



APM-BC P2 Plan 1999-2004 Completion Report

November 15th&16th, 2004 PAC Workshop

Agenda

APM-BC P2 Completion Report

- P2 history - Events leading up to the P2 Process at Kitimat Works
- Development of the 1999-2004 P2 Plan and Multimedia Permit
- Opportunities and Information Gaps Identified in the First P2 Plan
- Summary results of the 1999-2004 P2 Plan
- Completion Status of P2 Opportunities and Information Gaps
- P2 Indicators 1999 - 2004
- Detailed P2 Completion Summaries

P2 = Pollution Prevention



A P2 Plan prioritizes environmental management actions Known as P2 opportunities.

Based on the principals of:

- ☞ Avoiding,
- ☞ Eliminating, or
- ☞ Reducing

the use of energy and materials at source rather than treating, containing, or releasing pollutants to the environment.

P2 Plan will:

**Maximize human health, environmental, social,
and economic benefits.**



Events Leading up to the P2 Process



1993 Province and Industry met to discuss a potential project to explore and develop a P2 initiative.

P2 Demonstration Project

Across board consensus that there was benefit in alternatives to traditional command and control or end pipe environmental management systems.

Alcan joined into the process through signing a memorandum of understanding with the Province in 1995, and formally commenced the P2 Demonstration project in 1996.

1996 P2 Planning Demonstration Project



Steps

Action

Phase 1 - Project Initialization

- Established PAC
- Site specific terms of reference

P2 Site Specific
Terms of Reference

Phase 2 - Site and Operational Review

- State of environment review
- Process mapping
- EMS review
- P2 Opportunity and information gap review

P2 Site and
Operational Review
Report

Phase 3 - Prioritization of P2 Opportunities

- Development of P2 targets and objectives
- Environmental, technical and financial considerations
- Evaluation and prioritization of P2 opportunities and information gaps

P2
Opportunities
Report

1996 P2 Planning Demonstration Project



Steps

Action

Phase 4 - Pollution Prevention Implementation

- Voluntary P2 Plan to implement actions
- Multi-media regulatory P2 Authorization to implement actions

**P2 Plan
and
Multi-media
Authorization**

Phase 5 - Monitoring and Evaluation

- Monitoring and evaluation protocol
- Continuous improvement based on key performance indicators

