RESPONSIBLE CARE®
Verification Report

NOVA Chemicals Corporation

October 1 to 5, 2018

Chemistry Industry Association of Canada

Responsible Care®
Our commitment to sustainability.

Disclaimer

This report has been produced by a team, convened by the Chemistry Industry Association of Canada (CIAC), to provide advice to the member-company and assist it in meeting its Responsible Care® commitments. The material in this report reflects the team's best judgment in light of the information available to it at the time of preparation. It is the responsibility of the CIAC member-company that is the subject of this report to interpret and act on the report's findings and recommendations as it sees fit. Any use which a third party makes of this document, or any reliance on the document or decisions made based upon it, are the responsibility of such third parties. Although CIAC members are expected to share the results of this guidance document with interested parties, the Association, its member-companies, their employees, consultants and other participants involved in preparing the document accept no responsibility whatsoever for damages, if any, suffered by a third party as a result of decisions made or actions based on this report.

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EXECUTIVE SUMMARY

This report documents the observations and conclusions of the independent verification team tasked with conducting a Responsible Care verification of some of NOVA Chemicals Corporation's ("NOVA") facilities. The verification was undertaken from October 1 through October 5, 2018 at NOVA's Calgary and Joffre, Alberta facilities and two facilities south of Sarnia, Ontario. This was the eighth Responsible Care verification completed for NOVA. The last verification was conducted in June 2015.

While considering all aspects of the Responsible Care Commitments during the verification, the team placed an emphasis on conducting a more in-depth examination of the company's document management system.

As a result of the examination conducted, and in consideration of the observations communicated within this report, the verification team is of the opinion that the Responsible Care Ethic and Principles for Sustainability are guiding company decisions and actions, and that a self-healing management system is in place to drive continual improvement. The verification is completed, and no further involvement is required by the verification team.

Signed: **Gerry Whitcombe** Date: 31 October 2018
Verification Team Leader

For more information on this or a previous Responsible Care Verification Report, please contact your local company site or NOVA's overall Responsible Care coordinator:

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Summary of Verification Team Observations

Findings Requiring Action
There were no findings requiring action

Works in Progress

1. To formalize the inclusion of end use sustainability benefits on the form that the Technical Decision Board uses.
2. The current effort to review and revamp Sarnia area emergency awareness communication is a work in progress.
3. The modification of STD 140 to specify a requirement to schedule the communication of hazards, risks and credible scenarios to near neighbours and CAPs at prescribed intervals is a work in progress.
4. The expansion of the work of the Responsible Care cultural committee in ME to the scope of work at MW is a work in progress.
5. The development and implementation of the risk communication program to potentially impacted stakeholders on the US side of the river is a work in progress.
6. Adding a member to the BCAP from Corunna is a work in progress.
7. Consider sampling/spot-checking to ensure shelter-in-place is understood by St. Clair near plant residential neighbours. In general, the expectation is that when any company facility poses a risk, all near-plant neighbours are known to be knowledgeable about shelter-in-place.

Improvement Opportunities

1. Specific to ME, ensure that companies using the pipeline overhead are performing ongoing assessment of their lines.
2. Create a specific visitor safety indoctrination for ME visitors.
3. Add to the 'Responsible Care Checklist', which is a part of the Management of Change process, changes which are specific to the Codes of Practice, e.g. Community Impact.
4. Provide feedback to INEOS on the benchmarking of the NOVA ERP against X731-03. (please refer to the 2018 INEOS Responsible Care Verification Report)
5. Benchmark company Critical Infrastructure and Business Continuity (CI/BC) systems against CIAC guidance (checklist)
6. To set targets for waste reduction and diversion of wastes from landfill for non-hazardous wastes of ME.
7. To develop 'canned' information packages for employees who are delivering the Responsible Care message outside NOVA.
8. To add the Responsible Care logo to visitor badges and lanyard.
9. To explicitly require sales and technical service personnel to look for and report on issues of concern when visiting customers.
10. To include toll manufacturers and contract laboratories in Std 450: Supply Chain Controls.
11. To review supplier evaluation checklists to better incorporate RC code requirements.
12. Enhance issues log of items raised by JCAP in order to ensure that they are not neglected and there are structured updates on long-term issues in advance of issue closure.
13. Consider additions to the work flows associated with AP100 Developing Corporate Procedures that will ensure the Codes of Practice do not become diluted over time.
14. To include in the Sustainability Strategy, development of a mechanism to rank new and existing products against the three pillars of sustainability, in order to incorporate it into product choice decision-making.
15. To include more traditional sustainability performance measures (energy, footprint) in the sustainability report.

Successful Practices

1. The venture that Asset Recovery and Community Relations has established with Habitat for Humanity is a successful practice.
2. The high level of the adoption of a safety culture throughout all levels of the organization is a successful practice.
3. The addition of Cause Centered Improvement' to the IR&I process adds an important deep analysis tool to NOVA's ability to clearly understand and address the causes of current unwanted or poor performance and is a successful practice.
4. Contribution to project STOP, marine plastic reduction initiative is a successful practice.
5. Incorporating sustainability into product development by designing a recyclable oxygen barrier film structure, which can be used to package food products such as meat, cheese and nuts that traditionally have been in non-recyclable, mixed-material packaging is a successful practice.
6. The development of RC & Sustainability Culture throughout the company as demonstrated by employee adoption of Taking Care (e.g. amongst other things, belief in Target Zero is Possible and in Safety Interactions) is a successful practice.
7. The enthusiastic engagement and work of the Taking Care action team at MW is a successful practice.

1. Introduction

1.1 About Responsible Care Verification

As a member of the Chemistry Industry Association of Canada (CIAC), the most senior executive responsible for NOVA's operations in Canada attests annually to CIAC and its peers that NOVA's operations conform to the expectations contained in the Responsible Care Commitments and are guided by Responsible Care Ethic and Principles for Sustainability.

The Responsible Care® Ethic and Principles for Sustainability

We dedicate ourselves, our technology and our business practices to sustainability - the betterment of society, the environment and the economy. The principles of Responsible Care® are key to our business success, and compel us to:

- *work for the improvement of people's lives and the environment, while striving to do no harm;*
- *be accountable and responsive to the public, especially our local communities, who have the right to understand the risks and benefits of what we do;*
- *take preventative action to protect health and the environment;*
- *innovate for safer products and processes that conserve resources and provide enhanced value;*
- *engage with our business partners to ensure the stewardship and security of our products, services and raw materials throughout their life-cycles;*
- *understand and meet expectations for social responsibility;*
- *work with all stakeholders for public policy and standards that enhance sustainability, act to advance legal requirements and meet or exceed their letter and spirit;*
- *promote awareness of Responsible Care and inspire others to commit to these principles.*

As an element of this commitment to Responsible Care, the company must, every three years, participate in an external verification intended to:

- Provide the Executive Contact with an external perspective when assessing if the company is indeed meeting the intent of the Responsible Care Commitments, along with advice on areas that may require attention;
- Identify opportunities for assisting the company when benchmarking its own practices and performance against those of its peers, thus supporting continual improvement;
- Contribute to the credibility of Responsible Care amongst company personnel and stakeholders, as well as the stakeholders of the broader industry;
- Identify successful company practices that can be promoted to peers in the CIAC membership; and
- Support the identification of areas of common weakness so that collective tools and guidance can be developed to improve performance in those areas across the CIAC membership.

Verification is conducted according to a common protocol, developed by the association's members and others, including several critics of the chemical industry. The verification is conducted by a team consisting of:

- Knowledgeable industry experts with experience in Responsible Care;
- A representative of the public at large (usually with a public interest background and with experience in Responsible Care gained from serving on the CIAC's National Advisory Panel) and
- One or more representatives of the local communities where the company's facilities are located.

Once completed, the Verification Report is made publicly available through the CIAC website (www.canadianchemsitry.ca). The company is also expected to share the report with interested persons in its communities and other stakeholders as part of its ongoing dialogue processes.

