



Shaping a world that is better
tomorrow than it is today



2018 Sustainability Report

Contents

About NOVA Chemicals	01
A Message from the NOVA Chemicals Management Board.....	02
How We Create Value.....	04
About this Report	06
Sustainability at NOVA Chemicals.....	08
Global Challenges.....	10
Ethics & Compliance	16
Foundations.....	18
Safety is a Shared Responsibility	20
Caring For The Environment.....	26
Actively Sought After	30
Performance Tables	36
GRI Supplemental Information	38

All amounts in this report are in USD unless otherwise specified.

Advisory

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About NOVA Chemicals

NOVA Chemicals develops and manufactures chemicals and plastic resins. Our company is headquartered in Calgary, Alberta, Canada and has operations in Alberta and Ontario in Canada, as well as Pennsylvania, Ohio and Louisiana in the U.S. NOVA Chemicals is wholly owned by Mubadala Investment Company of the Emirate of Abu Dhabi, United Arab Emirates.

Our plastic resins are used in a wide range of consumer and industrial applications, including flexible packaging for dry, liquid and frozen foods, as well as non-foods, protective packaging for electronics and other

durable goods, and a wide range of rigid goods and containers such as bulk storage containers, playsets and closures. You can learn more about our company [in this video](#).

Our company's purpose is to help shape a world where the plastic products vital to our health and happiness are even better tomorrow than they are today. Through our commitment to sustainability and Responsible Care® principles, our employees consistently work to ensure health, safety, security and environmental stewardship throughout every facet of our operations.



Our company's purpose is to shape a world where the products vital to human health and happiness are even better tomorrow than they are today.

Our Growth Strategy

Our strategy leverages our ability to deliver game-changing technology and create an exceptional customer experience so that we can meet growing consumer demand for polyethylene in the Americas. Our key strategic priorities include:

1. Growing significantly through a combination of organic internal growth, acquisitions and joint ventures, while optimizing the way we all work together.
2. Delivering game-changing technology that makes tomorrow
3. Being actively sought after by all our stakeholders. By being responsible and passionate, innovative and collaborative, we can set ourselves apart from the competition.

even better than today. This includes ongoing creation and ideation to be at the forefront of innovation in our industry, truly enabling customers to develop plastic products that make everyday life healthier, easier and safer.

2018 Corporate Highlights

- NOVA Chemicals' total polyethylene sales for the year topped 2.1 million tonnes.
- In our styrenics business, the ARCEL® resin business set a new sales and production record of 12,700 tonnes.
- In October, we were re-certified as a Responsible Care Company through the verification of the Chemistry Industry Association of Canada (CIAC).
- In January, we announced the SAP® Gen Z project, deploying the latest technologies to make a better experience for our customers, suppliers and employees.
- We received financial support from the Canadian federal government's Strategic Innovation Fund, from the Government of Ontario's Jobs and Prosperity Fund and from the Government of Alberta, Canada to support current expansion and refurbishment projects including: the new polyethylene facility and the expansion of an existing ethylene facility in Ontario; the development of new catalyst manufacturing capabilities in Alberta; and Joffre Site's [Ethylene 2 Furnace Refurbishment Project](#) (Phase 1 and 2).
- Bayport Polymers LLC (Baystar™), the 50/50 joint venture owned by Total Petrochemicals & Refining USA, Inc. (TPRI) and Novaleis Holdings LLC — itself a joint venture co-owned by Borealis AG ("Borealis") and NOVA Chemicals Inc. ("NOVA Chemicals") — began construction of a new 625,000 metric tonne-per-year Borstar® polyethylene unit at its production site in Pasadena, Texas, with anticipated start-up in 2021. The state-of-the-art Borstar technology will allow Baystar to produce enhanced polyethylene products for the most demanding applications.
- Baystar is also building a one-million-ton per year steam cracker in Port Arthur, Texas. The new cracker will process ethane and supply feedstock for its existing 400,000-ton-per-year polyethylene units as well as the new Borstar polyethylene unit in Pasadena.

A Message from the NOVA Chemicals Management Board



Todd Karran



Julie Beck



John Thayer



Naushad Jamani



Arnel Santos

“Shaping a world where the products vital to human health and happiness are even better tomorrow than they are today” is the central purpose of NOVA Chemicals. In living that purpose, we are passionate about the value we help to create through the many products that contribute to everyday life. We are equally passionate about how we deliver an “even better tomorrow” in the ways that we collaborate, innovate, learn and improve. This report is our way of sharing our progress over the past year, our aspirations for the future, and an opportunity to reflect on the challenges that we see.

One of the most important roles we provide as a leadership team is helping to guide the strategies for Sustainability and Responsible Care practices. In 2018, the company advanced its approach to sustainability by developing an enhanced sustainability strategy. We believe that businesses like ours are a positive catalyst for change as part of a global community. Our sustainability strategy defines our aspirations and commitments in promoting a circular plastics economy and climate care, protecting natural resources, and embedding sustainability in our organizational design and operational processes, including our roles as a sustainability collaborator and global citizen working with other stakeholders.

In 2018, we became a founding member of the Alliance to End Plastic Waste, an alliance of more than 30 companies with an investment of \$1.5 billion (USD) to reduce plastic waste in the environment and a partner in Project STOP, a three-year investment of nearly \$2 million

In 2018, we became a founding member of the Alliance to End Plastic Waste, an alliance of more than 30 companies with an investment of \$1.5 billion (USD) to reduce plastic waste in the environment and a partner in Project STOP, a three-year investment of nearly \$2 million (1.5 million EUR) to prevent plastic debris from reaching the ocean.

(1.5 million EUR) to prevent plastic debris from reaching the ocean. Through both efforts, we are committed to supporting ocean health, spurring innovation for the circular economy and working with communities and stakeholders to address waste management infrastructure opportunities in targeted regions.

Shared future successes hinge on developing technologies that deliver transformational change for our customers and our industry. Our research and design teams are focusing on resin designs and plastics applications that deliver improved recyclability, more efficient transportation and enhanced durability. Based on our research and collaboration in the industry, we are also providing recommendations to inform the next generation of recycling standards. We believe our record 2018 sales performance is a confirmation of the value that we bring to our customers.

As we build capacity to support the global demand for plastic products, the expansion of our ethane cracker and our second Advanced SCLAIRTECH™ technology facility (AST2) in Ontario, Canada continues. Along with the closing of our joint venture with Borealis

and Total S.A. in Texas creating Bayport Polymers LLC (Baystar), these achievements continue to support our growth plans.

Executing on our ambitions requires supportive business practices, starting with our unwavering commitment to the Responsible Care ethic and principles. To ensure safe, reliable and competitive operations, we have focused on standardizing procedures and instilling a mindset of continuous improvement across our company. And in 2018, employees across the company joined together to engage in our inaugural Safety Day, with the theme: *Goal ZERO Starts with Me* — supporting our goal of zero injuries and incidents in our workplace.

We want to thank every one of our employees for their ongoing commitment to our company and our purpose. It's clear that we have passionate, innovative and responsible colleagues who will drive our success through their collaborative nature. Together, we can help shape a world where the plastic products vital to our health and happiness are even better tomorrow than they are today.

– NOVA Chemicals Management Board

Building Capacity

As we work to achieve our purpose, we are building capacity to meet the increased global demand for plastic products by expanding our existing facilities and participating in joint ventures with other companies.

Refurbishment of Ethylene 2 (E2) furnaces in Joffre, Alberta — **Nine of eleven furnaces** are being refurbished to help meet growing ethylene demand.

Advanced SCLAIRTECH technology facility (AST2) in Sarnia-Lambton region, Ontario — We are building a second AST facility to increase NOVA Chemicals' polyethylene production capacity by approximately **450,000 tonnes per year**, with anticipated startup in 2021

Ethane cracker expansion in Corunna, Ontario — Expansion by approximately **50 percent** will provide ethylene feedstock to our new AST2 facility, with anticipated startup in 2021

Olefins Plant in Geismar, Louisiana — We acquired an 88.46% interest in 2017. The plant produces approximately **884,000 tonnes of ethylene annually**.

*New Borstar unit with our joint venture partners — In February 2019, NOVA Chemicals and our joint venture partners at Bayport Polymers LLC (Baystar) began construction of a new **625,000 tonnes-per-year** Borstar polyethylene unit in Pasadena, Texas, with anticipated startup in 2021.

*New steam cracker in Port Arthur, Texas — Baystar is building a **one-million-tonne per year** steam cracker in Port Arthur, Texas, with anticipated startup in 2020.

**Non-operated facilities*

NOVA Chemicals' Locations:

Canada

Joffre, Alberta

- Joffre Manufacturing Site

Red Deer, Alberta

- Red Deer Executive Place Office

Calgary, Alberta

- NOVA Chemicals Head Office
- Centre for Performance Applications
- Centre for Applied Research

Sarnia-Lambton region, Ontario

- Corunna Manufacturing Site
- St. Clair River Manufacturing Site
- Moore Manufacturing Site
- Manufacturing East Corporate Centre

United States

Painesville, Ohio

- Painesville Manufacturing Site

Monaca, Pennsylvania

- Beaver Valley Manufacturing Site
- Beaver Valley Technology Center

Pittsburgh, Pennsylvania

- U.S. Commercial Center

Geismar, Louisiana

- Geismar Manufacturing Site

Mont Belvieu, Texas

- NOVA Chemicals Ethylene Trading Hub

Houston, Texas

- Houston Commercial Office



How We Create Value

Key Resources

In order to manufacture products, we require these key resources:



Natural Gas



NGLs and Other Hydrocarbons



Water



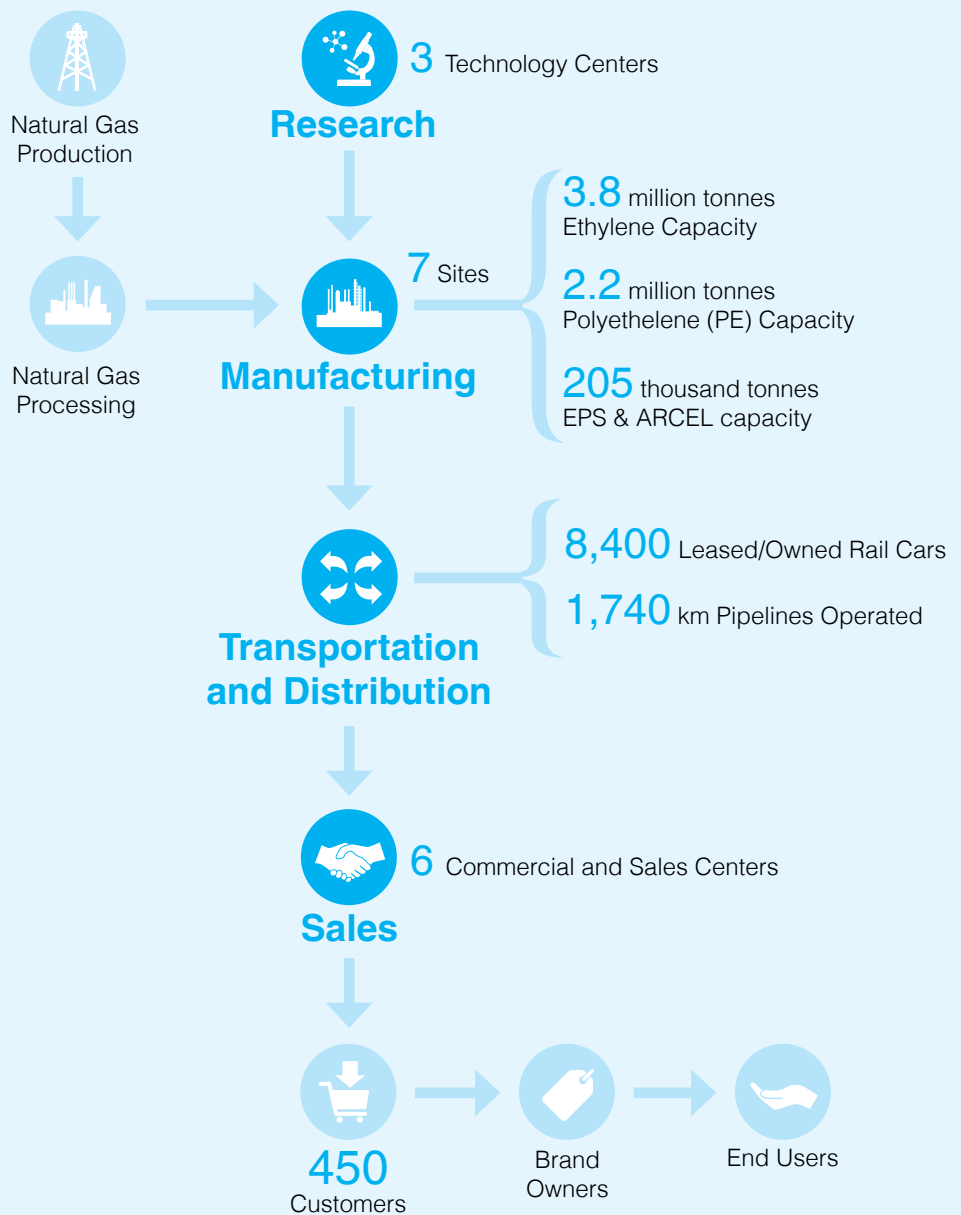
2,900 Employees



3,000 Suppliers

Business Activities

NOVA Chemicals develops and manufactures chemicals and plastic resins, with a focus on research and development to enable plastic products that are better and safer than they are today:



Our plastic resins are used in a wide range of consumer and industrial applications, including flexible packaging for dry, liquid and frozen foods, as well as non-foods, protective packaging for electronics and other durable goods, and a wide range of rigid goods and containers such as bulk storage containers, playsets and closures.

