



# North Vancouver Risk Mitigation Strategies

ERCO Worldwide North Vancouver respectfully acknowledges that it operates on the traditional, ancestral and unceded territory of the Sḵwx̱wú7mesh (Squamish), xʷməθkʷəy̓əm (Musqueam) and səliłwətał (Tseil-Waututh) Nations.



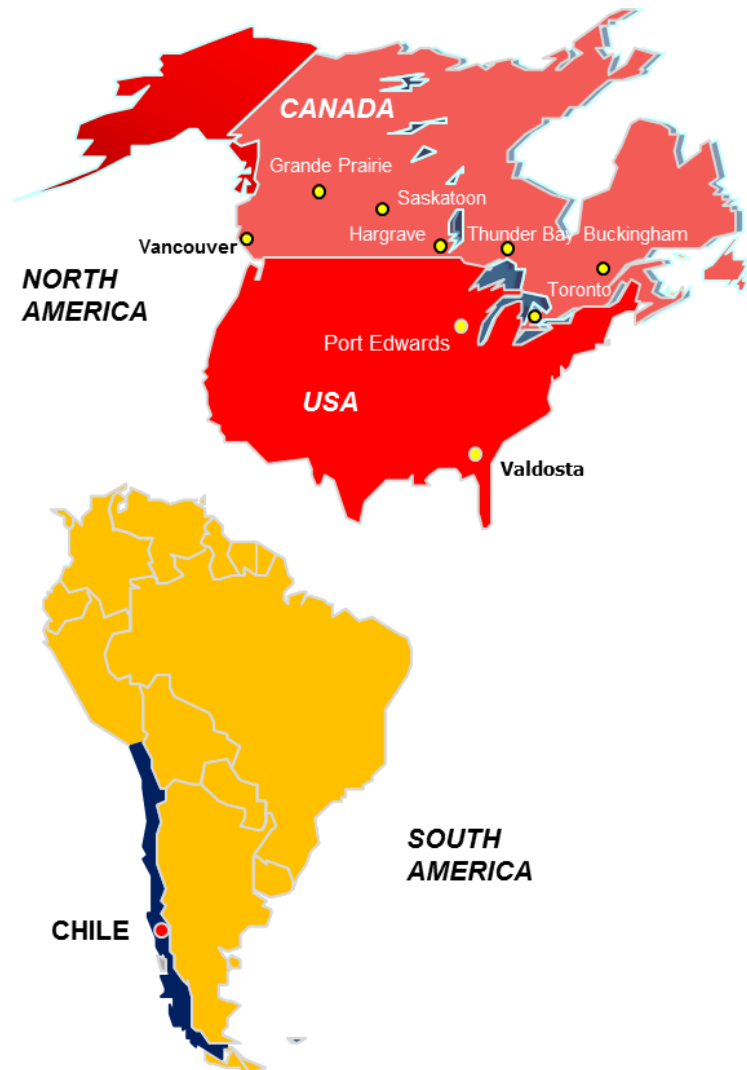
**Responsible Care®**  
Our commitment to sustainability.





# ERCO Worldwide Locations

- Toronto, ON - Head-office and R&D Lab
- Saskatoon and Port Edwards produce chlor-alkali products
- Buckingham and Thunder Bay produce sodium chlorite
- Chlorate export capability from Canadian East and West Coasts