Additional information on Responsible Care and/or the verification process can be found at the CIAC website www.canadianchemistry.ca, or by contacting the Director, Responsible Care at CIAC at glaurin@canadianchemistry.ca or (613) 237-6215 extension 233.

1.2 About NOVA Chemicals

NOVA is a multinational chemical company owned by The International Petroleum Investment Company (IPIC) of the Emirate of Abu Dhabi and is headquartered in Calgary, Alberta. NOVA employs approximately 2600 workers with the majority of operations in Alberta and Ontario in Canada, and in Pennsylvania and Ohio in the United States. NOVA is a producer of plastics and chemicals and develops products for the consumer, industrial and packaging markets around the world.

In Canada, NOVA conducts research in Calgary Alberta and manufactures ethylene and a variety of polyethylene products at its facility in Joffre, Alberta (near Red Deer) and in three sites located near Sarnia, Ontario in St Clair Township (Corunna, St Clair and Moore). The Joffre facility uses natural gas as raw material feed while the Corunna plant has recently switched from a crude oil feedstock to natural gas liquids (NGL) sourced from Marcellus Shale deposits in the northeast United States. The Joffre site also accepts NGLs from the Bakken oil shale formation in North Dakota.

For more information visit their website at www.novachem.com

1.3 About This Verification

The verification of NOVA was conducted on October 1 to October 5, 2018 and included team visits to the Calgary and Joffre Alberta and St. Clair Township Ontario sites. During the course of the verification, the team had the opportunity to interact with a wide range of company personnel, as well as stakeholders external to NOVA. Attachment 2 contains a list of company employees and of external stakeholders interviewed and their affiliations.

This was the eighth Responsible Care verification completed for NOVA. The last verification was conducted in June 2015

The verification team was comprised of the following individuals.

Name	Affiliation	Representing
Gerry Whitcombe	CIAC Verifier	Industry (team leader)
Carl Yank	CIAC Verifier	Industry
David Powell	CIAC Verifier	Public-At-Large
Mike Forsyth	Red Deer Community	JCAP Member
James Anger	Sarnia/Corunna Community	BCAP Member

2. Team Observations Concerning the Responsible Care Commitments (Codes and benchmark and Collective Expectations)

During the verification of NOVA, the verification team looked for evidence that the company was addressing the expectations documented in the Responsible Care Commitments (152 code elements plus 28 benchmark and collective expectations). While considering all aspects of the Responsible Care Commitments during the

verification, the team placed an emphasis on conducting a more in-depth examination of the company's document management system.

In communicating its observations, the verification team will make repeated reference to the following categories of observations:

1. **Findings Requiring Action** document instances where the verification team observes specific company actions (or the absence of company actions) which are inconsistent with the detailed codes and benchmark and collective expectations contained in the Responsible Care Commitments. Where possible, the verification team
will communicate, based on their experience and judgment, why it is inconsistent and how the observation relates back to a possible gap in the expected management system and / or the ethic and principles underpinning company actions. The team may also provide advice on how the situation might be responded to.

2. **Works in Progress** document instances where the verification team has observed the company self-initiating actions in response to identified gaps and deficiency arising from other internal or external audit and review activities, or where the company has self-initiated important improvement opportunities.

3. **Successful Practices** document instances where the team believes the company has taken actions that strongly support sustained excellence in performance, and which should be communicated throughout the CIAC membership.

4. **Improvement opportunities** identify instances where the verification team has observed company actions and decision making as being largely consistent with the expectations detailed in the Responsible Care Commitments, but for which the team is of the opinion that the company could support further improvement by considering alternate or additional benchmarks when undertaking its planning and decision making.

The verification team's observations of how the company has addressed the Responsible Care Commitments are as follows:

2.1 Team Observations Concerning Operations Code

2.1.1 Design and Construction of Facilities and Equipment

NOVA uses a design and construct stage-gate called PD&I (Project Development and Implementation) that has an 'in-depth content' component covering all aspects of the RC (Responsible Care) codes for this area. They will most often hire outside consultants to completely manage capital projects and have established protocols requiring embedded company personnel to oversee all aspects of the project.

PD&I is used for managing the design, implementation, start-up and commercial operation phases for the design and construction of large projects. Incorporated into the design process are risk assessments, minimization of emissions (fugitive and process), improved practices, anticipation of regulatory changes, understanding the worst case scenario, minimization of material and energy use and incorporating design considerations to minimize the long term impact on the eventual closure and dismantling of the project. This includes minimizing the use of underground infrastructure. GHG (Greenhouse Gas) emission considerations are built into construction projects to some extent.

During the construction phase, there is a focus on health & safety, including ensuring contractor competence, and that they understand RC and what it requires. An overall RC plan for construction includes waste

management, traffic and other off-site impacts, including none from blasting, noise, and environmental impacts.

The extensive community consultation about construction - what it involves and its impacts - included newsletters, open houses with the broader community, and meetings with near neighbours (twice per year), including door-to-door contact. Issues raised by the community included dust, for which a mitigation plan was implemented, and noise. Concerns came to the site through the ME Communications Consultant and the construction coordinator. The site Communication Team tracked them and provided feedback.

The same requirements are a contractual obligation of construction and engineering contractors. NOVA's engineering personnel review contract engineering output. Nova verifies that contractors follow the RC construction plan. A company team provides oversight for engineering in the design stage, as well as oversight for the procurement phase. Any deviations must be approved by NOVA, as engineering contractors do suggest improvements.

NOVA's RC gap analysis for this area is based upon the standards one would expect to find in a plant environment instead of to a process design methodology as seen in PD&I documentation. This is a shortcoming in their code compliance process where the team would expect the "In-Depth Content" from the PD&I process to be the basis for comparison. This shortcoming is used as an example within an improvement opportunity in the Management System section of this report specifically involving the 'document creation and management' process.

NOVA's implementation of the Responsible Care codes for this area fully meet code implementation expectations.

2.1.2 Operations Activities

NOVA's RC Standards, procedures and practices governing activities in the four sections of this code area fully meet Responsible Care implementation expectations.

a. General Considerations

The General Considerations section deals with ensuring that all standards, procedures and work practices are fit for use and cover all appropriate RC requirements. NOVA gets comfort from knowing that standards are in place, are used properly and are audited (both internally and externally). The document review process is used to make changes. It is not done in isolation and by working with other facilities best practices move the bar up. All audit findings and recommendations from investigations also roll through document management. Benchmarking at the plant level is done on an ad-hoc (but regular) basis with peers and through industry associations.

b. Laboratory Practice

The Joffre laboratory, which focuses primarily on air and water testing, was discussed. The lab also performs a risk assessment on new chemicals coming on site, which includes industrial hygiene. The lab has a representative on the site safety committee. This lab is ISO 17025 certified and all lab procedures conform to that standard. The lab also conforms to all site safety, health, loss prevention and environmental standards.

The lab has not had a gap analysis done comparing its operating practices to the Responsible Care codes for this area. This is a gap in understanding - all lab practices are likely in conformance, but this is not definitely known. This situation is used as an example (shown below) in the Management System section of this report specifically involving the 'document creation and management' process.

- There is no systems to determine that all company groups are identified and understood to be in compliance with RC (e.g. MW Air/Water lab is certified to ISO 17025 but its status with respect to the appropriate RC codes is uncertain).

This and other examples led to the following opportunity presented in that section:

Consider additions to the work flows associated with AP100 Developing Corporate Procedures that will ensure the Codes of Practice do not become diluted over time.

c. Transportation and Physical Distribution

NOVA owns and operates the pipelines near it's ME sites, owns two pipeline systems at Joffre, and a third at Joffre is now owned and managed by Pembina.

In the east NOVA owns 35 pipelines, (28 currently in use), with longest being 20 km. Three pipelines go across the St Clair River to the U.S., one for NGL, one for ethane and one for a byproduct. In the west the total pipeline length has just dropped from approximately 1700 km to 2x200 km (two lines are in the same right of way). Pipeline safety is supported by a pipeline safety practitioner at each site.