Production capacity as of December 31, 2018

Impacts

Our business creates impacts that we seek to reduce:



5 million tonnes of CO₂ Emissions



Waste Generated



Water Consumption



0.41 Recordable Injury Frequency

Value Created

In 2018, we generated **\$4.5 billion in revenue**. We look for opportunities to share that value with all of our stakeholders in the following ways:



For Employees

- Skills and Opportunities for Development
- Wellbeing
- Opportunity to Make a Difference in the Community and Society e.g. United Way
- **\$465** million Paid in Salaries and Benefits



For Communities

- Safe Operations
- Job Creation
- Community Prosperity
- **\$713** million in Capital Expenditures
- **\$2.5** million Invested in Communities
- **>6,000** hours Volunteered



For The Environment

- Informing Standards for Recyclability
- Designing for Recyclability and with Post-Consumer Recycled Content
- **38%** Reduction in Sulphur Oxides in the Last Five Years
- **10%** Reduction in GHG Intensity in the Last Five Years



For Industry Partners and Government

- Taking a Leadership Role in Industry Associations (ACC and CIAC)
- Collaborating in Policy Development with Industry Associations and Government Regulators



For Society

- Investing in STEAM* and Future Generations
- Enabling Safer and Better Plastics Products
- Contributing to Food Waste Reduction

*Science, Technology, Engineering, Arts and Math

About This Report

Scope of This Report

- Unless otherwise noted, this report covers performance for the calendar year 2018, with historical data dating back to 2014, for NOVA Chemicals and our subsidiaries covered in our consolidated financial statements.
- In July 2017, we acquired an 88.46% interest in the Geismar facility. We include the performance of the Geismar facility for the full calendar year 2018.
- We report environmental data based on operating control (i.e., we report 100 percent of environmental impacts of our operated facilities regardless of ownership percent). Using this principle, we do not report our portion of environmental impacts for non-operated joint ventures such as the Baystar joint venture's facilities that are operated by Total.
- This report has been prepared in accordance with the GRI® Standards: Core option.
- Our previous full sustainability report was released in 2016, and a collection of case studies with performance metrics was released in 2017.
- Data is based on permanent employees. When noted, safety data includes contractors.
- Techniques for data measurements and calculations, if not industry standard, are stated with the data.
- Financial data is in U.S. dollars and environmental data is in metric units.
- Senior management and relevant staff have reviewed all information and believe it is an accurate representation of our performance. Third-party assurance of our sustainability report was not conducted.
- The terms NOVA Chemicals, our, we, the company and the corporation refer to NOVA Chemicals Corporation and its subsidiaries as a whole. [see "About NOVA"].

Materiality Assessment

This report provides information on the topics that are most relevant to our stakeholders and that can impact the success of our business. To select which sustainability topics to report on, we reviewed the results of previous materiality assessments conducted in 2014 and 2016 and also considered recent business and societal changes. The environmental and social topics that inform our responsible practices have remained relatively unchanged from previous reports.

As global citizens, we also want to direct our efforts towards solutions for global challenges. In 2018, we conducted a prioritization workshop,

This report provides information on the topics that are most relevant to our stakeholders and that can impact the success of our business.

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using the [United Nations Sustainable Development Goals](#) (SDGs) and industry reports to select topics for the prioritization process. A team of internal subject matter experts discussed the underlying topics contained in the SDGs. After careful consideration and analysis, we prioritized three

global challenges: plastics circular economy, plastics in the ocean and climate change. It is in these areas we believe we can have the most impact, leveraging our intellectual and technical capabilities, facilities and products in pursuit of solutions.

Topics Covered In This Report

As we make progress towards a more sustainable business and society, we seek to maintain a balanced approach that creates a positive societal impact and maintains our unwavering internal commitment to safe and reliable operations.

Sustainability Focus Areas	Plastics Circular Economy	Climate Care	Sustainability Citizenship	Sustainability Collaborator	Sustainability in Operations	Sustainability Design & Integration	Page 08-09
	Plastics Circular Economy		Plastics in the Ocean		Climate Change		Pages 10 – 15
	Ethics & Compliance	Business Ethics					Pages 16 – 17
		Responsible Value Chain					
	Foundations	NOVA's Nature					Pages 18 – 19
		1NOVA					
Continuous Improvement							
Safety is a Shared Responsibility	Employee and Contractor Safety					Pages 20 – 25	
	Process Safety						
	Transportation Safety						
	Product Safety						
Caring for the Environment	Environmental Management					Pages 26 – 29	
	GHG and Other Air Emissions						
	Water Use and Quality						
	Process Waste Reduction						
Being Actively Sought After	Inclusion and Diversity					Pages 30 – 35	
	Wellbeing						
	Employee Engagement and Development						
	Community Engagement and Investment						



Sustainability at NOVA Chemicals

NOVA Chemicals embraces global approaches to sustainability that recognize the role of business as a positive catalyst for change. We believe we can influence collective and individual behaviors to create shared value, protect natural resources, promote circular design and enhance delivery of responsibly produced products and services.

To live our purpose, we must embed sustainability in organizational design and decision making and engage our employees and other stakeholders to drive performance. Underpinning it all, is our ongoing commitment to Responsible Care, an industry and company platform that codifies responsible practices, ethics and principles in support of sustainability.



When the Responsible Care initiative was developed in 1985, it was an expression of the chemistry industry's commitment to safety. Over the years it has evolved to include the industry's commitment to sustainability — the betterment of society, the environment and the economy.

Our Sustainability Journey

Our sustainability journey extends from becoming a founding member of the Responsible Care initiative in 1985 to our current-day commitment as a founding member of the Alliance to End Plastic Waste. Taking stock of this sustainability journey below continues to inspire us to be a positive catalyst for change.



Looking Forward: Sustainability Strategy

Plastics play an essential role in modern life. Thousands of products are enabled through plastic production, including packaging that keeps our food safe, medical instruments and supplies, lightweight yet durable containers, clothing, sport equipment, household products, and even products that make up our homes and cars. Plastics provide diverse social, economic and environmental benefits. The challenge is to balance this great value of plastic with its responsible treatment after first use.

Plastic is required to meet the growing consumer demand for products that make everyday life healthier, easier and safer; this demand supports our growth ambitions. NOVA Chemicals will be a catalyst for positive change, creating opportunities for shared value, innovating to create plastics that continue to meet the needs of modern society and contributing to the development of a sustainable plastic circular economy.

Sustainably meeting our business objectives is a goal requiring bold collaboration inside our industry and

across our value chain, as well as innovation at unprecedented levels. In 2018, the company advanced its approach to sustainability by developing an enhanced sustainability strategy that provides new direction across the organization and which will be communicated to our internal and external stakeholders. To accomplish this task, we established a Sustainability Strategy Development Team, overseen by the NOVA Chemicals Management Board (NMB). We are committed to proactively and visibly addressing the sustainability opportunities and challenges for our company and industry, harnessing the collective effort and skills of everyone in the company.

Our sustainability strategy contains six focus areas to proactively advance sustainability across our company and industry. The strategy calls out specific areas of focus and is complemented by our ongoing focus on a broader range of sustainability topics material to NOVA Chemicals. Our aspirations in each of these areas illustrate the level of our ambition, not a specific target.

Focus Area	Our Aspiration
A Plastic Circular Economy	We recognize the value in post-use plastics and work to extend the lifecycle of plastics to reach established plastics industry goals to recycle or recover 100 percent of plastic packaging by 2040. Working together with a wide variety of stakeholders, we strive to create a world free of plastic pollution.
Climate Care	NOVA Chemicals is committed to responsibly managing our greenhouse gas emissions and promoting and maintaining sustainability throughout our operational facilities.
Sustainability Citizenship	As a responsible global citizen, NOVA Chemicals will collaborate and provide leadership to select challenges and opportunities that promote natural resource conservation and in particular ocean health.
Sustainability Collaborator	We are actively pursuing collaboration partners to develop a portfolio of new and emerging sustainability technologies and innovations to more quickly and effectively achieve our sustainability goals.
Sustainability In Operations	We are committed to promoting and maintaining sustainability in operations. We will proactively and responsibly manage the water, land, air and biodiversity impacted by our operational facilities.
Sustainability Design & Integration	Sustainability will be implemented through organizational design and leadership, strategy, management systems and business processes. All employees will be engaged to help drive sustainability performance and engage with our various stakeholders.

Governance For Sustainability

The Board of Directors, not a separate committee, addresses sustainability matters in our company. The Board meets on at least a quarterly basis and has established two standing committees, the Audit Committee and the Remuneration Committee. The NMB is composed of members of senior management and reports directly to the Board of Directors.

Sustainability has become an important element of how all employees carry out their roles in the company. Sustainability is a specific focus of many functions within NOVA Chemicals, including: Environment; Human Resources; Health and Safety; Product Stewardship; and Community Relations among others. These corporate functions work to monitor best practices, develop company-wide programs and support our facilities in adhering to the company-wide direction. We complete regular reviews of the effectiveness of systems and programs and set annual performance and improvement objectives. We use stakeholder input and consider best available science and practices to responsibly manage issues.



Taking Care

Our work at NOVA Chemicals results in plastic products that take care of food, water and other goods vital to life. To enable these products, we must first take care of the people, places, materials and processes that make them possible. We take care with respect to our operations, communities, products and the environment. Taking Care is a way to think and a way to work. It's our particular approach for putting Responsible Care into practice.



Global Challenges

We are committed to bold collaboration with diverse stakeholders to create shared value for our business and society. NOVA Chemicals aims to address global challenges by supporting collective efforts to develop a plastics circular economy, eliminate plastics in the ocean and act on climate change.

Plastics Circular Economy

Plastic is a valuable and versatile material that makes everyday life easier, healthier and safer. Plastic packaging protects products, prolongs food shelf life (reducing food waste) and requires less emission-intensive transport to consumers than other forms of packaging because of its lower weight¹. Despite these advantages, plastic is not always easily recycled and recovered. Common barriers include:

- Many plastics films are multi-material, making them non-recyclable
- Higher-value, high-volume end markets for recycled materials need to be identified or created
- Insufficient collection, sortation, recycling and recovery infrastructure

Our Approach

To make a meaningful impact in the development of a plastics circular economy, we are applying a multifaceted approach. In our areas of expertise, we leverage our collective research skills and technical know-how to address some of the barriers to recycling in the following ways:

- Improving recyclability of packaging by innovating in resin and flexible plastic film structure design
- Creating a market for recycled plastics by designing structures with post-consumer resin incorporation

- Reducing technological barriers to recycling plastic packaging through our research and collaboration around recycling standards

In some of the large-scale structural areas such as waste sortation, collection and management, we are collaborating with industry associations, funding affiliates and forming partnerships (such as Project STOP, page 15) to scale solutions.

A circular economy prioritizes the extension of product life cycles, extracting maximum value from resources in use and recovering materials at the end of their service life.

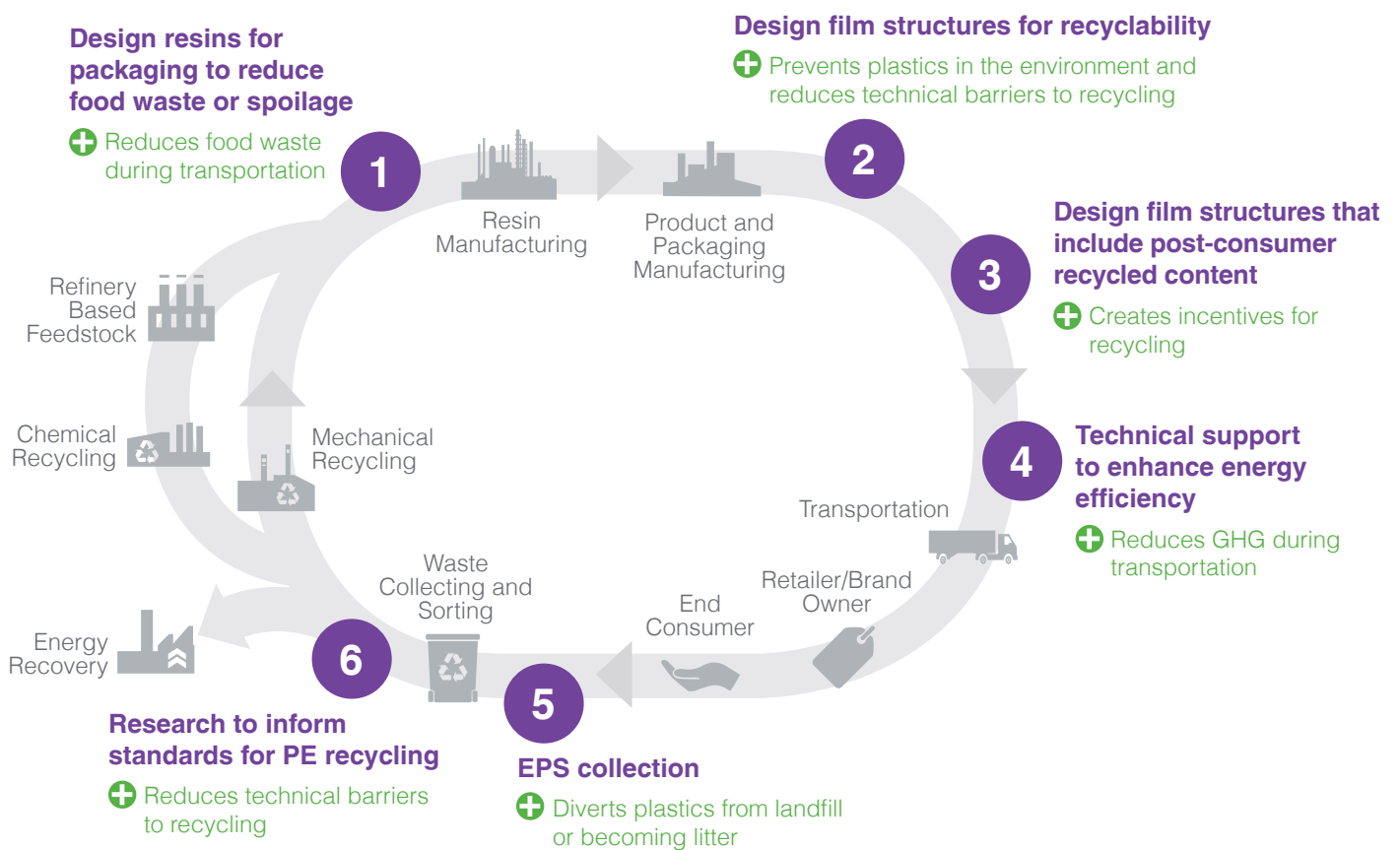
A plastics circular economy is one in which plastics are reused, recycled and recovered as many times as possible with the goal of avoiding becoming a waste stream.

