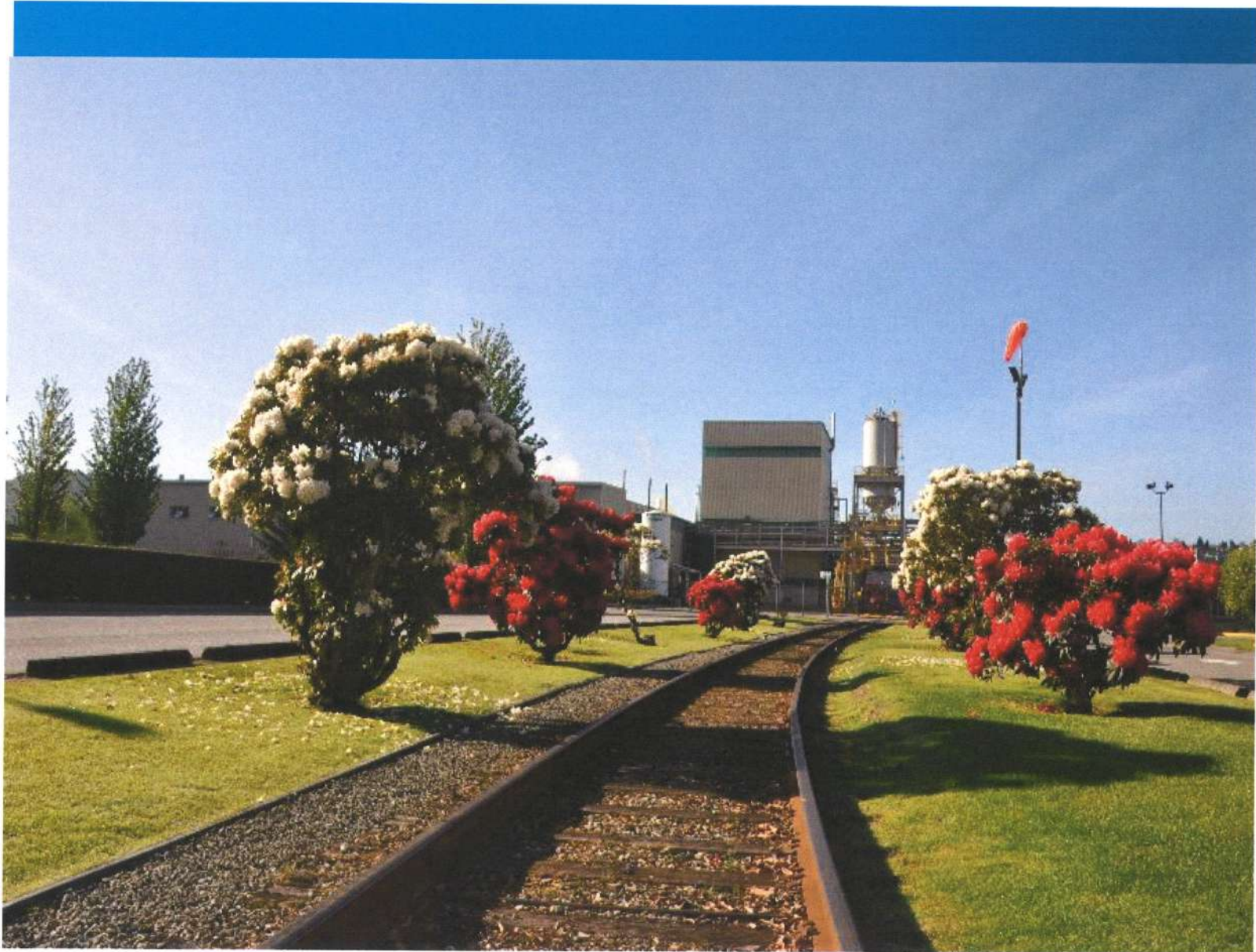


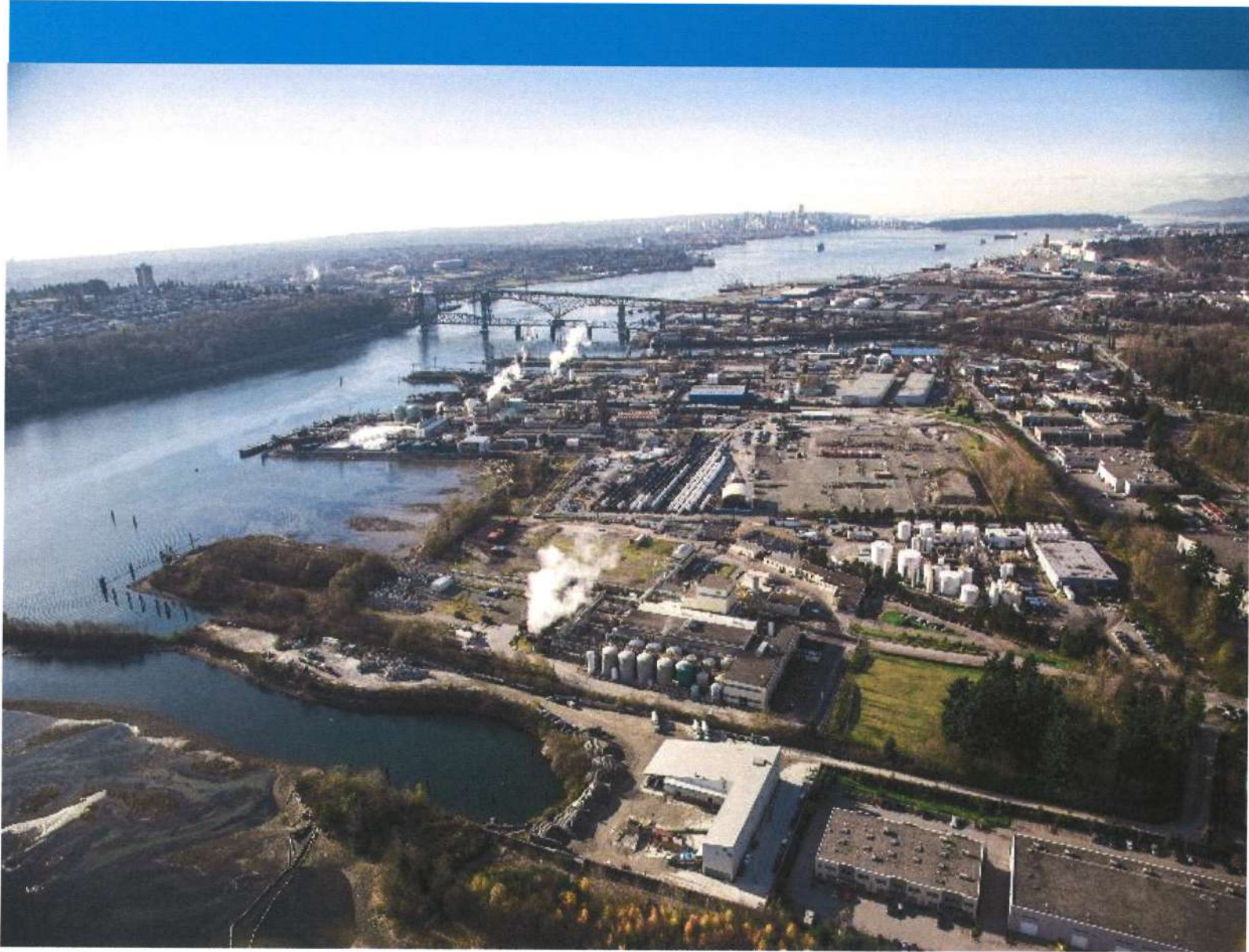
ERCO Worldwide

NV Quantitative Risk Assessment Summary

“Together we can create an injury free workplace.”







Quantitative Risk Assessment - Summary

- 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 3rd 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*. 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:

Quantitative Risk Assessment - Summary

- **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

Quantitative Risk Assessment - Summary

- 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

Risk Mitigation

- 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.

Risk Mitigation (2)

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.



Containment Sump Construction



New HCl Tank – Containment in Service

