMA remediation and investigation strategies to meet Ontario drinking water standards in the Elmira Aquifer pertaining to its removal from groundwater.

The presentation covered the students' research questions, the significance of their results, methods, findings, and study limitations. It addressed the nature of NDMA, its harmful effects, and the longstanding contamination of the Elmira Aquifer, emphasizing the challenges in removing this chemical from groundwater and its impact on the community's water supply. Various remediation techniques such as ex-situ ultraviolet (UV) treatment, reverse osmosis, granular activated carbon, and both ex-situ and in-situ bioremediation strategies using propane oxidizing bacteria were detailed. The presentation discussed the pros and cons, implementation systems, and potential discharge areas for these treatments, drawing insights from a Community Assessment for Public Health Emergency Response (CASPER) literature review and a LANXESS facility tour in Elmira. The study's overall conclusion that a multi-step approach is necessary to effectively treat NDMA in the Elmira Aquifer was underscored.

18:30 David Hofbauer entered the meeting.

The committee raised questions regarding the theoretical and practical aspects of this research. The presenters elaborated on the Canadian and US focus of their study, highlighting successful applications of similar technologies in evidence-based case studies with drinking water standards similar to Ontario. The presenters also described how the case studies they examined commonly applied multiple technological strategies where it was difficult to assess the individual effects of each one. They also discussed LANXESS's successful local use of the technologies studied, emphasizing again the importance of a multi-step remediation approach.

In response to further questions from the committee, the presenters described their interest in studying the technologies, touring the LANXESS facility, and gaining a deeper understanding of this environmental issue. They also explained limiting their focus on NDMA over both it and chlorinated benzene due to the high availability of research materials. The committee further clarified the differences between the ex-situ and targeted in-situ treatment, the availability of microbial bioremediation methods for chlorinated contaminants vs. the limitations around this for NDMA, and the hazards of injecting propane into the contaminated groundwater for propane-oxidizing bacterial treatment were emphasized. The effective application of UV and activated carbon remediation technologies by LANXESS and the energy intensiveness of these treatments were also noted. The remaining NDMA contamination in the aquifer and the technical challenges associated with its treatment, particularly regarding well site selection and aquifer substrate conditions like silt were described by the company. LANXESS spoke to the importance of further consulting with GHD and WSP regarding removing the mass of these contaminants with ex-situ treatments to meet 2028 deadline targets.

The committee discussed the scalability of the technologies presented in the study, focusing on the required scale for remediating 2 million gallons of water daily from the Elmira Aquifer. They noted considerations such as costs, energy demands, and the requirement for full-time personnel to oversee continuous treatment operations. Additionally, the committee explored the study's conclusion on employing a multi-step remediation approach further, emphasizing the importance of the combination of different technological processes in the case study applications to enhance overall efficiency, with each contributing specific capability.

The committee questioned whether evidence from other case studies addressed the effectiveness of technologies at the asymptotic plateau of treatment, similar to the current situation with the pump-and-treat method being used in the Elmira Aquifer. Since this was beyond their study, the presenters could not address this and were unable to respond to this initially, but after further inquiries were made regarding potential future research directions the presenters suggested focusing on comparing reverse osmosis and UV remediation technologies, alongside proposing another LANXESS facility tour in the future for additional insights.

In response to a committee question, it was noted that no other in-situ methods are currently available for NDMA remediation besides the propane oxidizing bacteria treatment, which poses explosion hazards and is unsuitable for community use. Discussions explored the potential for alternative, safer bioremediation treatments, referencing an associated unsuccessful and discontinued in-situ Chemical Oxidation (ISCO) pilot test that took place a decade ago in the central area of Elmira, west of the LANXESS site. The importance of specific aerobic and anaerobic conditions for tailored in-situ bioremediation treatments for different compounds was highlighted.

Additionally, the importance of conducting further site characterization was emphasized for future bioremediation work. However, it was noted that there is already sufficient information available to continue discussions on cleanup options like this due to the extensive prior studies of the site. The localized impact and limited broader scale effectiveness of permanganate-based bioremediation were noted from environmental remediation experience.

The student research presenters were complimented on their comprehensive work by the committee. It was also noted similarly from past LANXESS monthly progress reports that carbon and UV remediation treatments have demonstrated effectiveness.

There was no further discussion regarding this.

7. Review of LANXESS April 2024 Monthly Progress Report

Linda Dickson presented her summary of LANXESS's April 2024 Monthly Progress Report.

Hadley Stamm provided a response that well W3R has been up and running since the end of May, in response to questioning around of the exact date that the wireless equipment was recently installed for well W3R.

The committee further discussed a containment breach that occurred in April beneath the NW portion of the site, specifically north and west of the dam and southwest of the creek. LANXESS explained their efforts to control water levels through extraction well operations relative to the creek, which is typically challenged during high spring water events. Due to significant seasonal high fluctuations in water levels in this area, it was noted that the water lost was diluted, and such events typically do not result in exceedances of contaminant concentrations or adverse impacts. The ministry mentioned that the Environmental Compliance Approval (ECA) has previously been amended to reduce monitoring requirements, but that additional specific

monitoring is required to address data gaps that occur during storm events, particularly in spring months when containment breaches are common like this. It was emphasized that GHD, on behalf of LANXESS, collects surface water samples as close as possible to these events to monitor any potential negative effects through testing.

There was no further discussion regarding this.

8. Updates

7:04 Mari MacNeil entered the meeting.

H. Stamm presented the following LANXESS Elmira – TRAC Update.

LANXESS first provided an informal update on well PW6, noting that its replacement is progressing ahead of schedule, although potential supply chain challenges post-COVID-19 could still affect the overall timeline.

8.1 Human Health and Ecological Risk Assessment (HHERA) Revisions

The company described their discussion of necessary revisions in the HHERA with the ministry on June 12th, 2024. They also highlighted submitting initial comments at the end of May and their request for a formal meeting with the ministry's technical team to plan the execution of this work. The company described that after this technical discussion, they intend to finalize this report, incorporating the additional data collected by the ministry from the creek's floodplain. LANXESS noted also planning to update their progress regarding this at the next TRAC meeting.

8.2 Removal of Canagagigue Creek Hotspots

LANXESS discussed that their next remediation work for the hotspot removal on the creek will depend on findings from the risk assessment. They emphasized their intention to undertake voluntary work on the creek, pending the assessment's outcomes, which may dictate mandatory obligations. The company highlighted uncertainty regarding whether mandated work would differ from voluntary efforts. They expressed a need to clarify regulatory obligations before proceeding with targeted voluntary work.

Questions were raised by the committee regarding the timeline for submission of the final HHERA. LANXESS indicated it is expected to be completed by the end of summer, but that creek cleanup work is unlikely this year. Anticipating additional ministry comments post-submission, the company noted not foreseeing cleanup work commencing until next summer.

The committee questioned perceived delays in cleanup efforts during the preparation of ongoing reports. The company emphasized the importance of understanding the rationale behind cleanup efforts, considering their potential impact, and ensuring alignment with community interests.

The committee provided additional comments on the importance of avoiding unintended impacts on the creek by ensuring accurate identification of contaminant hot spots. The need for a thorough risk assessment before initiating any further work to gain a comprehensive understanding was emphasized.

8.3 Technical Advisory Group (TAG) and the Ministry of the Environment & Parks (MECP) Written Comments on the LANXESS Canagagigue Creek Clam Biomonitoring Program

LANXESS discussed wanting a deeper understanding for this clam biomonitoring work from the HHERA study that is expected to be completed. It was also emphasized that they would like to further understand the analysis of fish tissue data and long-term monitoring obligations under their ECA permit. The company highlighted challenges in obtaining clams for the biomonitoring program due to the Ministry of Natural Resources and Forestry (MNRF) licensing restrictions for introducing them into the creek. The company proposed fish tissue monitoring every 3-5 years as an alternative method for the ministry's consideration.

19:23 Geoff Moroz entered the meeting.

Using alternative clam species abundant in the upstream watershed for in-situ monitoring was suggested in response by the committee. They also recommended that GHD utilize further expertise to provide more detailed insights into creek biology and testing methods. In reply, LANXESS noted interest in exploring a collaboration with EnviroScience Inc., a US-based company specializing in bioremediation.

The ministry provided comment on the consideration of native clam species for biomonitoring, emphasizing the need to understand their upstream source in the Grand River in relation to the LANXESS site and other inputs into the creek system as well as their population size as it must be sufficient to support the study work without negatively impacting the species harvested for this work. The committee further underscored the significance of utilizing expert knowledge to study potential native clam populations for biomonitoring. The importance of understanding clam population size, baseline contaminant exposure, and maintaining a sufficient multiple-year supply of clams from healthy, stable populations with contaminant levels below detection limits for effective monitoring was further emphasized.

There was no further discussion regarding this.

9. 2028 Order Deadline

Regarding the 2028 cleanup deadline, LANXESS stated that it is unfeasible to meet this target set 30 years ago. They emphasized future efforts to address the removal of the mass of remaining aquifer contamination through consultations with GHD and Stantec consultants. They also noted exploring plans around sparging various wells and leveraging Joe Ricker's plume analytics as well as current existing studies to effect change in the environment of the contaminated site.

Discussion around the 2028 deadline and developing a proposal for a remedial framework by 2026 occurred, with ongoing updates on a remediation framework set as a standing future TRAC agenda item. The committee expressed interest in hearing the ministry's response to future proposed frameworks. The company highlighted the slow progress and challenges in their remediation efforts, emphasizing the iterative process of conducting remediation pilot tests to advance the cleanup work.

The committee requested a comprehensive summary of remediation technologies employed and studies acquired, emphasizing the need to revisit the potentially outdated draft remediation framework and technologies used for in situ and ex-situ treatment documents prepared five years ago. The committee decided, after further discussion, to proceed with this while also exploring new strategies through a technical experts meeting. To ensure inclusivity of perspectives, it was determined that the meeting will involve hydrogeologist consultants, representatives from the company and ministry, TRAC's Technical Expert, and community members.

9.1 ACTION: H. Stamm of LANXESS to initiate a Technical Experts Meeting involving hydrogeologist consultants, representatives from the company and ministry, TRAC's Technical Expert, and community members.

The committee discussed reformulating its framework questions for community outreach, emphasizing their current regulatory and technical aspects and the need for public education. The critical role of technical experts in formulating these current draft questions was highlighted.

The committee reviewed the five-year age and potential retooling of these questions, including a follow-up on past discussions from the Technical Advisory Group (TAG) group on questions to pose to the public in consideration of the 2028 order deadline. A technical experts meeting before September was deemed crucial for revising these current draft questions effectively.

The committee discussed answers, feasibility, and relevance of fundamental questions they aim to address, emphasizing the need for responses from those capable of providing answers. They focused on the critical nature of addressing these issues effectively. The audience for the framework questions and considerations regarding existing water in the aquifer for cleanup evaluations were discussed, focusing on containment vs. cleanup strategies to conserve this water supply resource.

The committee also deliberated on the overwhelming weight of these questions for community committee member volunteers to answer compared to mandated experts and the ministry. The balance between expectations and the participatory capacity of the committee was considered.

Discussion focused on the assimilation of treated water into the stream, its current non-usage, and the perception surrounding these issues. The evaluation included the relevance and methodologies of Ontario Drinking Water Standards, prompting a query to the Ministry of the Environment Conservation and Parks (MECP) regarding their establishment, particularly in terms of the public perception of minor exceedances.

9.2 ACTION: The MECP to follow up with their Water Resources Branch regarding the historical establishment of the limits for the key contaminants for the committee.

Concerns were raised about site-specific cleanup criteria from the MECP, contrasting with offsite contamination and the evolution of cleanup approaches over the past decades, varying by regulatory requirements and company-driven initiatives.

The importance of the technical nature of these questions was emphasized. Considerations extended to water conditions and industrial vs. end-use drinking water, as well as the contextual relevance of unanswered questions to generate discussion and input on the 2028 order deadline.

In conclusion, the committee meeting organizers were tasked with determining questions to prioritize for this ongoing future discussion. The company's investment in treating contaminated water intended for discharge into the creek, and reassessing priorities leading up to 2028, was highlighted. The role of technical experts, the committee, and public feedback, alongside the necessity to educate the public and allow experts to shape future directions and question formulations, was underscored.

9.3 ACTION: Chair Councillor N. Cadeau, and Technical Expert Tiffany Svensson, to identify and formulate questions related to developing a remediation framework in preparation for the 2028 order deadline, for future discussion.

There was no further discussion regarding this.

10. Preparing The Spring TRAC Update for Council

The committee discussed preparing a comprehensive update to present to Council on August 27th. This high-level presentation will cover the committee's purpose, recent structural changes, and relevant work. Discussion highlighted the importance of including diverse perspectives and differing views on the committee's direction in the presentation. Committee members were encouraged to propose questions for Council for the presentation via email to Chair Councillor N. Cadeau.

10.1 ACTION: Chair, Councillor N. Cadeau, and Technical Expert T. Svensson will prepare a draft of the presentation, within the next month, which will be circulated to the committee for feedback.

There was no further discussion regarding this.

11. Other Business

11.1 2023 Annual Environmental Report

D. Hofbauer presented his summary of the 2023 Annual Environmental Report, prepared by GHD on behalf of LANXESS.

The committee discussed the notable annual reoccurring recommendation for the plant to develop a labeling system to ensure drums are not stored longer than 90 days, per ministry guidelines. They also reviewed LANXESS's waste disposal practices. It was confirmed there have been no violations and that the plant follows recommended disposal guidelines.

There was no further discussion regarding this.

12. Correspondence

12.1 Alan Marshal's May 14, 2024, Council Meeting Delegation

12.2 LANXESS April 2024 Progress Report Prepared by GHD

12.3 2023 Annual Environmental Report

12.4 Student Research Paper on Advancements in NDMA Remediation

It was noted that four documents were received since the last TRAC committee meeting and there was no further discussion regarding these.

13. Next Meeting

The committee agreed to reschedule the next meeting to September 12th, 2024, at 6:00 pm, moving it a week earlier.

14. Adjournment (8:18 P.M.)

14.1 Card Signing for Ramin Ansari's Retirement

Committee members were invited to sign a card for Ramin Ansari's retirement.

Moved by Dr. S. Siebel-Achenbach
Seconded by Ryan Prosser

The committee adjourns to meet again on Sept 12, 2024.

…Carried.

Recorder: Stacey Bruce, Committee Support Specialist

Township of Woolwich
Technical Remediation Advisory Committee (TRAC)
Meeting Minutes

Thursday, Sept 12, 2024
6:02 p.m. – 8:07 p.m.
Hybrid Meeting
Hosted in Council Chambers and on Zoom
24 Church Street West, Elmira

Present from TRAC:	Councillor Nathan Cadeau, TRAC Chair Mayor Sandy Shantz, Councillor Eric Schwindt Tiffany Svensson, Technical Expert Susan Bryant, TRAC Community Member Bryan Broomfield, TRAC Community Member *Linda Dickson, TRAC Community Member* Dr. Sebastian Siebel-Achenbach, TRAC Community Member Karl Belan, Region of Waterloo
Stakeholders:	*Chris Foster-Pengelly, Grand River Conservation Authority* Hadley Stamm, LANXESS Corporation *Jason Rice, Ministry of the Environment, Conservation and Parks* Lou Almeida, GHD Alan Deal, GHD
Present from Staff:	Stacey Bruce, Committee Support Specialist
Regrets:	Eric Hodgins, TRAC Community Member Ryan Prosser, TRAC Community Member David Hofbauer, TRAC Community Member

Italics indicate a virtual participant.

Call to Order at 6:02 P.M.

Land Acknowledgement

Chair Councillor Nathan Cadeau read a Land Acknowledgement.

Disclosures of Pecuniary Interest

No pecuniary interests were declared.

Approval of Previous Minutes

A vote was held to adopt the Technical Remediation Advisory Committee (TRAC) minutes of June 13, 2024, which carried. However, since the mover was not a voting member, the motion is invalid. Approval of these minutes is deferred to the committee's next meeting, where a new vote will be conducted.

Delegations

None.

Updates

LANXESS Canada Co.

Follow Up Summary from the Sept 10th Technical Experts

It was noted that ten people attended the meeting. Two new technical experts were unable to attend in person but are planning to visit the site at a later date. As an outcome of the meeting, it was highlighted that Jesse Wright, PE, PG – Environmental Engineer, Arcadis, will review the conceptual site model and identify data gaps. This will be completed in 2025. Additionally, Cullen Flanders, Environmental Remediation Engineer, GHD, proposed turning off the interior off-site wells, pending the approval of the Ministry of the Environment Conservation and Parks (MECP) approval, to allow natural conditions to return for monitoring groundwater while continuing peripheral pumping. This approach would involve sampling and analyzing groundwater concentrations, measuring water levels and constituent levels, and conducting pilot and bench-scale tests. It was emphasized that C. Flander's approach aims to enhance NDMA attenuation through the development of in-situ methods, although this may take decades. An example was provided of a similar site with NDMA remediation in California that also relies on ultraviolet destruction. Additionally, the meeting discussed ideas for direct water recirculation to address contaminants in soil. It was noted another approach could involve applying treated water to areas of source concentrations, where NDMA is bound in soil, or along the southern front of the plume to follow the pumping path and flush out their persistent environmental presence. However, it was noted that this would require the development of significant infrastructure, although it could use the currently treated water for remediation.

Mayor Sandy Shantz joined the meeting virtually at this point.

In response to a question, the next steps after the Technical Experts meeting were outlined to the committee. It was noted that this includes addressing unresolved details from past studies, such as the 2017 in-situ chemical oxidation (ISCO) and tracer study and presenting this work to the TRAC committee to enhance transparency. It was pointed out that in the ISCO study, the chemical oxidant showed its effectiveness is limited to within 13 meters of the injection point and would require millions of liters for broader application due to this limitation in spatial effectiveness. However, it was highlighted that the solution could still be useful as a tool to treat the mass of constituents of concern in areas lacking existing infrastructure. Other plans described included completing and submitting the unfinished 2018 Technical Evaluation Study alongside the currently proposed groundwater bench and pilot test proposals for future Ministry review. Long-term plans were also described, involving preparing a report evaluating remedial technical alternatives in terms of their feasibility, such as thermal remediation, which may not be suitable for Elmira's deep NDMA plume. It was noted that J. Wright will refine the conceptual site model by next summer. Additionally, it was recommended to propose new remediation

objectives and, once approved by the MECP, to develop a new draft control order. Considering the council's education on the issue, timing will be aimed at accommodating a submission before the next election. It was noted that this process will involve legal reviews, community input, and MECP review timelines. Additionally, planned updates to GHD's 3D conceptual site model, which will illustrate geology, NDMA and chlorobenzene mass, and impacts overlaid on street level geographical maps, were discussed. It was noted these updates will be shared with the TRAC committee in the future, once completed.

Summer Fieldwork Updates

Replacement of Well PW5

Commissioning of on-site containment well PW6

Investigating Well Extraction Pumping Rates

Comments were provided regarding outstanding work from 2024, noting that current efforts involve addressing issues with on-site containment well PW4 by performing an active carbon replacement as an initial troubleshooting step, and that equipment will be cleaned, inspected, and replaced as needed. The installation of on-site containment well PW6 was noted to be underway and on track for completion by the end of the year. It was emphasized that work on well PW6's power supply is being finalized to LANXESS plant and code requirements.

In response to the committee's question about the expected end of life for wells PW5 and PW4, it was noted that PW5, installed in 2005, is nearing the end of its service life, while PW4, installed in the 1980s and operational since the early 1990s, is also approaching the end of its effective use. Comment was provided that the lifespan of these wells is influenced by their maintenance and installation history. GHD further mentioned that 7 wells were recently replaced in the on-site upper aquifer containment system. They highlighted that well replacement and performance are continuously assessed. Additionally, the MECP and GHD discussed the ECA requirement for continuous monitoring of select wells, which are equipped with data loggers to facilitate and ensure ongoing maintenance.

Progress Update on LANXESS 2024 Work Plan

Several key efforts planned for 2025 were discussed, including submitting annual monitoring and audit reports for 2024. The need to complete a hazards analysis of the Containment and Treatment System (CTS) to ensure safe operation guidelines are met, along with continuing discussions with the MECP on the off-site aquifer Remedial Framework and the preparation and submission of the Canagagigue Creek Human Health Environmental Risk Assessment (HHERA), was noted. It was also mentioned that the creek HHERA was recently discussed further with the MECP at the end of August but a response to comments has not been finalized, although additional data sets have been provided by the MECP. The assessment of off-site groundwater extraction target rates was also outlined, alongside the proposed update of Joe Ricker's plume stability analysis for groundwater remediation. Of note, a similar long-term pump

and treat method remediation modeling work to be presented by J. Ricker at the upcoming October RemTech Conference this year in Alberta from LANXESS's Clover Bar site that helped the company stop the spread of contamination and monitor natural attenuation processes at the site was mentioned. Work to redevelop the on-site containment well PW5 was also noted.

The performance of wells, particularly PW4 and PW5, was discussed, highlighting their underperformance and the plan to replace PW5 with PW6 by the end of the year. Ongoing efforts to monitor and redevelop wells across the site to maintain groundwater containment were also addressed. The committee discussed concerns about pumping rates and containment stability for these critical wells. The end of the lifetime of well PW5 and its replacement with PW6 were underscored. It was noted that the evaluation of the underperforming well PW4 by a contractor revealed that while the well's performance is within expected limits, it is not meeting its targets. Based on troubleshooting efforts to date, higher pressures in PW4 suggest a buildup of fine materials from the use of regenerated carbon in the carbon treatment system rather than an equipment issue, which is not related to performance or differential pressure. It was highlighted that wells are continuously monitored in accordance with the ECA, and GHD is working to address issues, although this process takes time. PW6 is expected to be operational by the end of the year. GHD commented that they are focused on balancing pumping rates to maintain containment, with minor deviations of up to 5% unlikely to result in immediate loss of containment. The explanation was provided that flow can be adjusted to restore containment if needed, and further investigations into well maintenance by GHD are ongoing.

In response to the committee's questioning, seasonal fluctuations in groundwater levels and pumping rates were discussed, noting that shallow groundwater rates vary between 30-40 gpm in spring and 20 gpm in late summer. In contrast, it was noted deep groundwater typically shows less seasonal variation. Recent difficulties by GHD in maintaining pumping rates were attributed to a regional decline in groundwater levels, including a 1.5-meter drop last year, which has since risen by 1 meter, as observed and confirmed by the Region of Waterloo in their regional groundwater monitoring programs. This pattern, now in recovery, was attributed by the Region of Waterloo to potentially low external sources contributing to recharge from a dry year in 2022 with minimal snowpack.

In response to the Ministry's inquiry about having more than one pre-approved outside well technician or contractor available, GHD stated that they are actively seeking additional contractors and are continually exploring options for well maintenance and drilling. Currently, Lotowater in Paris, Ontario, which is also used by the Region of Waterloo, was noted as the primary contractor. Additionally, Well Initiatives Limited from the Guelph area was suggested to GHD by the Region, although it is known they have fewer staff available. It was noted, however, that at this time no other contractors in the area are known.

The committee inquired about the status of data collection for the HHERA. It was noted that all data has been collected and shared with LANXESS and Stantec consultants. The Ministry added that they are finalizing a technical report for their fall 2023 floodplain soil study on select properties along the creek and that the data and report will be shared with the TRAC committee after the information has been shared with the private landowners.

In response to the committee's questioning, it was clarified why the regenerating carbon recently implemented in the upper aquifer (UA) carbon tower is being operationally discontinued. The decision was noted to be due to this practice resulting in decreasing carbon grain size and increasing carbon fines content, which is thought to be contributing to the current buildup of pressures observed in the UA tower. It was explained that to address these backpressure issues, the regenerated carbon is now being replaced with "virgin" carbon.

In response to further committee questions, it was clarified that well monitoring involves tracking water levels in real-time using data loggers, which show seasonal fluctuations where water levels are higher in spring and lower in late summer and winter. It was noted this monitoring is ongoing, with targets adjusted based on historical data and current conditions. GHD emphasized using both data logger information and manual measurements to assess well performance, with warning levels set for specific parameters to manage potential issues. The committee expressed further concerns about reverse flow and containment loss, and it was noted the company is currently addressing this through sampling. The committee additionally discussed developing warning points based on differential pumping rates to monitor and address any drop in well performance. It was noted that while the wells needing monitoring are identified, water levels frequently falling below target rates is concerning. It was concluded that these fluctuations will be further considered, particularly in relation to water elevation levels.

At 18:39 Mayor S. Shantz entered the meeting in person.

<u>GHD/Alan Deal Historic Location of Dense Non-Aqueous Phase Liquids (DNAPL) & LANXESS Off Site Isotopic Analysis Study</u>

Alan Deal, GHD presented a 2018 study focused on Chlorobenzene Source Evaluation. It was emphasized that in its pure form, chlorobenzene exists as a dense non-aqueous phase liquid (DNAPL), as its density is greater than water, and it is highly insoluble, typically sinking to the bottom of a water table. The "one percent rule" of chlorobenzene's aqueous solubility was reviewed, suggesting that DNAPL may be present when groundwater concentrations exceed 1 percent of its effective aqueous solubility, which for chlorobenzene is 4,900 µg/L.

A key observation from the early 1990s at the LANXESS site was revisited, focusing on well P4W and monitoring well OW88. A diagram from the current conceptual site model was presented, illustrating chlorobenzene being released at the surface in the vicinity of where these wells are now located and a mass of DNAPL migrating down through the Upper Aquifer and fractures in the Upper Aquitard into the Upper Municipal Aquifer near well PW4. It was noted that while chlorobenzene has since been purged from monitoring well OW88, it still remains in the Upper Aquifer today. In contrast, it was discussed that insufficient chlorobenzene was present at the subsurface near well OW88 to penetrate the subsurface depths and migrate within the Upper Municipal Aquifer, as it adhered to the soil during migration from higher elevations.

The capture of this chlorobenzene by the Upper Aquifer Contaminant System was highlighted, along with historical chlorobenzene concentration models showing plume areas in both the

Upper Municipal Aquifer (1990) and the Lower Municipal Aquifer (1998) after the containment system became operational. These models illustrated changes in the plume size, migration, and chlorobenzene reductions over time.

The remaining areas of concern regarding the presence of DNAPLs were also addressed. Monitoring data from wells PW4 and W4 revealed gradual decreases in chlorobenzene concentrations on logarithmic scales. However, it was discussed that sustained high concentrations of chlorobenzene from well PW4 suggest the continued presence of residual DNAPL in the Upper Municipal Aquifer. At the same time, declining concentrations in W4 indicate that DNAPL is likely no longer present in that area.

In response to a question from the committee about using the proposed direct water recirculation method to pump treated water to address this contamination, it was explained that while this method might help flush out some of the concentrations toward the treatment system, it would not be very efficient because DNAPL is strongly bound to surface sediments.

An overview was provided on the completed Chlorobenzene Source Evaluation, covering four key activities: reviewing historic chlorobenzene users, installing and sampling a new monitoring well, analyzing samples for volatile organic compounds (VOCs), and conducting isotope analysis. It was noted the review of historic chlorobenzene users in the Environmental Risk Information Services (ERIS) database identified several facilities in Elmira that currently or previously used chlorinated solvents. The former Varnicolour facility at 84 Howard Avenue was discussed further in relation to historical chlorobenzene concentration models showing plume areas in both the Upper Municipal Aquifer (1990) and the Lower Municipal Aquifer (1998), where these properties were highlighted to be located directly west and southeast of the contaminant plume.

It was described that a new monitoring well nest was installed as part of this evaluation to investigate any potential chlorobenzene source north of the plume. It was noted that the investigation indicated that chlorobenzene was present in samples from wells OW187-36 and OW187-39, but at relatively low levels, significantly less than the Ontario Drinking Water Quality Standards (ODWQS). It was emphasized that these results ruled out the possibility of an unknown additional source of chlorobenzene mass in the municipal aquifer north of the existing plume.

An overview of a VOC sample analysis investigation, led by consultant Peritus on behalf of the property owner at 84 Howard Avenue and shared with GHD, was provided. This investigation was noted to have been conducted to support a Record of Site Condition (RSC) submission to the MECP. It documented contamination on and around the property that overlaps with LANXESS's well monitoring data. It was highlighted that Upper Aquifer monitoring well MW45 at 84 Howard Avenue detected VOCs including 1,1-dichloroethane, cis-1,2-dichloroethene, trichloroethene, and trans-1,2-dichloroethene, but not chlorobenzene.

It was further noted that cis-1,2-dichloroethene concentrations were above applicable standards on the 84 Howard Avenue property attributed to known past contaminant spills from

Varnicolour's solvent recycling operations. Depictions of VOC plumes of benzene, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride were shown, further indicating their presence on or in the proximity to the 84 Howard Avenue site.

It was discussed that this VOC analysis concluded that trichloroethene, cis-1,2-dichloroethene, and vinyl chloride are present in the Upper Municipal Aquifer and originate from the 84 Howard Avenue property as a source. However, it was noted that these VOCs are not contaminants of concern (COCs) at the LANXESS site, although they are directly in the flow path from 84 Howard Avenue to LANXESS. In addition, it was further noted that the LANXESS site continues to be a source of chlorobenzene.