¹Trucost®, 2016. "Plastics and Sustainability: A Valuation of Environmental Benefits, Costs, and Opportunities for Continuous Improvement" from <https://plastics.americanchemistry.com/Plastics-and-Sustainability.pdf>

We support major North American plastic industry association¹ goals:

- 100% of plastic packaging recyclable or recoverable by 2030
- 100% of plastic packaging is reused, recycled, or recovered by 2040
- 100% of resin manufacturing sites will participate in [Operation Clean Sweep Blue](#) by 2022

Our Contribution to the Plastics Circular Economy — Overview



Related UN Sustainability Development Goals

<p>2 ZERO HUNGER</p>	<p>3 GOOD HEALTH AND WELL-BEING</p>	<p>9 INDUSTRY INNOVATION AND INFRASTRUCTURE</p>	<p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	<p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p>
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¹This includes the American Chemistry Council (ACC), the Chemistry Industry Association of Canada (CIAC) and the Canadian Plastics Industry Association (CPIA)

Our Contribution to the Plastics Circular Economy — Details

1 Innovations to Reduce Food Waste

We design plastic resins and film structures that help reduce food waste. Packaging must be able to withstand handling, falls, and pressure from other products when stacked. Package integrity in food packaging, which includes the strength of the package seal and the toughness of the film structure, helps prevent food waste by reducing spoilage and leakage.

Our innovative scientists and engineers recently developed a new PE resin for the sealant layer — the innermost layer of a multilayer film that keeps food safe and protected — in flexible packaging. Our new resin is more than three times tougher than typical sealant resins and improves seal integrity throughout the supply chain, from manufacturing to the consumer's home. And because our sealant resin is PE it can be used as part of a PE-based recyclable package. This new sealant layer can be used for frozen, liquid and dry food in pillow pouches (e.g. frozen peas) and stand-up pouches (e.g. granola).



2 Design for Recyclability

In the last five years, we have directed our efforts to design plastic resins and film structures that can be more efficiently recycled. In 2017, we designed a fully recyclable film structure for stand-up pouch (SUP), which can be used to package food products such as crackers, candy and nuts (which traditionally have been packaged in non-recyclable, mixed material structures).

In 2018, we focused on improving and diversifying the use of fully recyclable PE structures. Some notable advances:

- **Flexible bottles:** SEMCO, a packaging company located in Monaco, has designed a flexible alternative to the small rigid bottles that are commonly used for condiments. We helped them transition from a mixed-material structure to a fully recyclable version, made of polyethylene. In 2018, this product received an Innovation Award at SIAL Paris (Salon International de l'alimentation), the world's largest food innovation exhibition.
- **Large format box pouches:** We expanded the use of our recyclable film structure design into a higher volume pouch (2-14 Kilogram) that is made of polyethylene and can withstand the demands of large, heavy packages. Common applications for this large format are pet food, flour, candy and rice, among others. As of April 2019, customers are producing commercial quality pouches.



3 Uses for Post-Consumer Recycled Content

In 2018, we completed proof of concept for a film structure with 20 percent post-consumer recycled (PCR) content that can be used in the stand-up pouch. By incorporating recycled polyethylene in a product, we are helping to create a market for post-consumer content.



4 Technical support to enhance energy efficiency

In 2018, we worked with one of our customers to redesign the film structure of the [ConservaCube®](#), a flexible film cube used for heavy packages such as kitty litter, dry concrete mix, and pet food. We helped the customer design a film structure that could be manufactured in one step to replace a multi-step, multi-location process, while retaining the required recyclability, strength and resistance to withstand up to 55 pounds per cube and friction incurred in storage and transportation.

The ConservaCube package design increases transport efficiency (by packing more volume of product in a single truck or container and therefore reducing the number of trips needed) which in turn helps to reduce transport-related emissions. The design won four Flexible Packaging Association awards.



5 Expanded Polystyrene (EPS) Collections

Our continued partnership with the Pennsylvania Resources Council (PRC) and Appliance Warehouse has resulted in the collection and recycling of over 12 tonnes of expanded polystyrene packaging material from numerous PRC Hard to Recycle events held in Pittsburgh and surrounding areas since 2013. NOVA Chemicals continues to expand the collection and recycling program in the Beaver County areas as well. Currently,

EPS foam is accepted from 8 different organizations and 2 Beaver County municipalities. The cumulative total amount of EPS packaging foam collected for recycling since the program's inception in 2013 is over 39 tonnes.

NOVA Chemicals was the recipient of EPS Industry Alliance's 2018 Excellence in EPS Recycling Award for the EPS collection and recycling program.



6 PE Recycling Research and Advocacy

We are committed to improving recycling by actively engaging in collaborative projects to improve recyclability of packaging structures, incorporate recycled content and overcome challenges associated with the recycling system.

We are engaging with organizations that set technical industry standards for recyclability (such as the [Association of Plastic Recyclers](#) (APR) in the US), and offering guidance on how to best assess qualities of collected materials so recycle/reuse is possible. In 2018, we:

- Conducted studies to determine how many times packaging films can be recycled for safe and effective reuse and how that informs plastic resin design.
- Worked with the APR to determine acceptable levels of non-PE materials (e.g., ink, colorants, barrier materials/additives) when recycling packaging films.
- Made recommendations to replace hard-to-recycle package designs with ready-to-recycle alternatives (e.g., NOVA Chemicals' design for the stand-up pouch).
- Continued to support organizations such as the [American Chemistry Council](#), and [Canadian Plastics Industry Association](#) which are trying to develop solutions to other supply chain challenges such as collection and sorting.



Plastics in The Ocean

We are committed to working with others in the global community to proactively prevent plastic waste from reaching the oceans and to clean up plastic waste that is already in the environment. At the heart of this challenge is improper waste management which leads to leakage into oceans and seas (approximately 8 million tonnes per year¹). We invest in projects with global reach that strengthen our positive impact as global citizens and contribute to shaping a world that is even better tomorrow than it is today.

Our Approach

We are collaborating with others at a global level to support ocean health and the development of waste management infrastructure where it is most needed through two major projects: Alliance to End Plastic Waste and Project STOP.

“We believe plastics are too valuable of a resource to end up as litter or trash. The reason we are so passionate about this issue is that we believe it to be a solvable one.”

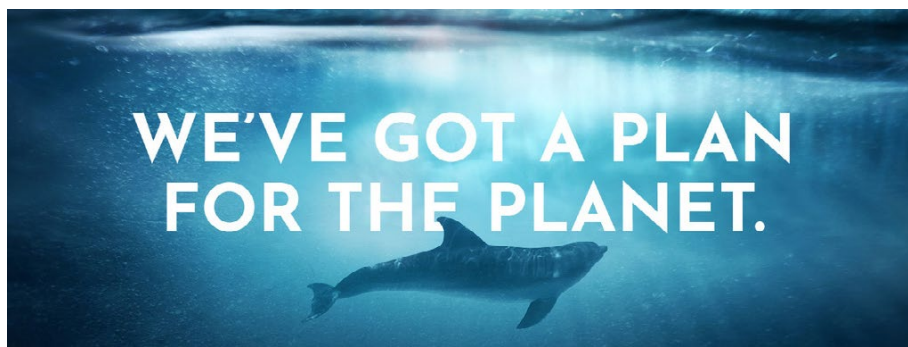
– John Thayer, Senior VP of Polyethylene Business at NOVA Chemicals

Related UN Sustainability Development Goals



Alliance to End Plastic Waste

NOVA Chemicals is a founding member of the [Alliance to End Plastic Waste](#), an alliance of more than 30 companies working to advance solutions to reduce plastic waste in the environment, with a specific focus on ocean pollution. The Alliance has made a combined investment of \$1.5 billion over the next five years to work with governments, institutions, companies, non-government organizations and communities to support investments and programs that help eliminate plastic waste in the environment.



The Alliance has a comprehensive four-part strategy:

- **Infrastructure** development to collect and manage plastic waste, and increase recycling in areas of greatest need.
- **Innovation** to advance and bring to scale new technologies that make recycling and recovering plastics easier and create value from all post-use plastics.
- **Education** and engagement of governments, businesses, and communities to mobilize action.
- **Clean up** to help stop plastic waste at its source, focusing on cities and major rivers that carry significant amounts of plastic waste to the ocean.

¹Alliance to End Plastic Waste.



Project STOP

In 2018, we committed to a three-year investment of nearly \$2 million to [Project STOP](#), with the goal of preventing plastic debris from reaching oceans. Project STOP works with cities to create effective waste management systems that eliminate leakage of plastics into the ocean.

The first city partnership was launched last year in Muncar, a coastal fishing community in Banyuwangi, Indonesia. Project STOP has brought in international waste management experts to provide guidance on implementing a waste management system that is owned and operated by the city government. Project STOP also provides financial support for collection vehicles and containers,

equipment for waste collection, reuse, recycle and treatment (including dry marketable and wet compostable waste) and promotes behavior change and creates jobs in the community.

All profits from the sale of recyclables or the processing of organic waste are kept by the local community and used to cover collection and sortation worker salaries and operating costs of the system. Project STOP's aim is to design a low-cost system that can capture as much value from waste as possible, so

the financial burden on residents for collection is as low as possible. Existing local initiatives (and informal waste pickers) are supported and integrated into the business model.

The Muncar project started its implementation phase in April of 2018; collection, sorting and processing for recycling is now ongoing, as are clean-up and consumer behavior change campaigns. Handover to the city government is scheduled for April of 2021.



Collection, sorting and processing for recycling is now ongoing as part of the Muncar project, as are clean-up and consumer behavior change campaigns.

Climate Change

Driven by the [Paris Agreement](#), businesses and governments are intensifying efforts to transition to a lower carbon future and to mitigate and adapt to the impacts of climate change. The goal of the signatories of the Paris Agreement is to limit global temperature increase to well below 2 degrees Celsius. Despite the lack of consensus on the degree of change required by corporations, individuals and governments, we share a common interest in addressing the impacts of population growth and natural resource consumption and in reducing our effects on climate change at NOVA Chemicals.

Our Approach

We are committed to responsibly managing our greenhouse gas emissions throughout our operational facilities. Our operations are largely based in Canada. As a strong supporter of the Paris Agreement, Canada has implemented a carbon levy and other carbon-limiting regulations. We comply with and recognize the importance of implementing responsibly and appropriately developed regulations.

Read more about GHG emission reductions on page 26 and 27.

We engage with the Canadian federal and provincial governments, and U.S. regulatory agencies, to ensure prospective regulations reflect a balance between environmental protection, financial constraints and technical feasibility. As well, we have provided our input to governments on

tax structures and other socio-economic issues. Generally, we work through industry associations to address industry-wide challenges and to provide feedback on proposed regulations.

Related UN Sustainability Development Goals





Ethics & Compliance

At NOVA Chemicals, our reputation is centered on our commitment to be a responsible company. Responsibility starts with operating ethically at all times. Our commitment to ethical conduct can be summarized in one simple sentence: *Do what is right*. We do what is right in our relationships with our coworkers, our partners and our communities.



2018 Highlights

- Code of Conduct refresh and Mobile App substantially completed
- Code of Conduct Bi-Annual Certification and Questionnaire completed



2018 Challenges

- Ensuring refreshed tools and resources are available to guide and support responsible decisions and actions
- Increasing awareness and sustaining positive participation in the use of the Code and supportive tools and resources



Looking Forward

- Full implementation of the refreshed Code and supporting Mobile App
- Responsible Business Communication training
- Mandatory Code training for all employees
- New EthicsPoint® Incident Management System

Code of Conduct

NOVA Chemicals' Business Conduct Policy, the company's [Code of Conduct](#) ("the Code"), contains expectations, obligations and responsibilities that guide ethical conduct for everyone who works directly for or who represents NOVA Chemicals. Our Code serves as a guide for making sound decisions, acting responsibly and living our values.

In 2018, NOVA Chemicals refreshed its Code of Conduct to include new topics such as Responsible Business Communications, Sustainability, Immigration and Upholding Human Rights.

A new Mobile App was created to enhance access for people when not working from a desk. The Mobile App provides easy-to-access links to other resources including the Ethics Line and online reporting. Full roll out of the Code and the Mobile App is scheduled for 2019.

The Code of Conduct Bi-Annual Certification and Questionnaire was conducted with all permanent employees including senior management. 2,900 employees completed the process representing 100% of the active and eligible employee population. This Certification process requires employees to: re-read the Code; certify that they understand and agree to be bound by

its terms, and; comment on actual or observed violations of the Code or a precursor to a violation.