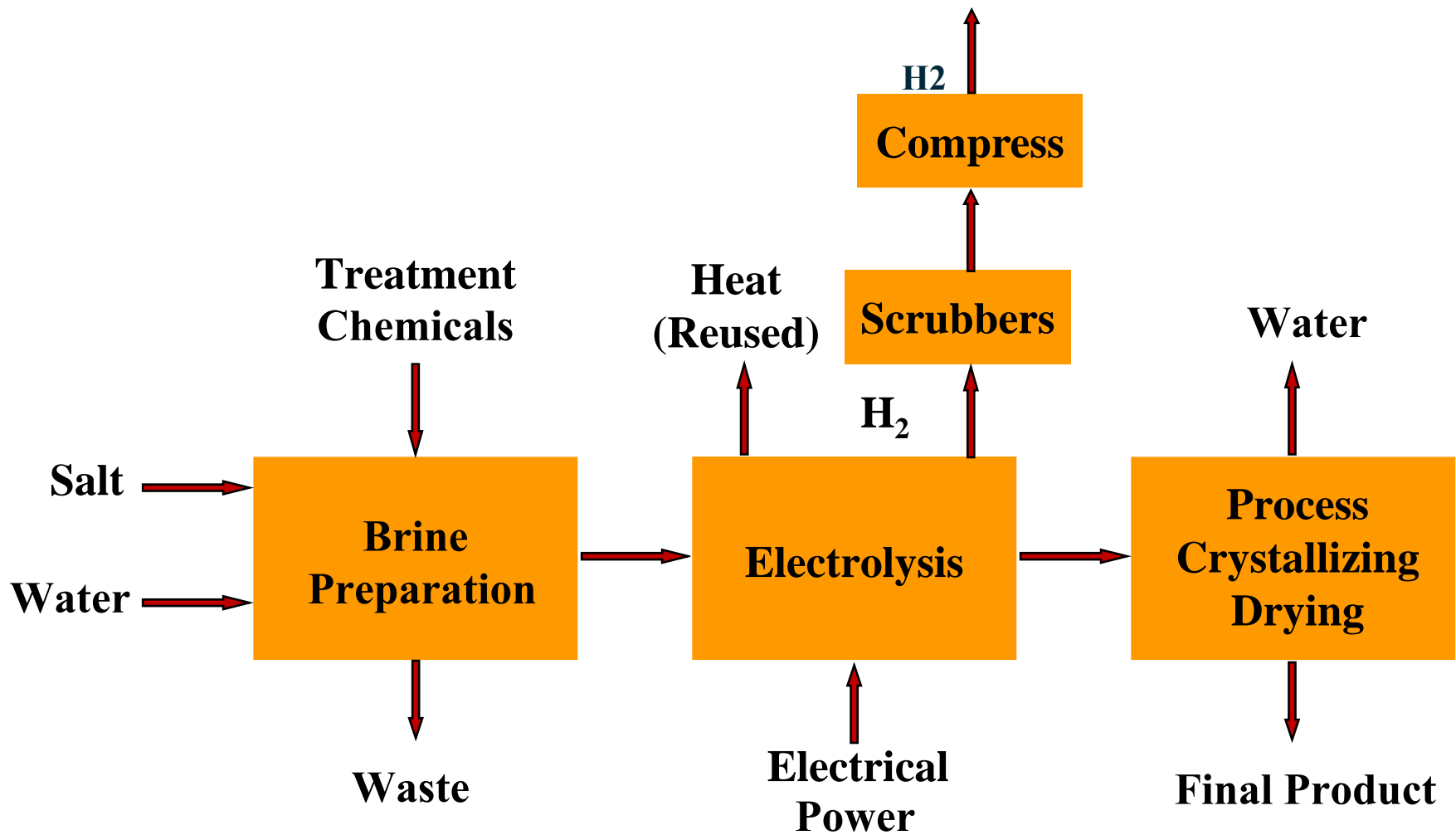
# NV Site Facts

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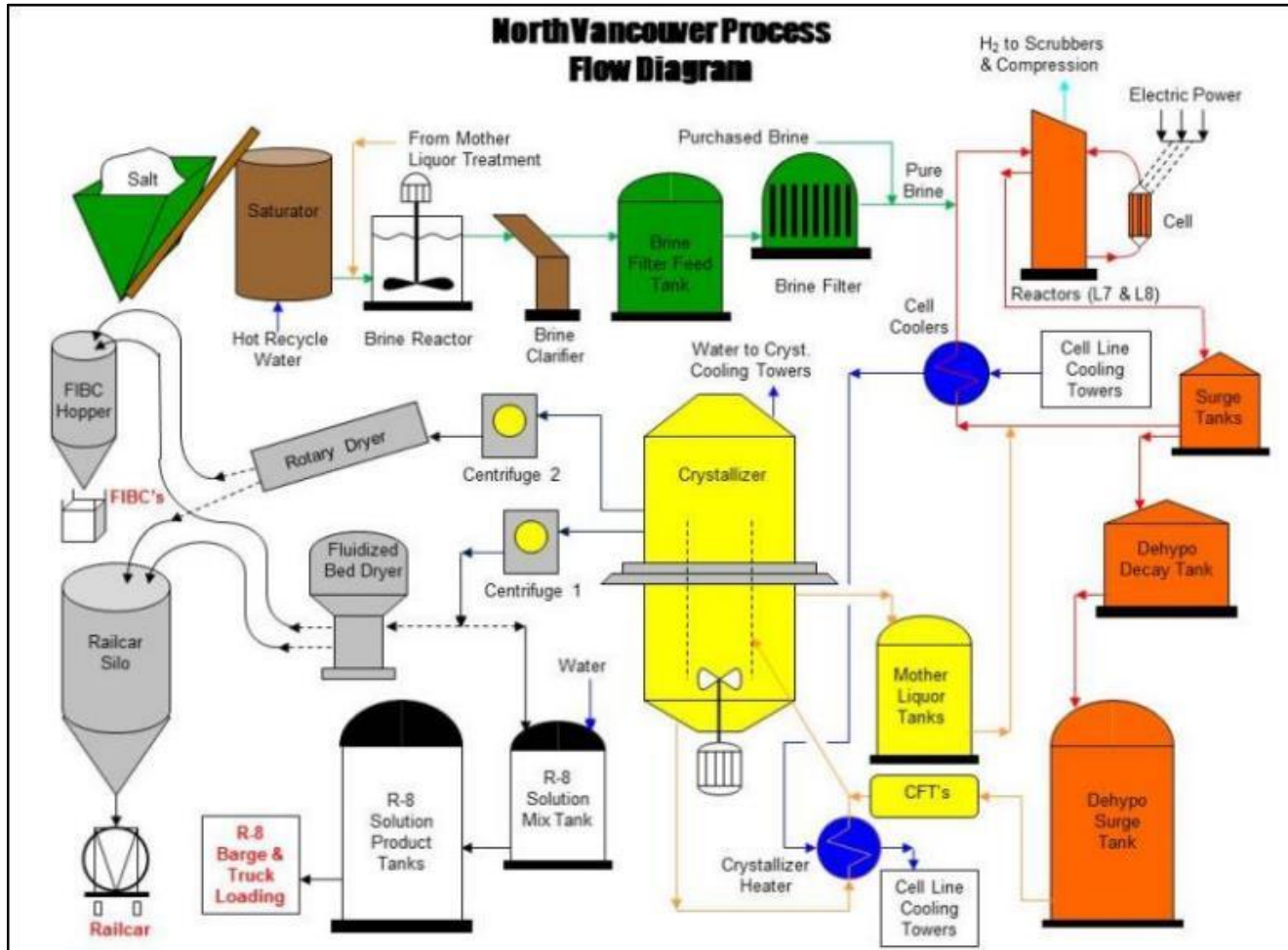
- Operates in an ecologically sensitive area
- 20 acres
- Graphite technology started in 1957...66 years
- ERCO cell technology installed 1988-1991
- New ERCO-designed high efficiency cells replaced 2005-06, & replacement cycle is currently underway 95% complete
- ERCO Worldwide LP celebrated 125-year anniversary Nov 3, 2022
- Nameplate capacity: 103,400 MT Sodium Chlorate
- 40 Full time employees
- High plant on-time (>90% capacity for past 15 years)



# Sodium Chlorate Process



# Process Flow Diagram



# Risk Mitigation Strategies

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- Responsible Care Verification
- Process Designed and Maintained for Safe Operations
- Process Safety Management
- Quantitative Risk Assessment
- Emergency Response Training and Preparation





# ERCO Responsible Care Policy



As a member of the Chemistry Industry Association of Canada, this company fully supports the industry's responsible management of chemicals and the practice of Sustainability. The principles of Responsible Care are key to our business success, and compel us to:

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



# Responsible Care Commitment



For close to four decades, Canada’s chemistry industry has led the way in ensuring safe, responsible, and sustainable chemical manufacturing through its United Nations (UN)-recognized environmental, social and governance (ESG) initiative, Responsible Care. Founded in Canada in 1985, Responsible Care is now practiced in 73 countries and by 96 of the 100 largest chemical producers in the world

Responsible Care companies strive to the ethic to “do the right thing and be seen to do the right thing.” Dedicated members are constantly innovating and working toward safer and greener products and processes, and work to continuously improve their environmental, health, and safety performance.

Responsible Care covers all aspects of a company’s business, employees, nearby communities, and the environment, over the entire life cycle of its products.