The results from a limited data set of groundwater samples collected from six wells and analyzed for chlorine and carbon isotopes by Tracer Technologies Inc. in February 2019 was described. It was noted that the analysis aimed to determine if isotopes could identify multiple sources of chlorobenzene, but no correlations could be made.

In response to concerns about offsite VOC contamination of the aquifer, it was emphasized that there is no risk to the public from this because the contaminated water is deep underground, not being pumped for use, and contained within LANXESS's off-site collection system, where it will be treated.

Regarding concerns of potential indoor air contamination issues from the VOCs at the 84 Howard Avenue property, which now includes the Elmira Pump Company, the MECP noted that the property owner has not yet submitted a Record of Site Condition. However, the owner's pursuit of this record has been previously discussed with the Ministry's Guelph District Office.

Questions were raised about whether the current collection and treatment system is designed to handle existing conditions, including dissolved VOCs and chlorobenzene. Concerns were also expressed about the potential future use of the aquifer as a drinking water source and the impact of these additional VOCs on this. It was emphasized that the current treatment system effectively manages this contamination and noted that only one of the VOCs associated with 84 Howard Avenue exceeded Ontario Drinking Water Quality Standards (ODWQS).

It was further explained that LANXESS's offsite groundwater collection and treatment system is focused on the Upper and Lower Municipal Aquifers and that they have no influence on the Upper Aquifer in the area of 84 Howard Avenue, which is not a usable drinking water source, but that the company's water collection and treatment is focused on the deeper aquifer water.

Clarification was provided that the chlorobenzene in the Upper Aquifer is not actively being treated. The non-aqueous nature of this DNAPL contamination, its limited migration through groundwater, and its minimal risk were further described. The potential for addressing this pollution with future enhancements to the collection and treatment system, such as C. Flanders' proposed observations of natural attenuation conditions, was also discussed.

It was clarified that the VOCs present at the 84 Howard Avenue site are included in GHD's comprehensive contaminant scans of groundwater influent to treatment system, and LANXESS's activated carbon treatment system effectively removes all such VOCs. It was also noted that recent models indicate that most off-site chlorobenzene concentrations in the municipal aquifers are expected to be treated by the 2028 order deadline.

In response to the committee's questions, it was confirmed that no DNAPLs are present off-site or at on-site pumping well PW4. It was explained that off-site well W8 has high chlorobenzene concentrations, but it remains unclear if these will decrease or stabilize under active pumping. The source of this contamination—whether DNAPL or dissolved phase—has not yet been identified. It was explained that if pumping was stopped, concentrations could rise under natural conditions if an unknown source of chlorobenzene remains. The low likelihood of DNAPL migrating off-site due to its non-aqueous nature and adherence to sediment was also clarified, with concerns limited to the LANXESS plant and not extending off-site.

There was no further discussion regarding this.

2028 Order Deadline and Remediation Framework Discussion

Draft discussion questions around the 2028 Order deadline and LANXESS' 2018 Remediation Framework were considered. It was noted that at the recent Technical Experts meeting, the focus was on aligning priorities for the water supply, community engagement, and managing time constraints before 2026. The committee discussed refining open-ended questions, clarifying responsibilities, and proposing a phased approach to address these issues. It was noted that coordination with LANXESS, the Ministry, and the Region of Waterloo is needed to draft a new control order, with LANXESS expected to propose a timeline by Q3 of 2025. Additionally, community engagement through TRAC's efforts was discussed, including expectations for LANXESS to provide a proposal for revised remediation objectives with reasonable options for consideration. The need for community assistance with these efforts over the next 2-3 years was highlighted, and it was noted that this topic will remain a standing item on the committee's agenda for further discussion.

Fall Presentation to Council

The recent well-received biannual presentation to the council was mentioned, along with plans for the next presentation tentatively scheduled for February 2025. A LANXESS 2024 work plan, offered by GHD, is expected to be included in the next TRAC update to the Township's council if timing permits. It was suggested that making these presentations accessible through TRAC's EngageWR project website could enhance community engagement. It was determined that the next presentation should focus on high-level key outcomes from the recent Technical Experts meeting, outline the committee's current work, and detail the process leading up to the 2028 control order deadline. Since Council is familiar with J. Ricker's recent plume stability presentations, it was noted that these can be referenced. It was also suggested that information from LANXESS on the current draft remediation framework questions, LANXESS's proposed

project work, and discussions on potential non-potable municipal aquifer water usage be included.

At this point in the meeting, Chris Foster Pengelly left.

Other Business

It was noted that LANXESS has a new Plant Manager, Rob Arndt, who is open to meeting with the TRAC committee.

Ontario Drinking Water Quality Standards for NDMA

In response to a question raised at the June 13, 2024 TRAC meeting, the MECP provided background information on the Ontario Drinking Water Quality Standard (ODWQS) for NDMA, focusing on the age of these limits and their variability across jurisdictions. It was noted that Ontario established a strict NDMA standard of 0.009 ug/L in 1991 due to contamination in Elmira's municipal aquifers, which was later formalized under the *Safe Drinking Water Act*, 2003. This was based on NDMA's classification as a probable carcinogen in humans and animals. For comparison, Health Canada has higher threshold limits (0.04 ug/L) based on lifetime cancer risks of 1 in 100,000 people. While the MECP does not find Health Canada's derivation problematic, Ontario's stricter limit remains to ensure optimal water treatment and chlorination processes that prevent NDMA formation. The Ministry emphasized that it does not plan to amend the current ODWQS for NDMA based on current science.

It was noted by the committee that it is beneficial to cleanup efforts to know the current ODWQS for NDMA will remain unchanged.

Correspondence

The following three documents were received since the last June 12, 2024, TRAC committee meeting:

- LANXESS May 2024 Progress Report Prepared by GHD
- LANXESS June 2024 Progress Report Prepared by GHD
- LANXESS July 2024 Progress Report Prepared by GHD
- LANXESS August 2024 Progress Report Prepared by GHD

Review of LANXESS May, June & July Monthly Progress Reports

This item was noted but not discussed further.

Next Meeting – November 14, 2024

Fall Meeting Schedule

The committee canceled their October 10, 2024, meeting and will meet again on November 14, 2024, when essential items are expected for discussion.

Adjournment (8:07 P.M.)

Moved by Dr. Sebastian Siebel-Achenbach
Seconded by Susan Bryant

The committee adjourns to meet again on Nov 14, 2024.

…Carried.

Recorder: Stacey Bruce, Committee Support Specialist

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Our ref: 11192137-LTR-60

15 October 2024

Ms. Lubna Hussain
Director, West Central Region
Ontario Ministry of the Environment
119 King Street West, 12th floor
Hamilton, ON
L8P 4Y7

LANXESS Canada Co./Cie (LANXESS) Progress Report September 2024

Dear Ms. Hussain

This letter presents a summary of the September 2024 LANXESS Progress Report.

The following noteworthy items regarding the Combined Groundwater Collection and Treatment System (CTS) are discussed in the report text.

The average monthly pumping rates of PW4, PW5, W5A, W9, and E7 were less than their Target Average pumping rates during September 2024. The PW4 pumping rate was reduced to 1.3 litres per second (L/s) during the first half of the month due to a buildup of carbon fines in the UA Carbon Tower which had resulted in plugging of the tower screens and pore spaces within the granular activated carbon in the tower. LANXESS discontinued the use of regenerated carbon and has switched to virgin carbon for the foreseeable future to reduce the carbon fines in the tower and has completed additional carbon change outs within the tower. Additionally, on September 19, 2024, LANXESS backflushed all screens on the UA tower, which allowed additional flow from PW4. PW5 continued operating at a reduced pumping rate in September 2024. Despite not meeting the Target Average pumping rate, hydraulic monitoring data indicate PW5 currently generates an effective groundwater capture zone. LANXESS is in the process of connecting the new replacement well PW6 to the existing treatment system infrastructure and is working towards bringing the well online. The pumping rate of W5A was below its Target Average pumping rate in September 2024. The well is unable to maintain its pumping rate; LANXESS will schedule inspection and rehabilitation of the well, subject to contractor availability. W9 continued pumping at a reduced rate during September 2024. The well pump is running at maximum capacity, therefore, LANXESS believes that the decreased pumping rate is due to an issue with the pump/motor and/or decreased well efficiency. LANXESS has scheduled inspection of the pump/motor and possible video inspection for the week of October 7, 2024. The E7 average daily pumping rate was less than its Target Average pumping rate in September 2024 due to issues with the wipers on Train B. Train B repeatedly shut down between September 12 and September 25, 2024 due to pump pressure alarms on the main pump PLC. LANXESS' Rayox contractor investigated the issue and determined that the Train B wipers and the solenoid valve that runs the Train B wipers were not operating correctly. These were replaced and Train B was restarted on September 25, 2024 at its target pumping rate.

During September 2024, the CTS operated within the Effluent Limits and within the Effluent Objectives for all compounds.

Please refer to the detailed information in the Progress Report for further information on these items.

Regards

Luis Almeida
Project Manager

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AB/kf/60

Encl.

Copy to: Jason Rice, MECP
Rob Arndt, LANXESS
Hadley Stamm, LANXESS
LANXESS Public Distribution List
Esther Wearing, MECP
Jamie Petznick, LANXESS
Michelle Yantzi, LANXESS

September 2024

Progress Report
LANXESS Canada Co./Cie
Elmira, Ontario

GHD has prepared this report on behalf of LANXESS Canada Co./Cie (LANXESS) and submitted it to the Ontario Ministry of the Environment, Conservation and Parks (MECP). This report complies with the administrative reporting requirements of the November 4, 1991 Control Order (Control Order), the Amended Environmental Compliance Approval (ECA) No. 0831-BX6JGD (Combined On-Site and Off-Site Groundwater Collection and Treatment Systems [CTS]), and Certificate of Approval (C of A) No. 4-0025-94-976 (E7/E9 Treatment Facility).

Unless otherwise stated, all data included in this report were collected in September 2024.

The Progress Report is organized as follows:

1. Monitoring and Analytical Data

A summary of the LANXESS monitoring programs is provided in Table 1.

A summary of the analytical results for the CTS is presented in Attachment A.

A summary of the analytical results from the monthly August 2024 Environmental Appeal Board (EAB) monitoring of discharges to surface water through storm water outfalls 0200, 0400 and 0800, and the storm water drainage system (SWS), is included in Attachment B. Attachment B is not required under the Control Order but is provided for review. Due to delays with the analytical data, the analytical results from the monthly September EAB monitoring will be provided in the October Progress Report.

A summary of the analytical results for groundwater samples collected as part of the 2024 Off-Site Routine Groundwater Monitoring (R.G.M.) Program is presented in Attachment C.

LANXESS collected confirmatory volatile organic compound (VOC) samples from monitoring well OW127-4 in September 2024. This well is part of the Creek Bank Groundwater Monitoring Program. A summary of the analytical results for groundwater samples collected as part of the confirmatory sampling event in September 2024 is presented in Attachment D.

LANXESS collected monthly groundwater samples from the Upper Municipal Aquifer (MU) sentry wells on August 29, 2024 and September 19, 2024, and results are presented in Attachment E.

2. Correspondence, Meetings, and Events

September 12, 2024	August 2024 Progress Report submitted to MECP West Central Region (WCR)
September 12, 2024	Technical Remediation Advisory Committee (TRAC) Meeting

3. CTS Monitoring and Performance

A schematic process flow diagram of the CTS is provided on Figure A.1 (Attachment A).

The September 2024 average pumping rates for the CTS containment wells PW4 and PW5, the CTS extraction wells W3R, W5A, W5B, W6A, W6B, W8 and W9, the Upper Aquifer Containment System (UA CS) wells, and E7, as compared to the target average pumping rates, are listed below, and shown graphically on Figures A.2 and A.3 (Attachment A).

Average Daily Pumping Rates		
September 2024 (Litres/second [L/s])		
Containment and Extraction Wells	**Target Average (1)**	**Average**
On Site Wells		
PW4	2.9	1.5
PW5	1.8	1.6
Upper Aquifer Wells	--	0.6
Off Site Wells		
W3R	18.5	21.5
W5A	4.5	1.8
W5B	4.2	4.3
W6A	0.20	0.36
W6B	0.30	0.40
W8	0.05	0.09
W9	13.6	9.7
E7	23.9	20.9
Yara	--	0.2

Notes:

(1) As wells and treatment system components require periodic downtime for maintenance, the Target Average pumping rate is set at 90% of the set point rate. GHD recommends that LANXESS maintain the target pumping rates greater than or equal to these rates.

With the exceptions discussed below, the containment and extraction wells, including the UA CS wells, are operating as intended.

The PW4 average monthly pumping rate was less than its Target Average pumping rate in September 2024. The PW4 pumping rate was reduced to 1.3 L/s during the first half of the month. This was due to a buildup of carbon fines in the UA Carbon Tower which had resulted in plugging of the tower screens and pore spaces within the granular activated carbon in the tower. Additional fines were inadvertently added to the UA Carbon Tower in late July 2024 when the carbon was replaced and backwashed in the W4 Carbon Adsorber. LANXESS discontinued the use of regenerated carbon and has switched to virgin carbon for the foreseeable future to reduce the carbon fines in the tower and has completed additional carbon change outs within the tower. Additionally, on September 19, 2024, LANXESS backflushed all screens on the UA tower, which allowed additional flow from PW4. During the plant-wide annual hydro shutdown, on September 21, 2024, carbon fines within the system plugged the Rayox A UV system. Additional downtime was required to clean out the Rayox system and feed tank. PW4 was restarted on September 26, 2024 at its target pumping rate.

As detailed in ECA No. 0831-BX6JGD, LANXESS shall measure and maintain on-site containment at the western site boundary between monitoring wells OW58-13 and OW105d. If the water level in on-Site monitoring well OW62-17 is not at least 1 centimetre (cm) lower than the water level in off Site monitoring

well CH-47E, LANXESS shall adjust pumping rates to maintain containment, and if containment is not attained within five working days (or in the event of routine maintenance, equipment repair, or circumstances beyond LANXESS' control, the elevation differential required need not be maintained for periods of time up to two weeks), LANXESS will initiate monthly groundwater sampling for chlorobenzene and n-nitrosodimethylamine (NDMA) analyses, collected from six off-Site sentry monitoring wells. While PW4 was operating at a reduced pumping rate, this 1 cm differential could not be maintained. LANXESS collected groundwater samples from off-Site MU sentry monitoring wells OW58-13, OW165-17, CH-47E, CH-97B, CH-56B, and CH-89B on August 29, 2024 and on September 19, 2024. Tables E.1 and E.2 (Attachment E) provide the MU sentry well results. Figures E.1 through E.6 (Attachment E) present the NDMA and chlorobenzene results for March 2008 through September 2024. GHD completed statistical analyses on the MU sentry well data to identify trends in the concentrations of NDMA and chlorobenzene in groundwater samples collected from these wells. The following table summarizes the trend analysis results:

Trend Analysis Results		
Monitoring Wells	**NDMA Trends**	**Chlorobenzene Trends**
OW58-13	>50% ND	100% ND
OW165-17	>50% ND	>50% ND
CH-89B	>50% ND	>50% ND
CH-47E	**Decreasing Trend**	**Decreasing Trend**
CH-56B	**Decreasing Trend**	**Decreasing Trend**
CH-97B	>50% ND	>50% ND

GHD did not complete the trend analysis for the OW58-13, OW165-17, CH-89B, and CH-97B data sets because the majority of the results were non-detect and the statistical model is not valid for data sets where the chemical of interest was not detected in the majority of the samples. GHD identified statistically significant decreasing trends in NDMA and chlorobenzene concentrations over time in the groundwater samples collected from MU sentry wells CH-47E and CH-56B. The decreasing trends and the persistence of the non-detect results for NDMA and chlorobenzene in the groundwater samples from OW58-13, OW165-17, CH-89B and CH-97B provide an independent line of evidence that the on-Site MU containment wells continue to achieve hydraulic containment of the most heavily impacted groundwater beneath the southwest portion of the Site in 2024. LANXESS will complete the semi-annual sampling as part of the MU Sentry Well Monitoring Program in October 2024 and provide similar trend analyses in the October Progress Report.

PW5 continued operating at a reduced pumping rate in September 2024. The well is currently unable to maintain its Target Average pumping rate. PW6 is being installed as a replacement well to maintain the Target Average pumping rate. PW6 is on schedule for completion by the end of the year as previously committed to by LANXESS.The PW5 Target Average pumping rate is an internal operational guideline LANXESS uses when operating extraction/containment wells, which includes a significant safety factor. Despite not meeting the Target Average pumping rate, hydraulic monitoring data indicate PW5 currently generates an effective groundwater capture zone. LANXESS is in the process of connecting new replacement well PW6 to the existing treatment system infrastructure and is working towards bringing the well online. The communication and power lines are scheduled to be installed in October 2024.

W5A continued pumping at a reduced rate (between 2.2 L/s and 2.5 L/s) in September 2024 as the well is unable to maintain its target pumping rate (4.5 L/s). LANXESS will schedule inspection and rehabilitation of the well, subject to contractor availability.

W9 continued pumping at a reduced rate during September 2024. The well pump is running at maximum capacity, therefore, LANXESS believes that the decreased pumping rate is due to an issue with the pump/motor and/or decreased well efficiency. Due to delays with contractor availability, LANXESS has scheduled inspection of the pump/motor and possible video inspection for the week of October 7, 2024. Additionally, W9 was shut down from September 23, 2024 through September 26, 2024 to complete the annual service and maintenance on the Trojan UV system.

The E7 average daily pumping rate was less than its Target Average pumping rate in September 2024 due to issues with the wipers on Train B. Train B repeatedly shut down between September 12 and September 25, 2024 due to pump pressure alarms on the main pump PLC. LANXESS' Rayox contractor investigated the issue and determined that the Train B wipers and the solenoid valve that runs the Train B wipers were not operating correctly. These were replaced and Train B was restarted on September 25, 2024 at its target pumping rate.

a) Bypass or Upset Conditions

The bypass or upset conditions encountered in the CTS are summarized in Table A.1 (Attachment A).

b) Data Summary and Interpretation

Table A.2 (Attachment A) presents the analytical results for the CTS samples collected in September 2024 and summarizes the effluent pH and temperature. The discharge pH was between 7.22 and 7.32 Standard Units (su), which is within the ECA discharge limit pH range of 5.5 to 9.5 su. The effluent temperature was between 13.8 and 14.4 degrees Celsius (°C), which is less than the discharge limit of 25°C.

The ATS removed ammonia to concentrations that were less than those required by the ECA.

The Combined Discharge Effluent[1] met the Effluent Limits and Effluent Objectives for all indicator parameters in September 2024.

Table A.3 (Attachment A) summarizes the effluent discharge flow rates. The total flow rate of treated groundwater discharged to the Creek via SS+890 was 34.5 L/s. The total flow rate of additional treated groundwater discharged to the Creek via Shirt Factory Creek (at storm water outfall 0800) was 6.7 L/s. The total flow rate of the combined treated groundwater discharged to the Creek (SS+890 discharge plus Shirt Factory Creek discharge) was 41.2 L/s, which was less than the discharge Effluent Limit of 92.2 L/s.

c) Supplementary Data

As part of the ongoing monitoring of on-Site carbon treatment performance, on September 3, 2024, LANXESS collected samples from the carbon tower influent (GCI) and carbon tower effluent (GCE) for VOC and base/neutral and acid extractable compound (BNA) analyses. Table A.4 (Attachment A) presents the GCI and GCE analytical results.

On September 3, 2024, LANXESS collected samples from the influent to and treated effluent from the portable carbon adsorbers installed to pre-treat groundwater from UA CS wells U+500 and U+560. ECA No. 0831-BX6JGD does not require the collection of groundwater samples from UA CS wells; however, LANXESS has been collecting these samples on a voluntary basis to monitor and improve the performance of the on-Site granular activated carbon (GAC) Tower. LANXESS analyzed the samples for VOCs and BNAs. Table A.4 (Attachment A) presents the analytical results for the influent and pre-treated effluent samples from the U+500 and U+560 containment wells.

d) Routine Maintenance

Routine maintenance tasks completed on the CTS in September 2024 are summarized in Table A.5 (Attachment A). These activities are completed by LANXESS personnel as part of on-going preventative maintenance and system inspections. These maintenance activities do not typically cause a system bypass or shutdown and are not required by the Control Order or ECA. This information is being provided to demonstrate LANXESS' commitment to proactively maintain the CTS and ensure continued operations.

e) Receiver Water Quality Data

As per Amended ECA No-0831-BX6JGD, the receiver water quality monitoring program has been reduced from monthly to once every three (3) months. LANXESS will complete the next quarterly routine monitoring event in October 2024.

---

[1] The Combined Discharge Effluent value was calculated by multiplying the average flow rates by the concentration of the analytes at the SS+890 GE outfall and the additional effluent discharge location via Shirt Factory Creek.

Summary of Efforts Made and Results Achieved

During September 2024, the CTS operated within the Effluent Limits and within the Effluent Objectives for all compounds.

4. Remedial Action Plan

There are no new activities to report for this item in September 2024.

5. E7 AOP

The average E7 pumping rate (20.9 L/s) was less than its recommended Target Average pumping rate (23.9 L/s) during September 2024 due to issues with the Train B wipers and associated solenoid valve. The influent sample collected on September 23, 2024 contained NDMA at a concentration of 0.01 micrograms per litre (µg/L). NDMA was not detected in the effluent sample collected on September 23, 2024 (reporting detection limit [RDL] = 0.01 µg/L).

6. Environmental Audit

There are no new activities to report for this item in September 2024.

7. Remediation of Former Operating Pond Area

There are no new activities to report for this item in September 2024.

8. Additional Work/Studies

There are no new activities to report for this item in September 2024.

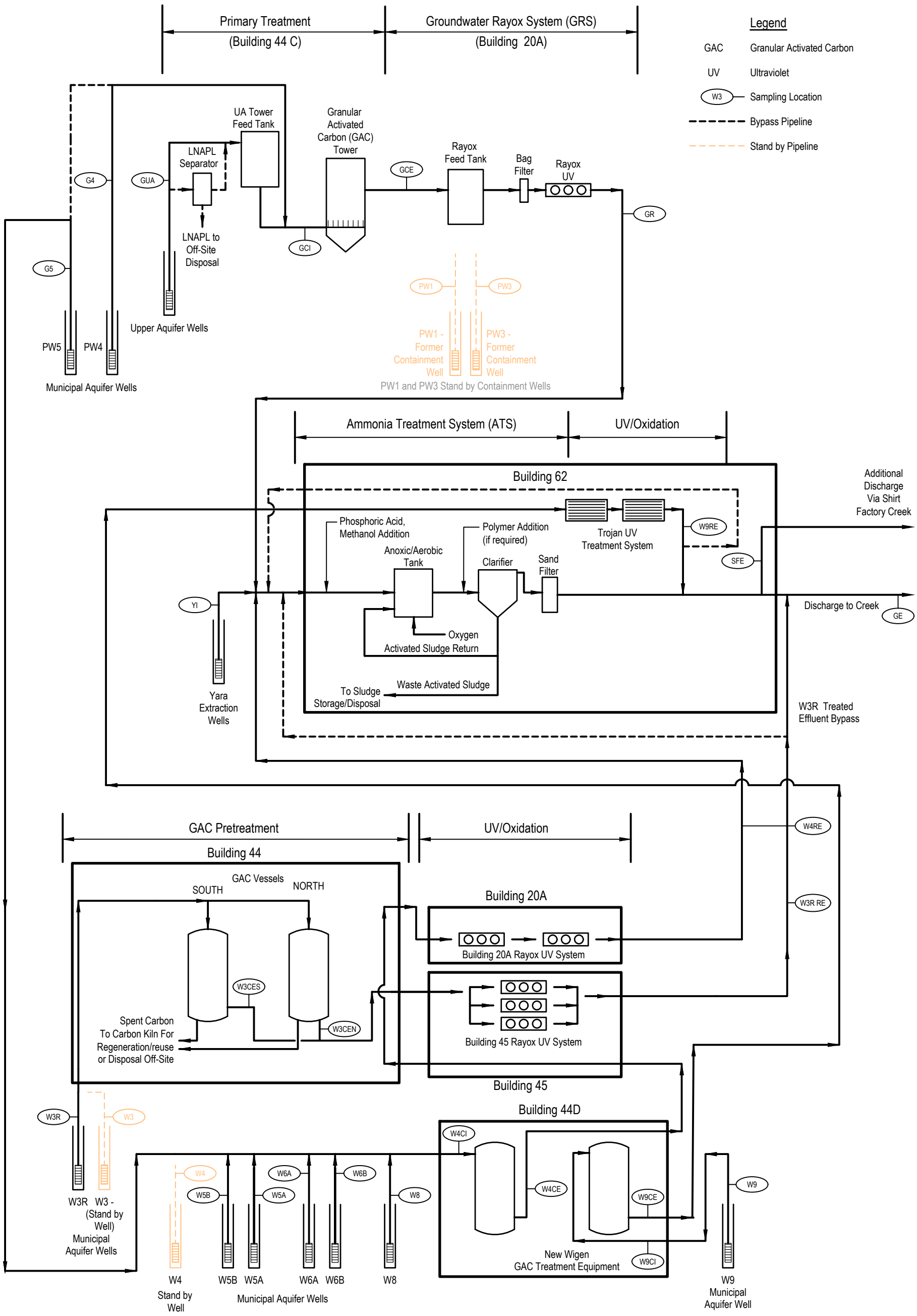
Table 1

Monitoring Program Summary
LANXESS Canada Co./Cie
Elmira, Ontario

Media and Sampling Program	Parameters	Frequency	September 2024 Results Location
Treatment System			
Off-Site Groundwater Collection and Treatment System (Off-Site CTS) Influent	Offsite Broad Scan (Schedule D)	Annual	-
On-Site Groundwater Collection and Treatment System (On-Site CTS) Influent	Effluent Broad Scan (Schedule C)	Annual	-
Combined On-Site and Off-Site Groundwater Collection and Treatment Systems (CTS) Effluent	Indicator parameters	Monthly	Attachment A
	Effluent Broad Scan (Schedule C)	Quarterly	-
CTS Effluent - Acute Toxicity	Not applicable	Quarterly	-
CTS Effluent - Chronic Toxicity	Not applicable	Semi-annual	-
Surface Water			
Environmental Appeal Board (EAB) Sampling	Select VOCs, semi-volatile organic compounds (SVOCs), pesticides, general chemistry	Monthly	Attachment B
Primary Surface Water Quality Monitoring	Indicator parameters	Quarterly	-
	Effluent Broad Scan (Schedule C)	Quarterly	-
Secondary Surface Water Quality Monitoring	Indicator parameters	Quarterly	-
	Effluent Broad Scan (Schedule C)	Quarterly	-
Upper Aquifer Hydraulic Containment Requirement	Schedule E	As required	-
Receiver Biomonitoring Program – Clams	See Biomonitoring Reports	Biennial (Even Years)	-
Receiver Biomonitoring Program – Benthic		Biennial (Odd Years)	-
Groundwater			
Groundwater Elevation Monitoring Program (GEMP)	Elevation	Semi-annual	-
Upper Municipal Aquifer (MU) Sentry Well Monitoring Program	n-Nitrosodimethylamine (NDMA), chlorobenzene	Semi-annual	Attachment E
NAPL Monitoring Program (NMP)	Elevation	Annual	-
Creek Bank Groundwater Monitoring Program – Spring Round	NDMA, chlorobenzene	Annual	-
Creek Bank Groundwater Monitoring Program – Summer Round	Selected pesticides and volatile organic compounds (VOCs)	Annual	Attachment D
Off-Site Sentry Well Monitoring Program	NDMA +/- chlorobenzene	Annual	Attachment C
Off-Site Plume Monitoring Program	NDMA +/- chlorobenzene	Biennial (Odd Years)	-

Attachment A

Analytical Results
Collection and Treatment System



LANXESS CANADA CO./CIE
ELMIRA, ONTARIO

Project No. **11192137**
Date **October 2024**

TREATMENT SYSTEM PROCESS FLOW SCHEMATIC

FIGURE A.1

Filename: N:\CA\Waterloo\Projects\662\11192137\Digital_Design\ACAD 2020\Figures\LTR-GEMP2024SEPTEMBER-DIR060\11192137-GHD-00-00-LTR-EN-D101_WA-GEMP2024SEPTEMBER-DIR060.dwg
Plot Date: 01 October 2024 9:13 AM

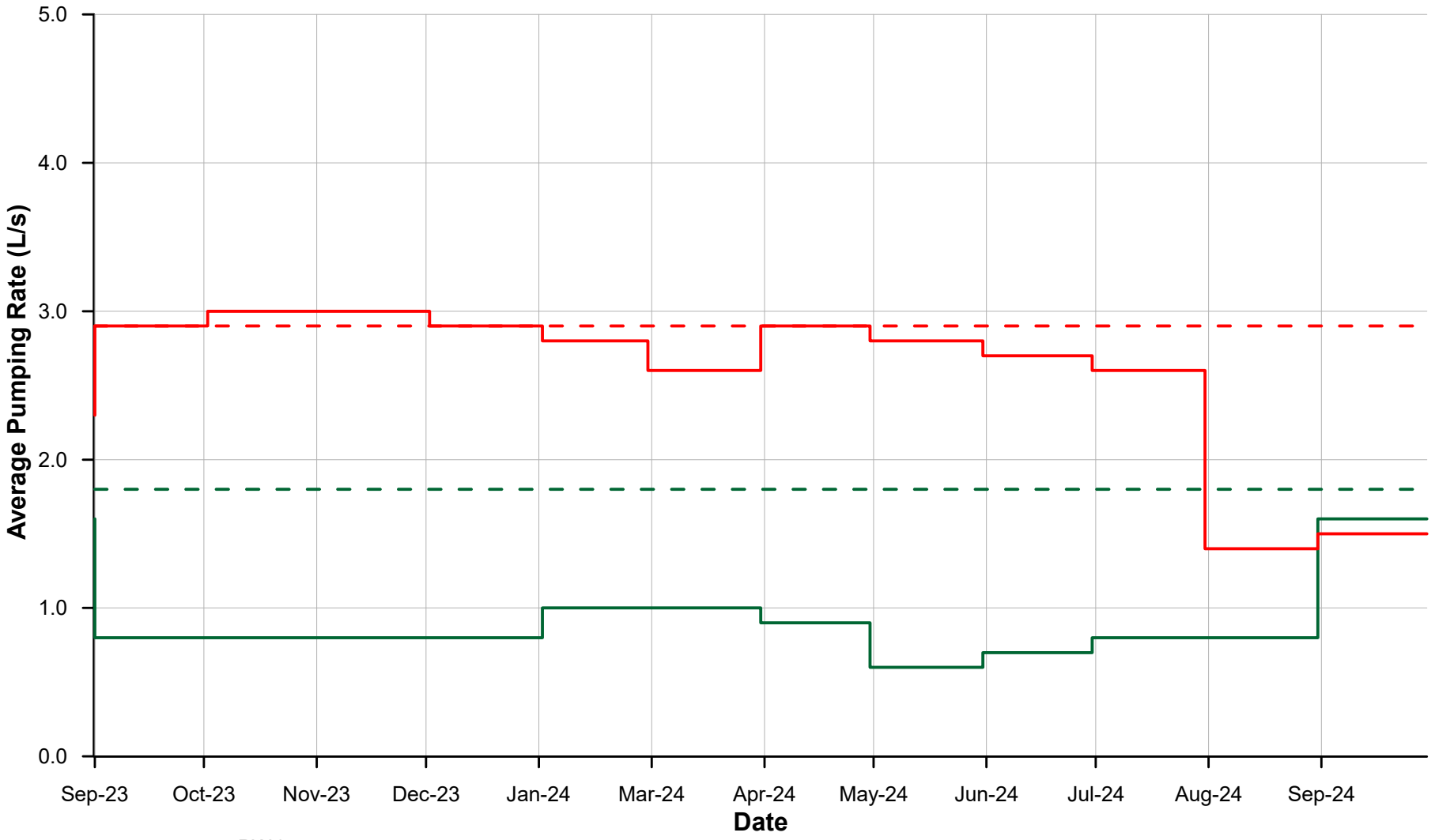


figure A.2

ON-SITE EXTRACTION WELL AVERAGE VS. TARGET PUMPING RATES

LANXESS CANADA CO./CIE

Elmira, Ontario

*Note: Target pumping rates were updated based on the average daily pumping rates recommended in the 2015 Model Check Point Analysis (GHD, June 2016). The Target Average pumping rates are 90% of the recommended daily Set Point pumping rates since the wells and treatment system components require periodic downtime for maintenance.