Employees are also encouraged to speak with their leader, HR Business Partner or a member of the Law Department for assistance.

Ethics & Compliance Training and Engagement

Training on the Code is mandatory for all permanent employees and as part of our onboarding process for new employees. During the online training, individuals are led through a series of real-life scenarios and tested on their understanding of the Code. Additionally, targeted training is provided based on employee roles, emphasizing high risk areas such as antitrust law, conflicts of interest and corruption.

Business Conduct

Acting with integrity is essential to maintaining our reputation and the future growth of our company. Our ethical guidelines aim to ensure compliance with all laws and regulations, support questioning and learning and prevent costly mistakes. Our concept of acting ethically is broad and includes our responsibilities:



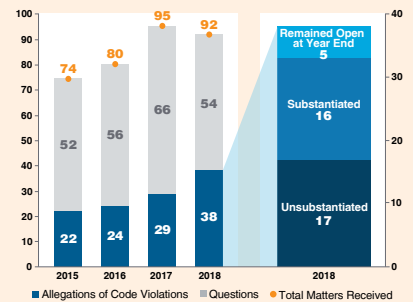
Raising Concerns and Getting Help

Questions or concerns about actual or suspected ethical or legal violations can be submitted in the following ways: confidential NOVA Chemicals Ethics Line; web-based Workplace Alert Program; Legal or Human Resources departments; employees' leaders; Ethics & Compliance; Chief Compliance Officer.

When a matter is raised, it is evaluated by Ethics & Compliance as to the

materiality and appropriate next steps. Investigation is undertaken where appropriate. Once the investigation is complete a final report is written, including details of the investigatory steps taken and findings, conclusions, and/or recommendations. The Board receives quarterly reports and an annual presentation on the activities of the Ethics & Compliance Program.

Matters and Allegations



The continued high volume of matters being addressed, particularly questions versus complaints, reflects the high level of interest shown by employees and leaders in "doing the right thing".

Responsible Value Chain

NOVA Chemicals seeks to work with suppliers, customers and distributors who are committed to ethical and responsible business practices. Unethical behaviors by suppliers or parties who represent NOVA Chemicals or who can be perceived to do so can affect our reputation and potentially expose us to financial or legal issues.

To carry out NOVA Chemicals' manufacturing, construction and other service activities, we work with over 3,000 suppliers that provide feedstocks, raw materials, supplies for maintenance, repair and operations (MRO) and transportation services. We also partner with more than 8 distributors of our products. Our activities in this area:

- Internal and Third-Party Screening** — We have an internal process and use a third-party service provider to screen suppliers, customers and distributors based on specific criteria (e.g., countries with which trade is prohibited or restricted, denied party lists compiled by government agencies).
- Security, CTPAT and PIP Programs** — To help ensure the security of our international supply chain, we are a member of the U.S. Customs Trade Partnership Against Terrorism (CTPAT) and the Canada Border Services Agency Partners in Protection (PIP) program.
- Supply Chain Risk Network** — In 2018, we formed a cross-functional team to work on supply chain risk management, the NOVA Chemicals' Supply Chain Risk Network. This team assists and supports our commercial and logistics functions in identifying and managing risks associated with the transportation and storage of products in the supply chain.



Foundations

NOVA Chemicals has bold ambitions and plans to grow significantly in the Americas beyond our traditionally US and Canadian markets. We must do so purposefully, in accordance with our values, and by continuously improving.

NOVA's Nature: Our Values

NOVA's Nature is how we conduct ourselves everyday with each other, our partners and our customers. To deliver on our purpose and to achieve our strategic goals, we must live NOVA's Nature.

There are four values that make up NOVA's Nature:

Be responsible: We conduct ourselves with honesty and integrity and take accountability for our actions. Being responsible means we think holistically, keep our promises and show a "Zest for ZERO". Zest for ZERO includes our aspirational goal of zero incidents and our drive for zero errors, redundancies and waste in all forms (time, effort, resources, materials).

Be passionate: We are motivated and energized to help shape a world that's even better tomorrow than it is today. Being passionate means we engage fully, rally others and drive change within our company.

Innovate: We fuel our success with everyday curiosity, imagination and creativity. We innovate by learning and growing every day, finding a better way to do our work and challenging our biases.

Collaborate: We proactively reach across boundaries to partner with each other as well our customers, suppliers and communities. We collaborate by aligning on common goals, encouraging every voice, and building networks that matter.



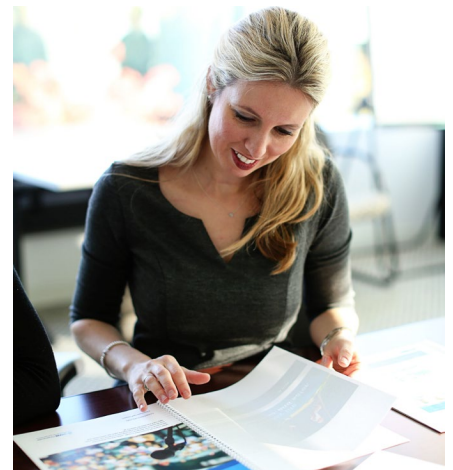
1NOVA Mindset: Optimizing the Way We All Work Together

In order to achieve our ambitious growth goals while fulfilling our purpose, we must optimize the way we all work together. This means building a common and scalable approach for growth, becoming more agile, developing expertise in new areas and creating standardization in the right areas. We refer to this as 1NOVA.

In 2016, 1NOVA was introduced to create a set of best practices and systems that optimize how we work together and provide the foundation for growth. Over time, we have made significant progress on achieving those objectives and are becoming more agile, scalable and efficient as a result. An example is standardization of our

driving procedures (see page 21). Based on the success of that rollout, we are better equipped to standardize other procedures in the coming years.

1NOVA is a critical component in optimizing how we work together and continues to ensure consistency across the organization.



Continuous Improvement

Another way we can optimize the way we work together is through Continuous Improvement, which helps us achieve safe, reliable and competitive operations.





Continuous Improvement (CI) is a mindset and system of principles and practices to create value through the elimination of waste, variation and complexity. CI enables NOVA Chemicals to get better at getting better, by developing and supporting problem-solving people who can apply this mindset to any area of their work or personal life.

Continuous Improvement enables NOVA Chemicals to get better at getting better.

The CI system enables everyone, every day to see if there is a better way. The implementation of our CI Framework includes:

CI reduces downtime from 10 weeks to 1 week

In late summer of 2018, our Corunna site in Ontario experienced a significant weather event that resulted in substantial equipment damage, taking two cracking heaters out of service and impacting production rates. Typically, surveying the damage and assessing risks would have required numerous groups and up to several days. Instead, thanks to CI, we called an Area Problem Solving meeting and all required personnel quickly assembled. Initially, we thought the equipment would take at least nine weeks to arrive, but through CI problem-solving methods and the cooperation of our colleagues we were unpacking the pieces we needed 20 hours later. One week later, we were fully operational.

 <p>Respect and develop people</p>	<p>This includes learning and coaching. Our employees become coaches so they can help others learn and problem solve.</p>
 <p>Make performance visible</p>	<p>Using visual boards with defined accountabilities and clear performance results at our facilities.</p>
 <p>Standards are the basis for improvement</p>	<p>Standards must be created by the people that use them and fit for purpose.</p>
 <p>Be deliberate in how we improve</p>	<p>This includes creating time to routinely problem solve, such as daily and monthly operations review meetings and area problem solving meetings.</p>



Safety is a Shared Responsibility

At NOVA Chemicals, we believe in a zero-injury workplace. We are responsible for our own personal safety and for the safety of the people around us, our coworkers, customers and communities near our operations. Our safety efforts encompass employees and contractor safety, the safety and integrity of our facilities, product transport and the safety of our products.



2018 Highlights

- Hosting our first company-wide Safety Day
- Standardizing our safe driving procedure and training 2000 employees on safe driving
- Improving our alarm management as part of process safety improvements



2018 Challenges

- Integration and standardization of safety processes, especially of new facilities



Looking Forward

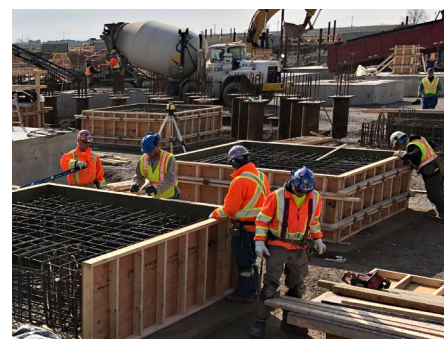
- Continue 1NOVA implementation and standardize other safety procedures
- Provide new training for our Technical Advisors, as part of our new emergency response plan

Employee and Contractor Safety

We remain deeply committed to Goal ZERO (zero injuries and incidents in the workplace) and our belief that all work-related illnesses and injuries can be prevented. We work hard to ensure the safety of everyone working at our sites and to foster a culture in which all workers feel responsible for maintaining the safety of their colleagues.

To support the achievement of Goal ZERO, standardization in critical processes is imperative. In 2018, employee safety initiatives focused on extending standardization processes used earlier for Crane and Hoisting procedures to standardize new Safe Driving Procedures across our sites (read more on page 21.) Planning for the company-wide implementation of the RC 14001® management system, which combines the Responsible Care Framework with ISO 14001, was launched. This work was further supported by enhancing our Responsible Care governance structure to create functional Strategy Teams designed to leverage learning and improvement opportunities and develop program strategies to drive improved operating performance outcomes.

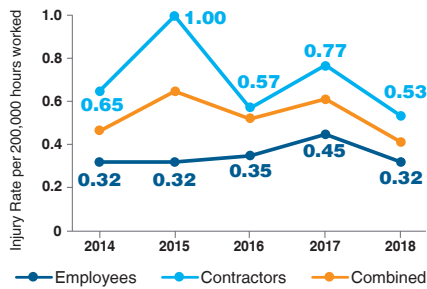
Contractors perform many different roles and functions across our company and are an important part of our workforce. They are essential to the current expansion of our facilities.



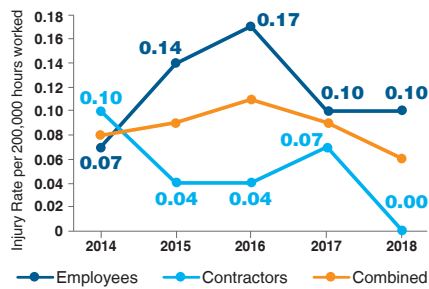
Contractors perform many different roles and functions across our company and are an important part of our workforce.

In 2018, contractors performed 42% percent of the work (based on exposure hours) at our sites. Goal ZERO is only achievable with their active participation. To ensure we work with safe contractors, we monitor contractor safety statistics, written safety policies/programs and insurance information through the [ISNetworld®](#) centralized system.

Recordable Injury Rates



Lost Time Injury Rates



Our goal is to continue our downward trajectory to ZERO, for both employees and contractors.

Safe Driving

As part of our efforts to standardize processes (read more about 1NOVA Standardization on page 19), we introduced a new Safe Driving Procedure in 2018. While over 300 procedures were identified as potential standardization candidates, driving was chosen as the first process to be standardized. Driving is relevant to nearly all employees and contractors, and is one of the riskiest and most complex tasks we do every day.

We also wanted to improve on our driving performance from 2017, when we experienced more than 100 vehicle incidents. The majority of the incidents were minor and occurred at low speeds, such as backing out of parking spots. Although these incidents typically result

In 2018, our employees experienced 13 percent fewer vehicle incidents than in 2017.

in only minor vehicle damage, driving always has the potential for significant injury or incidents.

As part of our introduction of the Safe Driving Procedure, we featured an interactive (e-learning) training module. Eighty percent of employees have already completed the module; we plan to ensure all employees complete the training by the end of 2019. In 2018, our employees experienced 13 percent fewer vehicle incidents than in 2017.



As part of our efforts to standardize processes, we introduced a new Safe Driving Procedure in 2018.



Our Commitment to Goal ZERO

In 2018, every one of our employees received two commemorative coins inscribed with our values and the elements of our Taking Care platform. Taking Care is how we put Responsible Care practices into action.

The coins are a tangible reminder of our commitment to zero workplace injuries and of safety's central role in our growth aspirations. Employees were encouraged to use the coins in their safety interactions (a conversation that highlights and then recognizes safe or at-risk behavior), safety meetings, or to display at their workstations.

Process Safety

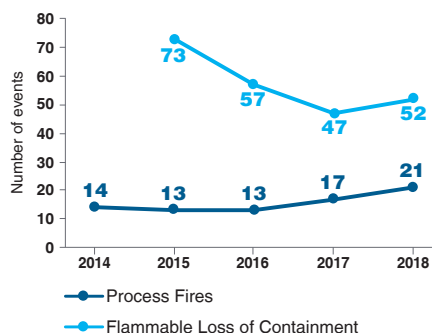
While employee and contractor safety emphasizes the prevention of hazards (such as tools use, heights, slippery surfaces and vehicle use) that can affect one individual at a time; process safety focuses on reducing hazards that have the potential to affect several people or assets.

Our process safety procedures are designed to protect people, property, and the environment, and to maintain the confidence and trust of our employees and the communities we operate in. We seek to achieve this through strong design, operations, and maintenance of our facilities, and by fostering a strong safety culture, including shared beliefs about safety, being respectful of hazards, and responsibly and accurately quantifying and managing risk.

As a petrochemical company, we manage flammable liquids and gases. Process safety specifically targets the prevention of the release of potentially dangerous materials and/or the release of energy (such as fire or explosion). Process fires occur when a flammable liquid spills or gas leaks, even if in small volumes, near an ignition source and starts to burn. After years of declining numbers of process fires, the recent upward trajectory in the number of process fires has renewed our emphasis in this area.