Pipelines are highly regulated by the Alberta government, for example, with respect to emergency management. The regulations address Responsible Care requirements. Responsible Care assurance audits check Responsible Care standards against procedures for pipeline management.

At the point of transfer from NOVA-owned pipelines to third-party ownership, the selection of third party owners is managed under MOC, and requirements are built into contractual agreements. Ongoing assessment is done out of head office. There is a RC Management Plan for every supplier which is explicit about RC expectations, including ongoing management and audit plans

Improvement Opportunities

- Specific to ME, ensure that companies using the pipeline overhead are performing ongoing assessment of their lines.

d. Maintenance

Maintenance work by company employees is supplemented by a large contingency of contractors which include a core group of contracted employees dedicated to the site as well as other contractors that are used as required. Some of these dedicated employees could potentially spend their entire career working at, for instance, the Joffre site.

NOVA successfully implements initiatives with external resources (e.g. via apprenticeships) that anticipate a high level of retirements and ensures the availability of fully trained and competent workers. Another proactive initiative was the integration of human factor considerations into various work systems.

NOVA has a rigourous hiring process for contractors and uses ISN® (a global contractor and supplier management company) to assist them in qualifying and hiring contractors that meet their requirements. ISN® gathers and verifies all the necessary information, ranging from safety, environmental, insurance, compliance, etc. For smaller contractors who cannot afford to belong to ISN® there is an alternate process. Problem contractors and specific contract employees are identified on a list of those not to be rehired.

Successful practices have improved maintenance which includes a focus on turnaround management as well as applying adaptive software for a more proactive and reactive response to changing trends and needs. Evaluating condition-based maintenance triggers versus time-based triggers are seen as an

opportunity to further improve their maintenance performance. A high standard of housekeeping was observed during the site tour.

NOVA has confidence that they are appropriately managing change that might not yet have been identified and as a consequence are not finding many surprises. All work must happen within the SAP (Enterprise Resource Management software) environment, all equipment that is worked on must exist in SAP and all equipment is treated as critical. Spare parts are the responsibility of asset management and this is governed by MOC and risk management. Human factors are an ongoing issue as the experience level lowers with retirement but it is being managed closely.

2.1.3 Safety and Security

The team is of the opinion that standards, procedures and practices for the Safety and Security section of the codes of practice fully meet Responsible Care code implementation expectations.

a. Occupational Health and Safety

NOVA has been very successful in implementing a safety culture that was clearly seen at all levels of the organization. The improved safety performance highlighted during the last verification has remained stable notwithstanding the significant amount of change brought on by company growth and organizational changes. New hires are placed on teams with experienced personnel in order maintain strong safety performance.

The ''Taking Care'' initiative implemented during the last verification cycle is well ingrained and now includes ''Taking Care Action Groups. They identify and implement initiatives internally and for the community. The ongoing use of employee ''Safety Interactions'' were also seen as well integrated in the culture and not led by the need of meeting a quota. The ''Am I Ready'' program that provides a readiness self-assessment prior to initiating a task and the belief throughout the organization that ''Goal ZERO'' is possible were further demonstrations of a leading safety culture.

In ME the new digital gate displays at the St. Clair River, Moore and Corunna Sites include recordable incident tracking. Milestones such as length of time without recordables are recognized. There is an annual Safety Day in May for employees and on-site contractors. RC moments are shared at the beginning of all meetings and at other times. There has been a shift to discussion of safe behaviours and not just risky behaviours.
The verification team observed that the visitor safety training video was excellent for the Red Deer site while the Corunna site was using a contractor safety video for visitors. The latter brought concerns that the amount of detail in the video could overshadow the essential safety messages for a visitor.

Successful Practice

- The high level of the adoption of a safety culture throughout all level of the organization is a successful practice.

Improvement Opportunity

- Create a specific visitor safety indoctrination for ME visitors.

b. Process Safety Management

NOVA demonstrated that it has a well-structured and extensive process safety management system with very knowledgeable leaders. Risk assessments covering whole processes (revalidations) are carried out on a 5-year cycle in addition to the risk assessments relating to changes as well as capital and growth projects. A good practice is insuring that the revalidation teams include new participants as well as some from the previous assessment. Various hazard assessment tools such as HAZOP, LOPA, FME and WHAT IF are used. Risk matrices are used to guide corrective actions, and operations do not occur which involve risks above an established limit.

A past process safety incident is summarized and published 2-3 times per year throughout the organization as a mechanism to sensitize new and seasoned employees on the hazards and the various layers of safety protection installed in their plant processes. In other programs photos containing various 'plant problems' are presented and employees are asked to identify the various issues. A three-year process safety culture survey is in its third cycle. CCPS Vision 2020 has evolved over the last three years but NOVA continues its focus on instilling a process safety culture.

NOVA does an assessment of its PSM system every three years with the industry standard of the Canadian Society for Chemical Engineering to identify any gaps or opportunity for improvement which drives a documented action plan. Facility self-assessments of regulatory compliance are done periodically, the most recent in 2016, and the CIAC PSM self-assessment was completed in 2017. The FCM procedure involves a check list of changes related to environment, regulatory, industrial hygiene, health and ergonomics, safety, process safety and emergency response.

MOC governs all change; including employees, information technology and suppliers, and PSM practitioners are required for the latter two of the three allowed change types (small plant projects, changes triggering hazard review and capital projects). The management of change process (MOC) incorporates the use of a Responsible Care checklist which could be further improved by adding RC Code requirements such as those relating to Community Outreach. A database of all known risks has been created for each site, based on NOVA experience, as well as industry experience, more broadly.

Improvement Opportunity

- Add to the 'Responsible Care Checklist', which is a part of the Management of Change process, changes which are specific to the Codes of Practice, e.g. Community Impact.

c. Emergency Management

Site Emergency Management

In general, the Manufacturing West (MW) site has excellent processes, interactions and structures. Joint emergency drills are held with INEOS, which also has well-trained personnel. Table tops exercises are carried out regularly, and a full exercise is held every three years with Lacombe County, the City of Lacombe and other rural communities. Training is done of Lacombe first responders.

There was an Improvement Opportunity in the INEOS RC Verification that related to checking the NOVA Joffre site Emergency Response Plan against X731-03. Corporate Standard 180 (Emergency Preparedness and Response) is based on Canadian Standards Association (CSA) Z246.2-14 which is understood to contain enhancements reflecting X731. Since NOVA provides ERM services to their neighbour the two guiding documents should be checked, and the results reported to INEOS.

The continued contributions of the Joffre ER Team to the regional Mutual Aid and to the municipal ER capabilities for non-industrial incidents are exemplary.

Improvement Opportunity

- Provide feedback to INEOS on the benchmarking of the NOVA ERP against X731-03. (please refer to the 2018 INEOS Responsible Care Verification Report)

Transportation Emergency Management

There are transportation emergency response teams to provide technical advice, mostly on product information - one east, one west and one south. They can go the scene of an incident with technical advisors if needed. Contractors look after railcar transfers when this is needed.

For suppliers, for all modes of transportation, NOVA is involved in selecting the transporter, with respect to route, risk, etc. There is a Supply Chain Interruption team that monitors weather and develops options during events such as hurricanes.

There is an external audit of their management systems against regulatory requirements, and RC assurance audits against Standard 520 Transportation and Distribution.

d. Malicious Intent

A Site Vulnerability Assessment was done in 2017. They are done at every NOVA site. It includes consideration of active violence. Currently there are no safe rooms, and training to respond to active violence is needed.

e. Critical Infrastructure/Business Continuity

The Enterprise Risk Management Policy addresses critical infrastructure and business continuity risks. All facilities have Site Emergency Response plans that are activated immediately and there is a corporate Crisis Management Program and Team that will be invoked if needed. These two separate systems have been, and continue to be, tested. The system, however, has not been checked against CIAC guidance.