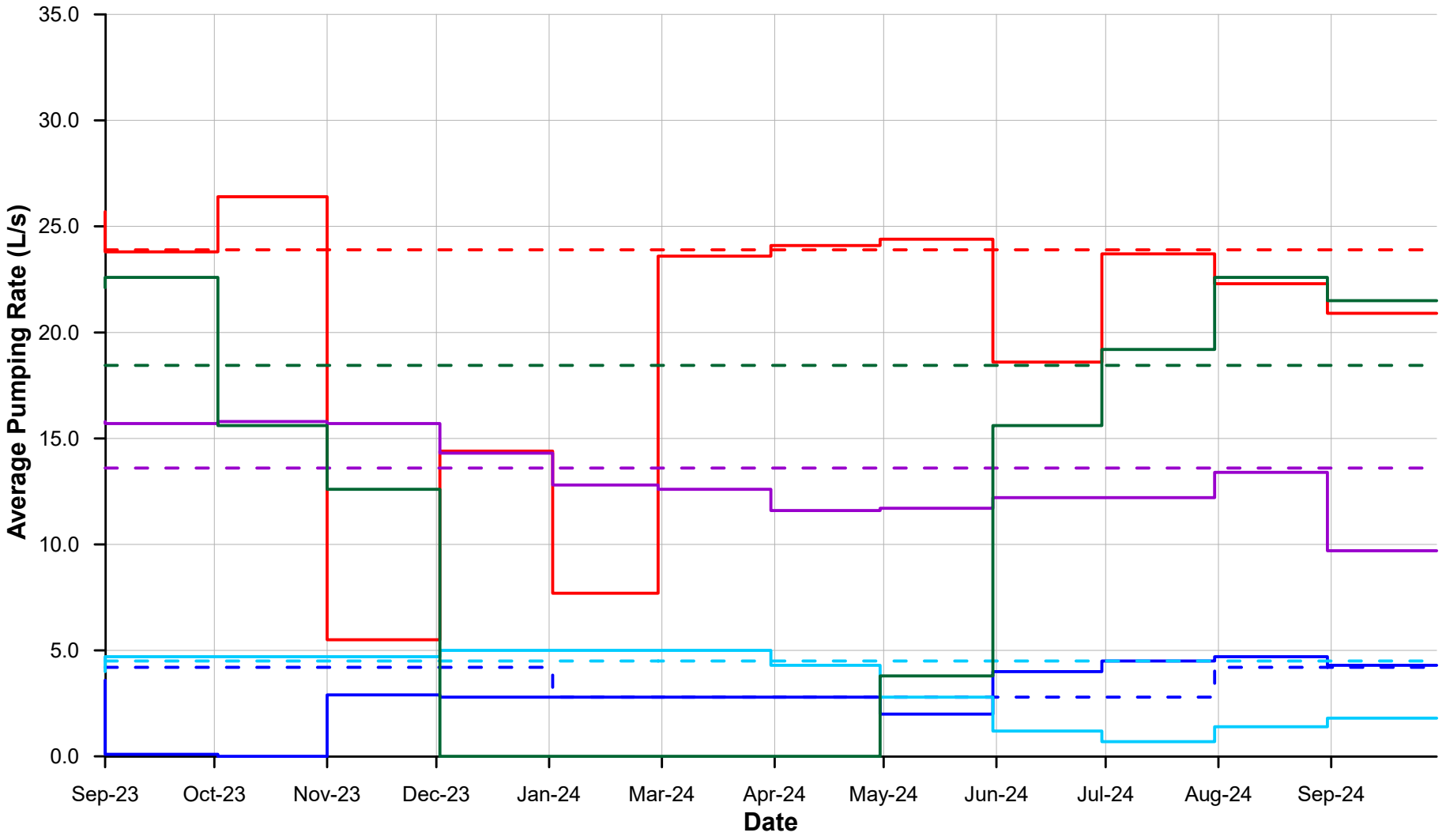


figure A.3a
OFF-SITE EXTRACTION WELL AVERAGE VS. TARGET PUMPING RATES
LANXESS CANADA CO./CIE
Elmira, Ontario

*Note: Target pumping rates were updated based on the average daily pumping rates recommended in the 2015 Model Check Point Analysis (GHD, June 2016). The Target Average pumping rates are 90% of the recommended daily Set Point pumping rates since the wells and treatment system components require periodic downtime for maintenance.

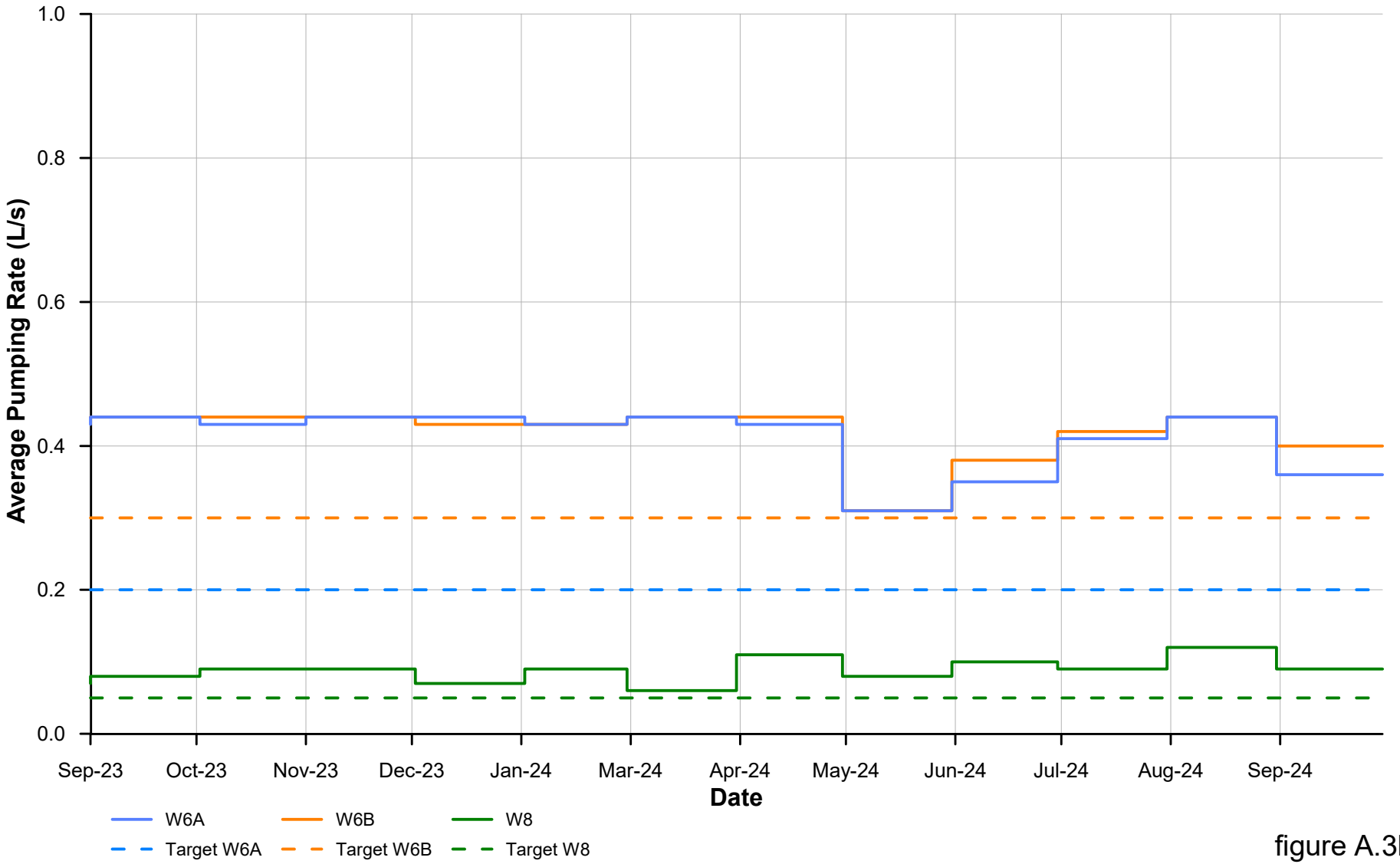


figure A.3b
OFF-SITE EXTRACTION WELL AVERAGE
VS. TARGET PUMPING RATES
LANXESS CANADA CO./CIE
Elmira, Ontario

*Note: Target pumping rates were updated based on the average daily pumping rates recommended in the 2015 Model Check Point Analysis (GHD, June 2016). The Target Average pumping rates are 90% of the recommended daily Set Point pumping rates since the wells and treatment system components require periodic downtime for maintenance.

LANXESS has reduced the W6A and W6B target average pumping rates as a result of reduced well capacity.

Table A.1

Performance - Combined On-Site and Off-Site Groundwater Collection and Treatment System
Bypass/Upset Conditions - September 2024
LANXESS Canada Co./Cie
Elmira, Ontario

ON-SITE GROUNDWATER CONTAINMENT AND TREATMENT SYSTEM

September 21	Shut down at 04:45 for annual plant-wide hydro shut down, plus additional downtime due to plugging of the Rayox system, and restarted September 26, 2024 at 13:30

OFF-SITE GROUNDWATER COLLECTION AND TREATMENT SYSTEM

W3R Groundwater Rayox System

September 21	Shut down at 04:45 for annual plant-wide hydro shut down, and restarted at 17:25
September 24	Shut down at 20:50 for Rayox lamp replacement, and restarted September 26, 2024 at 18:40
September 27	Shut down at 05:30 for scheduled maintenance, and restarted at 11:25

W5A/W5B/W6A/W6B/W8 Groundwater Rayox System [1]

September 21	Shut down at 04:45 for annual plant-wide hydro shut down, and restarted September 22, 2024 at 05:25
September 22	Shut down at 10:00 due to plugging of Rayox A, and restarted at 11:35
September 25	Shut down at 10:20 for cleaning of the Rayox A feed tank, and restarted September 26, 2024 at 16:00

W9 Groundwater Trojan UV/Oxidation System

September 21	Shut down at 04:45 for annual plant-wide hydro shut down, and restarted September 22, 2024 at 06:30
September 22	Shut down at 10:00 due to plugging of Rayox A, and restarted at 12:00
September 23	Shut down at 10:25 to complete the annual service on the Trojan UV system, and restarted September 26, 2024 at 18:15
September 30	Shut down at 10:35 due to a critical alarm on the Trojan system, and restarted October 2, 2024 at 12:30

Note:

[1] Groundwater pumped by PW5 is treated in the W5A/W5B/W6A/W6B/W8 Groundwater Rayox System and PW5 is, therefore, shut down when the W4/W5A/W5B/W6A/W6B/W8 system is shut down.

Table A.2

Combined On-Site and Off-Site Groundwater Containment and Treatment System
Analytical Results [1]
September 2024
LANXESS Canada Co./Cie
Elmira, Ontario

Sample Date	Parameter [2] [3]	Primary Treatment								Secondary Treatment				Tertiary Treatment		Combined Discharge Effluent[4]	Combined Discharge Effluent		
		W3R CEN	W3R CES	W4 CI	W4 CE	W9 CI	W9 CE	GCI	GCE	W3R RE	W4 RE	W9 RE	GR	SFE	GE		Limit	Adjusted Limit [5]	Objective
3-Sep-24	Ammonia-N (mg/L)													0.123	0.143	0.140	0.84[6]	0.84	0.62
3-Sep-24	Total Phosphorus (mg/L)													0.0487	0.138	0.123	0.5	0.5	--
3-Sep-24	BOD_5 (mg/L)													ND(2.0)	ND(2.0)	ND(2.0)	15	15	--
3-Sep-24	Total Cyanide (µg/L)													ND(2)	ND(2)	ND(2)	14	14	ND(5)
3-Sep-24	Formaldehyde (µg/L)													ND(2.0)	ND(2.0)	ND(2.0)	24	24	ND(5)
3-Sep-24	pH (s.u.)													7.32	7.22	7.24	5.5 - 9.5	5.5 - 9.5	--
3-Sep-24	Temperature (°C)													13.8	14.4	14.3	<25	<25	--
3-Sep-24	Chlorobenzene (µg/L)	1.46	2.74	68.2	ND(0.20)	20	2.26	1520	33.6	0.72	ND(0.20)	1.06	8.56	0.89	0.44	0.47	10	11.2	ND(0.5)
17-Sep-24	Chlorobenzene (µg/L)									0.84	ND(0.20)	0.35	33.0	0.29	0.46				
3-Sep-24	Toluene (µg/L)							135	0.77					0.79	ND(0.20)	0.21	5	5.6	ND(0.4)
3-Sep-24	1,1-Dichloroethane (µg/L)							ND(0.20)	ND(0.20)					ND(0.20)	ND(0.20)	ND(0.20)	10	10	ND(1)
3-Sep-24	g-BHC (Lindane) (µg/L)													ND(0.0030)	ND(0.0030)	ND(0.0030)	0.14	0.16	ND(0.003)
3-Sep-24	n-Nitrosodimethylamine (NDMA) (µg/L)[7]									ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)	0.14	0.16	ND(0.01)
17-Sep-24	NDMA (µg/L)[7]									ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)				
3-Sep-24	n-Nitrosodiethylamine (NDEA) (µg/L)[7]									ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	4	4	ND(0.06)
17-Sep-24	NDEA (µg/L)[7]									ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)				
3-Sep-24	Nitrosomorpholine (NMOR) (µg/L)[7]									ND(0.06)	ND(0.06)	ND(0.06)	0.09	ND(0.06)	ND(0.06)	ND(0.06)	4	4.5	ND(0.06)
17-Sep-24	NMOR (µg/L)[7]									ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)	ND(0.06)				
3-Sep-24	Benzothiazole (µg/L)							97.2	ND(2.0)					ND(2.0)	ND(2.0)	ND(2.0)	4	4.5	ND(2)
3-Sep-24	Carboxin (µg/L)							98.2	0.219					ND(0.100)	ND(0.100)	ND(0.100)	7	7.8	ND(2)

SS+890 Discharge (GE) Flow Rate	34.5 L/s
Shirt Factory Creek Discharge (SFE) Flow Rate	6.7 L/s
Total Combined Discharge Effluent Flow	41.2 L/s

Table A.2

Combined On-Site and Off-Site Groundwater Containment and Treatment System
Analytical Results [1]
September 2024
LANXESS Canada Co./Cie
Elmira, Ontario

Notes:

[1]	All samples analyzed by ALS Canada Ltd. unless otherwise noted.		
[2]	"Parameters" are the parameters identified in ECA No. 0831-BX6JGD.		
[3]	The Sample Locations are coded as follows:		
W3R CEN	W3R North Carbon Adsorber Effluent.	W3R CES	W3R South Carbon Adsorber Effluent.
W4CI	W4 Carbon Adsorber Influent. The influent may include influent from W5A, W5B, W6A, W6B, W8 and PW5.		
W4CE	W4 Carbon Adsorber Effluent. The effluent may include effluent from W5A, W5B, W6A, W6B, W8 and PW5.		
W9CI	W9 Carbon Adsorber Influent.	W9CE	W9 Carbon Adsorber Effluent.
GCI	On-Site Carbon Tower Influent.	GCE	On-Site Carbon Tower Effluent.
W3R RE	Effluent from the W3R UV system.		
W4 RE	Effluent from the W4 UV system prior to treatment through the ATS. The effluent may include effluent from W5A, W5B, W6A, W6B, W8 and PW5.		
W9 RE	Effluent from the W9 Trojan UV/oxidation system.	GR	On-Site Groundwater Rayox Effluent.
SFE	Additional Effluent Discharge via Shirt Factory Creek.	GE	Effluent Discharge to Canagaguige Creek.
[4]	The Combined Discharge Effluent value is a calculated value determined by using average flow data from GE Effluent Discharge via SS+880 and Additional Effluent Discharge via Shift Factory Creek and monthly sample results from GE and SFE.		
[5]	Adjusted Effluent Requirements are applicable to monthly average discharge flows greater than 46.0 L/s.		
[6]	Total Ammonia Discharge Effluent Limit value is the greater of: calculated concentration, or 0.84 mg/L (May-October) or 2.4 mg/L (November-April) as per ECA No. 0831-BX6JGD.		
[7]	Samples analyzed by the LANXESS lab, Elmira Ontario.		
ND(RDL)	Not detected at the associated reporting detection limit.		

Table A.3

Combined On-Site and Off-Site Groundwater Collection and Treatment System Flow Rates
September 2024
LANXESS Canada Co./Cie
Elmira, Ontario

Date	On-Site Flow Rate [1] (L/s)	Off-Site Flow Rate [2] (L/s)	ATS Influent Flow Rate [3] (L/s)	W3R Bypass Flow Rate (L/s)	W9 Bypass Flow Rate (L/s)	SS+890 Discharge Flow Rate (L/s)	Shirt Factory Creek Discharge Flow Rate (L/s)	Total Combined Discharge Effluent Flow Rate [4] (L/s)
9/1/2024	2.1	44.9	11.6	23.7	12.2	38.3	9.1	47.4
9/2/2024	2.1	44.6	11.4	23.7	12.0	38.1	9.0	47.1
9/3/2024	2.1	44.4	11.4	23.7	11.8	38.2	8.6	46.8
9/4/2024	2.1	44.1	11.3	23.7	11.6	37.7	8.9	46.5
9/5/2024	2.1	42.1	9.4	23.7	11.5	38.1	6.5	44.5
9/6/2024	2.1	41.6	9.0	23.7	11.3	38.3	5.7	44.0
9/7/2024	2.1	41.4	9.0	23.7	11.2	38.4	5.4	43.9
9/8/2024	2.1	41.2	9.0	23.7	11.0	38.0	5.7	43.7
9/9/2024	2.1	41.1	8.9	23.7	10.9	38.2	5.3	43.4
9/10/2024	2.1	42.9	10.8	23.7	10.7	37.8	7.4	45.2
9/11/2024	2.1	43.3	11.4	23.7	10.6	37.9	7.8	45.7
9/12/2024	2.1	42.9	11.2	23.7	10.5	37.6	7.7	45.3
9/13/2024	2.1	42.3	10.7	23.7	10.4	37.7	7.0	44.7
9/14/2024	2.1	42.6	11.1	23.7	10.2	37.6	7.4	45.0
9/15/2024	2.1	42.5	11.1	23.7	10.1	37.7	7.2	44.9
9/16/2024	2.1	41.7	10.3	22.9	10.8	36.8	7.2	44.0
9/17/2024	2.6	44.3	10.8	23.7	12.6	37.6	9.5	47.1
9/18/2024	2.9	45.8	12.6	23.7	12.6	37.5	11.4	48.9
9/19/2024	3.3	45.7	12.9	23.7	12.6	37.4	11.8	49.1
9/20/2024	3.3	43.2	11.0	23.7	12.0	37.3	9.3	46.7
9/21/2024	1.2	16.8	2.6	10.6	4.8	16.6	1.5	18.1
9/22/2024	0.0	38.0	6.1	23.7	8.4	33.8	4.3	38.1
9/23/2024	0.0	38.3	9.3	23.7	5.5	35.4	3.1	38.5
9/24/2024	0.0	28.8	9.3	19.7	0.0	28.9	0.1	29.0
9/25/2024	0.0	3.9	4.1	0.0	0.0	4.1	0.0	4.1
9/26/2024	1.5	11.7	4.5	5.3	3.4	10.6	2.6	13.2
9/27/2024	3.3	39.8	12.5	18.1	12.6	35.6	7.5	43.1
9/28/2024	3.2	45.4	12.4	23.7	12.6	38.9	9.7	48.7
9/29/2024	3.2	45.4	12.4	23.7	12.6	38.6	10.0	48.6
9/30/2024	3.3	38.1	12.6	23.7	5.3	37.2	4.4	41.6
Average	**2.1**	**39.0**	**10.0**	**21.5**	**9.7**	**34.5**	**6.7**	**41.2**
Minimum	**0.0**	**3.9**	**2.6**	**0.0**	**0.0**	**4.1**	**0.0**	**4.1**
Maximum	**3.3**	**45.8**	**12.9**	**23.7**	**12.6**	**38.9**	**11.8**	**49.1**

Notes:

L/s Litres per second
[1] The ECA requires that the influent flow rate to the on-Site Treatment System be less than 5 L/s.
[2] The ECA requires that the influent flow rate to the off-Site Treatment System be less than 87.2 L/s.
[3] The ECA requires that the influent flow rate to the Ammonia Treatment System be less than 46 L/s.
[4] The ECA requires that the monthly average effluent discharge flow rate be less than 92.2 L/s.

Table A.4

Supplementary Sample Analytical Results
September 2024
LANXESS Canada Co./Cie
Elmira, Ontario

Sample Location:	**UA500I**	**UA500CE**	**UA560I**	**UA560CE**	**GCI**	**GCE**
Sample Date:	**9/3/2024**	**9/3/2024**	**9/3/2024**	**9/3/2024**	**9/3/2024**	**9/3/2024**
Parameter [µg/L]						
Volatile Organic Compounds (VOCs)						
Benzene	22.8	1.96	25.6	ND(0.20)	9.8	ND(0.20)
Chlorobenzene	1130	45.1	646	ND(0.20)	1520	33.6
1,1-Dichloroethane	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Ethylbenzene	109	3.98	66.3	ND(0.20)	17.6	ND(0.20)
Toluene	10100	404	12400	0.51	135	0.77
m/p-Xylenes [1]	199	6.35	143	ND(0.40)	10.9	ND(0.40)
o-Xylene [1]	129	4.69	93.9	ND(0.20)	9.62	ND(0.20)
Base/Neutral and Acid Extractable Compounds (BNAs)						
Aniline	2010	193	2960	ND(2.0)	75.2	ND(2.0)
Benzothiazole	1400	65.5	31.8	ND(2.0)	97.2	ND(2.0)
Carboxin (Oxathiin)	2000	98.5	1580	ND(0.100)	98.2	0.219
2-Chlorophenol	17.5	1.16	0.42	ND(0.30)	5.01	ND(0.30)
2-Mercaptobenzothiazole	3300	128	ND(50)	ND(20)	232	ND(20)
2,4-Dichlorophenol	86.3 J+	3.98 J+	0.42	ND(0.20)	0.34	ND(0.20)
2,6-Dichlorophenol	9.55	0.62	0.26	ND(0.20)	0.24	ND(0.20)
2,4,5-Trichlorophenol	36.3	1.39	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
2,4,6-Trichlorophenol	11.3	0.69	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)

Notes:

UA500I	Influent to the installed UA500R portable carbon drum.
UA500CE	Effluent from the installed UA500R portable carbon drum.
UA560I	Influent to the installed UA560 portable carbon drum.
UA560CE	Effluent from the installed UA560 portable carbon drum.
GCI	Carbon Tower Influent.
GCE	Carbon Tower Effluent.
ND(RDL)	Not detected at the associated reporting detection limit.
J+	The result is an estimated quantity, but the result may be biased high.
[1]	Samples analyzed for m,p-Xylenes and o-Xylene only.
	No separate analysis for Total Xylenes.