In 2018, we introduced a new metric, “flammable loss of containment”¹, a precursor to process fires, with the aim of better understanding and reducing these events before they turn into process fires.

Process Safety Events



2018 process fires increased in part due to our increased operational capacity. In response, we have introduced a new metric, “flammable loss of containment”, a precursor to process fires, with the aim of better understanding and reducing these events before they turn into process fires.

Alarm Management

Operators at our sites monitor the ongoing chemical and manufacturing processes. Alarms are intended to draw an operator’s attention to an abnormal condition. When used appropriately, alarms are one of the first ways of preventing hazards from turning into accidents.

However, increasingly sophisticated technology (e.g. sensors, software) has led to the ability to monitor an increasing number of hazards and conditions. This led to alarm notices overcrowding operators’ screens, and operators having to make decisions about alarms of varying degrees of urgency. As an example, in 2012, an average operator at one of our sites could have up to 100 alarms on his or her screen at one time.

In 2012, we implemented a rigorous alarm management process with the goal to reduce the number of “suppressed and standing” alarms and introduced a new alarm design that prioritizes high-risk alarms. Our initial target of having no more than 30 alarms at one time was achieved in 2015. As an example of our continued successes, in 2018, many of our sites are now at less than 10 standing alarms under normal operating conditions, allowing our staff to focus on safe operations while fully being aware of any concerns which may exist.

Emergency Preparedness and Response

We conduct regular site-specific emergency training sessions, which include testing, inspection and response activities for a variety of emergency scenarios. In 2018, we conducted more than 200 emergency response drills.

We also conduct regular emergency response exercises in collaboration with local public safety authorities. For example, in Alberta, we are part of the Lacombe County Mutual Aid Organization (LCMAO) that brings together ten companies, municipalities and first responders to facilitate joint responses to emergencies. We all



train together and respond when necessary. To plan for such situations, we participated in three joint table top exercises and one joint field exercise. In addition to site-based support, our dedicated team responded to seven mutual aid calls and 10 emergency medical calls.

¹Flammable Loss of Containment is an incident that involves an unanticipated leak, spill, or leak of flammable material

Transportation Safety

Transportation safety refers to the measures we take to protect people, product, and the environment during transportation for our operations. Our goal is to ensure the safe transport of raw material to our sites and product from our facilities to our customers. Transportation safety excludes vehicle incidents that do not involve product transport, which we cover in employee and contractor safety (page 20-21). Some of our transportation safety activities include:

Auditing our Sites: In 2018, we conducted audits at our seven manufacturing sites, focusing on the loading and offloading processes and equipment to ensure safety and regulatory compliance.

Screening and Auditing Carriers: We work with 28 carriers, 25 percent of which are Responsible Care partners. To further ensure safe practices, we also utilize multiple layers and methods of screening, such as self-assessments on handling, routing, security and other safety aspects, third-party screening by industry-leading vendors and audits. In 2018, a third party audited three of NOVA Chemicals' carrier locations to ensure the carriers were adhering to industry-recognized procedures and policies.

Expanding Incident Reporting: Transportation incidents are a key performance indicator to monitor the safe transport of our products. In 2018, we broadened our reporting protocols to include transportation incidents and near hits reported outside of our

Transportation Emergency Phone Line. This includes incidents that occur at vendor and customer facilities. We engaged 13 suppliers and carriers through our supplier outreach program, to reinforce how to report incidents and work through corrective actions.

Pipeline Integrity: Another way we transport intermediate products (such as ethylene) and inputs (ethane) is by pipelines. NOVA Chemicals operates approximately 1,740 km of pipelines. Our inspection program includes right-of-way inspections, flyovers, in-line inspections and integrity or verification digs to examine anomalies from in-line inspections.

Preventing Pellet Loss: As part of [Operation Clean Sweep](#)[®] program, we shared information about the program with customers and encouraged them to take the pledge to reduce pellet loss during onloading, transport and offloading. In 2018, we also developed a Polyethylene Spill Response Guideline that establishes a standard practice

for carriers to use in cleaning up and recovering spilled pellets.

Strengthening Security: Each of our operating facilities has a site security plan, which includes measures to prevent dangerous goods from being stolen or otherwise interfered with during handling, transport, or importing. Prior to departing, the trucks or rail cars carrying dangerous goods are inspected and secured. Security seals are attached and recorded for continuity.

Emergencies During Transport: In 2018, we revised our Emergency Response Assistance Plan (ERAP) to incorporate the latest standards and industry best practices. The ERAP states our commitment to assist public emergency responders (e.g., fire fighters, ambulance) by sending NOVA Chemicals' technical advisors and specially trained emergency response personnel and equipment to the scene of a transportation incident involving NOVA Chemicals products or raw materials.

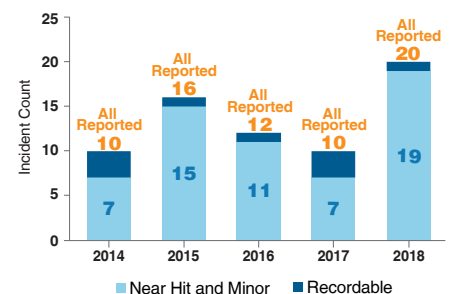
Five Years of Zero Non-Accidental Releases (NARs)

In 2018, we achieved five consecutive years of zero NARs¹. We focus on NARs because we can prevent them through the work we do. Our 2018 performance record is the result of: our dedicated rail tank car loading and unloading personnel; our railcar training program which entails securement of railcars and leak testing; our tank car specifications utilizing the RideTight[®] fluid-sealing management program, and; a tank car maintenance and qualifications program that exceeds regulatory requirements.



Buck Rogers, VP of Marketing, Chemicals at CN presents Carrie Maxim and Nick Robichaud with CN's Safe Handling Award² for 2018, in a ceremony held May 22nd, 2019 in Montreal, Canada.

Transportation Safety Incidents



Transportation incidents include spills and releases during product transport. A change in reporting protocol to include incidents at vendor and customer facilities resulted in an increased incident count for 2018.

¹ Non-accidental releases, an industry term to describe a tank car that has been found leaking, but has not been involved in an accident

² CN's Safe Handling Award is presented to customers who load freight cars with dangerous goods and meet strict standards for the safe handling and shipment of regulated products

Product Safety

Our product safety and information program is designed to understand and communicate safety impacts of our products, address product regulations and manage risks.

We conduct systematic evaluations of our products so they deliver their intended benefits, while protecting public health and the environment. Our products are evaluated for overall risk internally, with our trade associations, and by governments and other groups. Consistent with the American Chemistry Council's Product Safety Code and the Chemistry Industry Association of Canada's Stewardship Code, we evaluate and improve the safety performance of our products

by reducing hazardous components and substituting lower hazard raw materials.

We engage our suppliers and customers to help ensure product safety through our Responsible Care Outreach program and other initiatives. Suppliers and raw materials are checked for compliance with chemical control regulations, quality, Responsible Care practices and integrity expectations, and trade

compliance. We strive to do business with suppliers that adhere to the Responsible Care ethic.

We believe it is essential for people who use our products to have access to clear information on their contents and safe handling. In 2018, we conducted more than 1,500 stakeholder interactions, providing them with updated product safety and Responsible Care information.



Our products are evaluated for overall risk internally, with our trade associations, and by governments and other groups.

IN FOCUS: Safety Day



On May 9, 2018, approximately 2,400 employees and contractors across 17 locations participated in our inaugural Safety Day.

What is the goal of Safety Day?

Safety Day is an in-person event created to:

- Strengthen our safety culture by engaging leaders and employees.
- Focus on Goal ZERO, with the objective of improving our performance.
- Encourage employee understanding of safety performance.
- Create synergies between safety and other Responsible Care activities.

To reinforce our message, and align with safety initiatives across other industries, Safety Day took place during North American Occupational Safety and Health Week ([NAOSH](#)) and on the same day as [Steps for Life](#), a 5km walk that raises awareness of workplace injury and prevention.

How does Safety Day connect to Goal Zero?

Our aspiration to achieve Goal Zero requires strong, visible leadership. Safety Day was attended by NOVA Management Board members, giving us an opportunity to demonstrate safety leadership and share our safety commitment with employees and contractors.

Why spend time “talking about safety”?

Engaging leaders and employees to build a safety culture and improve our performance is worth the annual investment of time and resources. We also wanted to emphasize throughout our company the belief that “safe, reliable and competitive” operations are crucial to NOVA Chemicals’ success and future growth.

What did we do on Safety Day?

To strengthen individual accountability, our theme for 2018 was “Goal ZERO: Starts with Me”. A safety video, which reviewed everyday situations (e.g., driving to work, being distracted at work) served as a theme for discussion. Employees and contractors also took part in activities related to driving safety, drug awareness, ergonomics, fire safety, hazard recognition, personal protective equipment and safe work permits.

What were the results?

Following our inaugural 2018 NOVA Safety Day event, we have seen an improvement in many areas of safety performance. We have established Safety Day as an annual event to build on this momentum and look forward to future opportunities to further embed safety across our company.



Caring For The Environment

Enabling our customers to develop products that make our lives safer, healthier and easier, starts with taking care of our environment. Through innovation, operational excellence and environmental stewardship, we seek to protect resources and continually improve our environmental performance. To reduce our environmental footprint, we work on reducing greenhouse gases (GHGs) and air emissions, water management and waste elimination.



2018 Highlights

- Conducting a pilot for a new water treatment process at our Joffre site that reduces phosphate concentrations
- Developing a comprehensive GHG Decision Framework



2018 Challenges

- Finding innovative ways to manage and eliminate waste
- Finding innovative ways to manage and reduce our environmental footprint



Looking Forward

- Implementing the GHG Decision Framework
- Validating water reduction strategies at our Joffre site, AB before scaling up to other locations

Environmental Management

In 2018, we started the implementation of the RC 14001 technical specifications, which combine elements of Responsible Care initiatives and ISO 14001 and incorporates Environmental, Health, Safety and Security (EHS&S) performance improvement initiatives.

ISO 14001 is a widely recognized international standard that specifies requirements for an effective environmental management system designed to assist with identification,

management, monitoring and control of environmental issues. It also includes the need for continual improvement of an organization's systems and approach to managing environmental concerns.

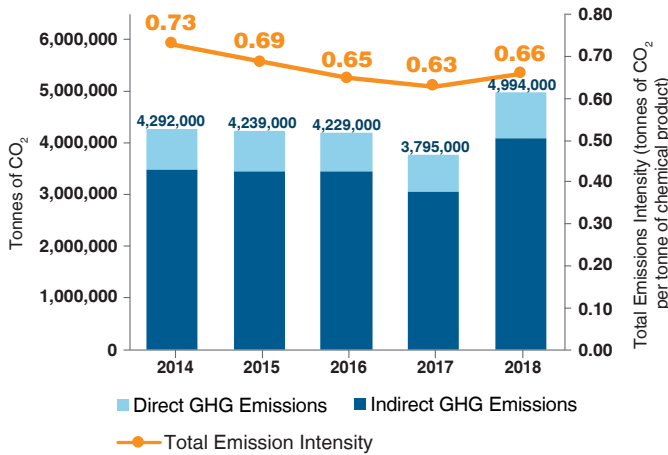
GHG and Other Air Emissions

The manufacturing process for ethylene, an important building block for many of our chemical products, is the source of 95% of our GHG emissions.

Ethylene is one of the most important raw materials in the petrochemical industry since it is a building block for many other chemical products. Ethylene production is the primary source of our GHG emissions. Until 2018, we have reported a 20-year trend in reducing air emissions and a relatively stable GHG trend. Absolute increases in 2018 GHG and other air emissions are the result of increased production at our Joffre site and the integration of our Geismar

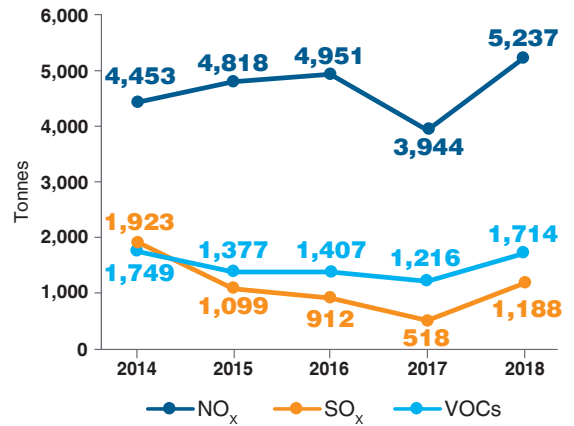
plant performance. With this growth, we still demonstrated a 10% improvement in GHG intensity over the past five years. As we grow, we will continue to pursue methods to improve emissions intensity through energy efficiency improvements, technology, offsets, carbon capture and enhanced decision tools to incorporate social, environmental and financial considerations, particularly for those related to carbon reduction strategies.

GHG Emissions



Absolute increases in 2018 GHG and other air emissions are the result of increased production at our Joffre site and the integration of our Geismar plant performance. We still demonstrated a 10% improvement in GHG intensity over the past five years.

Air Emissions



The 2014-2017 decline in air emissions was due to the upgrades to our Ontario facilities. The inclusion of the Geismar facility in 2018 resulted in an increase from our 2017 emission levels.

Water Use and Quality

Water plays an important role in our manufacturing processes, especially for cooling and to generate steam.

To meet facility requirements for water quality, some water must undergo pre-treatment processes. At our Joffre site, we use “cold lime softening” to treat the water from the Red Deer River. An outcome of softening is the generation of lime sludge (for details on how we manage lime sludge, see page 29).