Improvement Opportunities

- Benchmark company Critical Infrastructure and Business Continuity (CI/BC) systems against CIAC guidance (checklist)

f. Incident Reporting and Investigation

NOVA has a detailed and effective incident investigation process that is focused on strengthening systems to prevent reoccurrence of injuries and other incidents.

All new employees are trained in Incident Investigation and in the use of the Responsible Care Learning System with records the incidents. As part of NOVA safety culture, this prepares an employee for the eventual participating in an investigation as well as stresses that the investigation is a ''no blame'' exercise.

Since the previous RC Verification, NOVA has introduced the use of Causal Analysis to further improve the incident investigation process. This leading methodology targets more significant or complex incidents and is used to discover the causes of an unwanted effect. Learning is derived from those causes and then used as basis for action to shift or eliminate the causes.

Incident Managers and Incident Investigators receive one day of training on the management of investigations with a focus on causal analysis. Incident investigation experts receive 5 days if extensive training which includes subjects such as Cause Mapping, Effect Relationship, Human Factors, Safety Culture and Interview Practices.

Successful Practice

- The addition of Cause Centered Improvement' to the IR&I process adds an important deep analysis tool to NOVA's ability to clearly understand and address the causes of current unwanted or poor performance and is a successful practice.

2.1.4 Environmental Protection

Information on environmental protection is available from NOVA's website HERE
In addition, their performance relative to a select group of environmental measures is available HERE

All aspects of this area meet Responsible Care code implementation expectations.

a. Emissions and Waste Reduction

NOVA thoughtfully considers increases to its buffer zone land holdings adjacent to the Joffre Site by purchasing properties when this is possible and identified as the best impact mitigation measure. Part of the buffer zone at Joffre has been used to create a nature trail enjoyed by the general public.

NOVA has been involved with carbon pricing since 2008 and has invested in offsets in Alberta. With the Canadian federal program coming and the emergence of carbon pricing in the U.S., carbon pricing will be imbedded in decision-making for new projects, including consideration of offsets, for example, a wind farm.

The switch to ethane from natural gas as a feedstock was done to reduce site CO_2 and SO_2 emissions. NOVA is also considering its overall environmental footprint, in switching to new feedstocks to lower the overall footprint.

NOVA has discussed alternative feedstocks to fossil fuels, but no life cycle analysis has been done to determine if this would be sustainable.

The overall approach to emissions and waste reduction is to examine short, medium and long-term solutions.

There is an environmental team leader at each site, as well as for growth projects. A project to identify and repair leaks of ethylene and butadiene fugitive emissions to below regulatory requirements has achieved good reduction performance. Maintaining tank seals also reduces fugitive emissions.

NOVA looks for repeat issues and addresses them through repair and replacement. Once reductions have plateaued, the analytics process will be used to identify further reductions.

In ME the switch to a natural gas liquids feed has resulted in a reduction in GHGs, as has a reduction in liquid feeds and fuels which generate GHGs. Further reductions in GHGs are being considered through energy (heat) recovery, but these are now only funded by the federal government. SO_2 and H_2S emissions have also been reduced. Thermal oxidation is used to burn ethylene from polyethylene storage. Ethylene is a plant growth hormone, so an issue for nearby farms.

There is some reuse of process water, with consideration being given to increasing this.

b. Handling, Treatment and Disposal of Wastes

NOVA has programs and practices to insure the safe handling of waste generated by their operations.

There is no long-term storage of waste and the waste disposal companies are verified. In ME wax residue is the largest volume of waste generated that is transported by truck to a nearby incineration site operated by Clean Harbors, which reduces its fuel needs. NOVA has looked at ways for the wax waste to be recycled or reused, but it is not feasible because it has to be kept heated. Initiatives for recycling of wastes from polyethylene production are being undertaken. NOVA sells or gives away used office and operations equipment to contractors. There is not much non-hazardous waste going to landfill, but there are no targets set.

NOVA has contributed resources and $2,000,000 over three years to the global Project STOP initiative which targets stopping plastics from reaching the oceans especially in countries with high leakage of plastics into our oceans.

Asset Recovery and Community Relations has established a venture with Habitat for Humanity where surplus equipment and material from the Joffre Site is brokered by the Habitat for Humanity ReStore and when it is sold, receives the proceeds for Habitat.

Successful Practice

- The venture that Asset Recovery and Community Relations has established with Habitat for Humanity is a successful practice.
- Contribution to project STOP, marine plastic reduction initiative is a successful practice.

Improvement Opportunity

- To set targets for waste reduction and diversion of wastes from landfill for non-hazardous wastes of ME.

2.1.5 Resource Conservation

Resource conservation is addressed in Standard 530 Waste Management, Standard 270 Water Management and other standards.

A new environment plan to succeed the 2020 Environmental Plan is being developed, incorporating learnings from the latter. The focus of the 2020 plan was on awareness and establishing a baseline with respect to resource use. The new plan will set objectives and targets for improved performance. There will be initiatives to improve greenhouse gas management and reduce air emissions. Water is an emerging concern due to shortage and quality issues. In waste management, some wastes can be utilized as a product, and some can be used on site for energy. The approach will be to examine the overall footprint of, for example, a change from gas to electricity for energy, but included would be a consideration of the impacts of the electricity source.

2.1.6 Promotion of Responsible Care by Name

NOVA extensively promotes Responsible Care both internally and externally. It has integrated the use of the Responsible Care name in many policies, procedures and initiatives. As such, all levels of the organization understand Responsible Care but remains less knowledgeable that it's part of an industry and association-based initiative.

There is an RC Culture Committee, similar to Taking Care Committee (TCC) at MW (e.g. involved in clean-ups), which will emulate the TCC.

Promotion of RC through the supply chain is done with the Sustainability Report overview, which includes an internet URL for the full report. RC is discussed with suppliers and contractors involved in growth. Employees and contractors spread the word about RC beyond Nova.

Improvement Opportunities

- To develop 'canned' information packages for employees who are delivering the Responsible Care message outside NOVA.
- To add the Responsible Care logo to visitor badges and lanyard.

2.2 Team Observations Concerning Stewardship Code

2.2.1 Expectations of Companies

a. Research and Development (R&D) Expectations (85-92)

The Polyethylene R&D Decision Board oversees the early stage of R&D, before involving customers in the creation of new products.

NOVA monitors raw materials for new products, such as stabilizers and additives, and encourages suppliers to improve these or replace them with more sustainable alternatives.

The Product Slate Management Team oversees the commercialization process, working with the other key functions involved.

An example of the introduction of a more sustainable product is the development of a 100% PE stand-up pouch that can be recycled. Stand-up pouches were developed to lightweight packaging, but because they used different plastic layers, they were not recyclable.

Nova has signed on to the Industry Goal for Plastics - by 2030, 70% of plastics to be recyclable and 30% recoverable for another use (e.g. energy from waste); by 2050, 100% of plastics recyclable or recoverable.

Successful Practice

- Incorporating sustainability into product development by designing a recyclable oxygen barrier film structure, which can be used to package food products such as meat, cheese and nuts that traditionally have been in non-recyclable, mixed-material packaging is a successful practice.

b. Expectations Beyond R&D (93-114)

Raw Materials, Products and Services Characterization and Evaluation (93-99)

NOVA monitors raw materials in existing products, such as stabilizers and additives, and encourages suppliers to improve these or replace them with more sustainable alternatives, either during discussion or site visits.

The Technical Decision Board reviews the use of company products by particular customers and their end use, with respect to regulations, EH&S, and sustainability benefits. The latter are not included in the review form but are considered. Inclusion of sustainability benefits will likely be more formalized as part of the implementation of the Sustainability Strategy.

The Product Safety Team (created by the merger of Product Integrity and Product Stewardship), identifies emerging concerns and regulations, including sustainability. Each member of the team specializes in one area of concern to the team. It regularly assesses what is being supplied to NOVA, for existing and new raw materials, through questionnaires to suppliers.

NOVA has inherited some historical hazardous wastes via acquisitions, and these are being managed under Standard 530 Waste Management.