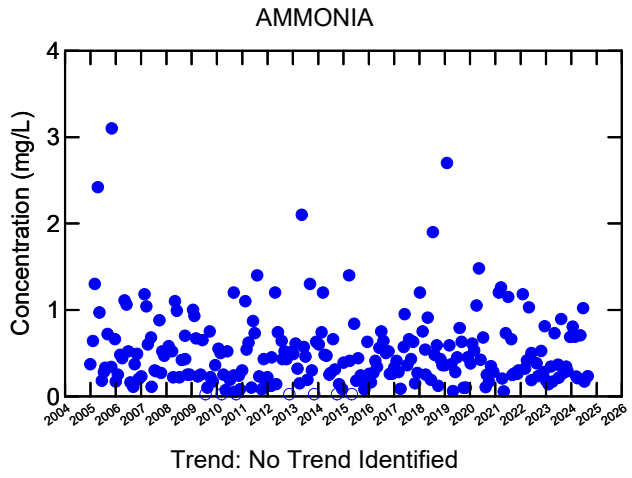
Table A.5

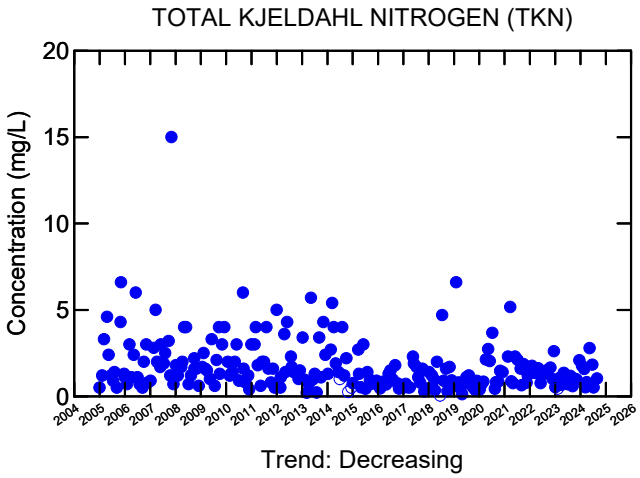
Maintenance Summary
On-Site and Off-Site Groundwater Collection and Treatment System
September 2024
LANXESS Canada Co./Cie
Elmira, Ontario

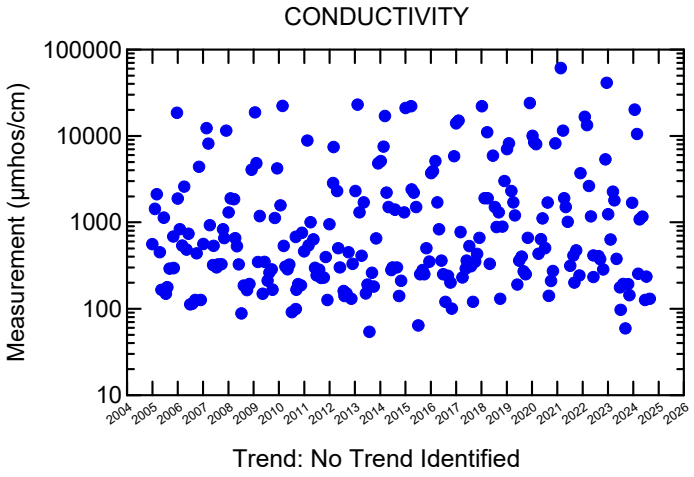
Start Date	Description	Work Type
09/03/2024	Check 44-PG-201 (44PM-45) - UA+500 Carbon System Pressure	Instrumentation
09/03/2024	Check 44-PG-202 (44PM-45) - UA+560 Carbon System Pressure	Instrumentation
09/03/2024	Check 62-PG-204 (62PM-23) - North Clarifier RAS Pump Pressure Guage	Instrumentation
09/03/2024	Check 62-PG-205 (62PM-23) - South Clarifier RAS Pump Pressure Guage	Instrumentation
09/03/2024	Check 62-PG-206 (62PM-23) - North Aeration Pump Pressure	Instrumentation
09/03/2024	Check 62-PG-201 (62PM-23) - South Aeration Pump Pressure	Instrumentation
09/04/2024	Check/Replace Bearings on North Aeration Pump	Mechanical
09/05/2024	Check 62-AIT-901 (62PM-13) - Nitrification Tank pH	Instrumentation
09/05/2024	Check 62-AIT-904 (62-ICP-904) - Nitrification Tank Dissolved O2	Instrumentation
09/05/2024	Check 62-AIT-790 (62PM-26) - Creek Water pH Transmitter	Instrumentation
09/05/2024	Rayox A Wipers #4 & #6 Sticking	Electrical
09/18/2024	Check 20-LT-322B (20PM-059) - W6B Well Level Transmitter	Instrumentation
09/18/2024	E7/E9 Rayox B Shutting Down on Pressure	Electrical
09/18/2024	Check 62-AIT-841 (62PM-02) - Nitrification Tank Anoxic pH	Instrumentation
09/18/2024	Check 62-AIT-844 (62PM-01) - Nitrification Tank Dissolved O2	Instrumentation
09/18/2024	Check 62-AIT-842 (62PM-10) - Nitrification Tank Anoxic ORP	Instrumentation
09/18/2024	Check 62-AIT-843 (62PM-04) - Nitrification Tank Aeration pH	Instrumentation
09/18/2024	Check 44-LT-302 (44PM-55) - W8 Well Level Transmitter	Instrumentation
09/18/2024	Check 44-LT-312 (44PM-056) - W9 Well Level Transmitter	Instrumentation
09/24/2024	Add Camlock Fitting to Bldg. #44D Backwash Tank Sump Line	Piping
09/25/2024	Open Bldg. #20A Rayox Feed Tank For Cleaning	Mechanical
09/30/2024	Check 62-TT-790 (62PM-25) - Creek Water pH Transmitter	Instrumentation

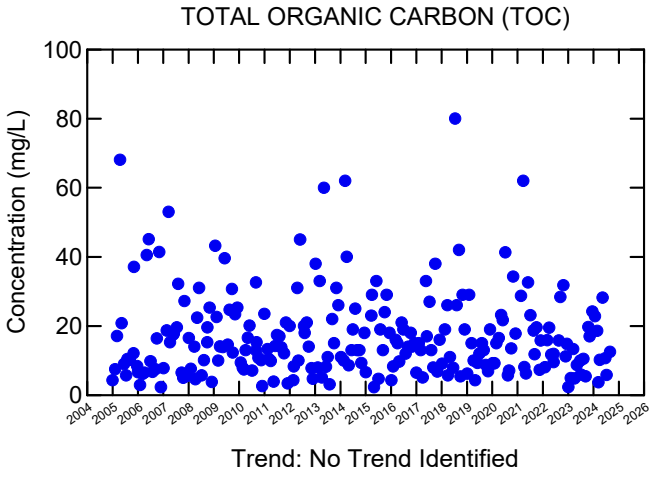
Attachment B

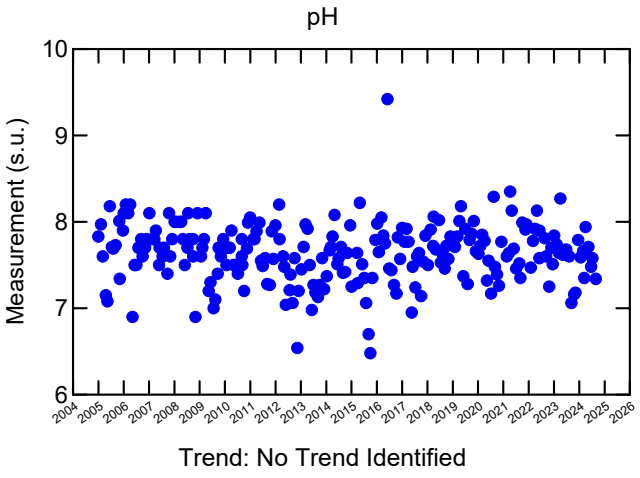
EAB Data











Legend:

- Detected Result
- Non-detect (plotted at one half the detection limit)

Notes:

Any detection limits elevated above target detection limit and/or detected values were not included in the trend analysis.

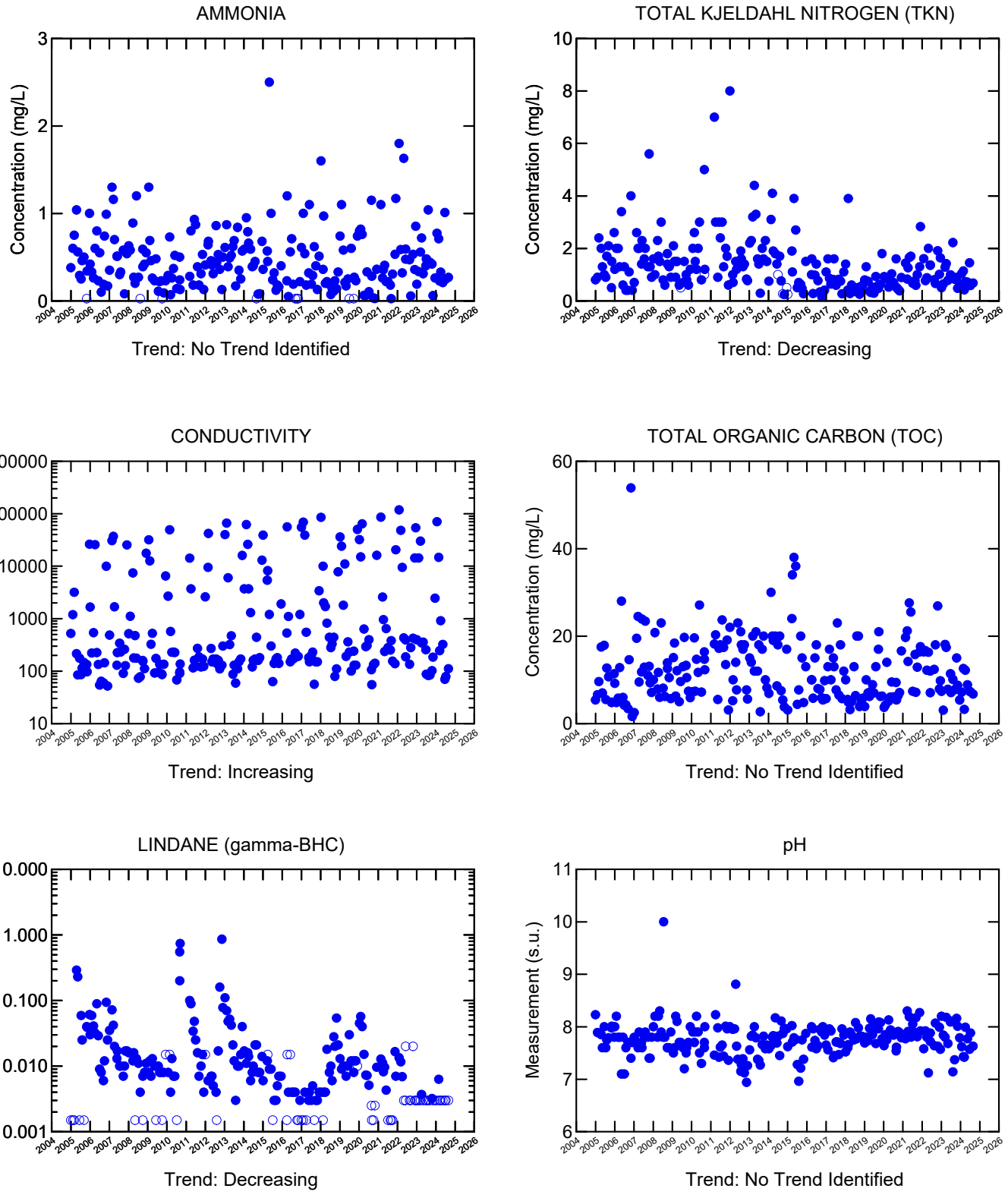
No Trend: trend analysis did not detect a significant trend above 95 percent confidence.

LANXESS Canada Co./Cie
Elmira, Ontario

ANALYTE CONCENTRATION vs. TIME
STORM WATER OUTFALL 0200

Project No. **11192137-38**
Date: **Oct 3, 2024**

FIGURE B.1



Legend:

- Detected Result
- Non-detect (plotted at one half the detection limit)

Notes:

Any detection limits elevated above target detection limit and/or detected values were not included in the trend analysis.

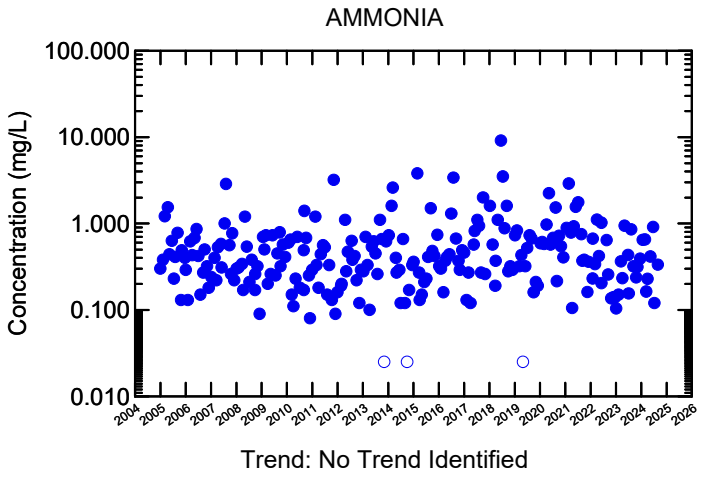
No Trend: trend analysis did not detect a significant trend above 95 percent confidence.

LANXESS Canada Co./Cie
Elmira, Ontario

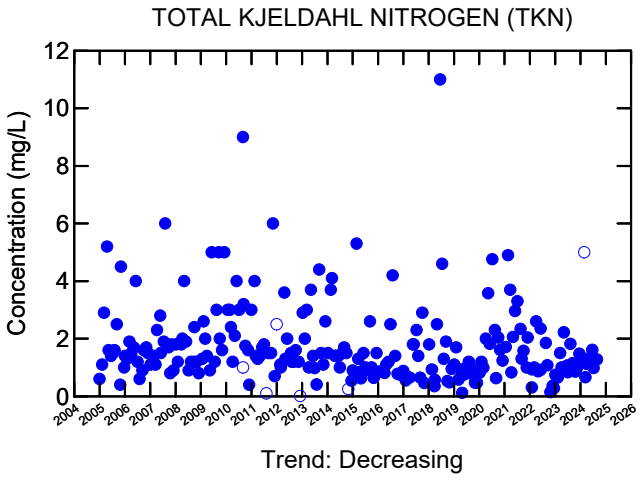
ANALYTE CONCENTRATION vs. TIME
STORM WATER OUTFALL 0400

Project No. **11192137-38**
Date: **Oct 3, 2024**

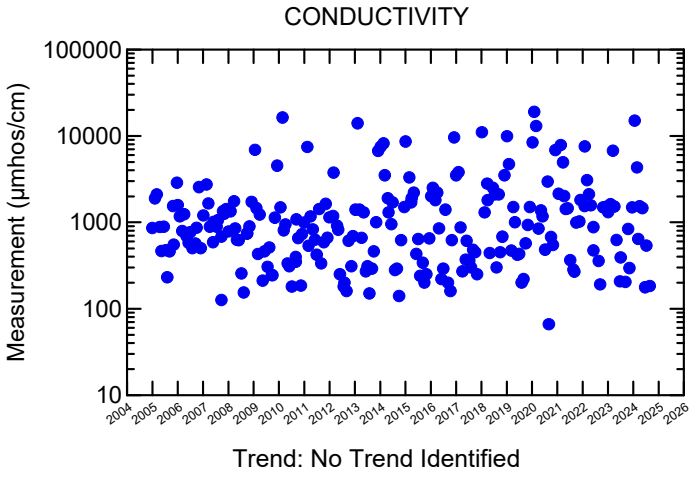
FIGURE B.2



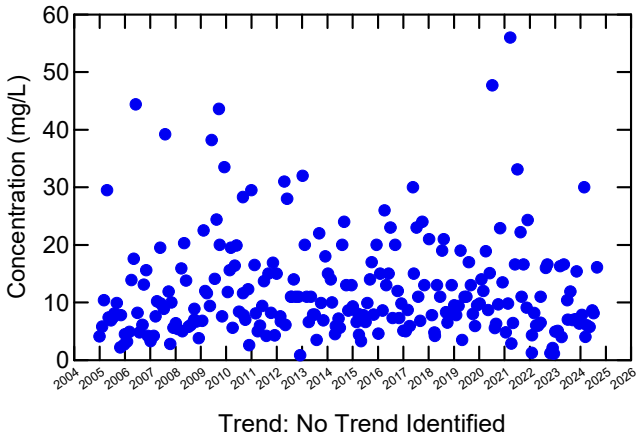
Trend: No Trend Identified



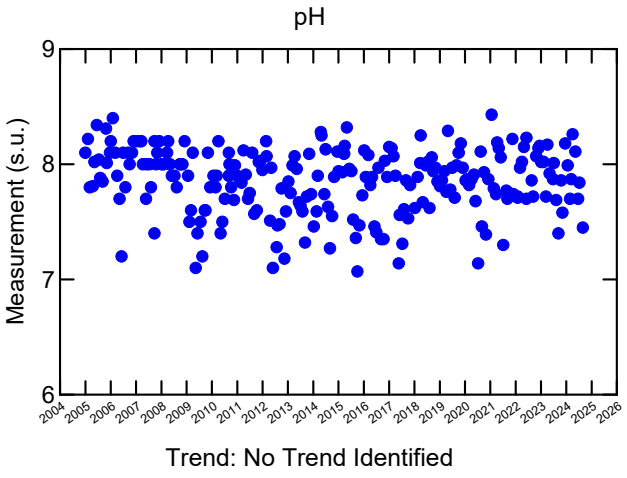
Trend: Decreasing



Trend: No Trend Identified



Trend: No Trend Identified



Trend: No Trend Identified

Legend:

- Detected Result
- Non-detect (plotted at one half the detection limit)

Notes:

Any detection limits elevated above target detection limit and/or detected values were not included in the trend analysis.

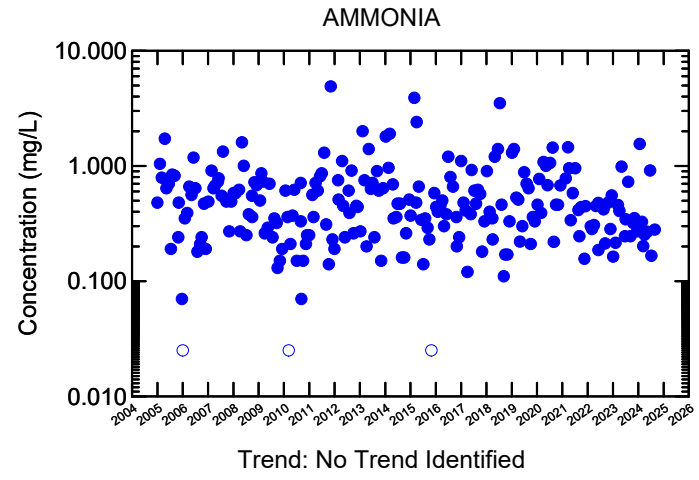
No Trend: trend analysis did not detect a significant trend above 95 percent confidence.

LANXESS Canada Co./Cie
Elmira, Ontario

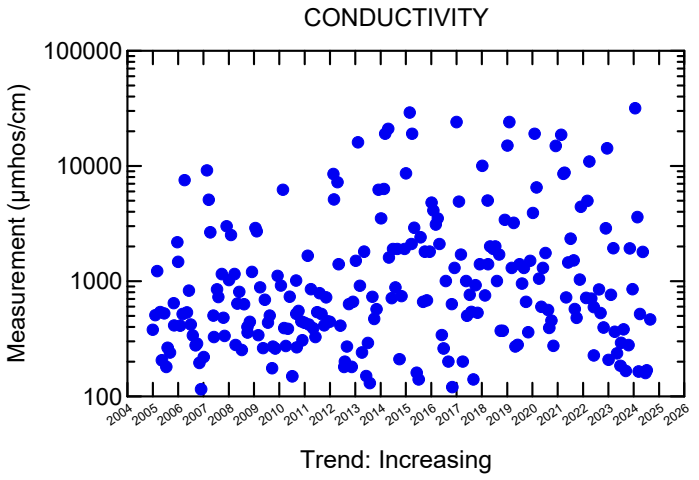
ANALYTE CONCENTRATION vs. TIME
STORM WATER OUTFALL 0800

Project No. **11192137-38**
Date: **Oct 3, 2024**

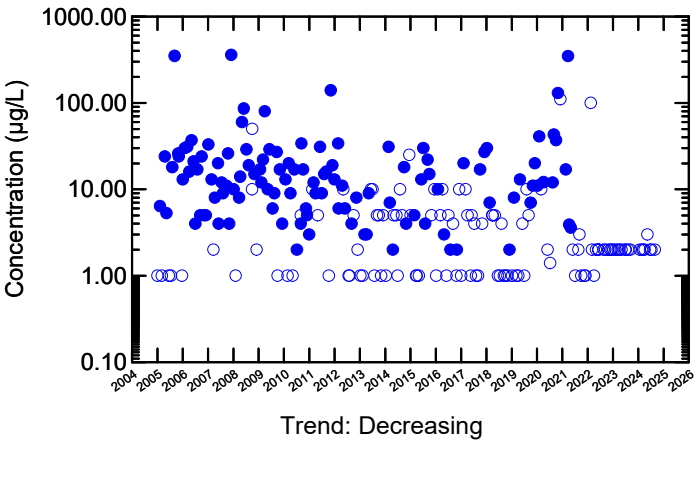
FIGURE B.3



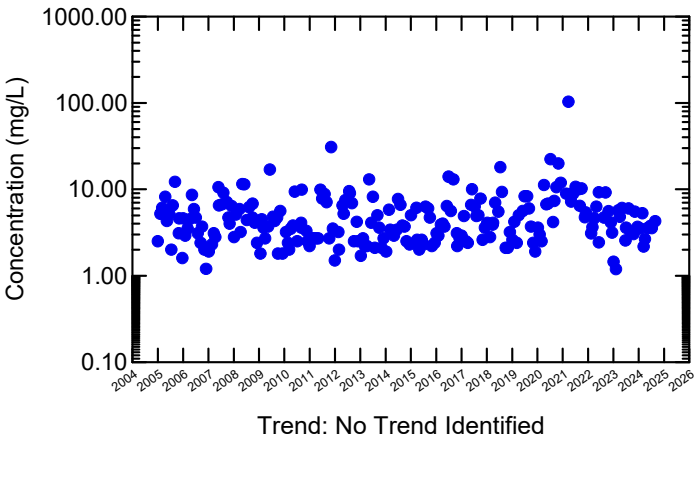
Trend: No Trend Identified



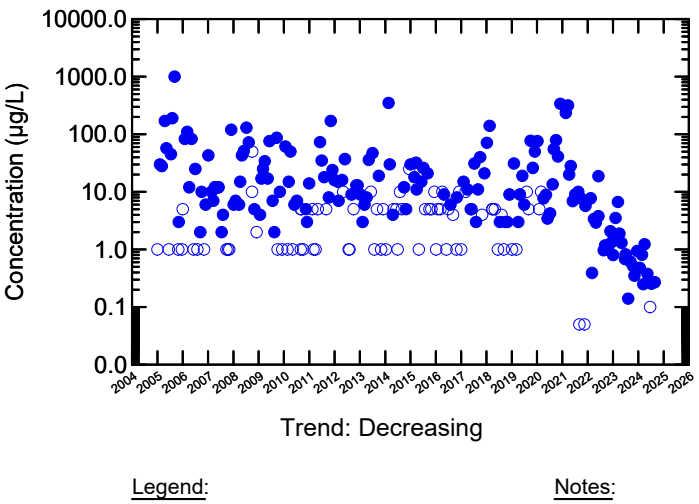
Trend: Increasing



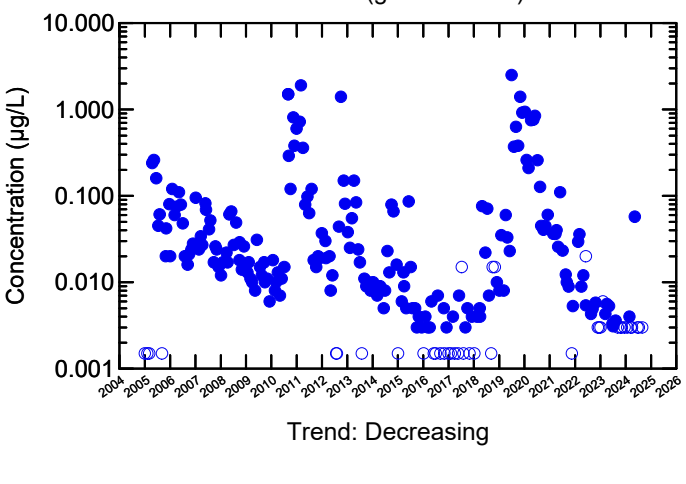
Trend: Decreasing



Trend: No Trend Identified



Trend: Decreasing



Trend: Decreasing

Legend:

- Detected Result
- Non-detect (plotted at one half the detection limit)

Notes:

Any detection limits elevated above target detection limit and/or detected values were not included in the trend analysis.

No Trend: trend analysis did not detect a significant trend above 95 percent confidence.

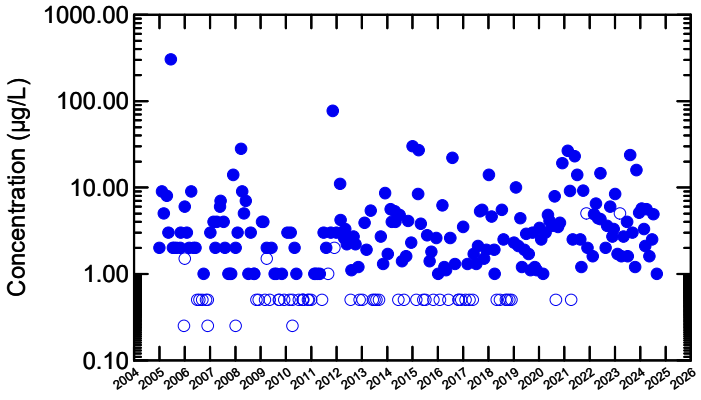
LANXESS Canada Co./Cie
Elmira, Ontario

ANALYTE CONCENTRATION vs. TIME
STORM WATER SEWER

Project No. **11192137-38**
Date: **Oct 3, 2024**

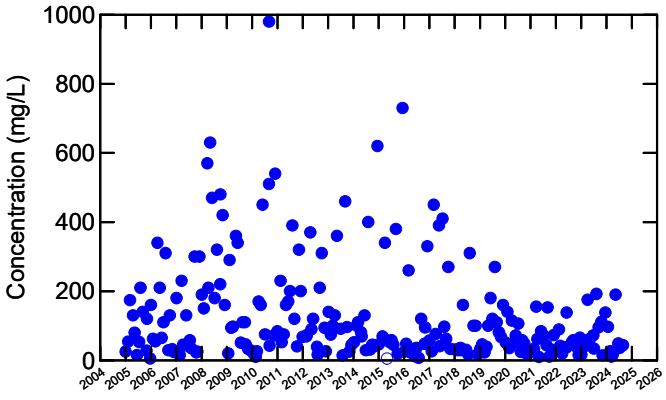
FIGURE B.4

PHENOLICS (TOTAL)



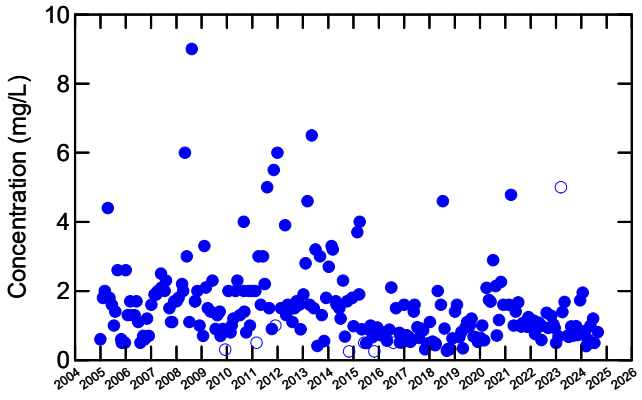
Trend: Increasing

TOTAL SUSPENDED SOLIDS (TSS)



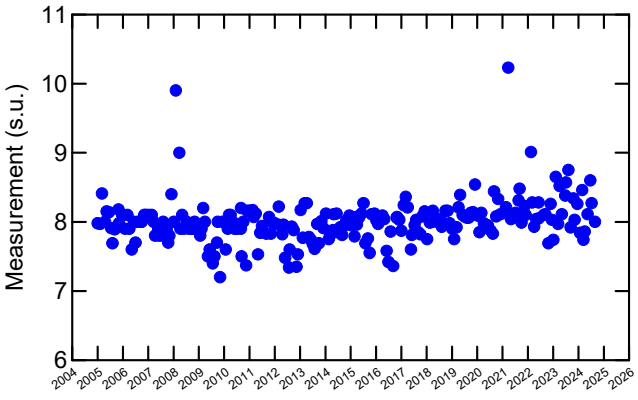
Trend: Decreasing

TOTAL KJELDAHL NITROGEN (TKN)



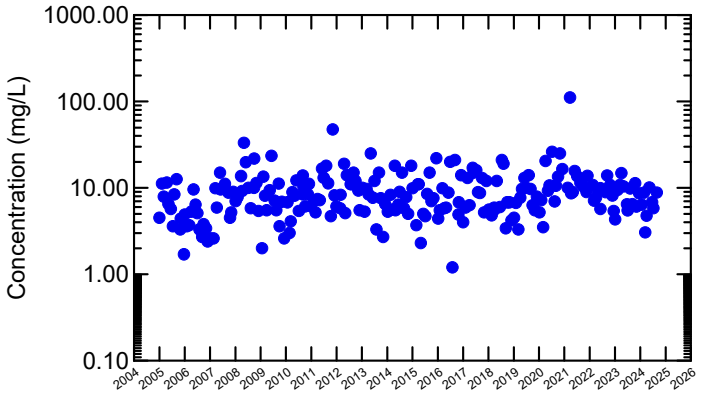
Trend: Decreasing

pH



Trend: Increasing

TOTAL ORGANIC CARBON (TOC)



Trend: Increasing

Legend:

- Detected Result
- Non-detect (plotted at one half the detection limit)

Notes:

Any detection limits elevated above target detection limit and/or detected values were not included in the trend analysis.

No Trend: trend analysis did not detect a significant trend above 95 percent confidence.