**P2
Annual Report**

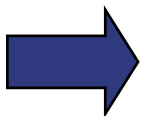


Process Mapping

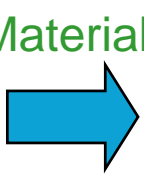


Inputs

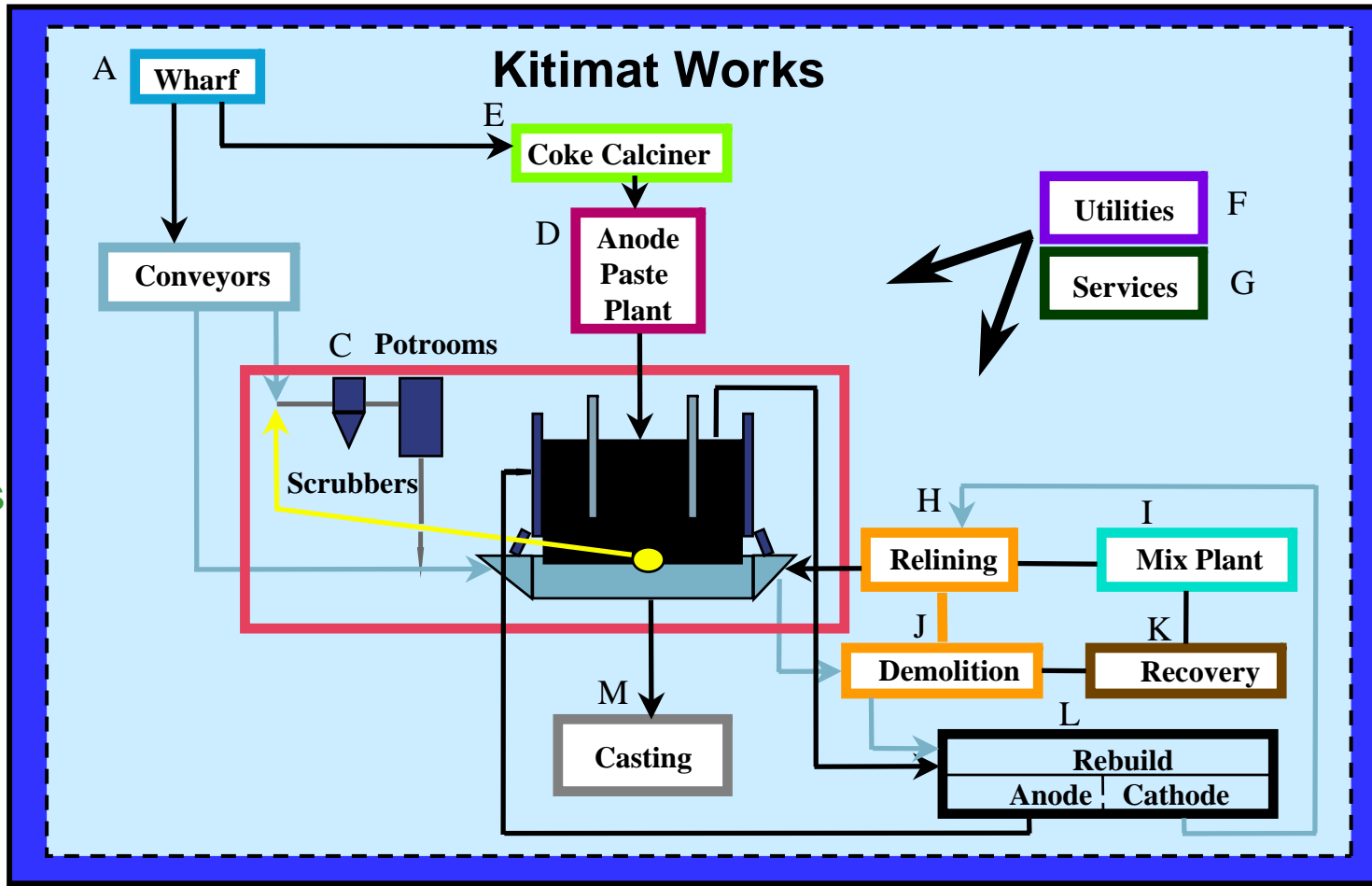
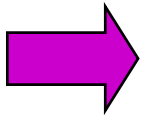
Water