Work in Progress

- To formalize the inclusion of end use sustainability benefits on the form that the Technical Decision Board uses.

2.2.2 Expectations with Respect to Other Parties

There is a RC Management Plan for every supplier which is explicit about RC expectations, including ongoing management and audit plans. Other parties are assessed by either a questionnaire or a site assessment. The

latter are determined by category of other party (e.g. customer versus supplier), risk, and issues of concern that arise. High risk customers of hydrocarbon products are visited. NOVA has 65 customers globally, and sales personnel visit customers in Central and South America, China and Europe. Raw materials from suppliers from abroad are analyzed, and some sites in other countries in Europe and Asia are visited based on risk.

Sales and technical services personnel do report issues of concern identified in visits to customer sites, but this is not a formal requirement.

With respect to business relations of Canadian operations with those in the U.S., all facilities and operations across NOVA follow the same standards and requirements,

Improvement Opportunities

- To explicitly require sales and technical service personnel to look for and report on issues of concern when visiting customers.
- To include toll manufacturers and contract laboratories in Std 450: Supply Chain Controls.
- To review supplier evaluation checklists to better incorporate RC code requirements.

2.3 Team Observations Concerning Accountability Code

2.3.1 Operating Site Communities

Overall, NOVA continues to do a very good job of communication and dialogue with site communities at MW and ME.

Joffre:
The Joffre site Communications & Community Manager collaborates with the Communications Consultant in ME, and they share learnings and best practices.

New community members to the 5 km radius area around the facility are identified through the annual door-to-door visits by the same consultant (EMIC) which does community outreach along NOVA's pipelines. EMIC must immediately report to NOVA any issues raised by community members during the door-to-door visits and confirm that community members know what to do in an emergency (i.e. shelter in place).

The verification report is shared with the Joffre CAP, posted on NOVA website, and is reviewed at an open house.

Communication to facility neighbors is done in several ways. Annually, there are two open houses and an emergency preparedness BBQ, the latter including EMIC. The SiteLine newsletter is sent to the surrounding community 3 - 4 times per year and is available on the website. Communication frequency increases when NOVA is undergoing construction of new facilities. Scheduled major turnarounds are reported in the newsletter, posted on the x-web and discussed at the JCAP. People are also informed via the Joffre Site Operations Info voice mail-based information line, about, for example, planned flaring.

JCAP members have a process to add items to the meeting agenda, in advance of meetings or during the meeting. JCAP has been involved in directing NOVA local donation funds and selecting from among several options (e.g. milestones/seasonal recognition.

There are no indigenous communities near the facility, but NOVA supports the indigenous community in Red Deer through the United Way. The Red Deer Native Friendship Centre is a United Way supported agency.

Company employees are very engaged in the community through initiatives such as river cleanups, RiverWatch and Eco-Float Day, and tree planting. Employees volunteer at United Way supported agencies, including the Native Friendship Centre. Employees who achieve a certain level of engagement in their work (e.g. number of safety interactions completed), get a contribution to a charity of their choice.

NOVA annually creates a calendar with art work done by the children of employees addressing sustainability. The calendar includes information about Goal ZERO and Responsible Care. The nature trail created on the buffer zone gets hundreds of visitors each year. There are educational activities for visitors. NOVA gets positive responses about the trail from a sign-in feedback process and web page presence.

The team became aware of several issues of concern to the community. Some issues raised by the JCAP are not addressed over time - usually long-term issues, such as trains spending a long time on the rail-crossing, which blocks the highway 815 south from Joffre (see HERE). Although this is an issue with the railway, because NOVA uses the railway for its products, it is indirectly involved. There is a municipal CAP which is attempting to address the concern. The team has an improvement opportunity with respect to issues not being addressed in a timely manner or where necessary for multi-year challenges, provided with status updates.

There is a particular flare, which was supposed to be "temporary" in nature, which has not yet been abated, but will be eventually. NOVA is working on reducing the severity of the vibrations that accompany flaring. Nighttime light pollution has been reduced by capping the lights to glow down, and they have been changed to sodium, with one wavelength. Nova addressed concerns from the other side of the river do reduce light pollution from work being done at the river. Noise levels during shutdown and start-up are monitored in order to keep them below a maximum level.
St. Clair Township

In response to the FRA from the last verification about ensuring that near neighbours know how to shelter in place, last year NOVA implemented a near-neighbour emergency preparation event, which included a presentation about a worst credible case scenario for each facility, and what to do in response. 38 neighbours came this year (seven last year). As part of the first emergency event, and at community events following, NOVA distributed an emergency preparedness quick reference card. The card includes shelter-in-place key messages, and emergency contact information related to NOVA in ME. The card was also distributed broadly in the region's community newsletter. Feedback about the card has been positive. Surveys from annual emergency preparedness events are showing that neighbours do understand what to do in an emergency.

There is an enhanced stakeholder contact list which is kept up to date and accurate on a quarterly basis. Participants at every event are asked to update their information. There is a Taking Care section in the community newsletter, which goes to the whole community. Neighbours know that they can call the Communications Consultant anytime with concerns. Any complaints go to the RCLS incident system. Neighbour interactions are logged (positive, negative or neutral), with follow up, as required. NOVA is working on how to communicate with potentially impacted stakeholders across the river in the US. NOVA does pipeline outreach in the U.S. so this may guide what will happen with those across the river. Inclusion on the stakeholder list is determined by where their home is located in relation to ME manufacturing facilities. Generally, this is also those who can be most impacted by operations (e.g. noise and light from flaring). There are more near neighbours around the St. Clair River Site, which can be a challenge for outreach.

If an incident occurs that requires notification, there is a process in place to notify the community. People can call the community CAER line to receive a recorded message from NOVA explaining the incident, media

and other direct means of communication are used. It is the municipality that notifies stakeholders of shelter in place – industry cannot do this directly.

NOVA acknowledged the need for change in the CAER and SLEA organizations in light of increased community demand for information that is consistent and understandable, and community concern about the antiquated mechanisms for communication with the community. The CIAC National Advisory Panel addressed this in its annual challenge letter. CAER and SLEA are working on this, with the assistance of a consultant and industry partners. The communication process and communication technologies, such as myCNN, are being examined, as well as how to best communicate non-shelter-in-place incidents and issues. Company-to-company information sharing is emerging. First responders will be involved. BCAP has significant input into this initiative. The timeline for implementation of change is emerging as mid-2019. CVECO is also assessing how it operates.

Opportunities to enhance dialogue with Indigenous communities are also being investigated, including Chief, Council and the broader community. Collaboration is positive with those involved in this effort.
There is an outreach and dialogue process for pipeline neighbours, including a brochure, letters and a survey to identify concerns. There is not much feedback from the survey.

Works in Progress

- The current effort to review and revamp Sarnia area emergency awareness communication is a work in progress.
- The modification of STD 140 to specify a requirement to schedule the communication of hazards, risks and credible scenarios to near neighbours and CAPs at prescribed intervals is a work in progress.
- The expansion of the work of the Responsible Care cultural committee in ME to the scope of work at MW is a work in progress.
- The development and implementation of the risk communication program to potentially impacted stakeholders on the US side of the river is a work in progress.
- Adding a member to the BCAP from Corunna is a work in progress.
- Consider sampling/spot-checking to ensure shelter-in-place is understood by St. Clair near plant residential neighbours. In general, the expectation is that when any company facility poses a risk, all near-plant neighbours are known to be knowledgeable about shelter-in-place.

Improvement Opportunities

- Enhance issues log of items raised by JCAP in order to ensure that they are not neglected and there are structured updates on long-term issues in advance of issue closure.

2.3.2 Other Stakeholders

1. Public Policy

(Not Reviewed)

2. Finance

(Not Reviewed)

3. Consumers

(Not Reviewed)

4. Transportation Corridor

NOVA utilizes a wide variety of transportation modes for their raw materials and products which include rail, trucks, pipelines and some marine activities. They own most of their PE (Polyethylene) pellet rail cars, while liquid and pressure tank cars are leased. Trucking is all done by contractors.