LANXESS Canada Co./Cie
Elmira, Ontario

ANALYTE CONCENTRATION vs. TIME
STORM WATER SEWER

Project No. **11192137-38**
Date: **Oct 3, 2024**

FIGURE B.5

Table B.1

Environmental Appeal Board (EAB)
Analytical Results - August 2024
LANXESS Canada Co./Cie
Elmira, Ontario

Sample Location:		**Storm Water Sewer**	**Storm Water Outfall 0200**	**Storm Water Outfall 0400**	**Storm Water Outfall 0800**
Sample ID:		**SWS 083024**	**0200 083024**	**0400 083024**	**0800 083024**
Sample Date:		**8/30/2024**	**8/30/2024**	**8/30/2024**	**8/30/2024**
Parameters	**Units**				
General Chemistry					
Ammonia-N	mg/L	0.280	0.233	0.268	0.334
Conductivity	umhos/cm	465	130	111	183
Cyanide (total)	mg/L	ND(0.0020)	0.0022	0.0034	0.0020
Dissolved organic carbon (DOC) (dissolved)	mg/L	4.28 J	--	--	--
pH, lab	s.u.	8.00	7.34	7.63	7.45
Phenolics (total)	mg/L	0.0010	--	--	--
Sulfide	mg/L	0.043	0.024	ND(0.018)	0.021
Total kjeldahl nitrogen (TKN)	mg/L	0.807	1.03	0.679	1.28
Total organic carbon (TOC)	mg/L	8.83	12.5	6.74	16.1
Total suspended solids (TSS)	mg/L	43.7 J	--	--	--
Herbicides					
2,4,5-TP (Silvex)	µg/L	ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
2,4-DB	µg/L	ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
2,4-Dichlorophenoxyacetic acid (2,4-D)	µg/L	ND(0.500)	ND(0.500)	ND(0.500)	3.00
Pesticides					
gamma-BHC (lindane)	µg/L	ND(0.0030)	ND(0.0030)	ND(0.0030)	ND(0.0030)
Semi-Volatiles					
2-Mercaptobenzothiazole	µg/L	ND(20)	ND(20)	ND(20)	ND(20)
Aniline	µg/L	ND(2.0) UJ	ND(2.0) UJ	ND(2.0) UJ	ND(2.0) UJ
Benzothiazole	µg/L	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Carboxin	µg/L	0.270	ND(0.100)	ND(0.100)	ND(0.100)
N-Nitrosodiethylamine	µg/L	ND(0.06) UJ	ND(0.06) UJ	ND(0.06) UJ	ND(0.06) UJ
N-Nitrosodimethylamine	µg/L	ND(0.01) UJ	ND(0.01) UJ	ND(0.01) UJ	ND(0.01) UJ
N-Nitrosodi-n-butylamine	µg/L	ND(0.06) UJ	ND(0.06) UJ	ND(0.06) UJ	ND(0.06) UJ
N-Nitrosodiphenylamine	µg/L	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
N-Nitrosodiphenylamine + Diphenylamine	µg/L	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)
Nitrosomorpholine	µg/L	ND(0.06) UJ	ND(0.06) UJ	ND(0.06) UJ	ND(0.06) UJ
Volatiles					
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	ND(20)	ND(20)	ND(20)	ND(20)
Ethylbenzene	µg/L	ND(0.20)	ND(0.20)	0.20	ND(0.20)
m&p-Xylenes	µg/L	ND(0.40)	ND(0.40)	0.99	ND(0.40)
o-Xylene	µg/L	ND(0.20)	ND(0.20)	0.46	ND(0.20)
Toluene	µg/L	ND(0.20)	ND(0.20)	ND(0.20)	0.31
Misc					
Oil and grease	mg/L	ND(5.0)	--	--	--

Notes:

ND(RDL)	Not detected at the associated reporting detection limit.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
--	The parameter was not analyzed for.

Attachment C

Analytical Results
Off-Site Routine Groundwater Monitoring Program

Table C.1

2024 Off-Site Routine Groundwater Monitoring
August 2024 Analytical Results
LANXESS Canada Co./Cie
Elmira, Ontario

Sample Location:		**OW15d**	**OW15i**	**OW16d**	**OW16i**
Sample ID:		**GW-4432-081924-AB-035**	**GW-4432-081924-AB-036**	**GW-4432-081924-AB-037**	**GW-4432-081924-AB-038**
Sample Date:		**8/19/2024**	**8/19/2024**	**8/19/2024**	**8/19/2024**
Sample Type:		**Original**	**Original**	**Original**	**Original**
Parameters	**Units**				
Field Parameters					
Conductivity	mS/cm	1.69	0.783	1.79	1.86
pH	s.u.	7.39	7.64	7.64	7.60
Temperature	Deg C	10.34	10.18	10.89	10.64
Turbidity	NTU	60.5	11.2	>1000	46.2
Semi-Volatiles					
n-Nitrosodimethylamine (NDMA)	µg/L	ND(0.00360)	0.0307	ND(0.00270)	0.142
Volatiles					
Chlorobenzene	µg/L	--	--	ND(0.20)	--

Notes:

ND(RDL) Not detected at the associated reporting detection limit.
J+ The result is an estimated quantity, but the result may be biased high.
-- The parameter was not analyzed for.

2024 Off-Site Routine Groundwater Monitoring
August 2024 Analytical Results
LANXESS Canada Co./Cie
Elmira, Ontario

Sample Location:		**OW16i**	**OW69-13**	**OW174-48**	**OW175-21**
Sample ID:		**GW-4432-081924-AB-039**	**GW-4432-081924-AB-041**	**GW-4432-081224-AN-105**	**GW-4432-081224-AN-104**
Sample Date:		**8/19/2024**	**8/19/2024**	**8/12/2024**	**8/12/2024**
Sample Type:		**Field Duplicate**	**Original**	**Original**	**Original**
Parameters	**Units**				
Field Parameters					
Conductivity	mS/cm	1.86	0.885	1.05	0.747
pH	s.u.	7.60	7.94	7.39	7.51
Temperature	Deg C	10.64	12.79	14.64	12.28
Turbidity	NTU	46.2	3.2	130	29.8
Semi-Volatiles					
n-Nitrosodimethylamine (NDMA)	µg/L	0.150	0.0327	ND(0.00310)	ND(0.00390)
Volatiles					
Chlorobenzene	µg/L	--	--	--	--

Notes:

ND(RDL) Not detected at the associated reporting detection limit.
J+ The result is an estimated quantity, but the result may be biased high.
-- The parameter was not analyzed for.

2024 Off-Site Routine Groundwater Monitoring
August 2024 Analytical Results
LANXESS Canada Co./Cie
Elmira, Ontario

Sample Location:		**OW175-37**	**OW175-44**	**OW175-44**	**OW191-26**
Sample ID:		**GW-4432-081224-AN-103**	**GW-4432-081224-AN-100**	**GW-4432-081224-AN-101**	**GW-4432-081924-AB-034**
Sample Date:		**8/12/2024**	**8/12/2024**	**8/12/2024**	**8/19/2024**
Sample Type:		**Original**	**Original**	**Field Duplicate**	**Original**
Parameters	**Units**				
Field Parameters					
Conductivity	mS/cm	1.48	2.10	2.10	1.27
pH	s.u.	7.39	7.29	7.29	7.03
Temperature	Deg C	13.12	13.34	13.34	10.06
Turbidity	NTU	124	0.0	0.0	26.5
Semi-Volatiles					
n-Nitrosodimethylamine (NDMA)	µg/L	0.662 J+	0.130 J+	0.134 J+	ND(0.00360)
Volatiles					
Chlorobenzene	µg/L	--	--	--	--

Notes:

ND(RDL) Not detected at the associated reporting detection limit.
J+ The result is an estimated quantity, but the result may be biased high.
-- The parameter was not analyzed for.

Attachment D

Analytical Results
Creek Bank Groundwater Monitoring Program

Table D.1

2024 Creek Bank Groundwater Monitoring Program
September 2024 Analytical Data
LANXESS Canada Co./Cie
Elmira, Ontario

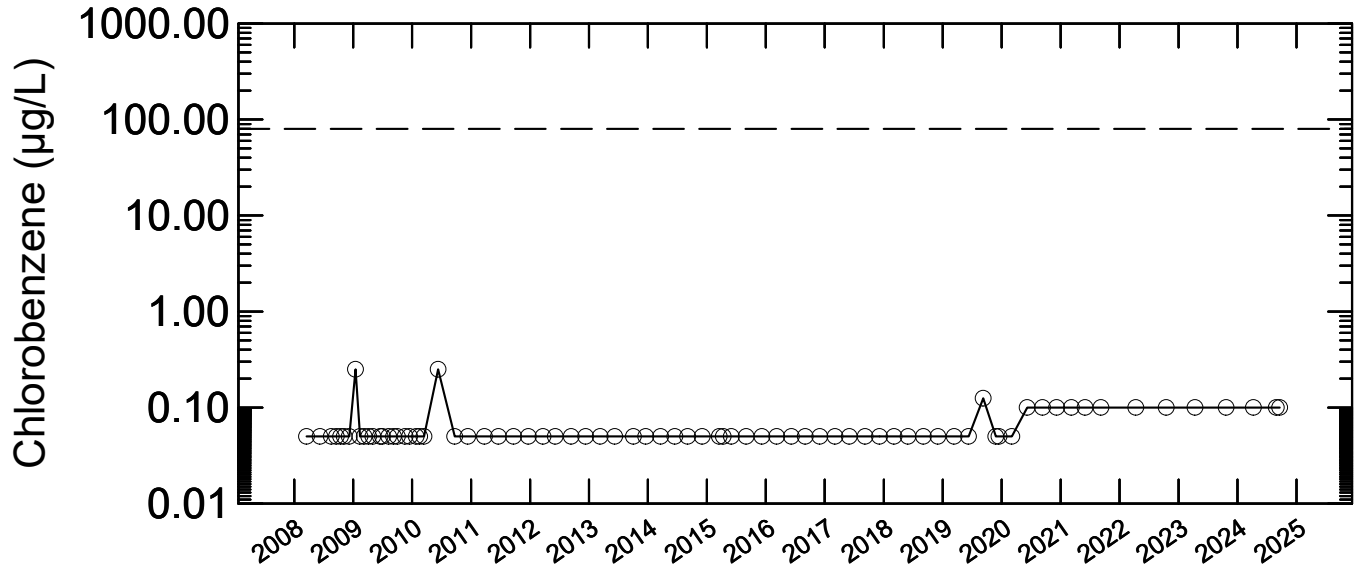
Sample Location:			**OW127-4**
Sample ID:		**Ontario**	**GW-5380-0905024-AB-001**
Sample Date:		**Table 8** [1]	**9/5/2024**
Sample Type:			**Original**
Parameters	**Units**		
Field Parameters			
Conductivity	mS/cm	-	6.68
Dissolved oxygen (DO)	mg/L	-	1.57
Oxidation reduction potential (ORP)	millivolts	-	-83
pH	s.u.	-	7.14
Temperature	Deg C	-	17.35
Turbidity	NTU	-	1.5
Volatiles			
Benzene	µg/L	5	3.74
Chlorobenzene	µg/L	30	32.1
Chloroform (Trichloromethane)	µg/L	2.4	ND(1.00)
1,2-Dichlorobenzene	µg/L	3	0.62
1,3-Dichlorobenzene	µg/L	59	ND(0.50)
1,4-Dichlorobenzene	µg/L	1	0.76
1,1-Dichloroethane	µg/L	5	ND(0.20)
1,2-Dichloroethane	µg/L	1.6	ND(0.50)
1,1-Dichloroethylene	µg/L	1.6	ND(0.50)
cis-1,2-Dichloroethylene	µg/L	1.6	ND(0.50)
trans-1,2-Dichloroethylene	µg/L	1.6	ND(0.50)
1,2-Dichloropropane	µg/L	5	ND(0.50)
Ethylbenzene	µg/L	2.4	ND(0.20)
1,1,1,2-Tetrachloroethane	µg/L	1.1	ND(0.50)
1,1,2,2-Tetrachloroethane	µg/L	1	ND(0.50)
Tetrachloroethylene	µg/L	1.6	ND(0.50)
Toluene	µg/L	22	ND(0.20)
1,1,1-Trichloroethane	µg/L	200	ND(0.50)
1,1,2-Trichloroethane	µg/L	4.7	ND(0.50)
Trichloroethylene	µg/L	1.6	ND(0.20)
Vinyl Chloride	µg/L	0.5	ND(0.50)
m&p-Xylenes	µg/L	300	ND(0.40)
o-Xylene	µg/L	300	ND(0.20)

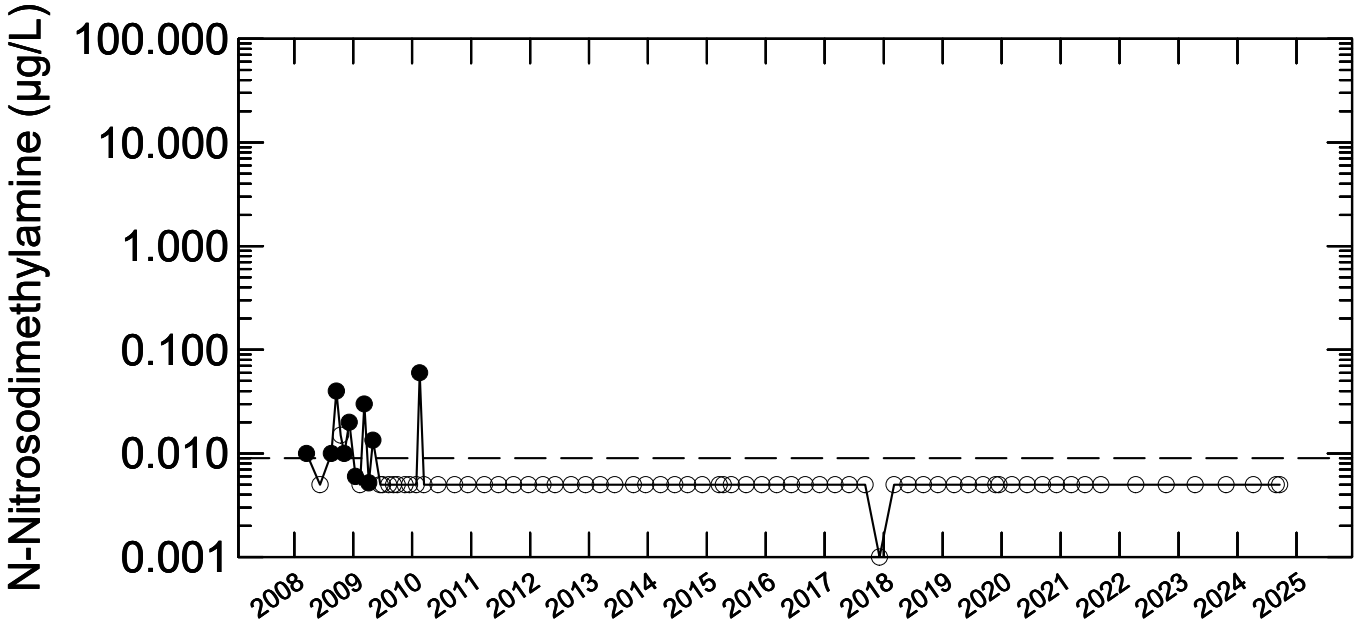
Note:

ND(RDL)	Not detected at the associated reporting detection limit.
[1]	Table 8 Generic Site Condition Standards for Use within 30 meters of a Water Body in a Potable Groundwater Condition . "Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario", Standards Development Branch, Ontario Ministry of the Environment, April 15, 2011.
-	No Table 8 Standard specified.
32.1	Concentration greater than associated Table 8 Standard.

Attachment E

Analytical Results
MU Sentry Well Monitoring Program





Legend:

● Detected Result

○ Non-detect

— — Ontario Drinking Water Standard

Note:

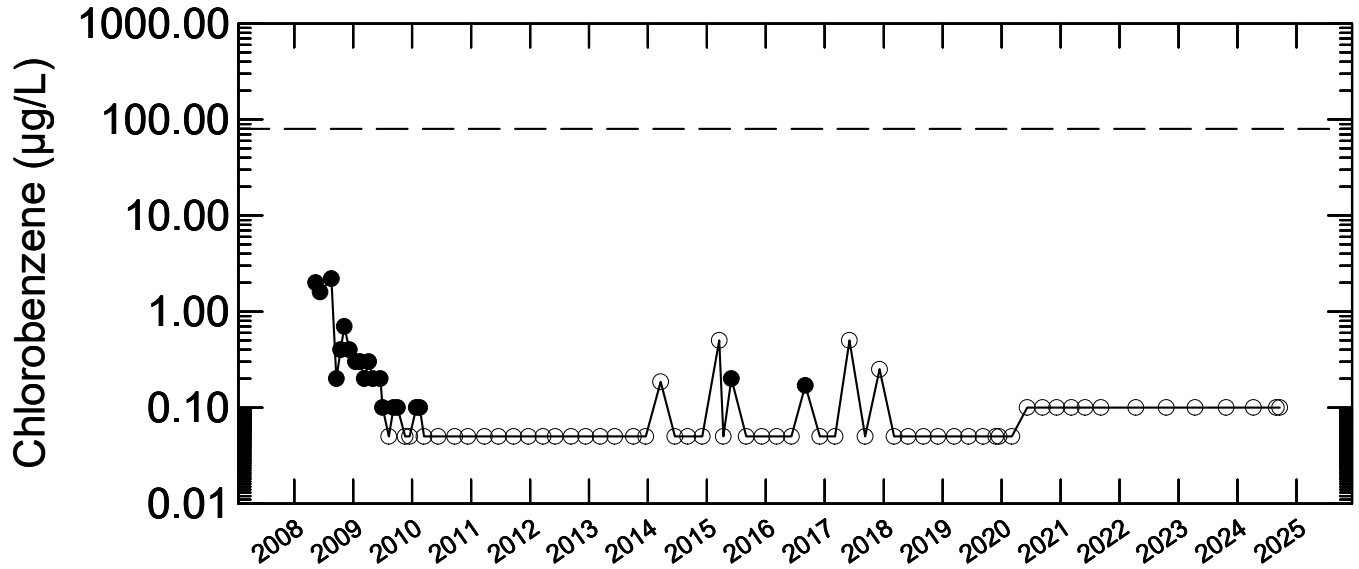
Non-detects are shown as one half the laboratory detection limit

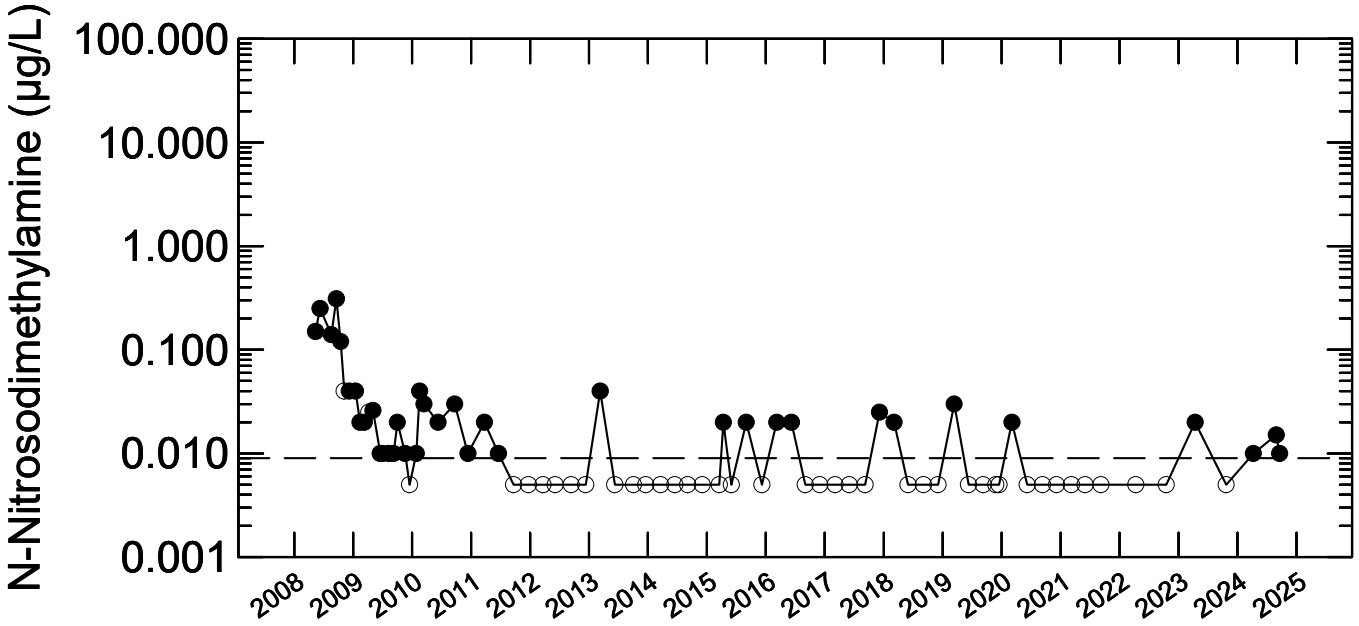
Evaluation of Groundwater Analytical Data
Lanxess Canada Co./Cie
Elmira, Ontario

Project No. **11192137**
Date: **Oct 1, 2024**

MU SENTRY WELL OW58-13

FIGURE E.1





Legend:

● Detected Result

○ Non-detect

— — Ontario Drinking Water Standard

Note:

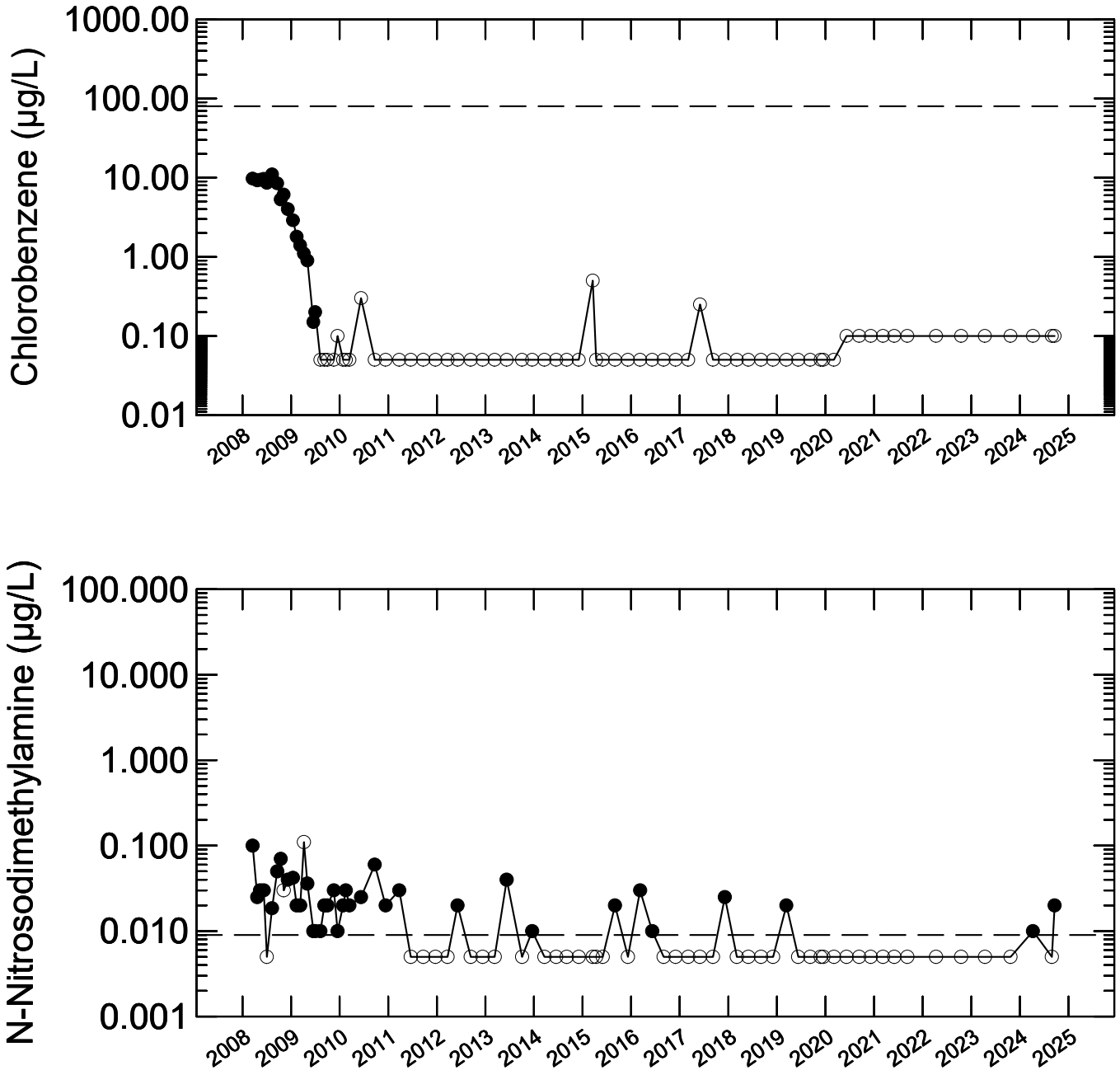
Non-detects are shown as one half the laboratory detection limit

Evaluation of Groundwater Analytical Data
Lanxess Canada Co./Cie
Elmira, Ontario

Project No. **11192137**
Date: **Oct 1, 2024**

MU SENTRY WELL OW165-17

FIGURE E.2



Legend:

● Detected Result

○ Non-detect

— — Ontario Drinking Water Standard

Note:

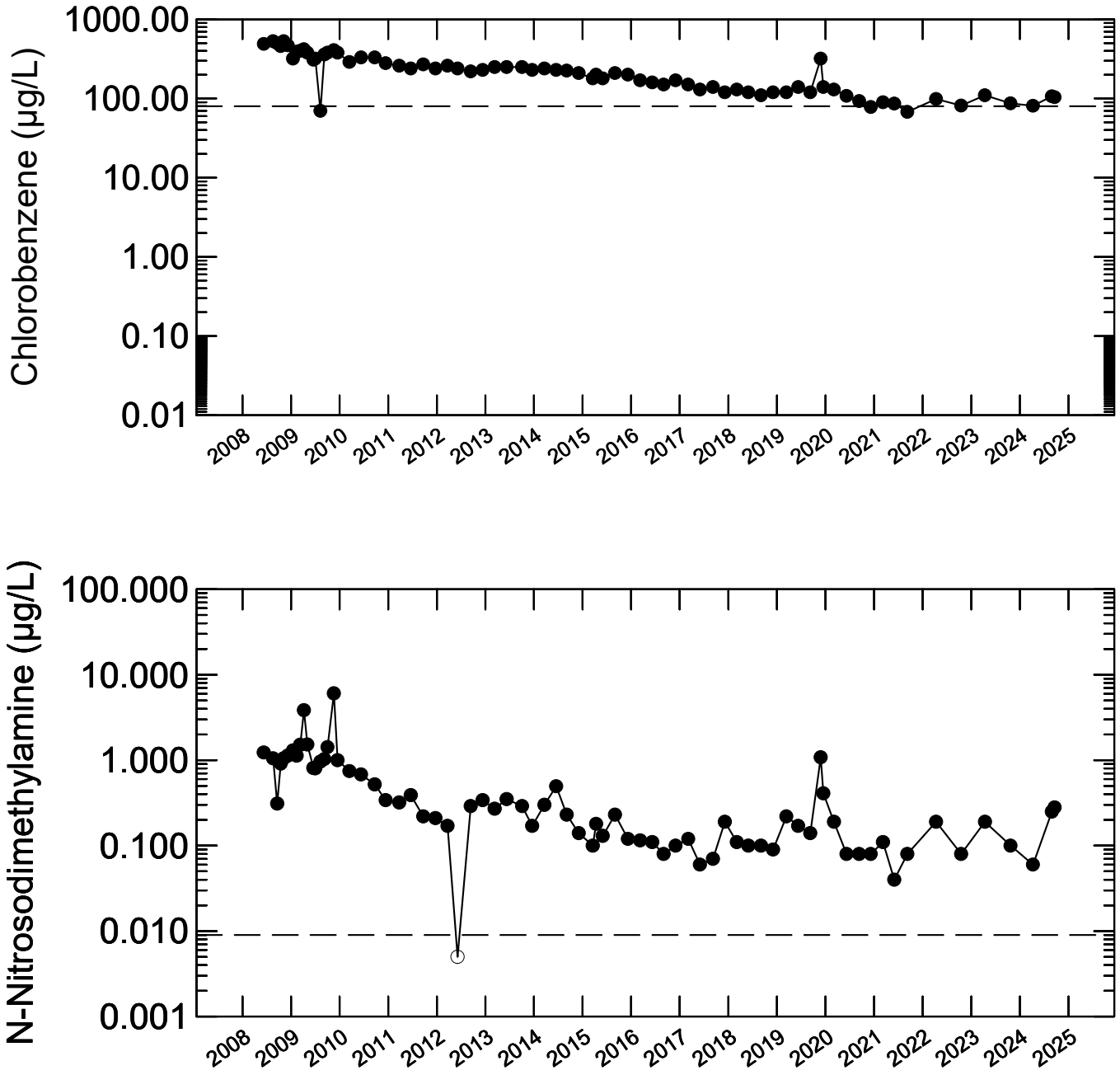
Non-detects are shown as one half the laboratory detection limit

Evaluation of Groundwater Analytical Data
Lanxess Canada Co./Cie
Elmira, Ontario

Project No. **11192137**
Date: **Oct 1, 2024**

MU SENTRY WELL CH-89B

FIGURE E.3



Legend:

● Detected Result

○ Non-detect

— — Ontario Drinking Water Standard

Note:

Non-detects are shown as one half the laboratory detection limit

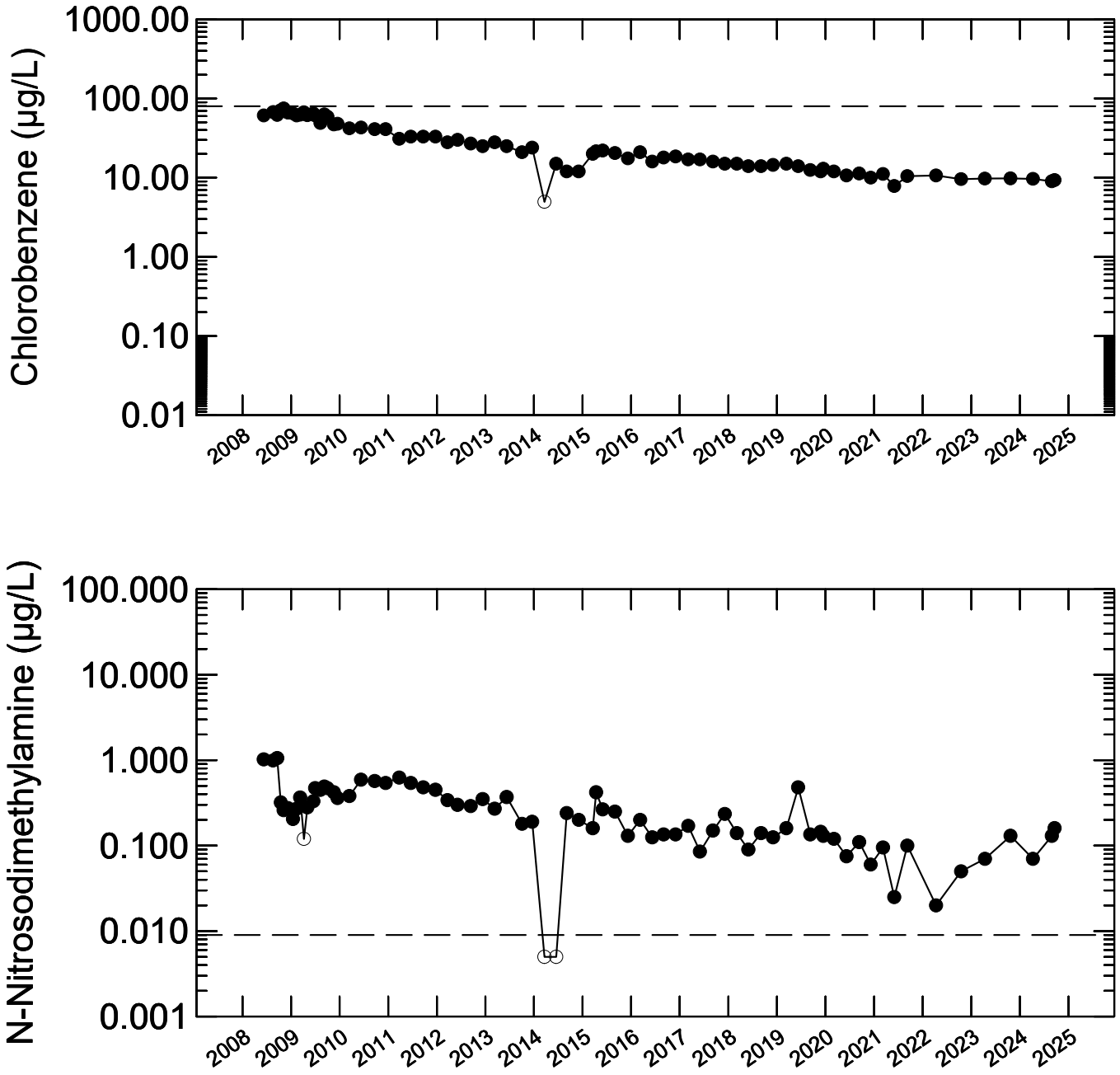
GHD

Evaluation of Groundwater Analytical Data
Lanxess Canada Co./Cie
Elmira, Ontario

Project No. **11192137**
Date: **Oct 1, 2024**

MU SENTRY WELL CH-47E

FIGURE E.4



Legend:

● Detected Result

○ Non-detect

— — Ontario Drinking Water Standard

Note:

Non-detects are shown as one half the laboratory detection limit

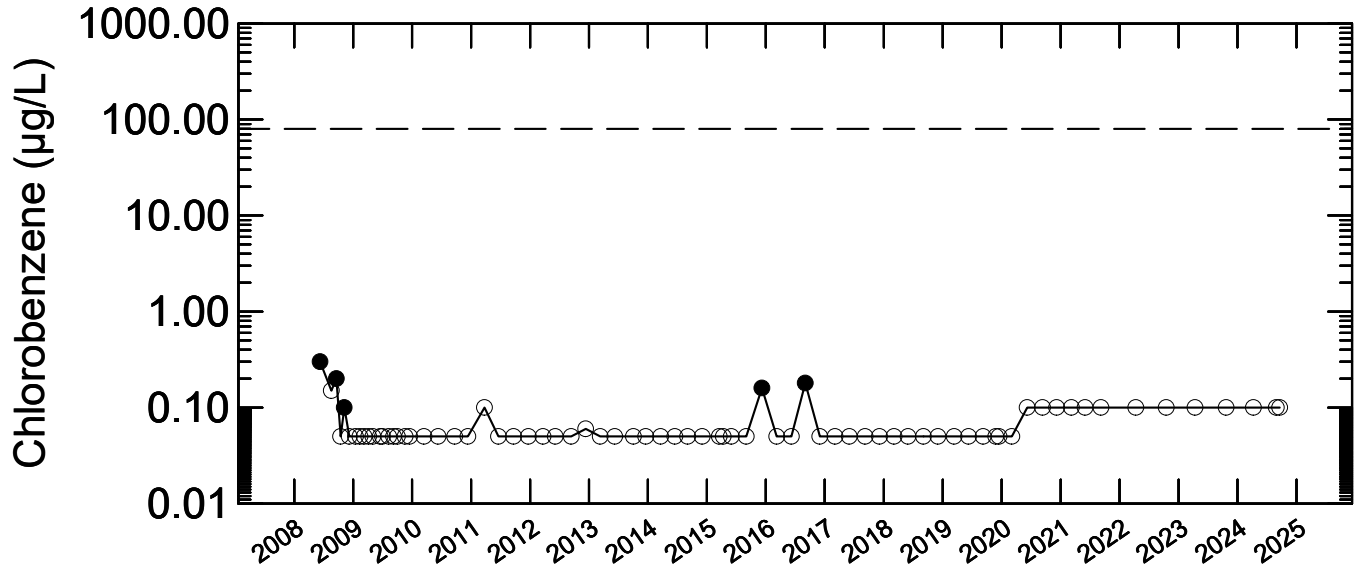
GHD

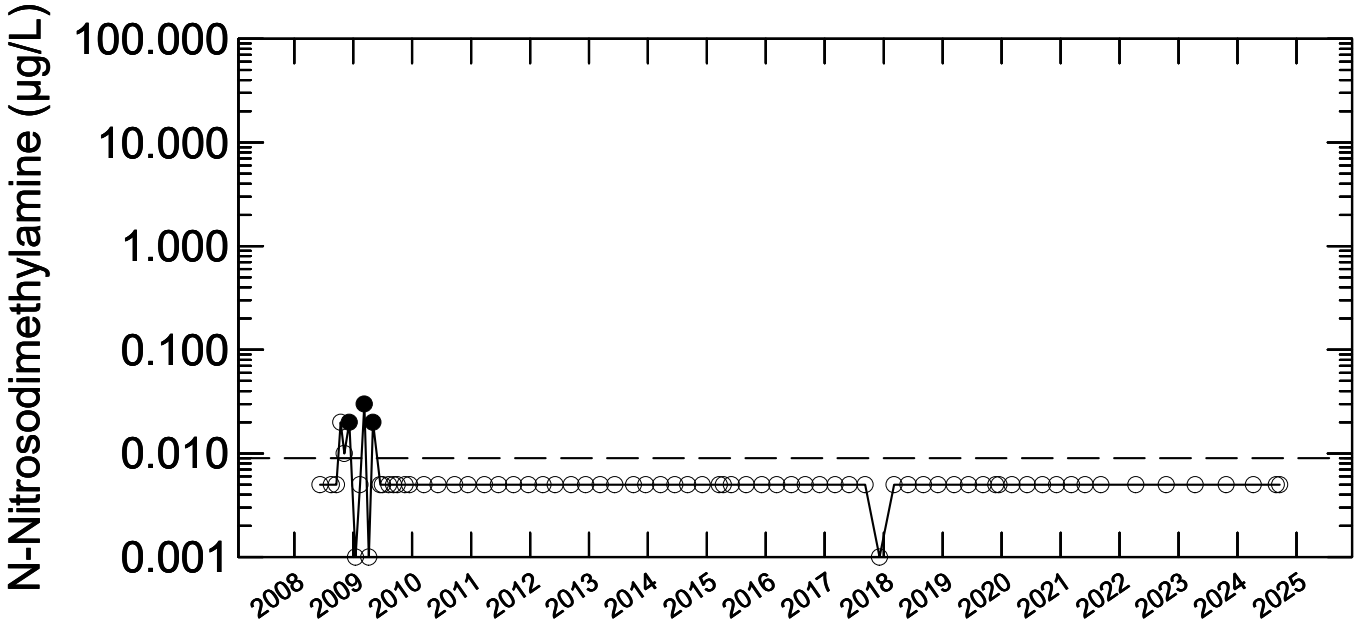
Evaluation of Groundwater Analytical Data
Lanxess Canada Co./Cie
Elmira, Ontario

Project No. **11192137**
Date: **Oct 1, 2024**

MU SENTRY WELL CH-56B

FIGURE E.5





Legend:

● Detected Result

○ Non-detect

— — Ontario Drinking Water Standard

Note:

Non-detects are shown as one half the laboratory detection limit

Evaluation of Groundwater Analytical Data
Lanxess Canada Co./Cie
Elmira, Ontario

Project No. **11192137**
Date: **Oct 1, 2024**

MU SENTRY WELL CH-97B

FIGURE E.6

Table E.1

Sentry Well Analytical Results - Chlorobenzene
LANXESS Canada Co./Cie
Elmira, Ontario

	Sample Location[1][2]					
	OW58-13	OW165-17	CH-89B	CH-47E	CH-56B	CH-97B
Aquifer Designation	**MU**	**MU**	**MU**	**MU**	**MU**	**MU**
Sample Date						
6-Mar-17	ND (0.1)	ND (0.1)	ND (0.1)	150	17 / 17	ND (0.1)
2-Jun-17	ND (0.1)	ND (1.0)	ND (0.5)	130	17 / 17	ND (0.1)
8-Sep-17	ND (0.1)	ND (0.1)	ND (0.1)	140	16 / 16	ND (0.1)
6-Dec-17	ND (0.1)	ND (0.5)	ND (0.1)	120	15 / 15	ND (0.1)
6-Mar-18	ND (0.1)	ND (0.1)	ND (0.1)	130	15 / 15	ND (0.1)
1-Jun-18	ND (0.1)	ND (0.1)	ND (0.1)	120	14 / 14	ND (0.1)
4-Sep-18	ND (0.1)	ND (0.1)	ND (0.1)	110	14 / 14	ND (0.1)
3-Dec-18	ND (0.1)	ND (0.1)	ND (0.1)	120	14 / 15	ND (0.1)
13-Mar-19	ND (0.1)	ND (0.1)	ND (0.1)	120	15 / 15	ND (0.1)
10-Jun-19	ND (0.1)	ND (0.1)	ND (0.1)	140	14 / 14	ND (0.1)
9-Sep-19	ND (0.25)	ND (0.1)	ND (0.1)	120	13 / 12	ND (0.1)
26-Nov-19	ND (0.1)	ND (0.1)	ND (0.1)	320	12 / 12	ND (0.1)
16-Dec-19	ND (0.1)	ND (0.1)	ND (0.1)	140	13 / 13	ND (0.1)
15-Jan-20	--	--	--	140 / 140	--	--
5-Mar-20	ND (0.1)	ND (0.1)	ND (0.1)	130	12 / 12	ND (0.1)
8-Jun-20	ND (0.2)	ND (0.2)	ND (0.2)	108	10.5 / 10.8	ND (0.2)
11-Sep-20	ND (0.2)	ND (0.2)	ND (0.2)	92.7	11.3 / 11.2	ND (0.2)
7-Dec-20	ND (0.2)	ND (0.2)	ND (0.2)	78.0	10.2 / 9.82	ND (0.2)
9-Mar-21	ND (0.2)	ND (0.2)	ND (0.2)	89.7	11.0 / 11.3	ND (0.2)
2-Jun-21	ND (0.2)	ND (0.2)	ND (0.2)	86.3	7.97 / 7.75	ND (0.2)
8-Sep-21	ND (0.2)	ND (0.2)	ND (0.2)	67.8	9.88 / 11.1	ND (0.2)
12-Apr-22	ND (0.2)	ND (0.2)	ND (0.2)	98.8	10.7 / 10.6	ND (0.2)
17-Oct-22	ND (0.2)	ND (0.2)	ND (0.2)	81.4	9.52 / 9.66	ND (0.2)
14-Apr-23	ND (0.2)	ND (0.2)	ND (0.2)	110	9.74 / 9.76	ND (0.2)
23-Oct-23	ND (0.2)	ND (0.2)	ND (0.2)	87.0	9.82 / 9.77	ND (0.2)
9-Apr-24	ND (0.2)	ND (0.2)	ND (0.2)	80.9	9.76 / 9.55	ND (0.2)
29-Aug-24	ND (0.2)	ND (0.2)	ND (0.2)	107	9.03 / 9.00	ND (0.2)
19-Sep-24	ND (0.2)	ND (0.2)	ND (0.2)	104	9.26 / 9.38	ND (0.2)

Notes:

9.8 / 9.7	Result / Duplicate Result
ND(RDL)	Not detected (ND) at the associated reporting detection limit (RDL).
[1]	From March 2008 until March 2020, samples analysed by Bureau Veritas (formerly Maxxam Analytics Inc.) unless otherwise noted. From June 2020 onward, samples analyzed by ALS Canada Ltd, unless otherwise noted.
[2]	Sample results are in micrograms per litre (µg/L) unless otherwise noted.
--	The parameter was not analyzed for.

Table E.2

Sentry Well Analytical Results - NDMA
LANXESS Canada Co./Cie
Elmira, Ontario

	Sample Location[1][2]					
	OW58-13	**OW165-17**	**CH-89B**	**CH-47E**	**CH-56B**	**CH-97B**
Aquifer Designation	**MU**	**MU**	**MU**	**MU**	**MU**	**MU**
Sample Date						
6-Mar-17	ND (0.01)	ND (0.01)	ND (0.01)	0.12	0.19 / 0.15	ND (0.01)
2-Jun-17	ND (0.01)	ND (0.01)	ND (0.01)	0.06	0.08 / 0.09	ND (0.01)
8-Sep-17	ND (0.01)	ND (0.01)	ND (0.01)	0.07	0.10 J / 0.20 J	ND (0.01)
6-Dec-17	ND (0.002)[4]	0.025[4]	0.025[4]	0.19[4]	0.23[4] / 0.24[4]	ND (0.002)[4]
6-Mar-18	ND (0.01)	0.02	ND (0.01)	0.11	0.14 / 0.14	ND (0.01)
1-Jun-18	ND (0.01)	ND (0.01)	ND (0.01)	0.10	0.09 / 0.09	ND (0.01)
4-Sep-18	ND (0.01)	ND (0.01)	ND (0.01)	0.10	0.12 / 0.16	ND (0.01)
3-Dec-18	ND (0.01)	ND (0.01)	ND (0.01)	0.09	0.13 / 0.12	ND (0.01)
13-Mar-19	ND (0.01)	0.03	0.02	0.22	0.18 / 0.14	ND (0.01)
10-Jun-19	ND (0.01)	ND (0.01)	ND (0.01)	0.17	0.15 J / 0.81 J	ND (0.01)
9-Sep-19	ND (0.01)	ND (0.01)	ND (0.01)	0.14	0.14 / 0.13	ND (0.01)
26-Nov-19	ND (0.01)	ND (0.01)	ND (0.01)	1.08	0.14 / 0.15	ND (0.01)
16-Dec-19	ND (0.01)	ND (0.01)	ND (0.01)	0.41	0.12 / 0.14	ND (0.01)
15-Jan-20	--	--	--	0.36 / 0.36	--	--
5-Mar-20	ND (0.01)	0.02	ND (0.01)	0.19	0.12 / 0.12	ND (0.01)
8-Jun-20	ND (0.01)	ND (0.01)	ND (0.01)	0.08	0.08 / 0.07	ND (0.01)
11-Sep-20	ND (0.01)	ND (0.01)	ND (0.01)	0.08	0.11 / 0.11	ND (0.01)
7-Dec-20	ND (0.01)	ND (0.01)	ND (0.01)	0.08	0.06 / 0.06	ND (0.01)
9-Mar-21	ND (0.01)	ND (0.01)	ND (0.01)	0.11	0.09 / 0.10	ND (0.01)
2-Jun-21	ND (0.01)	ND (0.01)	ND (0.01)	0.04	0.03 / 0.02	ND (0.01)
8-Sep-21	ND (0.01)	ND (0.01)	ND (0.01)	0.08	0.10 / 0.10	ND (0.01)
12-Apr-22	ND (0.01)	ND (0.01)	ND (0.01)	0.19	0.02 / 0.02	ND (0.01)
17-Oct-22	ND (0.01)	ND (0.01)	ND (0.01)	0.08	0.05 / 0.05	ND (0.01)
14-Apr-23	ND (0.01)	0.02	ND (0.01)	0.19	0.08 / 0.06	ND (0.01)
23-Oct-23	ND (0.01)	ND (0.01)	ND (0.01)	0.10	0.13 / 0.13	ND (0.01)
9-Apr-24	ND (0.01)	0.01	0.01	0.06	0.07 / 0.07	ND (0.01)
29-Aug-24	ND (0.01)	0.0151[5]	ND (0.01)	0.25	0.14 / 0.12	ND (0.01)
19-Sep-24	ND (0.01)	0.01	0.02	0.28	0.16 / 0.16	ND (0.01)

Notes:

9.8 / 9.7	Result / Duplicate Result.
0.03 | 0.042	Result | Split Sample Result (different laboratories reporting).
ND(RDL)	Not detected (ND) at the associated reporting detection limit (RDL).
[1]	Samples analyzed by LANXESS Technology Centre, Ontario, unless otherwise noted.
[2]	Sample results are in micrograms per litre (µg/L) unless otherwise noted.
[3]	Split samples analyzed by Bureau Veritas (formerly Maxxam Analytics Inc.)
[4]	Samples analyzed by Bureau Veritas (formerly Maxxam Analytics Inc.)
[5]	Sample analyzed by ALS Canada Ltd.
--	The parameter was not analyzed for.
J	Estimated concentration.

Ministry of the Environment, Conservation and Parks
Drinking Water and Environmental Compliance Division
West Central Region

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Ministère de l'Environnement de la Protection de la nature et des Parcs
Division de la conformité en matière d'eau potable et d'environnement
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November 8, 2024

Ms. Hadley Stamm
LANXESS Solutions US Inc.
111 RIDC Park West Drive
Pittsburgh, PA 15275-1112
USA

Dear Ms. Stamm:

RE: MECP Review Comments – LANXESS Elmira 2023 Annual Monitoring Report (AMR)

The Ontario Ministry of Environment, Parks and Conservation (MECP or ministry) has completed its review of the document prepared by WSP on behalf of LANXESS Canada Co./Cie (LANXESS) titled "*2023 Annual Monitoring Report, LANXESS Canada Co./Cie, Elmira, Ontario*" (2023 AMR) (WSP, March 28, 2024). As part of this review, the 2023 Groundwater Plume Analytics ® Services Report, prepared by WSP, and dated March 27, 2024, was reviewed.

The ministry reviewed the 2023 AMR from a groundwater perspective. The purpose of the ministry's review is to assess compliance with the conditions of amended Environmental Compliance Approval (ECA) No. 0277-BV2JU5 (November 13, 2020) and Control Orders issued by the ministry. The ministry's review comments are enclosed in the Attachment titled "*MECP review comments – 2023 AMR (WSP, March 28, 2024)*". In addition, this review also considers responses to MECP comments on LANXESS' 2021 AMR (WSP, March 30, 2022). WSP's response to comments were provided in Appendix E of the 2022 AMR (WSP, March 31, 2023).

The ministry requests that all comments and recommendations provided herein be incorporated into the next annual monitoring report (i.e., 2024 AMR). Where LANXESS disagrees with the ministry's recommendation or for comments relevant to the 2023 AMR, the comments are to be addressed in a written response provided as an attachment to the next annual monitoring report.

If you have questions, please contact the undersigned at jason.rice@ontario.ca.

Yours truly,

Jason Rice, P.Eng.
Regional Engineer

Attachment:
MECP review comments – 2023 AMR (WSP, March 28, 2024)

c.c. Her Worship Mayor Sandy Shantz, Woolwich Township
Tiffany Svensson, Technical Remediation Advisory Committee (TRAC)

ATTACHMENT
MECP review comments, 2023 Annual Monitoring Report (AMR), LANXESS Canada Co./Cie, Elmira, Ontario (2023 AMR) (WSP, March 28, 2024)

The 2023 AMR provided the up-to-date status of the operation of the treatment systems, containment of on-Site and off-Site groundwater plumes (i.e., NDMA and chlorobenzene), on-Site and off-Site groundwater quality, surface water quality, and recommendations for groundwater and surface water monitoring in 2024 monitoring program.

Summary of key findings presented in the 2023 AMR and 2023 Plume Analytics Report

- Treated effluent consistently met the Effluent Objectives and Effluent Limits, apart from toluene (January and February 2023) and chlorobenzene (February and March 2023). These noted detections were greater than their Effluent Objectives, but less than the Effluent Limits, and were short-term and isolated events that do not reflect a deficiency in the treatment system.

- The results of the 2023 toxicity testing completed in accordance with the conditions of Environmental Compliance Approval (ECA) No. 4816-B39S38 on samples collected from the primary SS+890 outfall (designated GE) and from secondary discharge location via Shift Factory Creek (designated SFE) indicated that the effluent was not acutely or chronically toxic.

- During most of 2023, the Upper Aquifer Containment System (UA CS) provided hydraulic containment of the southeast portion of UA1 in accordance with the conditions of ECA No. 4816-B39S38. However, local temporary apparent losses of hydraulic containment continue to occur during and immediately after high flow events in Canagagigue Creek (Creek). Surface water quality data from the samples collected during the loss of containment events show no impact to surface water quality.

- LANXESS continues to monitor UA1 groundwater elevations and adjusts UA CS pumping rates to optimize containment.

- On-Site pumping containment wells PW4 and PW5 provided hydraulic containment of on-Site Upper Municipal Aquifer (MU) groundwater beneath the southwest corner of the Site during 2023. The off-Site Collection and Treatment System (CTS) extraction wells (W3R, W5A, W5B, W6A, W6B, W8, and W9), and off-Site containment well E7, continue to contain the off-Site NDMA and chlorobenzene plumes and extract contaminant mass.

- NDMA was not detected (reporting detection limit [RDL] = 0.01 µg/L) in UA1 groundwater samples collected from monitoring wells along the Creek bank.

- The 2023 chlorobenzene concentrations in the samples collected as part of the Creek Bank Groundwater Monitoring Program were either not detected at their laboratory's Reportable Detection Limit (RDL) or were present at concentrations that were less than the Ontario Drinking Water Quality Standard (ODWQS) of 80 µg/L, and less than the Table 8 Generic Site Condition Standards for Use within 30 meters of a Water Body in a Potable Ground Water Condition (Table 8 Standards) of 30 µg/L, and less than the Table 8 GW3 component

value of 500 µg/L, which is an aquatic protection value used to back calculate a groundwater concentration within 30 m of a surface water body. The 2023 chlorobenzene results were consistent with results from previous years.

- Continued operation of the UA CS has maintained the significant improvement in the Creek surface water quality since the start of the UA CS operation in 1997.

- Concentrations of pesticides and additional volatile organic compounds (VOCs) in the six northwest Creek bank monitoring wells were largely not detected at their RDL or were present at concentrations that were significantly less than the ministry's respective Table 8 Standards.

- The off-Site NDMA and chlorobenzene plumes were generally stable; however, selected plume extents increased slightly in 2023.

- Long-term trends for NDMA and chlorobenzene concentrations in MU sentry wells are either decreasing or more than 50% of the results are non-detect, and NDMA and chlorobenzene concentrations are relatively low.

- The operation of the on-Site CTS and off-Site CTS at the Site has been and continues to be very effective at remediating impacted groundwater in the MA. Since 1993 the off-Site NDMA plume mass indicator has reduced by more than 99 percent in the upper municipal aquifer (MU) and more than 94 percent in the ML, and the off-Site chlorobenzene plume mass indicator has reduced by more than 96 percent in the MU and more than 74 percent in the lower municipal aquifer (ML).

- Although contaminant mass recovery rates and mass-in-place reduction rates are declining, the on-Site and off-Site remedial systems are still effective in continuing to remediate the MA and inhibit migration of contaminants from the Site.

- Recommended to continue the similar monitoring programs in 2024 as was conducted in 2023.

MECP Comments & Recommendations

Previous MECP Comments (2021 AMR)

1. MECP's key comments/concerns with respect to the residual source of NDMA and chlorobenzene at the Site and off-Site were satisfied by LANXESS responses provided in in Appendix E of the 2022 AMR.

2023 AMR

MECP has the following comments/concerns and recommendations with respect to 2023 AMR.

1. It is reported in Section 4.2 (pages 27-28) in the 2023 AMR that "*In 2023, LANXESS "pulse pumped" well E7. Containment well E7 was shut down on June 1, 2023 and re-started July*

13, 2023 (42 days), for strategic, purposeful "pulse pumping". During the resting phase of pulse pumping, contaminant concentrations increase due to diffusion, desorption, and dissolution in slower moving groundwater. Once pumping is resumed, groundwater with a higher concentration of contaminants is removed. Concentrations then gradually decrease until it is determined another resting phase is required".

It is not clear which contaminants (i.e., NDMA verses chlorobenzene) are showing the tendency of back-diffusion due to cessation of pulse pumping in well E7. A graphical presentation of these changes in concentration of NDMA/chlorobenzene can help to better understand this phenomenon. The following question is raised as a result of this change in concentration of NDMA/chlorobenzene:

- Is this back diffusion from impacted soils considered the principal release mechanism of dissolved NDMA/chlorobenzene to groundwater at the Site and off-Site from the most impacted wells?

2. MECP recommends justifying the inclusion of more short-range (i.e., a few weeks) pulse pumping tests/rebound tests on other NDMA impacted pumping wells on-Site and off-Site as this process seems to release more dissolved contaminants from the residual source in the soils/aquifers/aquitards. These pulse pumping tests/rebound tests may help to achieve an enhanced mass recovery.

3. The following information is provided in Section 1.2 (page 8) of the 2023 AMR:

   "*As detailed in the CSM, the sources of groundwater contamination have been decommissioned and remediated to the extent practical, resulting in significant reductions in the concentration and extent of groundwater contamination beneath the Site. While ongoing sources of contamination exist, such as residual non-aqueous phase liquid (NAPL) in the M-2 landfill, groundwater contaminated by this residual NAPL is contained beneath the Site and does not contribute to off-Site groundwater contamination. It is anticipated these sources of on-Site contamination will continue for the foreseeable future.".*

   The above statement "*While ongoing sources of contamination exist, such as residual non-aqueous phase liquid (NAPL) in the M-2 landfill, groundwater contaminated by this residual NAPL is contained beneath the Site and does not contribute to off-Site groundwater contamination*" is not clear and needs more clarification to explain the following:

   (i) where is this residual NAPL (i.e., present status of horizontal and vertical extent) sources?

   (ii) why are these residual sources not contributing off-Site groundwater contamination?

   (iii) what are the existing sources of dissolved NDMA and chlorobenzene in groundwater at the Site and off-Site?

4. The chlorobenzene concentration in groundwater at monitoring well CH-75B, located east of off-Site pumping well W3R, began increasing in 2019; however, the NDMA concentration began to decrease at the same time.

It is reported in Section 4.2 (page 29) in the 2023 AMR that "*It appears that shutting down W4 and increasing the pumping at W3R has increased the extent of the W3R capture zone, such that it now extends north to the location of W4. This has resulted in the southward migration of chlorobenzene in the vicinity of W4 to the location of monitoring well CH75B, as it migrates toward extraction well W3R*".

However, no explanation was provided for this rapid increasing trend of chlorobenzene in CH-75B. Similarly, no explanation was provided for the decreasing trend of NDMA in CH-75B since 2017.

It is recommended that future AMRs (i.e., 2024 AMR) should provide an explanation for the increase or decrease of NDMA/chlorobenzene in any wells with possible factors controlling the increasing or decreasing concentration of NDMA/chlorobenzene in groundwater at the Site/off-Site.

5. The rapid increase of NDMA concentration in CH-88B(R) for the Lower Municipal Aquifer since 2005 is not explained in the 2023 AMR. Similarly, the rapid increase of chlorobenzene in CH-68A since 2010 and a sudden increase of chlorobenzene concentration in OW61-34 for Lower Municipal Aquifer in 2022 were not explained in 2023 AMR.