Raw Materials

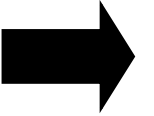


Energy

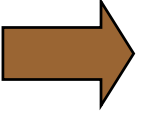


Outputs

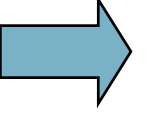
Metal Products



Effluents



Waste Products

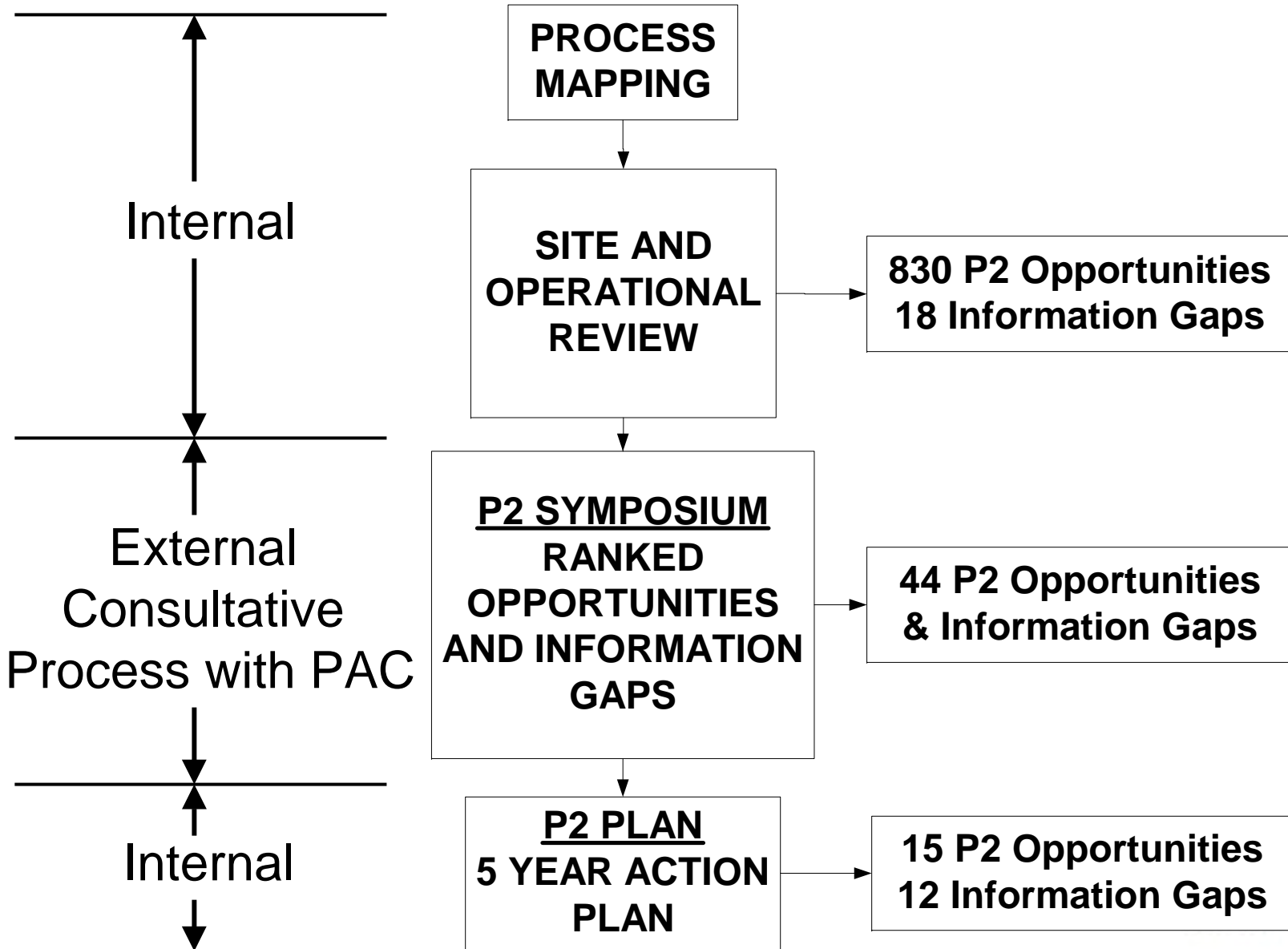


1999 Process mapping. Note that the Mix Plant and Recovery processes have been discontinued.

KITIMAT WORKS
1954 / 2004



P2 Planning Project



Pollution Prevention Hierarchy



Inputs

1. **Avoidance, Elimination, or Substitution** of polluting substances;
2. **Reduction** in the use of polluting substances;