Registration requires companies to implement 3 codes of practice containing 150 requirements focusing on Operations, Stewardship and Accountability.



# Process Designed and Maintained



- Process designed using the most recent technology and high-quality materials
- Environmental control equipment on all emission points
- Cell technology upgrade in 2006 \$10 million in capital spent.
- New design and process changes are reviewed for potential safety and environmental risks using MOC and PSSER procedures.
- 5-year rotating cycle for HAZAN analysis of all plant processes.
- Modern distribution control system monitored by continually trained operators control the manufacturing process.
- Preventative maintenance program that reduces equipment breakdown.

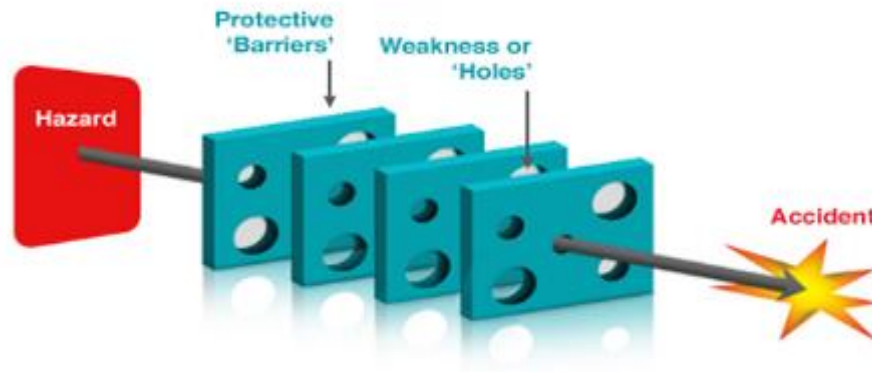


# Process Safety Management Overview

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## ➤ Definition

- “Process safety is a blend of engineering and management systems focused on preventing, or protecting against, incidents which release process materials or energy, particularly explosions, fire, and toxic releases.”



# Process Safety Management

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## Process Safety Management

- “The application of management principles and systems to the identification, understanding, and control of process hazards to prevent process-related injuries and accidents.”
- ERCO follows combination (based on site location and materials handled) of process safety management systems from:
  - **Chemistry Industry Association of Canada (CIAC)**
  - American Chemistry Council (ACC)
  - OSHA 1910.119 PSM Standard



# Process Safety Management

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- CIAC process safety management system used at North Vancouver
- Part of CIAC Responsible Care® commitments
- Compliant with Canadian Environmental Protection Act (CEPA) Environmental Emergency Planning Provisions under Section 200
- CIAC PSM comprised of 12 elements
- Elements are made up of minimum requirements for policies, practices, and procedures
- Multi-disciplinary involvement



# Process Safety Management

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- Compliance with requirements of CIAC process safety management system 12 elements:
  - Accountability: Objectives and Goals
  - Process Knowledge and Documentation
  - Process Safety Review Procedures for Capital Projects (PSSER)
  - Process Risk Management (Hazard Identification, Risk Assessment and Control)
  - Process Risk Management (Emergency Response Planning)



# Process Safety Management

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- Includes the following elements (continued)
  - Management of Change (MOC)
  - Process and Equipment Integrity (Operating Procedures)
  - Process and Equipment Integrity (Mechanical Integrity)
  - Human Factors
  - Training and Performance Management
  - Incident Investigation (Root cause analysis)
  - Company Standards, Codes, and Regulations
  - Audits and Corrective Actions
  - Enhancement of Process Safety Knowledge





# Process Safety Management Summary

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- CIAC Process Safety Management System applied at North Vancouver plant
- Part of CIAC Responsible Care® commitments
- All levels of ERCO have PSM responsibilities
- Compliant with Environmental Emergency Planning Provisions under CEPA 200
- CIAC PSM system comprised of 12 elements
- Each element utilizes Plan-Do-Check-Act management cycle



# Quantitative Risk Analysis (QRA) Purposes

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- To provide an objective third party and expert assessment of our facility
- To provide a basis of continuous improvement in site risk mitigation (update existing emergency response procedures and support process hazard analysis).
- To fulfill commitments to our neighbours through ERCO Worldwide's membership in the Canadian Chemical Producers Association (CCPA)