6. The off-Site groundwater NDMA and chlorobenzene plumes were generally stable; however, selected plume extents increased slightly in 2023. A spatial comparison of plume extents showing a comparison within early stages, 2022, and 2023 may help to understand plume stability/mobility more clearly.

7. MECP agrees with the recommended monitoring programs for 2024 as no specific changes in the 2022-2023 monitoring programs are requested.

8. MECP understands that LANXESS wants to proceed with next steps to evaluate the potential to enhance mass removal of NDMA and chlorobenzene through enhancing natural attenuation and focused pumping, while maintaining hydraulic control over the existing plumes.

   It is recommended that future AMRs (i.e., 2024 AMR) include information to reflect the on-going and existing status of natural attenuation of NDMA and chlorobenzene in groundwater at the Site, if any, based on water quality data or other applicable evaluation.

Subject: Outstanding TRAC Questions

Tiffany

Below are the responses to the outstanding TRAC questions provided in you email to GHD/LANXESS dated September 30, 2024. Your comments are presented in italicized text with responses provided below.

TRAC Question

- *Please provide all the lines of evidence that exist and have been used to address the lingering concerns expressed by Sebastian, TAG's Eastside Champion, about the Eastside GAP area. (i.e., provide topography information, flow path for historic waste management units, the presence of mature trees, soil, sediment and surface water quality used in the HHERA etc. Please provide groundwater data, historic aerial photography dating back to the 1940s, and surface soil data for this area. The composite sampling approach was used to successfully identify surface soil areas along the east side where additional sampling and subsequent soil remediation was completed. The outcome of the onsite and offsite soil investigations prove that the characterization methodology and approach was applicable and valid.*

Response

Gap Area History and Sampling

The Gap area (see attached figure) is a wooded area located in the southeast portion of the LANXESS property located at 25 Erb Street, Elmira, Ontario (Site). The Gap area is topographically high with slopes to a drainage feature located on the neighbouring property to the east (6670 Line #86), former gravel pit (GP1) to the west and the Canagagigue Creek further to the south. Predecessors to LANXESS operated former liquid waste and solid waste pits north of the GAP Area. During the operation of the liquid waste pits, wastewater was allowed to clarify in the pits prior to discharge of the liquid to the gravel pits located to the south. The liquid wastes were conveyed to the former gravel pits in an open swale which ran parallel to the Canagagigue Creek further to the west of the Gap Area. Based on historical documents reviewed, the GAP area has not been identified as historic area of either chemical manufacturing or historical waste management. Due to its isolated location, consistent presence of a wood lot, and topographically higher elevation with respect to the surrounding areas, it has not been considered an area of interest at the Site with respect to environmental liability or legacy. Soils and groundwater samples have been

collected from the Gap Area as part of investigations conducted in the 2000s, 2010s and 2020s.
The following present a summary of the historic sampling results for the Gap area:

- Two surface soil samples [S-17(02) and S-32(02)] collected in 2002 within the Gap area
- One test pit (TP07-11) completed in 2011 within the Gap area
- Three monitoring wells (OW14s, OW14i and OW14d [nested well]) currently located within the Gap area
- Three composite surface soil samples (SS09-15, SS20, SS21) collected within the Gap area, one in 2015 and two in 2017

Gap Area Analytical Data Summary:

The surficial soil samples were analyzed for dioxins and furan toxic equivalency (TEQ). The results are provided in Table 1 as follows:

Table 1 – GAP Area Historic Surface Soil Sampling Dioxin/Furan Results

Sampling location	**Sample type**	**TEQ* Criteria**	**Result picograms /gram (pg/g)**
S-17(02)	Grab Surface Soil	99	10.1
S-32(02	Grab Surface Soil	99	3.78
TP07-11	Test Pit	99	15.92
SS09-15	Composite Surface Soil	99	10.7
SS20	Composite Surface Soil	99	3.00/304
SS21	Composite Surface Soil	99	6.97

*- MECP's Generic Criteria as presented in Table 2 Full Depth Site Conditions Standards for Industrial Commercial F Property Use (Table 2) for fine to medium grained soil, TEQ criteria is 99 pg/g.

All dioxins and furan TEQ results are significantly less than the Table 2 Standard for Dioxins and Furans.
The surficial soil samples were also analyzed for DDD, DDE, and DDT. The results are provided in Table 2 below:

Table 2 – GAP Area Historic Surface Soil Sampling DDD, DDE and DDT Results

Sampling location	**DDD Result (pg/g)**	**DDE Result (pg/g)**	**DDT Result (pg/g)**
TP07-11	ND(0.04)	ND(0.04)	ND(0.04)
SS09-15	ND(0.0030)	ND(0.0030)	0.0035
SS20	ND(0.0020)/ND(0.0020)	ND(0.0020)/ND(0.0020)	ND(0.0020)/0.0024
SS21	ND(0.0030)	ND(0.0030)	0.0037
ND(RDL) – Not detected at the reporting detection limit			

There were only two detections slightly greater than the laboratory reporting detection limit for the constituent DDT. The Table 2 DDD criteria is 4.6 pg/g, DDE criteria is 0.52 pg/g, and the DDT criteria is 1.4 pg/g. All DDD, DDE and DDT results were less than the associated Table 2 Standards. Historic groundwater data generated from the sampling and analysis of samples collected from wells located in the GAP area (OW14s, OW14i and OW14d) do not indicate the present of herbicides or pesticides in any of the samples collected and

analyzed. This soil and groundwater data support the conclusion that the Gap area has not been impacted by historic Site activities.

Former Gravel Pit Investigation

The former gravel pit investigation included soil sampling of the former gravel pit areas and the southeastern portion of the LANXESS Site. These areas are all located on the LANXESS property and include the Gap area.

GHD collected surficial and near-surface soil samples in the southeastern area of the Site in August 2011, to obtain additional soil quality data to augment previous results obtained in 2001 and 2002. Two former gravel pits, GP-1 and GP-2, are located in this area of the Site, and were used to collect surface water overflow from the historic waste pits until approximately 1970. To provide sufficient data to assess human health and ecological risks posed by exposure to soils in these areas, GHD subdivided the gravel pit area based on the historic exposure risk into the following three areas:

- GP-1: Includes area in and immediately surrounding GP-1
- GP-2: Includes area in and immediately surrounding GP-2
- Southeast (SE Area): Includes general area surrounding gravel pits as well as the LANXESS portion of the Gap area

The statistical evaluation has focused first on contrasting the dioxin and furan and DDT concentrations in the three study areas, and then developing statistical interval estimates to represent maximum expected exposure concentrations to be used as inputs for subsequent risk assessment activities.

Based on the results of the statistical analyses, surface soils with the GP-1 area contain much higher dioxin/furan TEQ and DDT concentrations that do soils in GP-2 and the SE Area. In contrast, the GP-2 and SE areas appear to generally contain dioxin/furan TEQ and DDT concentrations within applicable criteria and may not pose unacceptable risk to human health and the environment, considering the analytes of interest (i.e., dioxins/furans and DDT). These results support the conclusion that the Gap area has not been significantly impacted by historical site activities.

HHERA (2022)

The most recent HHERA utilized sediment data from a surface water drainage area located at 6670 Line #86. This area has been identified as an area of concern by members of the Elmira community. This area consists of a portion of the east side of the LANXESS Site (Gap area) and the western side of the neighboring agricultural farm field property. The drainage area is a vegetated wetland and contains a woodlot and agricultural features. The ecology

in this drainage area is consistent with the ecology of the Canagagigue Creek study area, additionally, no consistent human usage is associated with this area or the ditch. However, should a trespasser/person walk through the area, incidental exposure (dermal, ingestion) to creekbank soil or sediment (in the drain) could occur.

Soil/sediment composite samples were collected from the drainage area both by LANXESS, and independently by an Elmira community member and shared with LANXESS in an email dated November 24, 2021. The following provides a summary of the data collected.
Sediment samples within the ditch (D-P1 and D-P2) were collected by GHD in 2020 from the drain feature.
Results from the drainage area soil/sediment samples and ditch sediment samples for total DDT (i.e., DDD, DDE, and DDT) and dioxins/furans (TEQ) are summarized below.

- DDD, DDE, and DDT results were reported for the samples within the ditch (D-P1 and D-P2) collected by GHD in 2020 from the drain feature itself. In general, DDT and its metabolites were not detected in these samples. Only one sample (D-P1 for 0-10 centimetre [cm] depth) had a reported concentration for DDD of 0.027 µg/g. A total DDT concentration for this sediment sample can be estimated by summing the DDD, DDE, and DDT results with DDE and DDT assigned their full detection limits. This results in an estimate of total DDT of 0.096 ug/g.

- Dioxins/furans (TEQ) results were available for two soil/sediment samples submitted by the Elmira community member and four sediment samples collected by GHD in 2020 from the drain feature itself. Of these six samples, five had dioxins/furans (TEQ) concentrations that were less than or equal to 4.4 pg/g; which is roughly equivalent to the sediment exposure point concentration for Reaches 2 and 1 of 3.7 pg/g**.** One sample (D-P1 for 10-30 cm) had a higher concentration of 24.4 pg/g. Reaches 1 and 2 are the Canagagigue Creeks areas furthest downstream of the Site and represent the areas with the lowest concentrations of dioxins/furans and DDT in soils and sediment.

Creekbank/floodplain soil and sediment data have also been collected from locations upstream of the drainage area within and adjacent to the Creek, with concentrations of dioxins/furans (TEQ) ranging from 0.755 to 42.9 pg/g. Although concentrations in the drainage area may be higher than the concentrations reported in the samples collected by the Elmira community member (based on the surrounding data), the reported concentrations for these samples as well as the soil and sediment samples collected by

LANXESS, are below the human health soil component value protective of direct soil contact (48 pg/g; MOE, 2011a).

The HHERA concluded that the measured concentrations of total DDT and dioxins/furans (TEQ) within the drainage area pose no unacceptable risks to receptors.

Effects of Historic Wastewaters on Trees and Vegetation

The presence of the significant wood lot located with the Gap and the aerial photographs (1930s to 2020s) reviewed do not show any vegetation loss, trees or canopy loss during the time the historic waste management units were in operation. The aerial photographs also do not show any visual evidence of earth movement or scaring and do not suggest any human activities occurred in the Gap area over this time period. The aerial imagery reviewed was concurrent with and after wastes were stored in the pits. The herbicides produced historically at the plant, and waste from the manufacturing processes placed in the pits, would adversely affect plant and tree growth within the wood lot and would likely result in a significant loss of vegetation, trees and tree canopy. These effects are not evident on the aerial photographs (1930, 1955, 1964, 1980 and 2016) available for review for the Gap area. The review and interpretation of the available aerial photographs support the conclusion that the Gap area has not been significantly impacted by historical site activities.

TRAC Question

- *Regarding the issue of recently discussed below target pumping rates issue, what do target rates mean on-site/off-site? Discuss layers of safety, protection, monitoring, hydraulic conductivities and what is being done to attain these target pumping rates, addressing TAG's longstanding question of 'how long would it take for loss of containment to happen?'*

Response

The off-Site target pumping rates are based on the maximum well capacity, or how much the well can pump. Typically, this target rate is 80 to 90% of the maximum well capacity.

The on-Site target pumping rates (PW4 = 2.9 litres per second [L/s] and PW5 = 1.8 L/s) were established at the maximum rate the wells could pump without causing well interference (i.e. resulting in the reduction in water levels and reduced pumping rates) with each other. Unlike the off-Site wells, the on-Site containment wells are in close proximity, close enough that their drawdown cones may overlap with each other.

The containment is monitored by the following tiered approach:

A) Target pumping rates
B) Continuous hydraulic monitoring data
C) Manual groundwater elevations
D) Groundwater quality analysis (actual sampling of the sentinel wells)

As long as target pumping rates are maintained, operational experience shows that hydraulic containment is maintained. However, data indicates containment is also maintained when there is a brief outage at a well, or when pumping rates are lower than the target pumping rates. Continuous hydraulic monitoring data provides a direct assessment of hydraulic containment at key points along the Site boundary, confirming that the target pumping rates are effective. Manual groundwater elevation data provide a broad "snapshot" of groundwater flow directions along the Site boundaries, confirming the continuous monitoring data at key locations continue to be effective sentinels. Groundwater quality analysis provides evidence that the quality of the groundwater immediately adjacent to the Site boundary is maintained or improved, the ultimate goal of maintaining hydraulic containment of the Site.
There are different degrees of containment, ranging from 0% containment, with no on-Site pumping, to 100% containment, where all groundwater constituents are contained. If all groundwater extraction were to cease on-Site, hydraulic containment would be lost in less than a day when the groundwater elevations have had sufficient time to recover from pumping and groundwater begins to flow off-Site. Groundwater velocity would be relatively high, reflecting the natural hydraulic gradient. Constituents would begin to migrate off-Site, but at a reduced rate relative to the groundwater velocity, because of attenuation mechanisms such as dispersion and sorption on to the aquifer matrix. It would take weeks or months for constituents to migrate to the sentry well locations and cause increasing constituent concentrations. A complete shutdown of all on-Site wells is not a typical occurrence. A more common situation would involve pumping the well at a rate which was less than the target pumping rate, which would not result in a complete loss of containment. While continued pumping at less than the target pumping rate would change hydraulic gradients, it would not revert to natural gradient that would exist if there were no pumping. It's also important to note that LANXESS has set target rates are above pumping rates that achieve containment.

LANXESS completes routine maintenance tasks on the containment and extraction wells as part of their on-going preventative maintenance and system inspections. LANXESS also completes pump/motor inspections, down-hole videos, well rehabilitation, and water blasting of the pipelines as needed to ensure continued operation of the wells at their

target pumping rates. Additionally, LANXESS performs annual specific capacity testing to monitor the performance of each well.

TRAC Question

- *Revisit and respond to TAG's written response to the revised HHERA (May 2023), provided on Oct 27th 2023. Include an update on the agreed upon request to clean up 'hot spots' in the vicinity of residents along the creek.*

Response

Stantec will revisit and provided comment responses to TAG's comments provided on October 27, 2023 as part of finalizing the HHERA. An update on the 'hot spots' will also be provided by LANXESS once the HHERA is finalized and approved by the MECP.

TRAC Question

- *Has LANXESS determined the effective solubilities of NDMA and chlorobenzene in the upper and lower municipal aquifer. Addressing the concern of using the "aqueous" solubility value of chlorobenzene in the September 12, 2024 presentation to support the assessment that there is no NAPLs present off site i.e. the effective solubility of a compound from a chemical mixture is less than its aqueous solubility.*

Response

The discussion on September 12, 2024, focused on why the 1% rule was at best a "rule of thumb" with respect to identifying the presence of DNAPL. GHD contrasted the situation at on-Site containment well PW4 versus former off-Site extraction well W4. At PW4, chlorobenzene concentrations remain in the 1,000's of µg/L after more than 35 years of pumping, which indicates an ongoing nearby source of chlorobenzene, almost certainly residual DNAPL. At former off-Site extraction well W4, pumping was initiated in 1997 with a chlorobenzene concentration of 4,400 micrograms per litre (µg/L) and in 2017, after chlorobenzene concentrations decreased to less than the Ontario Drinking Water Quality Standard of 80 µg/L, LANXESS terminated groundwater extraction via W4. The fact that the chlorobenzene concentrations were reduced relatively rapidly indicates there is no ongoing chlorobenzene source (DNAPL) near W4. GHD did not use the 1% rule or effective aqueous solubilities to infer or repute the presence of DNAPL.

TRAC Question

- *Consider developing a well installation log (monitoring and extraction wells) which provides the following information (Well Id, coordinates, driller, Consultant, Install*

date, target depth, aquifer, rational for installation, current and historic monitoring requirements).

Response

GHD maintains a list of monitoring wells and their completion details (well name, coordinates, installation date, target depth, aquifer) and it was routinely submitted to stake holders via the Annual Monitoring Report. When reporting requirements were consolidated in 2018 this practice was discontinued.

Most of the monitoring well network was installed in the 1990s, mainly to investigate and delineate the NDMA plume. The rationale for individual monitoring wells may not have been documented and/or preserved, further, the location may have been driven by accessible areas both physically and through property owner approval. The current groundwater monitoring requirements are provided in the 2023 Annual Monitoring Report and historic monitoring requirements were provided in previous editions of the Annual Monitoring Report.

Please call or email me is you have any questions or concerns.

Thanks

Lou Almeida B.Sc. (he/him)

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LEGEND

PROPERTY BOUNDARY	SS03-15 — ON-SITE COMPOSITE SOIL SAMPLE LOCATION (2015)
RIVER OR STREAM	SS20 — ON-SITE COMPOSITE SOIL SAMPLE LOCATION (1m WEST OF PROPERTY BOUNDARY) (2017)
TP07-11 — TEST PIT LOCATION	SS19A — OFF-SITE COMPOSITE SOIL SAMPLE LOCATION (<1m EAST OF PROPERTY BOUNDARY) (2017)
S-17(02) — CHEMTURA / GHD SURFICIAL SOIL SAMPLING LOCATION	SS19B — OFF-SITE COMPOSITE SOIL SAMPLE LOCATION (3m EAST OF PROPERTY BOUNDARY) (2017)
(36.54) — DIOXIN AND FURAN TEQ CONCENTRATION IN pg/g	SS19C — OFF-SITE COMPOSITE SOIL SAMPLE LOCATION (9m EAST OF PROPERTY BOUNDARY) (2017)
(8) — TOTAL DDT COMPOUNDS CONCENTRATION IN µg/kg	
OW14 — MONITORING WELL LOCATION	

0 10 20 30m

1:1000

N

GHD

LANXESS CANADA CO./CIE
ELMIRA, ONTARIO

Project No. **11192137**
Date **November 2024**

HISTORIC 'GAP' SAMPLING LOCATIONS

FIGURE 1

Filename: N:\CA\Waterloo\Projects\662\11192137\Digital_Design\ACAD 2020\Figures\PRE005\11192137-GHD-00-00-PRE-EN-D101_WA-005.dwg
Plot Date: 12 November 2024 5:16 PM

November 8, 2024

Attention: Mr. Jason Rice
Regional Project Engineer
Ministry of the Environment, Conservation and Parks
119 King Street West, 12th Floor
Ellen Fairclough Building
electronic correspondence

LANXESS Corporation
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Subject: Proposed Updates to Environmental Compliance Approval 0831-BX6JGD

LANXESS Canada Co./CIE (LANXESS) was issued an amended Environmental Compliance Approval (ECA) number 0831-BX6JGD on October 15, 2021, by the Ministry of Environment Conservation and Parks (MECP). Among the conditions of the ECA is condition 17 which outlines a requirement for receiver biological monitoring for ongoing and long-term assessment of impacts resulting from the Works and other related activities conducted on the LANXESS Elmira Site on the biota and habitats of Canagagigue Creek. This condition outlines three main programs, including a bio-monitoring survey of benthic invertebrates, a bio-monitoring survey of fish and biomonitoring using clams. The clam study involved the collection of uncontaminated source mussels from Balsam Lake, Ontario and their deployment for 21 days in cages along Canagagigue Creek (Aquatox 2019). Recovered clam tissues were analyzed for dioxins and furans. LANXESS is scheduled to complete these three biological monitoring programs in 2025.

LANXESS proposes the following changes and updates to their current ECA in an effort to replace and modify elements of condition 17, prior to their 2025 monitoring season.

1) Replace condition 17(2) – the caged clam study, with a resident fish tissue monitoring program. Small-bodied fish will be collected from four reaches outlined in the Fish Tissue Study Design submitted with this letter. The proposed frequency of tissue analysis is once every six (6) years, beginning in 2025. The methods and protocols will follow the Fish Tissue Study Design submitted with this letter. This change is proposed because the existing caged bivalve study is no longer a viable option, nor is removal of this condition from the ECA. A frequency of once every six years is appropriate for the monitoring of constituents of concern (dioxins and furans) which have a relatively long residency time, and this proposed schedule reduces potential population impacts to fish communities that may result from a more frequent sampling program.

2) Alter the frequency of bio-monitoring surveys (Condition 17(5) – fish community and benthic community sampling) to once every three (3) years instead of once every two (2) years. No changes to the methods of the

benthic and fish community studies are proposed and they shall remain consistent with the methods and protocols outlined in Section 2 of the 2004 Receiver Bio-monitoring Report for the Crompton Site in Elmira, Ontario, dated March 12, 2005, prepared by Stantec Consulting Ltd. This change is proposed so that fish community sampling efforts can line up with the proposed Fish Tissue Study such that fish tissues can be collected as part of the fish population study (fish community studies every three years, fish tissue studies every 6 years). A reduction in frequency of fish community sampling will allow for fish populations to recover from the removal of fish used in the Fish Tissue Study. Furthermore, long-term monitoring of fish and benthic communities in Canagagigue Creek has not shown appreciable changes over time (Stantec 2024) and a once per three-year monitoring program is more in line with federal effluent monitoring program frequencies, such as Environmental Effects Monitoring of mine and pulp and paper mill effluents (ECCC 2012). This change is anticipated to provide the information necessary to assess changes and trends in the receiver biological communities over the long-term, to reduce fishing pressure and monitoring stress for Canagagigue Creek communities, and to provide some relief for LANXESS from their abundant monitoring commitments associated with historical constituents of concern associated with the Elmira Site.

3) Alter the language used in ECA condition 17(4) from:

   Bio-monitoring Survey of fish species shall be undertaken at the fourteen (14) stations shown on Figure 2 in Schedule A.

   To:

   Bio-monitoring Survey of fish species shall be undertaken at the eight (8) reaches (A-H) shown on Figure 2 in Schedule A.

   This change is proposed to accurately reflect the methods being used. The number 14 refers to the upstream and downstream bounds of the 8 reaches and is in error.

4) Reporting associated with conditions 17(2) shall be included once every six (6) years as part of the Annual Monitoring Report required by condition 22.2 of the 2004 Receiver Bio-monitoring Report for the Crompton Site in Elmira, Ontario, dated March 12, 2005, prepared by Stantec Consulting Ltd. Reporting associated with conditions 17(3-5) shall be included once every three (3) years in the Receiver Bio-monitoring Report.

LANXESS is also requesting a review of the frequency of effluent Acute Toxicity sampling required as part of condition 14 of the ECA. The current frequency of Acute Toxicity testing is once every three (3) months (four times per year) with Chronic Toxicity to be completed twice a year, only if not acutely toxic. Acute toxicity results typically result in all samples being non-toxic with 0% mortality in both tested species (Rainbow Trout and *Daphnia magna*) (Stantec 2024).

LANXESS is seeking a reduction in the frequency of Acute Toxicity sampling outlined in condition 14(2) of the current ECA.

Given the nature of the proposed changes to the ECA and the introduction of a new Fish Tissue Study to replace the caged clam study, we anticipate MECP will require time to review and consider. We are available to discuss modifications and edits to the study design as proposed and on-line meetings can be arranged to go over suggestions or concerns you may have. Thanks for your continued time and attention, feel free to call or email me with any questions.

Yours sincerely,
LANXESS Corporation

Hadley Stamm
Environmental & Remediation Specialist

REFERENCES

AquaTox. 2019. Biomonitoring Study Using Clams (*Elliptio complanata*) and Leeches (*Nephelopsis obscura*). Prepared for LANXESS Canada Co./Cie by AquaTox Testing & Consulting Inc. 270 pp.

Environment Canada (ECCC). 2012. Metal Mining Technical Guidance Document for Aquatic Environmental Effects Monitoring. National Environmental Effects Monitoring (EEM) Office, Environment Canada.

Stantec. 2024. 2023 Receiver Biomonitoring Report for the LANXESS Site at Elmira, Ontario. GHD Ref. No. 005380 (33).

If you have any questions, please call me at (330) 441-8679, or you can email me at Hadley.Stamm@LANXESS.com

Environmental Compliance Approval Biological Monitoring Fish Tissue Study Design for the LANXESS Elmira Plant, Elmira, Ontario

Draft Report

November 7, 2024

Prepared for:
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Prepared by:

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100-300 Hagey Boulevard,
Waterloo ON N2L 0A4

Project/File:
160901603

Stantec

Limitations and Sign-off

The conclusions in the Report titled Environmental Compliance Approval Biological Monitoring Fish Tissue Study Design for the LANXESS Elmira Plant, Elmira, Ontario are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from LANXESS Canada Co./CIE (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

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Prepared by _____
(signature)

Joe Keene, M.Sc.
Senior Benthic Ecologist

Reviewed by _____
(signature)

Loren Knopper, B.Sc., M.Sc., Ph.D.
Senior Principal, Senior Technical Advisor for Research, Environmental Services

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1 Introduction

1.1 Background

LANXESS Canada Co./CIE (LANXESS) was issued an amended Environmental Compliance Approval (ECA) number 0831-BX6JGD on October 15, 2021 by the Ministry of Environment Conservation and Parks (MECP). Among the conditions of the ECA is condition 17, which outlines a requirement for receiver biological monitoring for ongoing and long-term assessment of impacts resulting from the Works and other related activities conducted on the LANXESS facility in Elmira, Ontario (Site) on the biota and habitats of Canagagigue Creek. This condition outlines three main programs, including a bio-monitoring survey of benthic invertebrates at 10 depositional stations, a bio-monitoring survey of fish at 8 reaches (the ECA indicates 14 stations, but this refers to the upstream and downstream bounds of the 8 reaches and is in error) and biomonitoring using clams. The clam study involved the collection of uncontaminated source mussels from Balsam Lake, Ontario and their deployment for 21 days in cages along Canagagigue Creek. Recovered clam tissues were analyzed for dioxins and furans. LANXESS is scheduled to complete these three biological monitoring programs in 2025.

As per Stantec's correspondence with the Ministry of Natural Resources (MNR) in 2022, that agency will not provide a licence to collect clams from Balsam Lake. There are insufficient clam populations within Canagagigue to provide enough mussels for a similar study using local mussels, which would be permitted.

On December 7, 2023 LANXESS provided the Woolwich Township Remediation advisory Committee/Technical Advisory Group (RAC/TAG) with a copy a letter submitted to the MECP on November 10, 2023 which provided a recommendation for future biomonitoring (as per Condition 17 (2) of ECA 0831-BX6JGD) at the LANXESS facility in Elmira, Ontario (Site). The goal of this letter was to remove the requirement of clam tissue sampling from the ECA going forward, since source clam collection could no longer be permitted. TAG did not support the request to discontinue the mussel monitoring program.

Given that LANXESS is unable to replicate the study design of the original ECA clam study requirements, nor was the removal of the clam biomonitoring ECA condition approved, Stantec has prepared a study design for an alternative replacement study that assess tissue from small-bodied fish species from Canagagigue Creek. This proposed ongoing monitoring is intended to satisfy long-term requirements of the ECA to assess potential impacts to aquatic organisms within the receiver.

1.2 Purpose

The purpose of this Study Design is to provide the sampling design and methods to be used in the evaluation of potential effects to the aquatic receiving environment of effluent from the LANXESS' discharges to Canagagigue Creek. This Study Design is intended to meet the requirements of an updated

ECA that is based on the current ECA (No: 0831-BX6JGD) but with condition 17(2) replaced with a fish tissue monitoring program.

2 Fish Tissue Program

This component of the biological monitoring program consists of a fish tissue study whereby resident fish are collected from several reaches in Canagagigue Creek, upstream, adjacent to, and downstream from the LANXESS Elmira Site. The study is a Control Impact Design with a single Reference reach and multiple exposure reaches.

2.1 Sampling Reaches

Fish will be collected during the summer fish community assessments conducted as part of ECA condition 17(4). During the summer fishing program, fish collected from two of the monitoring reaches (F and C) will be used in the fish tissue monitoring program (Figure 1). Two additional reaches, upstream (US) and downstream (DS) of the eight assessment reaches of that program will also be established and fished to provide fish tissue for the study.

There are natural barriers to fish passage within Canagagigue Creek that should provide some confidence that fish from the upstream reference area (e.g., upstream of the impoundment and north of Line 86) are unlikely to be captured farther downstream; therefore, would not be exposed to creek sediments within the LANXESS Site.

Reach US

Reach US is located upstream of the LANXESS Elmira Site, north of Church Street East (Line 86) (Figure 1). Fish collected here will provide reference fish tissue to be used to assess background levels of dioxins and furans. The specific length and location of Reach US will be determined in the field, based on the similarity of habitat and number and species of fish collected.

Reach F

Reach F is located immediately downstream of the causeway road crossing of Canagagigue Creek, east of the Elmira Plant. This reach is upstream from the confluence of Canagagigue Creek and Shirt Factory Creek. Reach F typically has large numbers and diversity of cyprinids (Stantec 2024).

Reach C

Reach C is located downstream from the Shirt Factory Creek confluence and upstream of the EImira Wastewater Treatment Plant discharge, Collection and Treatment System discharge and the Township Storm Water discharge to Canagagigue Creek. Reach C is contiguous with Reaches D and B which may provide an opportunity to supplement fish species/numbers collected in Reach C if necessary to achieve desired sample weights for the fish tissue program.

Reach DS

Reach DS is located downstream from Reach A (Figure 1) and the various discharges that enter Canagagigue Creek immediately upstream from Reach A. The specific length and location of Reach DS will be determined in the field, based on the similarity of habitat and number and species of fish collected.