A team of technical advisors provide 24-7 Emergency Response coverage for rail and truck incidents. Route assessments are carried out and a supply chain monitoring team continually oversees weather alerts to minimize transportation risks and business interruptions. NOVA carries out transportation and logistics audits and participates in TRANSCAER committees.

Distribution terminals are used both for non-hazardous and hazardous materials. Distributors, packaging facilities, warehouses, and trucking companies are regularly verified using QRC audits.

5. General Public

(Not Reviewed)

3. Team Observations on the Company Management System

It is a requirement of Responsible Care that companies have a documented, self-healing management system or systems capable of identifying and responding to deficiencies and otherwise supporting continual improvement across all company business units, functions, and sites and as a framework for implementing the Responsible Care Commitments.

The verification team studied NOVA's management system(s) and compared and contrasted the attributes of that system(s) to those of a self-healing overall management system as discussed in the CIAC Management System Guide. The verification team's related observations to NOVA's management system(s) are as follows:

NOVA has an exceptional Responsible Care Management system. It is well structured and documented, leadership driven and contains the required accountabilities. It is currently under revision as NOVA prepares to move forward with ambitious growth plans.

The team is of the opinion that all aspects of the current system meet Responsible Care management system implementation expectations.

Observations from interviews with company leadership

Manufacturing West:

- 'Goal ZERO' is considered a cultural belief.
- There is 95% achievement of safety interactions, because employees have embraced this - not really a measurable number anymore as it has become something which is just done.
- There is a culture of taking care and compassion within the plant and with the community.
- There is one standard and culture for both employees and contractors, with good supervision of contractors by NOVA.
- The Taking Care Action Team is proud and very engaged. It has initiatives inside and outside the plant, and it feeds issues and ideas to site management.
- There has been a history of commitment to process safety so now the focus is on looking for a new level of understanding and belief.

Manufacturing East:

- New operators are hired two years before an expected operator retirement, by utilizing the Lambton College coop system (CPAT)
- For new engineers, there is an engineering "bootcamp" with a strong RC focus, using university engineering coop programs.

- To keep an emergency response and safety focus with so few incidents, for emergency response (ER), they do many table-tops (~45 per year) and ER personnel do 80 hours of training annually.
- Safety alerts are reviewed with all personnel but there is a goal of maintaining a sense of vulnerability.
- The Industrial Education Coop (IEC) is utilized for contractor safety training, and although mandated in the Sarnia area, is an example of how to 'do it right'.
- Senior site managers are aware of area community concerns regarding the CAER and SLEA organizations and are championing efforts to resolve the issues.

Senior Executives

- are impressively committed to RC and its achievement
- the VP Operations is committed to rotating location visits each week
- are focused on preventing slippage on RC due to growth and other change
- believe challenges related to societal concerns (e.g. ocean plastic) and retaining capability during growth must be met
- show great pride in 'Goal Zero' and the positive momentum generated this year
- have pride in the systems that quickly share incident information, both pre and post investigation.
- support a strong focus on workforce planning
- will ensure all Canadian RC components are contained within their new management system
- are strong drivers of NOVA's grassroots sustainability initiative
- understand they must engage better with indigenous communities
- recognize that rapid growth requires a fundamental culture shift and further recognize that RC is critical to successful growth
- recognize that NOVA has a license to operate in communities, not a right

3.1 Observations on the PLAN Step

During the PLAN Step of the management system, the company decides what the goals of the company are and how they will be met. In determining those goals, it is expected the company will look inward, across its operations, but will also look outward, considering the expectations of stakeholders; regulatory requirements; relevant CIAC Responsible Care Commitments and supporting tools; and other industry benchmarks.

In considering the PLAN Step of NOVA's management system, the verification team observed the following:

- The Standards Development process is governed at the corporate level by CP030, Standards Development and Review. Each standard has a strategy team. Standards are reviewed on a five-year cycle. CP010, Responsible Care Manual, is included in this process. A new detailed corporate procedure development system, involving three phases, is under development.

3.2 Observations on the DO Step

During the Do Step in the management system, the company converts the decisions of the PLAN Step into action and ensures awareness and understanding by all involved. It is expected that the company will implement an organizational structure, assign responsibilities to appropriate personnel, supply sufficient training and resources to execute planned actions and develop and document standards, procedures and programs, as applicable.

In considering the DO Step of NOVA's management system, the verification team observed the following:

- The company has begun developing a new management system based upon the American Chemistry Council (ACC) RC14001 management system ISO standard.

One of the key management system procedures is document management (AP100 - Developing Corporate Procedures in the revised NOVA system). This is a work In progress with possible improvement opportunities that will ensure that this procedure identifies and incorporates CIAC Responsible Care (as well as all other requirements) into procedures under development. The following observations and suggestions relate to AP100.

1. Ensure corporate procedures are completely referenced to the requirements which cause them to be written. The team observed this in PSC030 where there is a reference section and concludes that an opportunity exists for the references to be more specific. For example, and by way of illustration only:

   3.0 REFERENCES….

   Trade Association References

   Chemistry Industry Association of Canada

   Stewardship Code Elements ST85, 93 and 106

   or

   Stewardship Code Elements ST85-92

2. Another way to ensure procedures accurately represent the intent of requirements is to leave the above section as it exists (as in e.g. PSC030) and include an appendix where specific analysis and interpretation of the requirements are documented. This has the benefit of allowing future reviewers the knowledge and guidance of past experts as well as allowing external reviewers to understand the links between the external requirement and the written procedure.

3. It was observed that references to specific requirements have been included in the body of the mentioned standard (e.g. "5.1.2 The PSC uses this Product Prioritization Spreadsheet as a repository for product EH&S information as required by ACC Product Safety Code MP3 and MP4."). We think interpretive or compliance information should be external to procedural steps.

4. The team observed, mostly, that Corporate Standards met the intent of the codes but there were instances where specifics in the codes were not apparent within the referenced standard. Some of these were:
   - Neither STD 140 or 180 explicitly address code element 39 (ensures that neighbours know what to do in an emergency)
   - NOVA STD 150, 410, 420 and PSC020 do not fully address code elements 121 and 123.
   - The Other Stakeholders section (Codes 137 to 152) of the Accountability Code cannot be determined to be completely mapped to NOVA standards (and has been identified by NOVA as a shortcoming).
   - There are no formal drivers to direct practitioners involved with resource conservation to review code compliance when applicable corporate standards are reviewed. Effort seems to be not centralized
   - There are no systems to determine that all company groups are identified and understood to be in compliance with RC (e.g. MW Air/Water lab is certified to ISO 17025 but its status with respect to the appropriate RC codes is uncertain).
   - In Design Engineering a gap analysis has not been done between the codes and the guidance provided in the PD&I in-depth content areas. These technical specs or guidelines should largely form the basis for code comparison rather than the plant standards which were used.

5. 'Code Experts' must be a part of initially writing a procedure and also of the review process. The expert's responsibility is to ensure the codes are interpreted appropriately and that dilution of code intent is not introduced over time.

6. A computerized document management system, if it allows the retrieval of external requirements information, could replace the current "NOVA Chemicals CIAC Code Mapping" document).
   - In such a system audits of compliance to requirements can easily be developed.
   - Using such a system as each procedure is generated makes the overall effort a much less onerous task.

Improvement Opportunity

- Consider additions to the work flows associated with AP100 Developing Corporate Procedures that will ensure the Codes of Practice do not become diluted over time.

3.3 Observations on the CHECK Step

During the CHECK Step in the management system, actions carried out in the DO Step are assessed to determine if they are actually being carried out according to plan, and whether they are achieving the desired outcomes and delivering continual improvement. Here, the overall management system and components will be reviewed along with employee competencies for assigned responsibilities, internal and external audits will be undertaken, incidents will be assessed to identify root causes, and performance measurement will be conducted and reviewed.