The majority of cooling water is responsibly returned to the environment. Water returned to surface water bodies goes through extensive testing before discharge to meet regulatory obligation and strict environmental standards.

In 2018, we undertook two projects to reduce water use and improve water quality, minimizing our impact on this valuable resource:

- We piloted a water quantity and quality model project at our Joffre, Alberta site to help us determine the most efficient way to reuse water and minimize discharge volume.
- To improve water quality, we are working to reduce phosphate in the residual water so that cleaner effluent water is returned to its source. We have achieved a reduction of phosphate by 30 to 40 percent at our Joffre, Alberta site by using a different approach to corrosion inhibition¹ and we continue to study other possible ways of further reducing phosphate. Our efforts, which go above and beyond the regulatory requirements, will ultimately be applied across NOVA Chemicals' sites.



Water returned to surface water bodies goes through extensive testing before discharge to meet regulatory obligation and strict environmental standards.

¹ We use corrosion inhibitors to maintain our cooling system

IN FOCUS: Reducing Waste in Manufacturing

NOVA Chemicals is committed to reducing the amount of waste that we produce, minimizing what we send to landfill for disposal and finding new value streams for waste.

What are the sources of waste?

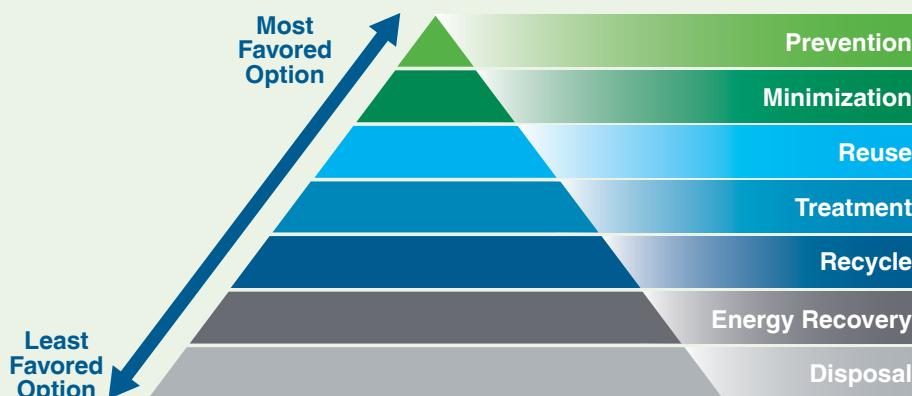
The production of ethylene, polyethylene and expandable polyethylene results in several solid and liquid waste streams. Some of our most challenging waste streams are thick mixtures of solids and liquids (sludge) which contain chemical compounds that must be separated or treated before they can be safely disposed of. Different types of sludge are by-products of water treatment or chemical processes.

NOVA Chemicals produces polyethylene pellets or resin that is used by processors to create final plastic products. The polyethylene that we produce and handle at our facilities is fully recyclable. In the operation of our polyethylene facilities, we occasionally produce off-specification polyethylene, which can still be sold and used to manufacture plastic products (see story on *Minimizing plastic waste from operations on page 29*).

What is our approach to managing waste?

In 2018 we completed a review of our waste streams to prioritize waste management strategies. Several criteria were established in this review based on risks and opportunities. For example, volume was not the only important consideration to prioritize waste. We also included factors such as hazardous vs. non-hazardous characteristics, transportation distance from our site to final disposal, regulations, as well as the potential for reuse, recycling, or energy recovery.

Our waste management hierarchy (which is based on the waste management hierarchy used by the U.S. Environmental Protection Agency) ranks our various waste management options. Our goal is to move as many waste streams, and as much volume as possible, towards the top of the waste hierarchy (e.g., prevent, reuse, recycle) and away from disposal of any kind.



What are our plans for the future?

We will focus on moving our priority wastes into upper levels of the waste management hierarchy and find new opportunities to find new uses for materials previously considered waste.

How are we reducing waste?

We prioritize and act on waste streams where we can have the most impact or can create the most value. Below are two examples of how we manage two important waste streams: lime sludge and excess polyethylene.



Repurposing by-products for agriculture

Lime sludge from our Joffre site in Alberta represents nearly 60 percent of our company's total waste by mass. Our Joffre site uses lime to remove hardness from the water extracted from the Red Deer River, so it can be used as cooling water. This process results in a sludge that is temporarily stored on-site in settling ponds. This sludge is primarily lime (calcium carbonate) with a small concentration of carbon, nitrogen and phosphorus.

Approximately 50 percent of this lime sludge is used in the phosphorus removal process, which treats water from our operations prior to its return to the Red Deer River. The rest of this by-product has been given to farmers in central Alberta, free of charge, for over 30 years. The high concentrations of calcium in these by-products make them useful to enhance soil properties and restore pH balance to the locally acidic soils.¹ The application of lime/phosphate by-product to agricultural lands is regulated and approved by Alberta Environment and Parks. In 2018, we diverted approximately 8,417 tonnes of lime sludge from landfill and repurposed it to improve agricultural yields in central Alberta.

Although there are local benefits from the re-use of the lime sludge from the Joffre facility, we are still interested in alternative options that could meet the site water quality needs and improve efficiencies while reducing the reliance on lime for softening at the facility.



Minimizing plastic waste from operations

Polyethylene (PE) waste, composed of lumps and strands generated during resin changes at our St. Claire River Site, is reused or recycled at a 98% rate. Starting in mid-2017, we contracted with an innovative plastics company to safely process the lumps and strands and recycle them into lawn furniture and plastic pots. In 2018, our St. Clair River Site sent more than 60 tonnes of PE for reuse.

All excess PE from Joffre and our Technology Facilities in Calgary, AB is sent to a processor of post-industrial plastics where the resin is turned into pellets for manufacturing. We have been sending excess PE from Joffre for recycling for many years, with 4,840 tonnes recycled in 2018. We are working to find ways to recycle all scrap and off-grade PE we produce at NOVA Chemicals.

¹ Research shows that when soil pH is increased from slightly acidic to nearly neutral nutrient availability and uptake is greatly increased.

Our Future Growth Plans

Actively Sought After

Our goal is to be actively sought after by all of our stakeholders. To be sought after, we believe it is essential to be a good employer, a good neighbor and a driver for economic prosperity. We focus on fostering a fair and inclusive workplace, engaging and developing our employees and leaders, investing in our communities and engaging with communities in line with Responsible Care practices.



2018 Highlights

- Scoring 85% in the Employee Engagement Survey results
- Began leadership training focused on quality conversations



2018 Challenges

- Emerging government policy and increasing stakeholder expectations
- Developing enhanced recruitment strategies in a dynamic labor market



Looking Forward

- Enhancing our approach to inclusion and diversity

Inclusion and Diversity

To achieve our company's purpose, our employees and leaders need to be inspired to do their best. We want to have healthy and engaged employees who believe in our company, share our values and want their work to make a difference.

We are committed to the principles of inclusion and respect. We seek to treat every employee in a fair manner and provide a work environment that enables all employees to pursue their careers. We also know that big ideas, innovations and continuous improvement do not come from one way of thinking. Instead, we embrace and celebrate all aspects of diversity — so we can learn from each other and offer the most creative solutions.

NOVA's nature is at the heart of this approach. (See page 18). In addition, the NOVA Network (TNN), an employee-driven professional development program, offers regular programming, a book club and other features that serve to strengthen personal growth and empowerment, diversity and inclusiveness.

To continue fostering a workforce where all employees feel welcome and valued, we are planning an Inclusion and Diversity strategy update in 2019.



Wellbeing

Wellness is an integral part of our culture, and we promote a happy, healthy, and productive workforce.

Our Total Well-Being program supports employees' physical, emotional, financial, social, and environmental well-being. Program offerings include an Employee Family Assistance Program, Health Risk Assessments, and Influenza Vaccinations. It also includes an online platform with tools to improve well-

being, including company-wide step challenges, digital coaching and tools to track personal choices for activities like walking, spending, journaling and screen time. Some highlights:

- 74 percent of our employees have joined the platform since 2016.
- Our employees have taken and tracked 1.75 billion steps since 2016.
- 6,093 trainings through Lifespeak™ wellness platform were completed during 2018 (top three topics: preventative health, stress management & resilience, and financial health).

Employee Engagement and Development

In 2018, we conducted an employee engagement survey to learn how employees feel about working at NOVA Chemicals, and how we could improve the employee experience.

- 83 percent of employees participated.
- Our engagement score was 85 percent (above industry average).
- More than 90 percent of respondents continue to believe strongly in our mission, remain proud to work at NOVA Chemicals, and are willing to put in extra effort to help the company succeed.
- Some areas for future focus include continuing to develop people leader capabilities, access to development opportunities for employees, continuing to embed quality conversations, and establishing a clearer connection between pay and performance.

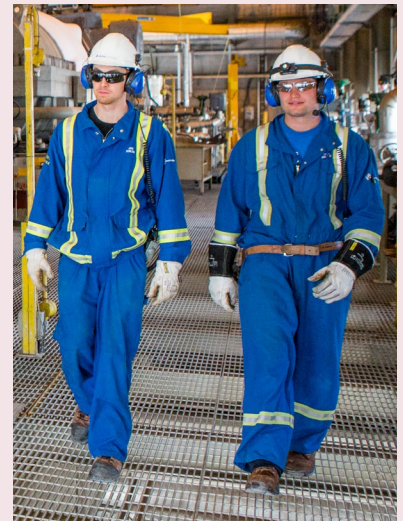
Employee Development

To help engage and inspire our employees, we encourage everyday innovation through collaboration and support for a learning culture. Up to 70 percent of our employee development occurs on the job, 20 percent is coaching from a leader and networking, and 10 percent is from formal learning (virtual or classroom).

Leadership Development

We want all of our employees and leaders to focus on individual work that aligns with our strategic priorities. Our commitment to team leaders in our company is to provide training to help them build their own skill set and to help them motivate their team members. Specifically, we put our efforts into two areas that drive performance: the quality of dialogue between leaders and employees; and setting clear expectations.

In 2018, we began offering [CONNECT The Neuroscience of Quality Conversation™](#) leadership training, focusing on facilitating effective conversations. In six face-to-face and virtual sessions leaders are introduced to concepts, supported by neuro-science research, that promote quality conversations and elevate individual performance and development. We expect to have all leader training completed by the end of 2020.



Employee Recognition

Our 2016 employee survey results indicated that employees wanted more opportunities for formal recognition for excellence. Through a new online portal, we enhanced our Applause Program, an award program in which leaders and/or peers nominate staff for individual and team accomplishments. In 2018, 100% of employees were nominated, and 70% of employees have placed at least one nomination for a peer.

Community Engagement

Being a good neighbor in our community is a significant goal for us at NOVA Chemicals. With the construction of several large-growth projects ramping up (see page 3), it is more important than ever that we reach out, engage with and invest in our communities.

As part of our commitment to [Responsible Care principles](#), we consult with our communities about our facilities, operations and products to share information, seek input and respond to concerns. Our Good Neighbor Program establishes our specific commitments and actions when managing the opportunities and impacts of our construction activities, including:

- Sharing information related to project impacts, opportunities, news and milestones in a timely way.
- Contributing to the local economy.
- Mitigating our impact on natural resources.
- Mitigating our impact on area roads.
- Mitigating construction noise.

We are putting these commitments into action during the construction of our new polyethylene facility in the Sarnia-Lambton region. Since construction started in 2018, we have engaged in numerous activities including building a berm to mitigate noise from the future facility and planting 1,700 trees to recreate the woodland features that were in the area before construction began.

In 2018, we also engaged with communities in the following ways:

- We worked with the Chemistry Industry Association of Canada (CIAC) to identify elements to guide engagement with Indigenous Communities.
- We continued working with our Sarnia-Lambton industry associations [the Sarnia Lambton Environment

Association (SLEA), and Community Awareness and Emergency Response (CAER)] on five key areas: emergency planning and preparedness, incident/operational change communications, CAER and SLEA organizational effectiveness, Community Advisory Panel effectiveness, and Indigenous engagement.

- In October, we hosted two events to celebrate Geismar's 50th anniversary and build brand awareness after our 2017 acquisition. More than 360 people (current and past employees with their families, and government officials) attended these two events.
- We continued to engage with the members of the Community Advisory Panel in each of our manufacturing regions.



Since construction of our new polyethylene facility in the Sarnia-Lambton region started in 2018, we have planted 1,700 trees to recreate the woodland features that were in the area before construction began.



More than 360 people (current and past employees with their families, and government officials) attended our Geismar's 50th anniversary events.

Community Investment

We believe in being a responsible neighbor, lending a hand through active service, and investing in select organizations dedicated to making a difference and improving quality of life.

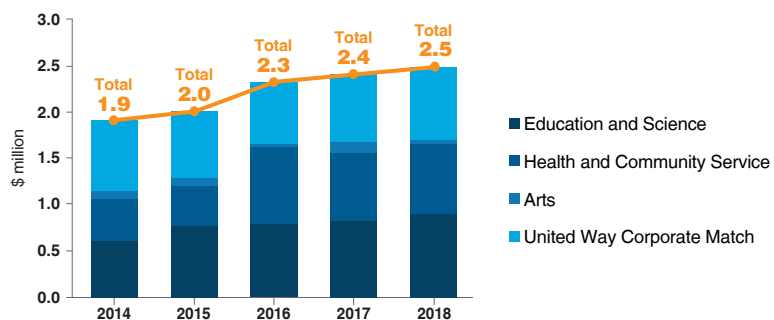
Investing in the Future

NOVA Chemicals supports the development of STEAM (science, technology, engineering, arts and math) education and wants to inspire youth to pursue those careers. In 2018, we:

- Made a five-year \$385,000 commitment to [Let's Talk Science](#), to ensure Canadian children have access to free, hands-on STEM (science, technology, engineering and math) enrichment activities. Let's Talk Science is an award-winning organization offering free STEM-based resources to support youth, educators and volunteers across Canada.
- Donated \$50,000 to establish an endowed scholarship at River Parishes Community College in Louisiana, for students in process technology, instrumentation and electrical studies.
- Enhanced First Nations education partnerships and community services by investing more than \$105,000 towards:
 - Wheels to Lambton, an Aboriginal Youth Transportation initiative ensuring First Nations students have access to Lambton College;
 - YMCA Aboriginal Youth Leadership initiative and Project North, building leadership skills in First Nations youth; and
 - Funding multiple achievement awards, an education bursary and summer programs.
- Celebrated six years of partnership with Earth Rangers®, a conservation organization that teaches children about biodiversity, the environment and how to help protect wildlife. Our support helps Earth Rangers bring their School Assembly program to 22 schools across Canada annually, inspiring students to take action in their homes, schools and communities.