PREVENTION

By-Products

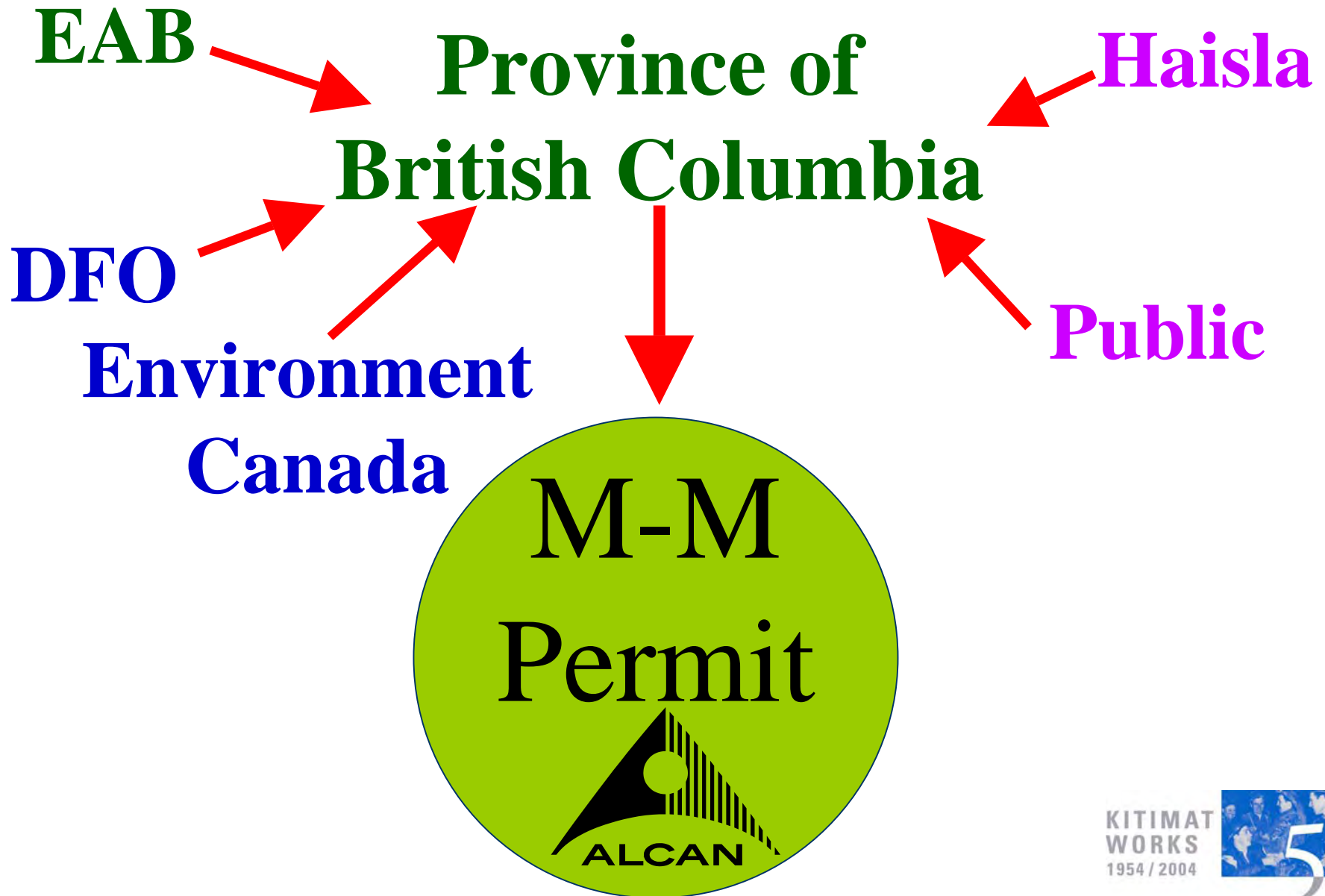
3. **Elimination** of and **reduction** in, the **generation** of polluting by-products;
4. **Reuse** and **recycling** of polluting by-products;
5. **Energy recovery** from polluting by-products;

3 R's

Outputs

6. **Treatment** or **contamination** of polluting residuals;
7. **Remediation** of impacted areas;

CONTROL



Permit Comparison Old Permits vs. Multi-Media

↔ **Greater transparency**

– Internet reporting

↑ **Easier to understand**

↓ **More parameters to report**

– i.e. NO_x, process parameters; carbon outs, pot starts,....etc

↑ **Recognizes P2 Plan as a voluntary initiative**

↑ **Incorporated permit amendments requested prior to 1999.**

P2 Terms of Reference



- Customized in consultation with the Public Advisory Committee
- Promote cooperation, consultation, and open communication
- Involve community and employees
- Use P2 Hierarchy to guide selection and prioritization of P2 actions.

Objectives:

- Reduce loss of hazardous materials
- Promote Environmental Management Systems
- Integrate all environmental permits and approvals
- Integrate environmental issues into strategic business plans
- Integrating environmental procedures into standard operating practices
- Complying with National and International standards programs

Summary of P2 Opportunities and Information Gaps

Summary of P2 Opportunities



Total Opportunities:	18
Completed Opportunities:	11
Opportunities with completion dates beyond 2004:	2
Opportunities outstanding with continuing effort:	5

Summary of P2 Opportunities



	Description	Status	Due Date	Comment
1	Roof Emissions from Pot Lines - Reduce Fg roof emissions to 1.6 kg/t Al	Continuing Effort	Dec-02	Achieved target in 2002 2 non-compliances in 2004
17	Coke Use - Increase Potlife to 2200 days and implement Pot Preheat	Continuing Effort	Jan-02	2023 day average potlife Pot preheat is implemented
21	Anode Quality - Reduce Paste Consumption from 537 to 515 kg/t Al	Continuing Effort	Jan-03	Achieved target in 2001 509 kg/t Al Averaging 522-523 kg/t Al
30	Green House Gases - Reduce GHG emissions by 10%	Complete	Jan-04	Achieved target in 1999 C.E / A.E.D.
38	Chlorine Emissions - Limit chlorine consumption in casting to 300kg/day	Complete	Jul-99	One none-compliance in 2002.