In considering the Check Step of NOVA's management system, the verification team observed the following:

- Site senior operations management believes that corporate RC standards give assurance that site procedures and practices are following the RC codes of practice since the standards are aligned with the codes. Auditing and review of the results leads to adjustment in site procedures, and even in the RC standards themselves. Audit teams have a corporate lead and auditors from other NOVA sites. Audit findings are compared among sites in order to identify common issues and solutions. The sites do request corporate advice in interpreting the RC standards.
- Site representatives are involved in benchmarking against what other companies and contractors do. The Centre of Applied Research is used for technical knowledge. Best practices are shared with their joint venture partner. NOVA also learns from participation in specialty organizations.
- NOVA has a comprehensive auditing system across its operations.

3.4 Observations on the ACT Step

During the ACT Step in the management system, the company translates the results of the CHECK Step into corrective actions for improvement. This includes revisiting the PLAN Step to decide whether changes are need to the company's stated goals or action plans, policies and procedures for achieving those goals. Considerations when examining the Act Step include whether and how: audit and review findings are responded to; performance is communicated internally and externally; employee and contractor performance is rewarded and corrected, etc.

In considering the Act Step of NOVA's management system, the verification team observed the following:

- Company processes effectively deal with actions generated from the Plan and Check steps of the management system.

4. Team Observations on the Responsible Care Ethic and Principles for Sustainability

Each CIAC member company is formally committed to the ethic of "Doing the right thing and being seen to do the right thing." This ethic, along with the principles for sustainability are expected to guide the company's

decision making and practices. In conducting the verification, the team is looking to understand how well the ethic is understood and adopted within the company, and the degree to which the principles inform the manner in which the company does its business.

The verification team carefully observed NOVA's decision-making processes and actions and compared and contrasted the attributes of those with the attributes of a company guided by the Responsible care Ethic and Principles For Sustainability as discussed in the Responsible Care Commitments (Appendix E). The verification team's related observations on the company's application of the Responsible Care Ethic and Principles for Sustainability are as follows:

There has been substantial progress on the company's journey to sustainability with sustainability reporting being a foundational step; four reports have thus far been issued. The initiative started with the Responsible Care platform, and developed Taking Care, with a Taking Care Action Team at each site. At the top level of the company, the Corporate Strategy for Sustainability is being developed. Taking Care is the current state, and the Sustainability Strategy is what is coming, with the goal of integrating the two. Taking Care is for employees to introduce RC as an industry initiative and then what NOVA does under the four elements of Taking Care (Operations, Communities, Products and Environment). The Corporate Sustainability Strategy is underway - a plan that is ready for approval which will lead to the imbedding of sustainability into business operations. It is being developed by a task team and will be implemented in 2019. There is input from employees into the 6 strategic areas of focus, particularly with respect to awareness and involvement in outreach. The strategy expands sustainability and integrates the strategy with Taking Care. It comes out of the Management Board requirement for an overall strategic plan for sustainability in 6 strategic focus areas, and the creation of aspirational sustainability targets. One example is how to address plastic waste by having plastics become a plastics circular economy. The management structure and management systems will now be examined to determine what needs to be changed in order to achieve the aspirational targets. Once the task team has finished its work, the two key mechanisms for implementation are a materiality assessment and incorporating the needs of stakeholders. A new organization of responsibility will take this on, including maintaining the strategy, and reviewing and revising it over time. The materiality assessment will involve examining 20 topics, determining which are the most important to NOVA and its stakeholders, and focusing resources on these.

NOVA's values - be responsible, be passionate, innovate and collaborate - drive the strategy, as do RC and NOVA's Sustainability Policy. The latter is refreshed every three years. Sustainability will have to be imbedded in the work of the RC Systems and Governance Team, which will determine how NOVA is doing and how it needs to improve.

Improvement Opportunities

- To include in the Sustainability Strategy, development of a mechanism to rank new and existing products against the three pillars of sustainability, to incorporate into product choice decision-making.
- To include more traditional sustainability performance measures (energy, footprint) in the sustainability report.

Successful Practices

- The development of RC & Sustainability Culture throughout the company as demonstrated by employee adoption of Taking Care (e.g. amongst other things, belief in Target Zero is Possible and Safety Interactions) is a successful practice.
- The enthusiastic engagement and work of the Taking Care action team is a successful practice.

The team requested the company provide examples of their efforts in living the eight principles for sustainability. They form a record of where the company believes it is and will serve as a point of comparison for the next verification. They are presented below verbatim:

- work for the improvement of people's lives and the environment, while striving to do no harm; Our mission is "to enable the development of great plastic products that make everyday life easier, healthier and safer."
    - Our role is to provide materials and knowledge that enable our customers to develop great plastic products;
    - Great plastic products are ones that are innovative, cost-effective, high-performing, environmentally friendly and that enhance quality of life;
    - Easier means saving consumers time and increasing convenience;
    - Healthier includes facilitating access to food, medicine, recreation and other essentials.
    - Safer includes protection for people, products and the environment.
    - Our polyethylene (PE) resins play a key role in assuring the safety of the food supply for consumer items like cereal, produce, meat and cheese to provide product safety and convenience, extend shelf-life and to reduce both materials use and waste.

- be accountable and responsive to the public, especially our local communities, who have the right to understand the risks and benefits of what we do;
    - We consult with our communities about our facilities, operations, and products in order to share information, seek input and respond to concerns. Through community advisory panels, training programs, open houses and personal visits, we strive to create open dialogue with our communities and near neighbours.
    - We provide active leadership to our industry associations so that the ideals of RC can evolve to address shared stakeholder concerns for social, economic and environmental sustainability.

- take preventative action to protect health and the environment;
    - We are "Responsible." We value the safety and well-being of our coworkers, communities and the environment. Everything we do includes the goal of sustaining them for the future. We believe in a zero-injury workplace.
    - Fulfilling our mission starts with a fundamental focus on health, safety and environment and extends to how we innovate and collaborate with others along our value chain and how we apply life-cycle management to our products and processes.
    - NOVA Chemicals has been actively working to reduce GHG emissions intensity since 1990 and we have reported our performance publicly since 1994.
    - Our priorities for improved energy conservation and GHG performance include:
        - Conversion to NGL feedstocks for our eastern assets
        - Cogeneration and energy efficiency improvements
        - Technology improvements in our furnaces and fired-equipment, separation processes and new manufacturing processes
        - The establishment and implementation of GHG Strategy to meet and exceed regulatory requirements and Paris Accord commitments as well as operationalize the ongoing reduction of Scope 1, 2 and 3 GHG emissions throughout our sphere of influence in the value chain.
        - We continue to work with our product portfolio to down and narrow gauge to reduce environmental footprint and our Scope 3 GHG emissions

- innovate for safer products and processes that conserve resources and provide enhanced value;

    - Our PE and EPS resins enable packaging designers to create packaging solutions that meet both performance and sustainability objectives to use less material and create less waste while providing product protection, consumer convenience and extended shelf-life.
    - We also strive towards a circular economy where plastic products can be reused, recycled and recovered to meet an industry aspiration of 100% reuse, recycling and recovery of plastic packaging by 2040.
    - In our own operations we work cooperatively with other stakeholders to develop safer processes and to conserve resources including projects such as upgrading furnace tube technology and the use of co-generation power to reduce air emissions as well as our GHG emissions footprint.
    - As reported, we have made game changing enhancements to our long-term feedstock supply which we expect will return our Joffre assets to full utilization and allow our Corunna cracker to use up to 100% natural gas liquids and help ensure the long-term viability of our Ontario assets.