Our employees volunteered more than 6,000 hours in 2018 to the United Way® Day of Caring® program, genScience, and other events — a 28 percent increase since 2014.

Community Investment



We continue our commitment to invest in our communities in the areas of education, health and community service, and the arts. This figure includes the corporate donation component of our employee matching program.

Our ongoing investments in the Sarnia-Lambton region are worth more than \$2 billion. The projects, expected to continue through 2021, are estimated to employ 800 to 1,000 construction workers at their peak, and will result in 150 permanent full-time jobs after plant start-up.

IN FOCUS: Strengthening Our Community Presence at The Canada Winter Games



What are the Canada Games?

The [Canada Games®](#) national development competition is Canada's largest multi-sport games and cultural event. Held once every two years, alternating between winter and summer games, the Canada Games represent the highest level of national competition for up-and-coming Provincial and Territorial athletes. The 2019 Canada Winter Games (The Games) held in Red Deer and other locations throughout Central Alberta, February 15 to March 3, featured over 150 events in 19 sports, as well as a major arts and cultural festival.

What was our role?

NOVA Chemicals was the Platinum Sustainability sponsor for The Games and the construction of the Gary W. Harris Canada Games Centre (The Centre) located at Red Deer College (The College). Our sponsorship began in 2016, when we committed \$1.5 million to support The Games and The College. The sponsorship was an example of NOVA Chemicals' commitment to the communities in which it operates.

Why did we support the Games?

We were proud to support Canada's young athletes, to contribute to The Games' community legacy in Red Deer, and to share our commitment to sustainability with The Games' attendees. Sustainability was important to the Canada Games Council and was a key objective of The Games. As an engaged sponsor, we were pleased to have an impact on several of The Games' sustainability initiatives including:

- Supplying thousands of merchandise bags made from recycled plastic bottles,
- Donating the athletes' collection of more than 3,000 mittens, toques and scarves as part of our sponsored *Mitts for Many Program*.
- Enabling The Centre's visitors to generate 102.5 Wh of energy from 854 laps over a distance of 342 Km through our *Pedal for Power Program*.



PLATINUM SPONSOR
COMMANDITAIRE PLATINE

What did we do?

Our financial contribution was divided equally between two major initiatives. The first was to sponsor the construction of The Centre — a legacy asset for Red Deer and surrounding community. The second was a Pillar Sponsorship for The Games to support sustainable practices and assets while leaving a positive legacy for future generations.

The Centre was one of the core operating venues of The Games, functioning as a training and competition venue for various sporting events. Located at the campus of The College, The Centre features labs, classrooms and a state-of-the-art fitness center. Built according to green-building standards, it achieved a silver **LEED®** certification. We also planted 150 trees along the NOVA Chemicals Waskasoo Creek Nature Walk, a new walking trail unveiled in October 2018 adjacent to The Centre. The accessible walkway circles a pond and natural area, providing barrier-free access to those from The College and community to enjoy.

"This unique collaborative sponsorship provided a significant opportunity to enhance The College's sustainability,

facilities and programming. Education, health, wellness and sustainability are all essential elements of The Centre and our Nature Walk is an outdoor extension of these themes," says Rick Van Hemmen, previous Joffre Site Leader.

To support sustainable practices and assets during The Games, employee volunteers staffed a NOVA Chemicals' booth, featuring the American Chemistry Council's (ACC) promotion of its **Plastics Makes It Possible® Tiny House**, a 170-square-foot residence that tours cities and events throughout North America. The home demonstrated more than a dozen ways in which innovative plastic building products can help homeowners create a more energy-efficient home and reduce the environmental impact associated with heating, cooling and powering their home.

In addition to the marquee initiatives, NOVA Chemicals supported The Games in several other areas by:

- Supplying thermal reusable lunch bags made from recycled plastic for the 3,600 athletes,

- Providing 3.5 Km of electrical cable for trail lighting and snow-making power infrastructure at a ski venue,
- Donating a supply of surplus furniture and equipment for use at The Games Volunteer Centre,
- Engaging three employee participants in the Torch Relay, a signature element of The Games,
- Engaging with The Games attendees through the volunteer support of more than 70 company employees.

What were the outcomes?

In addition to supporting Canadian youth and their achievements at this important national event, we contributed to sustainable practices while leaving a positive legacy for future generations. We also enhanced attendees' awareness of NOVA Chemicals' commitment to sustainability through visits and discussions at the NOVA Chemicals' booth and the ACC's Plastics Makes It Possible Tiny House. Approximately 5,000 visitors experienced NOVA Chemicals' booth and more than 4,500 visitors viewed the Tiny House.

9 employees
54 hours
~5,000 visitors
at our exhibit

~ 20,000 pins and lanyards handed out

>4,500 visitors to the Plastics Makes It Possible Tiny House

71 NOVA Chemicals volunteers —
2,800+ hours

Performance Tables

Ethics & Compliance						
	Units	2014	2015	2016	2017	2018
Business Ethics						
Matters Received	count	70	74	80	95	92
Questions	count	n/a	52	56	66	54
Code Violation Allegations	count	n/a	22	24	29	38
Unsubstantiated	count	n/a	12	10	19	17
Substantiated	count	n/a	6	8	10	16
Remained Open at Year End	count	n/a	4	6	0	5
By category						
Accounting, Auditing and Financial Reporting	count	n/a	n/a	2	0	3
Business Integrity	count	n/a	n/a	45	56	62
HR, Diversity and Workplace Respect	count	n/a	n/a	12	11	19
Environment, Health and Safety	count	n/a	n/a	4	5	8
Misuse, Misappropriation of Corporate Asset	count	n/a	n/a	0	0	1
Safety						
	Units	2014	2015	2016	2017	2018
Employee and Contractor Safety						
Recordable Injury Rate — Employees	count per 200,000 exposure hours	0.32	0.32	0.35	0.45	0.32
Recordable Injury Rate — Contractors	count per 200,000 exposure hours	0.65	1.00	0.57	0.77	0.53
Combined Recordable Injury Rate	count per 200,000 exposure hours	0.46	0.65	0.52	0.61	0.41
Lost-Time Injury Rate — Employees	count per 200,000 exposure hours	0.07	0.14	0.17	0.10	0.10
Lost-Time Injury Rate — Contractors	count per 200,000 exposure hours	0.10	0.04	0.04	0.07	0.00
Combined Lost-Time Injury Rate	count per 200,000 exposure hours	0.08	0.09	0.11	0.09	0.06
Fatalities — Employees and Contractors	count	0	0	1	0	0
Vehicle Incidents	count	102	149	76	122	106
Near Misses	count	693	572	502	563	551
Hazardous Conditions Reporting	count	3,009	1,032	1,164	2,240	1,020
Process Safety						
Total Process Fires	count	14	13	13	17	21
Flammable Loss of Containment	events	n/a	73	57	47	52
Transportation Safety						
Non-Accidental Releases	count	0	0	0	0	0
All Reported Material Distribution Inquiries	count	10	16	12	10	20
Recordable Distribution Incidents	count	3	1	1	3	1
Product Safety						
High Priority Products with Product Risk Profile	percent	100	100	100	100	100
Incidents of Non-Compliance or Product Related Health/Safety Concerns (e.g. Product Recalls, Allegations)	count	0	0	0	0	0
Products Subject to Information Requirements	percent	100	100	100	100	100

n/a – not available

Environment						
	Units	2014	2015	2016	2017	2018 ^{2,3}
Environmental Compliance						
Regulatory/Permit Exceedances ¹	count	3	4	5	10	5
Air Quality²						
Nitrogen Oxides (NO _x)	tonnes	4,453	4,818	4,951	3,944	5,237
Sulfur Oxides (SO _x)	tonnes	1,923	1,099	912	518	1,188
Volatile Organic Compounds (VOCs)	tonnes	1,749	1,377	1,407	1,216	1,714
Climate Change and GHG Emissions³						
Direct GHG Emissions (Scope 1)	tonnes carbon dioxide (CO ₂)	3,493,000	3,454,000	3,471,000	3,054,000	4,094,000
Energy Indirect GHG Emissions (Scope 2)	tonnes CO ₂	799,000	785,000	758,000	741,000	900,000
Total GHG Emissions Intensity	tonnes CO ₂ /tonne of product	0.73	0.69	0.65	0.63	0.66

Employees and Communities						
	Units	2014	2015	2016	2017	2018
Employees						
Total Number of Employees	count	2,565	2,663	2,724	2,857	2,885
Full-Time	count	2,497	2,587	2,657	2,782	2,820
Part-Time	count	68	76	67	75	65
Female	count	633	669	700	707	710
Male	count	1,932	1,994	2,024	2,150	2,175
Employees in the U.S.	count	438	427	434	559	578
Employees in Canada	count	2,127	2,236	2,290	2,283	2,291
Employees Covered by Collective Bargaining Agreements	percent	11.7	12.1	12.0	12.0	11.0
Total New Hires	count	187	193	184	168	220
Rate of New Hires	percent	7.3	7.3	6.8	5.9	7.6
Voluntary Turnover Rate	percent	3.1	4.5	3.3	4.9	5.2
Community Investment and Volunteering						
Community Investment	\$ millions	1.91	2.0	2.3	2.4	2.5
Volunteerism	hours	4,800	5,200	6,797	5,836	6,136
Economic Value Generated and Distributed						
Revenues	\$ millions	5,159	3,580	3,512	3,844	4,465
Taxes Paid ^{4,5}	\$ millions	302	282	116	92	35
Salaries and Benefits	\$ millions	473	439	441	464	465
Capital Expenditures	\$ millions	595	490	518	531	713

NOTES:

1. Regulatory/Permit Exceedance (RPE): includes reportable spills and other non-compliances with federal, provincial/state, or municipal approval, permit, or regulatory requirements with potential for adverse impact. This metric excludes administrative non-compliances and reports to the regulator related to minor issues such as instrument downtime, labeling and signage.
2. Our 2014-2017 air emissions data (NO_x, SO_x, VOCs) has been restated since the publication of our 2017 Sustainability Report to align with our GHG reporting and with the treatment of joint ventures as stated in the [GHG Protocol Corporate Accounting and Reporting Standard](#).
3. Absolute increases in 2018 GHG and other air emissions are the result of increased production at our Joffre site and the integration of our Geismar plant performance. Over the past five years, we still saw a 10% improvement in GHG intensity along with the growth. As we grow, we will continue to pursue methods to continue improving emissions intensity. Read more on page 26-27.
4. Includes income tax, property tax, and sales tax (GST, HST, QST).
5. NOVA Chemicals is committed to transparency and responsible tax payments. We are guided by tax principles that follow the intent of the law in our tax calculations and payments. Although our revenues increased in the last two years, income tax paid decreased due to a decrease in profit before tax as a result of unfavorable litigation in 2018 and 2017.

GRI Supplemental Information

This report has been prepared in accordance with the GRI Standards: Core option. This section contains additional disclosures to fulfill the GRI requirements that cannot be found in the body of the report. For more information on the GRI please visit www.globalreporting.org.

List of Material Topics and Where Impacts of Material Topics Predominantly Occur

We report on the topics that are most relevant to our stakeholders and that can impact the success of our business. The list of material topics and its boundaries is the result of our materiality assessment (details on page 6).

Topic	Within NOVA Chemicals	Outside of NOVA Chemicals			
		Suppliers/ Contractors	Communities	Customers	Society
Air Quality	Manufacturing Facilities	✓	✓	✓	
Ethics and Compliance	All Employees	✓			
Greenhouse Gases	Manufacturing Facilities	✓		✓	✓
Occupational Safety	All Employees and Contractors	✓			
Process Safety	Manufacturing Facilities	✓	✓		
Product Safety	Product Management			✓	✓
Product Sustainability	R&D, Manufacturing Facilities			✓	✓
Transportation Safety	Manufacturing Facilities & Supply Chain Management	✓	✓	✓	✓

Stakeholder Engagement

Our continued success depends on understanding and respecting the needs and interests of stakeholders at every stage of our operations. We think of stakeholders as persons or groups who are directly or indirectly affected by our operations, as well as those who have the ability to influence outcomes. The table below illustrates the range of stakeholders with whom we interact, the concerns they have raised, and how we engage with them.