Summary of P2 Opportunities



	Description	Status	Due Date	Comment
48	Ozone Depleting Substances Eliminate use of Halon 1211 Eliminate use of Halon 1301 Eliminate use of R12 and R22	Complete Complete On Target	Dec-00 Dec-02 Dec-10	Halons 1211 and 1301 were replaced in 2001 with CO2 and dry powder extinguishers
53	Natural Gas - improve efficiency by 20%	Continuing Effort	Jan-02	Meters are functioning and baseline data being collected
57	Spent Pot Lining -Reduce SPL by 15% (0.026 to 0.022 t/t Al)	On Target	Jan-10	Achieved in 2002. Effort required for long term
	Decision to recover energy, incinerate or neutralize SPL	Continuing Effort	Dec-99	Cement kiln option selected waiting on Lafarge for trials.
66	Dust and Steel Shot from Skirt Blasting	Complete	Jun-02	Material shipped to secure landfill

Summary of P2 Opportunities

	Description	Status	Due Date	Comment
69	Duct Scrapings	Complete	Jun-02	Material shipped to secure landfill.
71	Special Waste from Sandblasting - Classify and send to appropriate Landfill	Complete	Jun-02	Ferrous material removed. Carbon fractions shipped out as SPL
73	Dry Cell Batteries- Collect 75% for recycling	Complete	Jun-02	Batteries are recycled but performance metrics need to be developed
81	Recover and Recycle 750 t of ore in basements	Complete	Dec-99	2000-3000 T recovered annually.
85	Alumina Losses from the Wharf Reduce losses by 75% from 4200 to 1050 t/yr	Complete	Jun-02	Alumina Unloader solved ore unloading losses
89	Caustic Soda and Tuckers Etch	Complete	Jun-00	Treatment and disposal by a contractor.

Summary of P2 Information Gaps

Total Information Gaps:	12
Completed Information Gaps:	9
Information Gaps outstanding with continuing effort:	3

Summary of P2 Information Gaps

	Description	Status	Due Date	Comment
1	Material Losses from the Smelter Operations - not in the process mapping	Complete	Dec-00	Process mapping under current review
4	Air Emissions - PAH - Delineate fate and effects of PAH on ambient environment	Complete	Mar-01	
10	Air Emissions - Metals - Identify Metals emitted from casting and potrooms	Complete	Dec-00	Aluminum is 80-90% of measured metals
13	Air Emissions - Sulphur Dioxide - Fate and Effect of SO2 on ambient environment; review options to reduce SO2 emissions.	Complete	Dec-99	
17	Biological Pathways of Hydrogen Fluoride	Complete	Dec-02	Fluoride levels improved in small mammals.

Summary of P2 Information Gaps

	Description	Status	Due Date	Comment
21	Spent Pot Lining (SPL) Landfill Assessment of SPL Landfill	Complete	Feb-01	Low-moderate risks identified
23	Dredged Spoils (wharf sediments) & Overburden from the (SPL) Landfill - research techniques for remediation.	Continuing Effort	Dec-02	Characterization of 1 cell complete. Conceptual disposal method identified.
25	Dissolved Aluminum & Fluoride in Effluent & Storm Water - Investigate other possible sources of aluminum and fluoride.	Complete	Jul-99	1999 investigation led to mass balance project. 50% Fluoride originates from J-Stream.
28	Runoff from Aluminum Siding - Determine contribution siding to dissolved aluminum.	Complete	May-99	Significant measurements
32	Effluent Treatment - Determine long term treatment options.	Continuing Effort	Feb-03	Cat tail trials were unsatisfactory. B-Lagoon Capacity Enhancement project.