- engage with our business partners to ensure the stewardship and security of our products, services and raw materials throughout their life-cycles;
    - As part of our product safety process we lead and participate in research to understand the potential health impacts of products before they are introduced to the marketplace. In our R&D process, we select raw materials based on health, environmental and safety criteria
    - NOVA Chemicals works with its suppliers and carriers to ensure the safe handling, packing and transportation of raw materials; we characterize, manage and communicate product hazard and risk information; and we engage customers, carriers and distributors to work cooperatively to safely handle, use and dispose of our products.
    - As an industry partner in the value chain of shale gas development, we are committed to sharing our company and industry experience with RC and lessons learned to improve health, safety and environmental performance.
    - NOVA Chemicals is committed to keeping pellets from our waterways through our implementation of Operation Clean Sweep at all our sites, and transition to Operation Clean Sweep Blue by 2022.

- understand and meet expectations for social responsibility;
    - Social responsibility involves aligning our plans/actions with the interests and concerns of others inside and outside the company through open communication, feedback and collaboration.
    - We provide active leadership to our industry associations and communities so that the ideals of RC can evolve to address concerns for social, economic and environmental sustainability. Our recent announcement about Project STOP is an important example of our commitment to addressing ocean health and working to stop plastic waste.
    - NOVA Chemicals is committed to be a socially responsible neighbor. We maintain open, long-term relationships with all our community stakeholders.
    - We invest in the well-being of our communities by lending a hand to organizations dedicated to making a difference and improving the overall quality of life. Community investments are generally focused on three core areas that support the NOVA Chemicals business strategy, including Education and Science, Health and Community Services and the Arts.
    - Our employees volunteer through the United Way and various outreach services and programs.

- work with all stakeholders for public policy and standards that enhance sustainability, act to advance legal requirements and meet or exceed their letter and spirit;

- We provide active leadership to our industry associations so that the ideals of RC can evolve to address shared stakeholder concerns for social, economic and environmental sustainability.
- We are "Collaborative." We're a proactive partner to our customers, suppliers, coworkers and communities and work to create solutions that add value. Their success is our success

- promote awareness of Responsible Care and inspire others to commit to these principles.
  Externally
  - We provide leadership within our industry to promote RC principles and its standards.
  - We've published and promoted our 4th Sustainability Report for internal and external use.
  - We share company and industry experience and knowledge with value chain partners to improve health, safety and environmental performance.
  - Our business model is based on a foundation of RC and talented, engaged people.
  - We communicate RC and business performance together internally and externally.

  Internally
  - Our Responsible Care Management System (RCMS) applies to all NCC owned or operated facilities and supports the promotion of and commitment to Responsible Care.
  - Responsible Care Leadership and Performance starts with NOVA Management Board. The Operations Leadership Team –RC is responsible for operationalizing RC Performance throughout NOVA including cascading throughout functions and business units.
  - RC objectives and targets cascade throughout the organization.
  - Regular employee communications include RC objectives, metrics and performance.

5 Verification Team Conclusion

As a result of the examination conducted, and in consideration of the observations communicated within this report, the verification team is of the opinion that the Responsible Care Ethic and Principles for Sustainability are guiding company decisions and actions, and that a self-healing management system is in place to drive continual improvement. The verification is completed, and no further involvement is required by the verification team.

Company Response to Verification Team Report

On behalf of NOVA Chemicals, I have reviewed this verification report. The observations and conclusions contained in the report have been discussed with the verification team.

NOVA Chemicals appreciates the candor, enthusiasm and knowledgeable guidance offered by the verification team throughout the process. We appreciate the engagement of our local community representatives for their contribution to this verification and their ongoing involvement in our relationship with local communities. The challenging and thought-provoking discussions with the verifiers help drive continuous improvement in our programs and overall approach to Responsible Care. Similarly, the positive comments and recognition of Successful Practices provide external validation and reinforcement of our work.

NOVA Chemicals will communicate the results of the verification exercise with its CIAC peers at their next meeting and will discuss the verification results with our stakeholders, including those representing communities near our operating sites. We will give consideration to the Improvement Opportunities identified by the verification team and will assist the CIAC in communicating and sharing the identified Successful Practices to other CIAC members. The improvement opportunities will be discussed by the verification team and for those identified as providing value to the community, employees, and the company, plans will be developed and implemented. Our progress in implementing those plans will be discussed when preparing our Annual Statement of Re-Commitment to Responsible Care and communicated to the verification team at the time of our next verification.

James Baldwin
Responsible Care Leader
NOVA Chemicals
February 27th, 2019

Interview Lists

A: Company Personnel and External Parties Contacted During Verification Process

Day 1: Corporate Headquarters (Calgary, Alberta)	
Daryll Harrison	VP, NOVA Program Management
Sarah Marshall	Technical Services Leader
James Baldwin	Environmental Affairs and Sustainability Leader
Wendy Lomicka (phone)	Sustainability and Communication Leader
Adrian Cassola (phone)	Product Safety Team Leader
Chris Foy (phone)	Polyethylene Process R&D Leader
Anna Madajczuk (phone)	Advisor, Product Safety Team
Jim Dixon	Director of Responsible Care
Zoe Gulley (phone)	Causal Learning Specialist
Shawna Gillespie (phone)	Senior Commodities Manager, Raw Materials
Sandy Chamberlain (phone)	Raw Materials Coordinator
Elton Lawes	Environmental Analyst
Shane Lamden	Senior Environmental Advisor
Josh Cavanagh	RC Practitioner
Daniel Pritts	ERM team.
Jennifer Jackson	RC Governance and Systems Leader
Fred Henselwood	Process Safety and Risk Services Team Leader
Kathy Piper	JCAP
Anna Robertson	Attending with spouse
Jim Robertson	JCAP
Mike Forsyth	JCAP and Local Verifier
Lynn Cain	Attending with spouse
Angela Moores	JCAP
Lori Keller	JCAP
Larry Keller	JCAP
Day 2: Manufacturing West (MW) – Manufacturing Operations (Joffre, Alberta)	
Rick Van Hemmen	Director Regional Manufacturing
Ray Wasdal	Technical Procurement Leader
Rich Stonehouse	Asset Manager, E3 Leaders and Admin
Dean Dehod	MW Plant Availability Leader

Lois Erickson	MW Operations Leader
Bobbi Leibrecht	MW Integrated Services Leader
Paula Mitchell	MW Technical Services Leader
Krista Rands	Lab Tech, MW MI lab
Andrea Brack	MW Environmental Specialist
Paul Claerhout	Occupational Safety Team Leader
Janeth Liendo	MW Process Safety Team Leader
Christiana Lamoureux	Loss Prevention Coordinator
Chris Banbury	Rail Team Leader
Roxann Good	MW Communications Leader
Day 3: Sarnia	
Liz McLachlan	BCAP
Kris Lee	BCAP
Dan Hansen	BCAP
James Anger	BCAP and Local Verifier
Clarke Henry	BCAP
Brenda Lorenz	BCAP
Day 4: Manufacturing East (ME) – Manufacturing Operations (Sarnia-Lambton Area, Ontario)	
Tom Thompson	ME Regional Director
Rob Thompson	ME Operations Leader
Ted Cooper	Leader ME Reliability and Maintenance
Ryan Strauss	Leader ME Technical Service
Krista Randal	HR Business Consultant Leader
Kevin Schroeter	RC Team Leader ME
Alan Sivell	Manufacturing Lead AST ME
Jill Ward	Environmental Engineer ME
Thomas Brown	RC Lead for the AST2 Project
Dave Richmond	Director Project Management Office and Development
Richard Illves	Environmental Leader ME
Ryan Hornett	ME Manufacturing Infrastructure Team Leader
Arnel Santos	Senior VP Operations
Naushad Jamani	Senior VP Olefins and Feedstocks
Meaghan Lawrence	ME Communication Consultant
Don Cunningham	Safety Lead
Ryan Hicks	I&E SCRS

Kerry Charbonneau	QC Lab Moore/SCRS
Stephen Soetemans	I&E SCRS
Cass Opiela	RX SCRS
Jean Marc Babin	Mech Designer SCRS
Day 5: Manufacturing East (ME) – Manufacturing Operations (Sarnia-Lambton Area, Ontario)	
Nick Robichaud	Logistics Regulatory Compliance Manager
Todd Karran	NOVA Chemicals CEO

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