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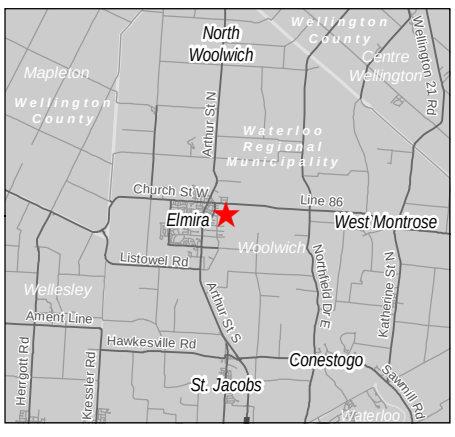
536000 536250 536500 536750

4827500 4827250 4827000 4826750 4826500

George Street
Spruce Lane
Church Street East
Duke Street
Line 86
Mill Street
Canagagigue Creek
Ratz Street
Onsite Dam
Reach H
Erb Street
Wyatt Street East
Reach F
Road Crossing
Shirt Factory Creek
Reach E
Reach G
Park Avenue East
Union Street
Reach D
Reach C
Reach B
Elmira WWTP Outfall (0+865)
CTS Outfall (GE Effluent)
1st Street East
1st Street East
Reach A
Township Storm Water Discharge

N



Legend

- LANXESS Property Boundary
- Onsite Dam
- Electrofishing Station
- Flow Direction

0 50 100 metres

1:3,500 (At Original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2019.
3. Orthoimagery © First Base Solutions, 2019. Imagery Date, 2018.

Stantec

Project Location
Regional Municipality of Waterloo

160960194 REVA
Prepared by DH on 2019-07-30
Revised by JB on 2021-01-21

Client/Project
LANXESS CANADA CO./CIE
LANXESS BIOMONITORING
ELMIRA, ONTARIO

Figure No.
1

Title
2025 Fish Collection **Reaches**

2.2 Sentinel Species and Sample Size

Targeting small minnows (*Cyprinidae/Leuciscinae*) is advantageous because they are less likely to move long distances across multiple regions/reaches of Canagagigue Creek and thus provide some site specificity relative to larger sport fish. Small-bodied fish are benthivores and detritivores and thus are closely associated with aquatic sediments within Canagagigue Creek; sediments which are assumed to contain the constituents of concern (COCs; i.e., Dioxins/Furans). There are several candidate fish species that are caught regularly from multiple reaches of the creek in sufficient number that will not likely negatively impact fish populations in the long-term, if collected as part of a once every six years sampling program (Stantec 2024).

Possible sentinel species to target include Longnose Dace (*Rhinichthys cataractae*), Common Shiner (*Luxilus cornutus*) or Central Stoneroller (*Campostoma anomalum*). Ideally, the same species will be collected from all sampling reaches, however, consistency of fish populations by location is not guaranteed within a sampling event or from one sampling event to the next. Sentinel species will be determined based on the size and number of fish catches during each sampling program. If necessary, fish from different species may be combined within or among composite samples to achieve the desired wet weight of tissue for the study.

A total of three replicate samples of whole-body composites of the target fish species will be collected from each of the four sampling reaches. Each composite sample will consist of 40 g of wet weight fish, a weight necessary to achieve desired detection limits for the COCs by the analytical laboratory conducting the tissue testing (Bureau Veritas).

2.3 Field and Laboratory Methods

Fish will be collected and sampled during LANXESS' biomonitoring program (i.e., fish communities, benthic invertebrates and sediment) already being conducted within Canagagigue Creek as per conditions 17(3-5) of the ECA. The summer fish sampling program is recommended to supply fish for the tissue study (typically conducted in August), as quantity and size of fish during the summer capture period have often been greater, relative to the spring sampling period (Stantec 2024). Fish will be collected under a Licence to Collect Fish for Scientific Purposes obtained from the Guelph District Ministry of Natural Resources (MNR). Fish will be collected from each reach using a backpack electrofisher and long handled dip nets. Fish to be used for the fish tissue study will be euthanized, and wrapped in clean, hexane-rinsed foil. Fish will be stored on ice in a cooler and transported to Stantec's Ecology Laboratory where they will be weighed, measured, divided and organized into composite replicate samples, repackaged in clean foil and frozen. Length (fork and total), wet weight and external condition will be documented for fish used in the fish tissue study. Frozen samples will be shipped to an accredited analytical laboratory (Bureau Veritas) for tissue processing and assessment of COCs.

Laboratory supporting analysis will include percent lipid and percent moisture for all tissue samples submitted. Tissue samples will be analyzed for the COCs (Dioxins and Furans) with specific parameters listed in Table 1.

Table 1 List of Constituents of Concern to be Analyzed in Fish Tissue

Organism	Chemicals to be analyzed	
	Dioxins	**Furans**
Small-bodied Fish	Total TetraCDD	Total TetraCDF
	Total Penta	Total PentaCDF
	Total HexaCDD	Total HexaCDF
	Total HeptaCDD	Total HeptaCDF
	OctaCDD	OctaCDF
	2,3,7,8-TetraCDD	2,3,7,8-TetraCDF
	1,2,3,7,8-PentaCDD	1,2,3,7,8-PentaCDF
	1,2,3,4,7,8-HexaCDD	2,3,4,7,8-PentaCDF
	1,2,3,6,7,8-HexaCDD	1,2,3,4,7,8-HexaCDF
	1,2,3,7,8,9-HexaCDD	1,2,3,6,7,8-HexaCDF
	1,2,3,4,6,7,8-HeptaCDD	2,3,4,6,7,8-HexaCDF
		1,2,3,7,8,9-HexaCDF
		1,2,3,4,6,7,8,-HeptaCDF
		1,2,3,4,7,8,9-HeptaCDF
	p,p DDT, o,p DDT, p,p DDE, o,p DDE, p,p DDD, o,p DDD	

Notes:

CDD chloro dibenzo-p-dioxin

CDF chloro dibenzofuran

DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane) (o,p' and p,p' isomers)

DDD (1,1-dichloro-2,2-bis(4-chlorophenyl)ethane) (o,p' and p,p' isomers)

DDE (1,1-dichloro-2,2-bis(4-chlorophenyl)ethylene) (o,p' and p,p isomers)

DCP dichlorophenol

TCP trichlorophenol

TeCP tetrachlorophenol

PCP pentachlorophenol

The target COC to be analyzed are based on: 1) ECA requirements; 2) the 1994/1995 MOE studies; and 3) data collected from previous studies on the Creek (Aquatox 2019). Dioxins and furans will be analyzed using High Resolution Mass Spectrometry (HRMS). DDT (and metabolites) will be analyzed using Gas Chromatography/Electron Capture Detection (GC/ECD).

A Recommended Detection Limit (RDL) of 5 ng/g is proposed for the chemical parameters assessed in the fish tissue study.

2.3.1 Fish Tissue Study Data Analysis

Data Assessment

Prior to analysis of the data, GHD will complete a data validation following current U.S. Environmental Protection Agency (EPA) protocols.

Dioxin and furan potency can be compared by calculating toxicity equivalency factors (TEFs). Dioxins and furans comprise a range of individual chemicals with similar molecular structures and compositions. The most toxic dioxin and furans have chlorine atoms in the 2, 3, 7, and 8 positions on the benzene rings within the molecules. These congeners are used as the basis for a dioxin and furan toxic equivalency (TEQ) calculation. 2,3,7,8-tetraCDD is assigned a TEF value of one. The other dioxins and furans are assigned a lower TEF value based on their lesser potency compared to the 2,3,7,8 congener. To obtain the TEQ value, the measured tissue concentration of each dioxin or furan isomer is multiplied by the TEF value. These TEQs will be summed for each station. The total TEQs thus assess the various dioxins and furans that are detected in a sample and then express them as an equivalent concentration of 2,3,7,8-tetraCDD.

The inclusion of the detection limits for non-detect congeners in the TEQ calculation results in artificially high TEQ numbers, making it difficult to determine whether conditions in the Creek are improving over time because real changes in TEQs are masked by even small changes in the detection limits. Therefore, in order to provide a better representation of overall changes in tissue concentrations in the Creek, a value of zero will be assigned for dioxin and furan congeners that are not detected when calculating the dioxin and furan TEQ for a sample. This approach is consistent with EPA guidance (US EPA 2006; 2015; 2016) and is considered an accepted practice by MECP.

Results from each reach will be compiled and summarized, once the data validation has been completed, and appropriate qualifiers are applied. Statistical analysis of the data (ANOVA) comparing exposure reaches to the reference reach fish will be performed. Analyzing 3 replicate tissue samples at each reach will allow for statistical comparisons among reaches (using ANOVA) and a determination of significant differences between tissue parameters in exposure fish versus reference fish.

Changes over time will also be assessed by statistically comparing tissue contaminant levels at each station/reach from sampling year to sampling year, over time. Furthermore, power analysis will be conducted to determine the appropriate number of replicate samples to provide sufficient statistical power to assess differences in future fish sampling programs. This will provide LANXESS and MECP with more robust, defensible data upon which to base future management decisions for Canagagigue Creek.

2.3.2 Fish Tissue Study Quality Assurance and Quality Control

Quality Assurance and Quality Control methods for the fish tissue study include:

- Use of sterile gloves for sample collection, changed between fish (samples)
- Use of clean bench material between each sample collected and avoiding sample contact with non-sterile surfaces

- Collection of supporting data including fish length, weight, and tissue sample lipid and moisture content
- All field personnel will have a good understanding of the fish tissue study objectives and experience with all required field equipment and sampling procedures
- Freezing of samples will be completed as soon as possible after samples are collected
- All samples will be labeled appropriately with a unique sample number that corresponds to supporting data
- Sample collection notes will be recorded on data sheets prepared prior to the field survey to facilitate the completeness of the field data, and subsequent data entry
- Chain-of-custody forms and sample submission forms used and appropriately filed
- Backup copies of field notes and bench sheets will be created electronically and in hard copy.

2.3.3 Future Considerations

During the course of future fish tissue monitoring programs at the LANXESS Site, if downstream reach (F, C and DS) fish tissue levels of the COCs are no longer significantly higher than in the upstream reference (US) fish tissue samples, the ECA condition 17(2) requirements to conduct this sampling program should be reevaluated. If fish tissue in a particular sampling reach of the creek does not significantly differ ($p>0.05$) from upstream reference tissue levels of the COCs in two subsequent monitoring events, tissue monitoring may no longer be required at that reach. If all downstream reaches do not significantly differ from the reference reach data, then the fish tissue monitoring program could be discontinued, provided LANXESS has not established a new potential source of these COCs in the future.

3 Reporting and Schedule

Field methods, laboratory methods, data analysis and results will be presented to provide a summary of the fish tissue study as part of the reporting requirements of ECA conditions 17(6) and 22. Reporting on the fish tissue study will be included in the annual monitoring report to be submitted to MECP in 2025 and every six years thereafter. The report will include colour maps, tables, and graphics, as necessary, to facilitate comparisons. Statistical analyses will be summarized in tables.

4 Closing and Disclaimer

This document entitled Environmental Compliance Approval Biological Monitoring Fish Tissue Study Design for the LANXESS Elmira Plant, Elmira, Ontario was prepared by Stantec Consulting Ltd. for the account of Alamos Gold Inc. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This Study Design provides the methods to be used in the evaluation of potential impacts of effluent discharge to Canagagigue Creek biota from the LANXESS Elmira Plant. This Study Design is intended to meet the requirements of the amended ECA and the requirements of ECA (No: 0831-BX6JGD) issued to LANXESS on October 15, 2021.

5 References

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MOEE (Ontario Ministry of the Environment and Energy). 1996. A report submitted to the Uniroyal Public Advisory Committee. Canagagigue Creek Mussel and Leech Biomonitoring Study.

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US EPA. 2016. National Functional Guidelines for High Resolution Superfund Methods Data. EPA 542-B-16-001. April 2016.

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November 14, 2024

Ms. Tiffany Svensson
Technical Remediation Advisory Committee
24 Church Street West
Elmira ON
N3B 2Z6

TRAC Questions – LANXESS Canada Co./Cie.

Dear Tiffany,

GHD has prepared this letter on behalf of LANXESS Canada Co./Cie. to respond to the Township of Woolwich, Technical Remediation Advisory Committee (TRAC) questions that were received in an email from you dated September 30, 2024. For ease in review the TRAC questions have been provided in italicized text with responses provided below.

TRAC Question 1

– ***Please provide all the lines of evidence that exist and have been used to address the lingering concerns expressed by Sebastian, TAG's Eastside Champion, about the Eastside GAP area. (i.e., provide topography information, flow path for historic waste management units, the presence of mature trees, soil, sediment and surface water quality used in the HHERA etc. Please provide groundwater data, historic aerial photography dating back to the 1940s, and surface soil data for this area. The composite sampling approach was used to successfully identify surface soil areas along the east side where additional sampling and subsequent soil remediation was completed. The outcome of the onsite and offsite soil investigations prove that the characterization methodology and approach was applicable and valid.***

Response

Gap Area History and Sampling

The Gap area (see Figure 1) is a wooded area located in the southeast portion of the LANXESS property located at 25 Erb Street, Elmira, Ontario (Site). The Gap area is topographically high with slopes to a drainage feature located on the neighbouring property to the east (6670 Line #86), former gravel pit (GP1) to the west and the Canagagigue Creek further to the south. Predecessors to LANXESS operated former liquid waste and solid waste pits north of the GAP Area. During the operation of the liquid waste pits, wastewater was allowed to clarify in the pits prior to discharge of the liquid to the gravel pits located to the south. The liquid wastes were conveyed to the former gravel pits in an open swale which ran parallel to the Canagagigue Creek further to the west of the Gap Area. Based on historical documents reviewed, the GAP area has not been identified as historic area of either chemical manufacturing or historical waste management. Due to its isolated location, consistent presence of a wood lot, and topographically higher elevation with respect to the surrounding areas, it has not been considered an area of interest at the Site with respect to environmental liability or legacy. Soils and groundwater samples have been collected from the Gap Area as part of investigations conducted in the 2000s, 2010s and 2020s.

The following present a summary of the historic sampling results for the Gap area:

– Two surface soil samples (S-17[02]) and S-32[02]) collected in 2002 within the Gap area
– One test pit (TP07-11) completed in 2011 within the Gap area
– Three monitoring wells (OW14s, OW14i and OW14d [nested well]) currently located within the Gap area
– Three composite surface soil samples (SS09-15, SS20, SS21) collected within the Gap area, one in 2015 and two in 2017

The surficial soil samples were analyzed for dioxins and furan toxic equivalency (TEQ). The results are provided in Table 1 as follows:

Table 1 GAP Area Historic Surface Soil Sampling Dioxin/Furan Results

Sampling location	Sample type	TEQ* Criteria	Result picograms /gram (pg/g)
S-17(02)	Grab Surface Soil	99	10.1
S-32(02	Grab Surface Soil	99	3.78
TP07-11	Test Pit	99	15.92
SS09-15	Composite Surface Soil	99	10.7
SS20	Composite Surface Soil	99	3.00/304
SS21	Composite Surface Soil	99	6.97
*- MECP's Generic Criteria as presented in Table 2 Full Depth Site Conditions Standards for Industrial Commercial F Property Use (Table 2) for fine to medium grained soil, TEQ criteria is 99 pg/g.			

All dioxins and furan TEQ results are significantly less than the Table 2 Standard for Dioxins and Furans.

The surficial soil samples were also analyzed for DDD, DDE, and DDT. The results are provided in Table 2 below:

Table 2 GAP Area Historic Surface Soil Sampling DDD, DDE and DDT Results

Sampling location	DDD Result (pg/g)	DDE Result (pg/g)	DDT Result (pg/g)
TP07-11	ND(0.04)	ND(0.04)	ND(0.04)
SS09-15	ND(0.0030)	ND(0.0030)	0.0035
SS20	ND(0.0020)/ND(0.0020)	ND(0.0020)/ND(0.0020)	ND(0.0020)/0.0024
SS21	ND(0.0030)	ND(0.0030)	0.0037
ND(RDL) – Not detected at the reporting detection limit			

There were only two detections slightly greater than the laboratory reporting detection limit for the constituent DDT. The Table 2 DDD criteria is 4.6 pg/g, DDE criteria is 0.52 pg/g, and the DDT criteria is 1.4 pg/g. All DDD, DDE and DDT results were less than the associated Table 2 Standards. Historic groundwater data generated from the sampling and analysis of samples collected from wells located in the GAP area (OW14s, OW14i and OW14d) do not indicate the present of herbicides or pesticides in any of the samples collected and analyzed. This soil and groundwater data support the conclusion that the Gap area has not been impacted by historic Site activities.

Former Gravel Pit Investigation

The former gravel pit investigation included soil sampling of the former gravel pit areas and the southeastern portion of the LANXESS Site. These areas are all located on the LANXESS property and include the Gap area.

GHD collected surficial and near-surface soil samples in the southeastern area of the Site in August 2011, to obtain additional soil quality data to augment previous results obtained in 2001 and 2002. Two former gravel pits, GP-1 and GP-2, are located in this area of the Site, and were used to collect surface water overflow from the historic waste pits until approximately 1970. To provide sufficient data to assess human health and ecological risks posed by exposure to soils in these areas, GHD subdivided the gravel pit area based on the historic exposure risk into the following three areas:

– GP-1: Includes area in and immediately surrounding GP-1
– GP-2: Includes area in and immediately surrounding GP-2
– Southeast (SE Area): Includes general area surrounding gravel pits as well as the LANXESS portion of the Gap area

The statistical evaluation has focused first on contrasting the dioxin and furan and DDT concentrations in the three study areas, and then developing statistical interval estimates to represent maximum expected exposure concentrations to be used as inputs for subsequent risk assessment activities.

Based on the results of the statistical analyses, surface soils with the GP-1 area contain much higher dioxin/furan TEQ and DDT concentrations that do soils in GP-2 and the SE Area. In contrast, the GP-2 and SE areas appear to generally contain dioxin/furan TEQ and DDT concentrations within applicable criteria and may not pose unacceptable risk to human health and the environment, considering the analytes of interest (i.e., dioxins/furans and DDT). These results support the conclusion that the Gap area has not been significantly impacted by historical site activities.

HHERA (2022)

The most recent HHERA utilized sediment data from a surface water drainage area located at 6670 Line #86. This area has been identified as an area of concern by members of the Elmira community. This area consists of a portion of the east side of the LANXESS Site (Gap area) and the western side of the neighboring agricultural farm field property. The drainage area is a vegetated wetland and contains a woodlot and agricultural features. The ecology in this drainage area is consistent with the ecology of the Canagagigue Creek study area, additionally, no consistent human usage is associated with this area or the ditch. However, should a trespasser/person walk through the area, incidental exposure (dermal, ingestion) to creekbank soil or sediment (in the drain) could occur.

Soil/sediment composite samples were collected from the drainage area both by LANXESS, and independently by an Elmira community member and shared with LANXESS in an email dated November 24, 2021. The following provides a summary of the data collected.

Sediment samples within the ditch (D-P1 and D-P2) were collected by GHD in 2020 from the drain feature.

Results from the drainage area soil/sediment samples and ditch sediment samples for total DDT (i.e., DDD, DDE, and DDT) and dioxins/furans (TEQ) are summarized below.

– DDD, DDE, and DDT results were reported for the samples within the ditch (D-P1 and D-P2) collected by GHD in 2020 from the drain feature itself. In general, DDT and its metabolites were not detected in these samples. Only one sample (D-P1 for 0-10 centimetre [cm] depth) had a reported concentration for DDD of 0.027 µg/g. A total DDT concentration for this sediment sample can be estimated by summing the DDD, DDE, and DDT results with DDE and DDT assigned their full detection limits. This results in an estimate of total DDT of 0.096 ug/g.
– Dioxins/furans (TEQ) results were available for two soil/sediment samples submitted by the Elmira community member and four sediment samples collected by GHD in 2020 from the drain feature itself. Of

these six samples, five had dioxins/furans (TEQ) concentrations that were less than or equal to 4.4 pg/g; which is roughly equivalent to the sediment exposure point concentration for Reaches 2 and 1 of 3.7 pg/g**.** One sample (D-P1 for 10-30 cm) had a higher concentration of 24.4 pg/g. Reaches 1 and 2 are the Canagagigue Creeks areas furthest downstream of the Site and represent the areas with the lowest concentrations of dioxins/furans and DDT in soils and sediment.

Creekbank/floodplain soil and sediment data have also been collected from locations upstream of the drainage area within and adjacent to the Creek, with concentrations of dioxins/furans (TEQ) ranging from 0.755 to 42.9 pg/g. Although concentrations in the drainage area may be higher than the concentrations reported in the samples collected by the Elmira community member (based on the surrounding data), the reported concentrations for these samples as well as the soil and sediment samples collected by LANXESS, are below the human health soil component value protective of direct soil contact (48 pg/g; MOE, 2011a).

The HHERA concluded that the measured concentrations of total DDT and dioxins/furans (TEQ) within the drainage area pose no unacceptable risks to receptors.

Effects of Historic Wastewaters on Trees and Vegetation

The presence of the significant wood lot located with the Gap and the aerial photographs (1930s to 2020s) reviewed do not show any vegetation loss, trees or canopy loss during the time the historic waste management units were in operation. The aerial photographs also do not show any visual evidence of earth movement or scaring and do not suggest any human activities occurred in the Gap area over this time period. The aerial imagery reviewed was concurrent with and after wastes were stored in the pits. The herbicides produced historically at the plant, and waste from the manufacturing processes placed in the pits, would adversely affect plant and tree growth within the wood lot and would likely result in a significant loss of vegetation, trees and tree canopy. These effects are not evident on the aerial photographs (1930, 1955, 1964, 1980 and 2016) available for review for the Gap area. The review and interpretation of the available aerial photographs support the conclusion that the Gap area has not been significantly impacted by historical site activities.

TRAC Question 2

– ***Regarding the issue of recently discussed below target pumping rates issue, what do target rates mean on-site/off-site? Discuss layers of safety, protection, monitoring, hydraulic conductivities and what is being done to attain these target pumping rates, addressing TAG's longstanding question of 'how long would it take for loss of containment to happen?'***

Response

The off-Site target pumping rates are based on the maximum well capacity, or how much the well can pump. Typically, this target rate is 80 to 90% of the maximum well capacity.

The on-Site target pumping rates (PW4 = 2.9 litres per second [L/s] and PW5 = 1.8 L/s) were established at the maximum rate the wells could pump without causing well interference (i.e. resulting in the reduction in water levels and reduced pumping rates) with each other. Unlike the off-Site wells, the on-Site containment wells are in close proximity, close enough that their drawdown cones may overlap with each other.

The containment is monitored by the following tiered approach:

A. Target pumping rates
B. Continuous hydraulic monitoring data
C. Manual groundwater elevations
D. Groundwater quality analysis (actual sampling of the sentinel wells)

As long as target pumping rates are maintained, operational experience shows that hydraulic containment is maintained. However, data indicates containment is also maintained when there is a brief outage at a well, or when pumping rates are lower than the target pumping rates. Continuous hydraulic monitoring data provides a direct assessment of hydraulic containment at key points along the Site boundary, confirming that the target

pumping rates are effective. Manual groundwater elevation data provide a broad “snapshot” of groundwater flow directions along the Site boundaries, confirming the continuous monitoring data at key locations continue to be effective sentinels. Groundwater quality analysis provides evidence that the quality of the groundwater immediately adjacent to the Site boundary is maintained or improved, the ultimate goal of maintaining hydraulic containment of the Site.

There are different degrees of containment, ranging from 0% containment, with no on-Site pumping, to 100% containment, where all groundwater constituents are contained. If all groundwater extraction were to cease on-Site, hydraulic containment would be lost in less than a day when the groundwater elevations have had sufficient time to recover from pumping and groundwater begins to flow off-Site. Groundwater velocity would be relatively high, reflecting the natural hydraulic gradient. Constituents would begin to migrate off-Site, but at a reduced rate relative to the groundwater velocity, because of attenuation mechanisms such as dispersion and sorption on to the aquifer matrix. It would take weeks or months for constituents to migrate to the sentry well locations and cause increasing constituent concentrations. A complete shutdown of all on-Site wells is not a typical occurrence. A more common situation would involve pumping the well at a rate which was less than the target pumping rate, which would not result in a complete loss of containment. While continued pumping at less than the target pumping rate would change hydraulic gradients, it would not revert to natural gradient that would exist if there were no pumping. It’s also important to note that LANXESS has set target rates are above pumping rates that achieve containment.

LANXESS completes routine maintenance tasks on the containment and extraction wells as part of their on-going preventative maintenance and system inspections. LANXESS also completes pump/motor inspections, down-hole videos, well rehabilitation, and water blasting of the pipelines as needed to ensure continued operation of the wells at their target pumping rates. Additionally, LANXESS performs annual specific capacity testing to monitor the performance of each well.

TRAC Question 3

– ***Revisit and respond to TAG’s written response to the revised HHERA (May 2023), provided on Oct 27th 2023. Include an update on the agreed upon request to clean up ‘hot spots’ in the vicinity of residents along the creek.***

Response

Stantec will revisit and provided comment responses to TAG’s comments provided on October 27, 2023 as part of finalizing the HHERA. An update on the ‘hot spots’ will also be provided by LANXESS once the HHERA is finalized and approved by the MECP.

TRAC Question 4

– ***Has LANXESS determined the effective solubilities of NDMA and chlorobenzene in the upper and lower municipal aquifer. Addressing the concern of using the “aqueous” solubility value of chlorobenzene in the September 12, 2024 presentation to support the assessment that there is no NAPLs present off site i.e. the effective solubility of a compound from a chemical mixture is less than its aqueous solubility.***

Response

The discussion on September 12, 2024, focused on why the 1% rule was at best a “rule of thumb” with respect to identifying the presence of DNAPL. GHD contrasted the situation at on-Site containment well PW4 versus former off-Site extraction well W4. At PW4, chlorobenzene concentrations remain in the 1,000’s of µg/L after more than 35 years of pumping, which indicates an ongoing nearby source of chlorobenzene, almost certainly residual DNAPL. At former off-Site extraction well W4, pumping was initiated in 1997 with a chlorobenzene concentration of 4,400 micrograms per litre (µg/L) and in 2017, after chlorobenzene concentrations decreased to less than the Ontario Drinking Water Quality Standard of 80 µg/L, LANXESS terminated groundwater extraction via W4. The fact that the chlorobenzene concentrations were reduced relatively rapidly indicates

there is no ongoing chlorobenzene source (DNAPL) near W4. GHD did not use the 1% rule or effective aqueous solubilities to infer or repute the presence of DNAPL.

TRAC Question 5

– ***Consider developing a well installation log (monitoring and extraction wells) which provides the following information (Well Id, coordinates, driller, Consultant, Install date, target depth, aquifer, rational for installation, current and historic monitoring requirements).***

Response

GHD maintains a list of monitoring wells and their completion details (well name, coordinates, installation date, target depth, aquifer) and it was routinely submitted to stake holders via the Annual Monitoring Report. When reporting requirements were consolidated in 2018 this practice was discontinued.

Most of the monitoring well network was installed in the 1990s, mainly to investigate and delineate the NDMA plume. The rationale for individual monitoring wells may not have been documented and/or preserved, further, the location may have been driven by accessible areas both physically and through property owner approval. The current groundwater monitoring requirements are provided in the 2023 Annual Monitoring Report and historic monitoring requirements were provided in previous editions of the Annual Monitoring Report.

Regards

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Project Manager

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AB/kf/64

Encl.

Copy to: Jason Rice, MECP
Hadley Stamm, LANXESS

LEGEND

PROPERTY BOUNDARY	
RIVER OR STREAM	
TP07-11	TEST PIT LOCATION
S-17(02)	CHEMTURA / GHD SURFICIAL SOIL SAMPLING LOCATION
(36.54)	DIOXIN AND FURAN TEQ CONCENTRATION IN pg/g
(8)	TOTAL DDT COMPOUNDS CONCENTRATION IN µg/kg
OW14	MONITORING WELL LOCATION
SS03-15	ON-SITE COMPOSITE SOIL SAMPLE LOCATION (2015)
SS20	ON-SITE COMPOSITE SOIL SAMPLE LOCATION (1m WEST OF PROPERTY BOUNDARY) (2017)
SS19A	OFF-SITE COMPOSITE SOIL SAMPLE LOCATION (<1m EAST OF PROPERTY BOUNDARY) (2017)
SS19B	OFF-SITE COMPOSITE SOIL SAMPLE LOCATION (3m EAST OF PROPERTY BOUNDARY) (2017)
SS19C	OFF-SITE COMPOSITE SOIL SAMPLE LOCATION (9m EAST OF PROPERTY BOUNDARY) (2017)

0 15 30 45m

1:1500

N

GHD

LANXESS CANADA CO./CIE
ELMIRA, ONTARIO

Project No. **11192137**
Date **November 2024**

HISTORIC 'GAP' SAMPLING LOCATIONS

FIGURE 1

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Plot Date: 14 November 2024 2:49 PM