Summary of P2 Information Gaps

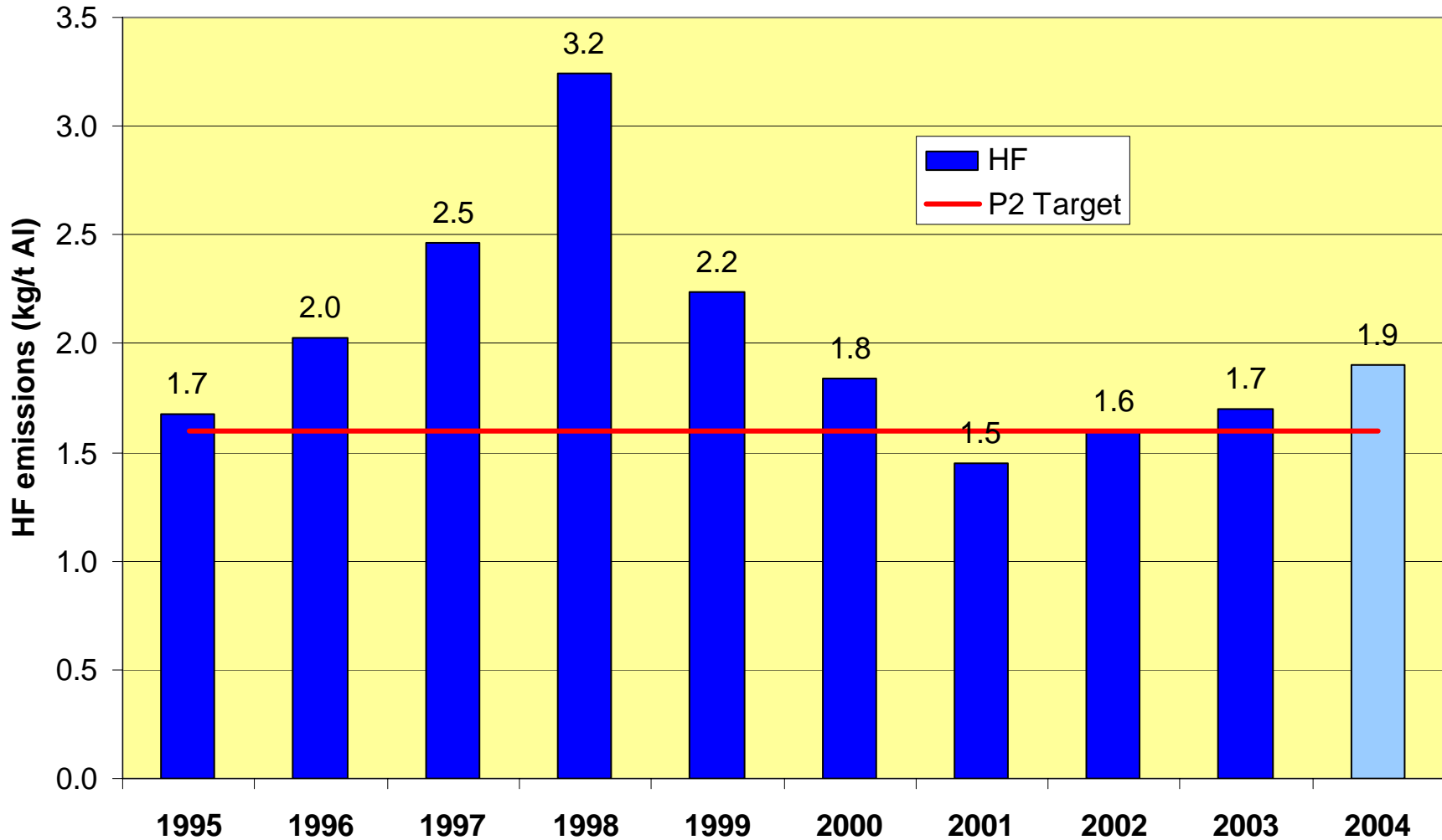


	Description	Status	Due Date	Comment
36	Inner Harbour - Identify impacts of PAH on Inner Harbour	Continuing Effort	Mar-03	NOAA Project PAH impacts not as anticipated.
47	PAHs in Clams and Juvenile Salmon - Develop research program	Complete	Dec-99	Led to NOAA project development. PAH uptakes and effects on immune systems.