Stakeholder Group	Topics and Concerns	How We Engage
Communities and First Nations	<ul style="list-style-type: none"> Public safety Environmental and social impacts Employment Noise, light, traffic Support for community programs Cumulative effects of production Plastics sustainability 	<ul style="list-style-type: none"> Call out system and phone number Conversations Community advisory panels Neighbor events/Open houses Volunteer activities Newsletters Website community information Responsible Care verification
Employees	<ul style="list-style-type: none"> Fair total compensation Safe work environment Career development Work/life balance Impact their work has on society 	<ul style="list-style-type: none"> Newsletters Employee Sessions Quality Conversations Engagement surveys Intranet and direct emails Volunteer opportunities
Customers	<ul style="list-style-type: none"> Cost Quality On-time delivery Mutual development benefits Safety Lifecycle of products 	<ul style="list-style-type: none"> Sales and marketing calls Joint development programs Collaboration at the Centre for Performance Applications Product information Training/Technical support Innovation
Suppliers	<ul style="list-style-type: none"> Stability Growth plans Fair treatment Mutual development benefits 	<ul style="list-style-type: none"> Meetings Joint development programs Training Technical support
Owner	<ul style="list-style-type: none"> Return on investment Responsible Care performance Strong governance and succession Strategic planning 	<ul style="list-style-type: none"> Board meetings Board site visits Regular correspondence Reports
Governments/Regulators	<ul style="list-style-type: none"> Impact to communities Corporate responsibility Investment Compliance requirements 	<ul style="list-style-type: none"> Reporting Periodic conversations Policy advocacy
Debt Investors	<ul style="list-style-type: none"> Long-term success Return on their investment Cash generation/Interest payments 	<ul style="list-style-type: none"> Conference calls Quarterly and annual reporting Conversations

Management Approach

The following section fulfills the reporting requirements outlined in GRI 103: Management Approach. Each Management Approach explains why we consider certain topics material and illustrate how we address these topics to achieve continual improvement. They describe fundamental management elements such as policies, responsibilities, strategies, training and reviews and provide context for associated performance information.

How We Manage Product Sustainability	
Why is this a material topic?	By extending the lifecycle of plastic post-use through recycling and recovery solutions, we are creating new opportunities and helping to eliminate plastic waste in alignment with our industry and other stakeholders.
Plan	<ul style="list-style-type: none"> • Incorporate sustainability in R&D, including design for recyclability and the incorporation of post-consumer resins, in the creation of new products. • Prioritize product sustainability projects, including contributions to the circular economy, during annual planning in key markets and suppliers • Collaborate with other parts of the supply chain including brands and retailers to inform annual product sustainability work • Work with industry associations to contribute to reducing barriers to recycling and inform recycling standards
Do	<ul style="list-style-type: none"> • Incorporate product lifecycle risk reviews considering sustainability as a key factor • Manage product waste streams and manufacturing waste responsibly • Invest in customer engagement team knowledge to identify product sustainability opportunities and solve customer challenges • Collaborate and develop products with customers that contribute to a plastic circular economy • Provide support and collaborate with others at a global scale to develop solutions towards a plastic circular economy and ocean health. • Form relationships with others in the plastics circular economy to reduce waste, improve recycling and reuse rates
Check	<ul style="list-style-type: none"> • Continually review programs and progress that address sustainability benefits and risks • Internal and external audit of related Responsible Care standards
Adjust	<ul style="list-style-type: none"> • Developed an enhanced corporate sustainability strategy in 2018 • Consider regulatory and societal expectations • Use sustainability scorecard to ensure robustness of the Sustainability Strategy

This disclosure on management approach applies to the product sustainability aspect (including our initial contributions towards the circular economy and ocean health) and addresses internal and external boundaries.

How We Manage Ethics and Compliance	
Why is this a material topic?	Ethics and compliance is central to business strategy; assists in ensuring and sustaining integrity in our performance and our reputation as a responsible business; reduces the risk of wrongdoing and mitigates penalties imposed by regulatory and governmental authorities for violations, should they occur.
Plan	<ul style="list-style-type: none"> • Our Code sets forth the ethical standards by which we conduct all our activities • Develop and communicate annual objectives to the Board/Leadership • Develop a communication and training strategy
Do	<ul style="list-style-type: none"> • Ensure our employees confirm their adherence to the Code and understand its content by completing mandatory training every second year • Present in-person training and discussions on the Code and recent compliance matters. • Maintain and monitor two helplines for reporting possible Code violations: the Ethics Line and the Anti-Harassment Line • Investigate and follow-up on matters reported to the helplines
Check	<ul style="list-style-type: none"> • Provide regular reporting to the Board of Directors and executive leadership on compliance performance and audit results • Maintain third party due diligence processes that screen business partners for integrity • Collaborate with internal partners to ensure that the program takes into account emerging issues • External and internal audit performed periodically, as needed
Adjust	<ul style="list-style-type: none"> • Baseline measures are in place to assess improvement over time in rate of misconduct, effectiveness of response and detection and control effectiveness. Key risk areas are identified through a continuous risk assessment process. • Update of the Code of Conduct

This disclosure on management approach applies to the ethics and compliance aspect identified as material and addresses internal and external boundaries.

How We Manage Occupational and Process Safety	
Why is this a material topic?	We undertake chemical processes that involve hazardous substances and could result in injury or significant hazardous outcomes.
Plan	<ul style="list-style-type: none"> • Leadership is provided by the Occupational and Process Safety Strategy Team • Set annual performance objectives on leading and lagging indicators • Understand legal and stakeholder requirements
Do	<ul style="list-style-type: none"> • Use Safety Interactions, <i>Am I Ready?</i> and other safety tools as means of establishing and communicating safe behavior • Provide hazard recognition and incident learning tools and training • Follow a “layers of protection” model for process safety • Conduct personal hazard and process safety risk assessments • Use operational management systems that align with Responsible Care
Check	<ul style="list-style-type: none"> • Incident investigations to learn • Occupational and Process Safety Strategy Team reviews incidents • Internal audits conducted at company facilities based on a risk assessment process • External audits (e.g., Responsible Care, ISO) conducted less frequently
Adjust	<ul style="list-style-type: none"> • Regular management review to evaluate risks, assess incident trends, deviations from targets, and changing regulations, and to develop management system modifications • Addition of Flammable Loss of Containment (FLOC) metric to help understand and prevent process fires

This disclosure on management approach applies to the occupational safety and process safety aspects identified as material and addresses internal and external boundaries.

How We Manage Transportation Safety

Why is this a material topic? We receive and ship large quantities of hazardous substances that could cause damage to people and the environment if accidentally released.

<p>Plan</p>	<ul style="list-style-type: none"> • Leadership is provided by the Supply Chain Risk Network, and Emergency Preparedness and Security Strategy Team • Set annual objectives; have a target of zero non-accidental releases • Establish criteria for carrier and mode selection • Understand legal and stakeholder requirements • Provide input on design of railcars used • Develop an emergency response plan for transportation and for each manufacturing site • Maintain Transport Canada approved Emergency Response Assistance Plan
<p>Do</p>	<ul style="list-style-type: none"> • Have internal transportation, distribution and emergency response standards that guide implementation • Work through TRANSCAER® to communicate information about shipments to communities • Have NOVALERT and emergency response contractors along major transportation corridors where our products and raw materials are shipped • Test our emergency plans by conducting regularly scheduled tabletop and live drill exercises throughout our operating areas • Engage carriers, suppliers and others in our Responsible Care Outreach program • Maintain an internal Railcar Inspection Training Program that includes securement of the railcars (to prevent (NARS) as a component of the program
<p>Check</p>	<ul style="list-style-type: none"> • Incident investigations • Supply Chain Risk Network team review of top transportation risks • Internal and external inspections/reviews/audits conducted regularly. In 2018, we conducted four external transportation compliance audits of our facilities. • Safety and compliance evaluations of key carriers. In 2018, a third party conducted motor carrier evaluations at four locations.
<p>Adjust</p>	<ul style="list-style-type: none"> • Regular management review to assess incident trends, deviations from targets, and changing regulations, and to develop management system modifications

This disclosure on management approach applies to the transportation safety and emergency preparedness aspects identified as material and addresses internal and external boundaries.

How We Manage Product Safety	
Why is this a material topic?	Our customers, regulators, society and NOVA Chemicals all expect safe products.
Plan	<ul style="list-style-type: none"> • Strategic direction is provided by a company wide Product Safety Strategy Team • Understand regulatory and stakeholder requirements • Set internal objectives
Do	<ul style="list-style-type: none"> • Maintain product safety documents (e.g. safety data sheets) and labeling • Test and register products as required • Engage customers and suppliers in our Responsible Care Outreach program • Conduct product and raw material integrity checks
Check	<ul style="list-style-type: none"> • Ongoing review of issues and risks by the Product Safety Team • Internal and external inspections/reviews/audits conducted regularly
Adjust	<ul style="list-style-type: none"> • Ongoing management review to assess trends, deviations from targets and changing regulations, and to develop management system modifications

This disclosure on management approach applies to the product safety aspect identified as material and addresses internal and external boundaries.

How We Manage Environmental Performance	
Why is this a material topic?	The manufacture of petrochemicals results in emissions that can adversely affect the environment.
Plan	<ul style="list-style-type: none"> • Factors that affect our environmental management include: Responsible Care, regulations, growth, economics, stakeholder perceptions and engagement, societal expectations, technology, and overall environmental performance • NOVA Chemicals Environment Strategy was created considering these factors and focuses on eight internal performance areas • Responsible Care Strategy Team and Environment Strategy Team provide direction
Do	<ul style="list-style-type: none"> • Five Responsible Care environmental standards are core requirements in all regions • Each facility follows Responsible Care and has an environmental management system designed to meet specific regional environmental issues • Use comprehensive environmental management information systems and Responsible Care Learning System
Check	<ul style="list-style-type: none"> • Environmental monitoring systems help ensure compliance • Facility self-assessments are conducted internally, and external Responsible Care verification audits are completed to validate systems are performing in accordance with regulations, Responsible Care ethics and principles and internal requirements • Performance is measured on an ongoing basis and reported periodically to senior leadership and made available publicly through Sustainability Reporting
Adjust	<ul style="list-style-type: none"> • Developed an enhanced corporate sustainability strategy in 2018 which is aligned to the Environment Strategy • Ongoing management review to assess trends, deviations from targets, and changing regulations, and to develop management system modifications to support continuous performance improvement • Regulatory changes require internal program revisions to meet compliance expectations • Implementation of the RC 14001 management system, which includes some elements of ISO 14001

This disclosure on management approach applies to the air quality and greenhouse gas aspects identified as material and to internal operations only.

GRI Index

This report has been prepared in accordance with the GRI Standards: Core option. We also provide information on additional topics and indicators beyond the ones required to fulfill the requirements of the Core option.

General Disclosures		Page
102-1	Company name	1
102-2	Primary brands, products and services	1, 4-5
102-3	Headquarters	1
102-4	Locations	3
102-5	Legal form	1
102-6	Markets served	4-5
102-7	Scale of the company	4-5
102-8	Employee numbers	37
102-9	Supply chain description	17
102-10	Changes to company or supply chain	3
102-11	Precautionary Principle or approach	Note 1
102-12	External initiatives	1, 11, 14, 15
102-13	Memberships	1, 14, 15, 17
102-14	CEO message	2
102-16	Values, principles and norms of behaviours	16
102-18	Governance structure, board committees	9
102-40	List of stakeholder groups	39
102-41	Collective bargaining agreements	37
102-42	Process to identify stakeholders	39
102-43	Approach to stakeholder engagement	39
102-44	Key topics raised by stakeholders	39
102-45	Entities included in financial statements	Note 2
102-46	Process to determine report content	6
102-47	Material topics and their boundaries	6
102-48	Restatement of information from previous reports	37
102-49	Changes in reporting	6, 37
102-50	Reporting period	6
102-51	Most recent CR report	6
102-52	Reporting cycle	6
102-53	Contact person for report	Back cover
102-54	Claims of reporting according to GRI	6
102-55	GRI content index	44
102-56	External assurance	6

Topic Specific Disclosures		Page
Business Practices		
103	Ethics and compliance, management approach	41
205-2	Communication and training about ethics/anti-corruption policies and procedures	16-17
201-1	Direct economic value generated and distributed	37
Environment		
103	Environmental performance, management approach	43
305-1	Direct (Scope 1) GHG emissions	27, 37
305-2	Energy indirect (Scope 2) GHG emissions	27, 37
305-4	GHG emissions intensity	27, 37
305-7	Nitrogen oxides (NO _x), sulfur oxides (SO _x), and other significant air emissions	27, 37
303-2	Management of water discharge-related impacts	27
Workplace Practices		
103	Occupational and process safety, management approach	41
103	Transportation safety, management approach	42
401-1	New employee hires and employee turnover	37
403-1	Occupational health and safety management system	20
403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	20-23
403-9	Work-related injury rates and fatalities	21, 36*
403-6	Promotion of worker health	31
404-2	Programs for upgrading employee skills/transition assistance	31*
Product Responsibility		
103	Product sustainability, management approach	40
103	Product safety, management approach	43
416-1	Percentage of significant products for which health and safety impacts are assessed for improvement	36, Note 3
416-2	Number of incidents of non-compliance concerning the health and safety of products	36, Note 4
417-1	Requirements for product and service information and labeling	36

*This is not a required indicator to meet the Core option, however, we provide information that partially meets the GRI disclosure requirement.

NOTES:

1. Although NOVA Chemicals has not formally adopted the precautionary principle, our consistent implementation of Responsible Care demonstrates a commitment to proactively identify, and prevent or mitigate negative impacts.
2. As a privately-held company, NOVA Chemicals does not have publically available financial statements.
3. Interpreted for application to NOVA Chemicals as: percentage of high priority products (based on our prioritization process) with a product risk profile available to the public.
4. Interpreted for application to NOVA Chemicals as: incidents of non-compliance specifically limited to US EPA TSCA allegations, US FDA product recalls and Canadian equivalents. Non-compliance with voluntary codes is not included.



To learn more about NOVA Chemicals, please visit:

www.novachem.com

For questions or comments, please contact:

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