**Risk = frequency x consequence of event**



# 1997 Quantitative Risk Assessment - Summary

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- ERCO Worldwide is a member of the CIAC (Chemistry Industry Association of Canada) and as a part of its Responsible Care® commitments requires risk analysis studies conducted for the major process hazards at each of its operating facilities.
- A 3<sup>rd</sup> party *Quantitative Risk Assessment (QRA)* was performed by JBF Associates for ERCO NV in 1997 to identifying the *worst imaginable* and *worst credible case scenarios*. As per CCPA guidelines the following were outside the scope of study: other accidental releases, impact of external events (earthquake, flood, sabotage, etc.) secondary release events ('domino' events).
- The modeling results from this work is used to update emergency response procedures & provide support for future project improvements to mitigate risk.  
This QRA was communicated to CAP in May 1998 & again in April 2006:



# 1997 Quantitative Risk Assessment - Summary

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## ➤ **Worst Credible Scenario**

- This accident is NOT expected to happen but is taken into account when developing emergency plans.
- A release of the maximum possible amount of unscrubbed cell gas containing chlorine during typical weather conditions – 30 min. duration.
- Estimate for incident, 1 in 970 years,
- This scenario is NOT expected to expose any offsite member of public in the vicinity of the plant to concentrations that would cause health effects

## ➤ **Worst Imaginable Scenario**

- Worst incident that could conceivably occur, but is NOT expected to occur,
- Failure of 32 % w/w Hydrochloric acid tank, releasing contents into containment in worst possible weather conditions
- Estimate for incident, 1 in 4300 years for frequency of exposure
- Potential for serious injury on inhalation up to 2500 m from facility – requirements to shelter-in-place by neighbours



# 1997 QRA Mitigation Recommendations Implemented

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## **Worst Credible Scenario – unscrubbed cell gas containing chlorine released**

Consider developing an operator checklist for verification of critical seals –  
**Complete**

## **Worst Imaginable Case – 32% HCL Tank release of full contents**

- Reviewed tank design with specialist engineers & found all requirements are met to contain over-pressure - **Complete**
- Remove vent isolation valve – **Complete**
- Increase berm volume – **Complete** – Aug. 31/98
- Improve under-pressure protection – **Complete** – Nov. 30/98
- Modify heavy equipment lifting procedures for tank farm – posted a no lifting zone for tank farm - **Complete**



# 2013 Quantitative Risk Assessment - Summary

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- In Dec 2013, ERCO Worldwide contracted Alp & Associates to perform new Risk Assessments Studies of its facilities.
- For NV, new processes (hydrogen compression) had been installed which required analysis & study also considered various HCl failures (tank and delivery truck hose rupture). Results are:
  - **Worst Credible Scenario** – remains the same – no risk to public outside facility
  - **Worst Imaginable Scenario**
    - **Explosion Scenario** – hydrogen release followed by building explosion – 1 every 435 years, pressure reduced to less than 1 psi on facility property – no effect to public outside facility boundaries.
    - **Hydrochloric acid exposure**
      - **Delivery truck hose rupture** – number of sub scenarios based on levels of response – worst case is flooding of roadway (1 every 28,500 years), distance for serious injury on inhalation up to 1600 m from facility – requirements to *shelter-in-place* by neighbours
      - **Storage tank rupture** – 1 every 2000 years with distance for serious injury on inhalation up to 870 m – requirements to *shelter- in-place* by neighbours



# 2013 QRA Mitigation Recommendations Implemented

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- ERCO Worldwide is committed to minimizing risk to employees and neighbours.
- 2 capital projects (\$1.2 million) to reduce risk associated with *Worst Imaginable Scenario* involving Hydrochloric Acid were approved and installed in 2017/18:
  - **New Hydrochloric Acid Tank** – pressure rated with improved vent system
  - **Underground HCl Containment Sump**
    - Collects/contains complete HCl truck tanker in event of hose rupture, or complete HCl tank in case of tank rupture.
    - Greatly reduces surface area of exposure in case of tank or hose rupture.

Projects have **reduced** distance requiring neighbours to *shelter-in-place* in case of unlikely tank/hose rupture to 300-400 m.



# Containment Sump Construction





# New HCL Tank and Containment in Service



# Risk Mitigation

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## Other Layers of Protection:

- Updated & stringent *Standard Operating Procedures* for operators & HCl tanker drivers
- Chemical Unloading System routinely audited by Production Management
- ERCO Process Safety Management audits
- Preventative maintenance of equipment
- Documented annual training program of plant employees
- Annual Emergency Response training for all employees
- On site drills with Emergency Responders.



# Emergency Response

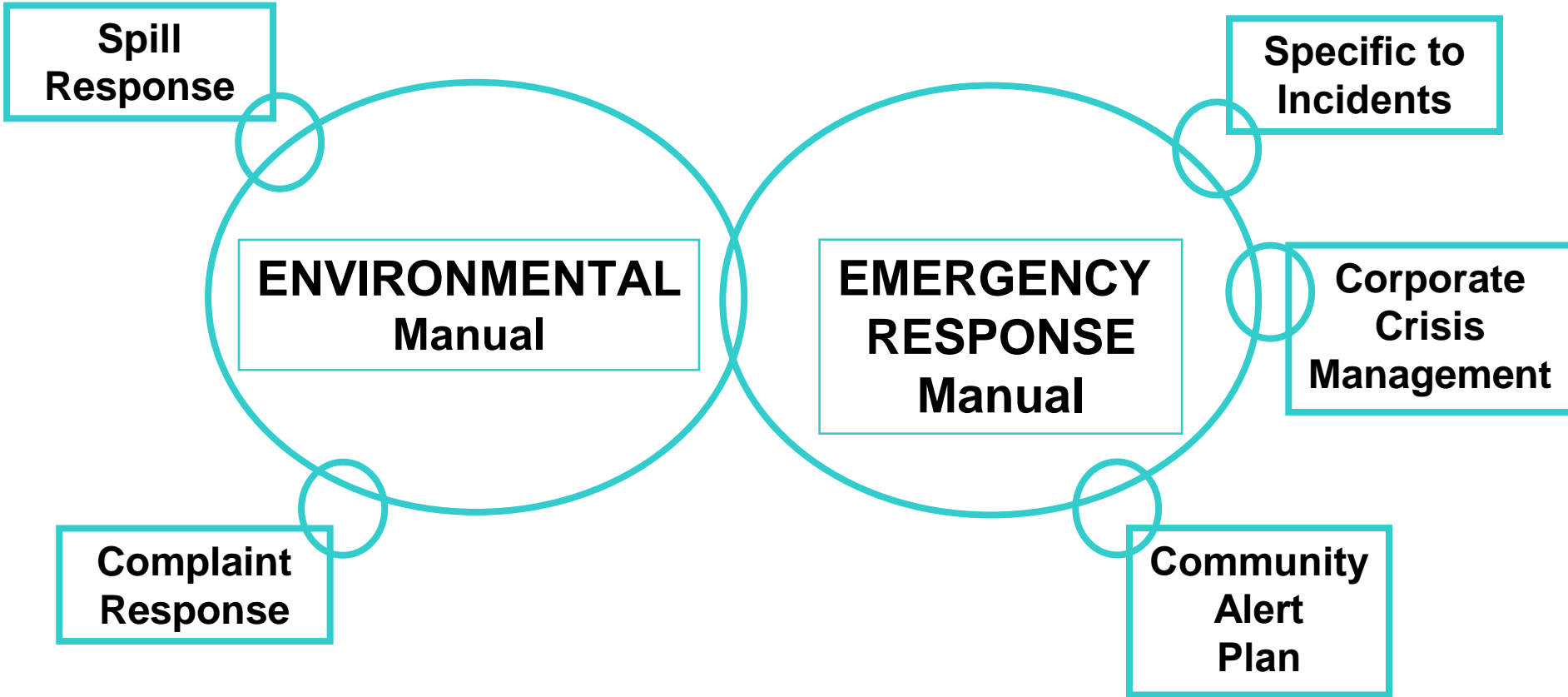
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## Emergency Procedures in Place

- Emergency response manual has procedures for 13 types of emergencies
- Site drills regularly performed to test potential emergencies
- The NVD Fire Department and the City of North Vancouver Hazmat team have integrated ERCO's plan with their area plan
- Employees trained regularly in response plan management
- Emergency equipment shutdown procedures in place
- Community Alert Network (ALERTABLE) activated by North Vancouver District Fire Chief or NSEM



# Site Emergency Response Plan





# **ERCO Worldwide North Vancouver Plant 2023**

## **End Of Presentation**