P2 Indicators

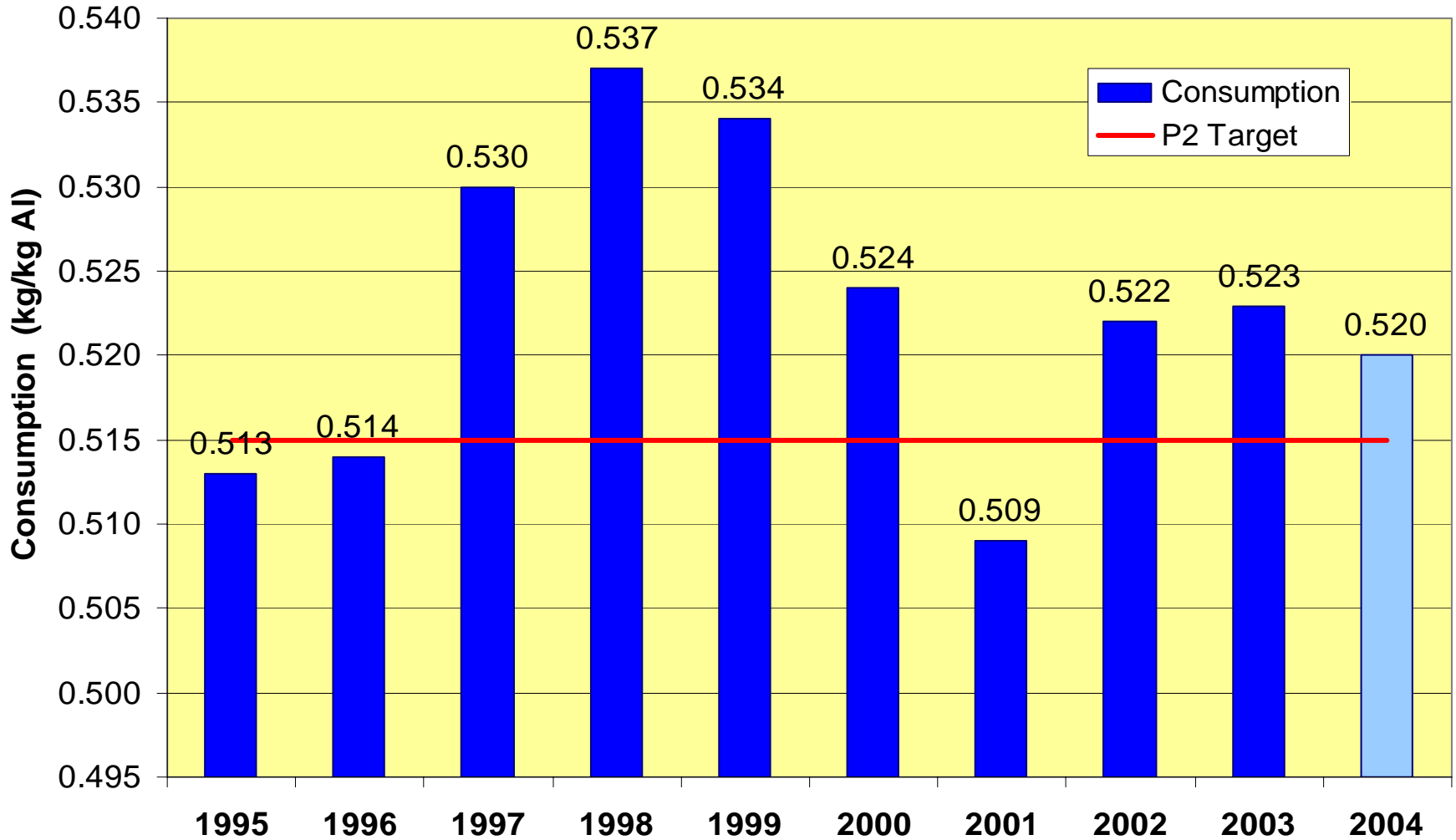
P2 Indicators

Hydrogen Fluoride Emissions

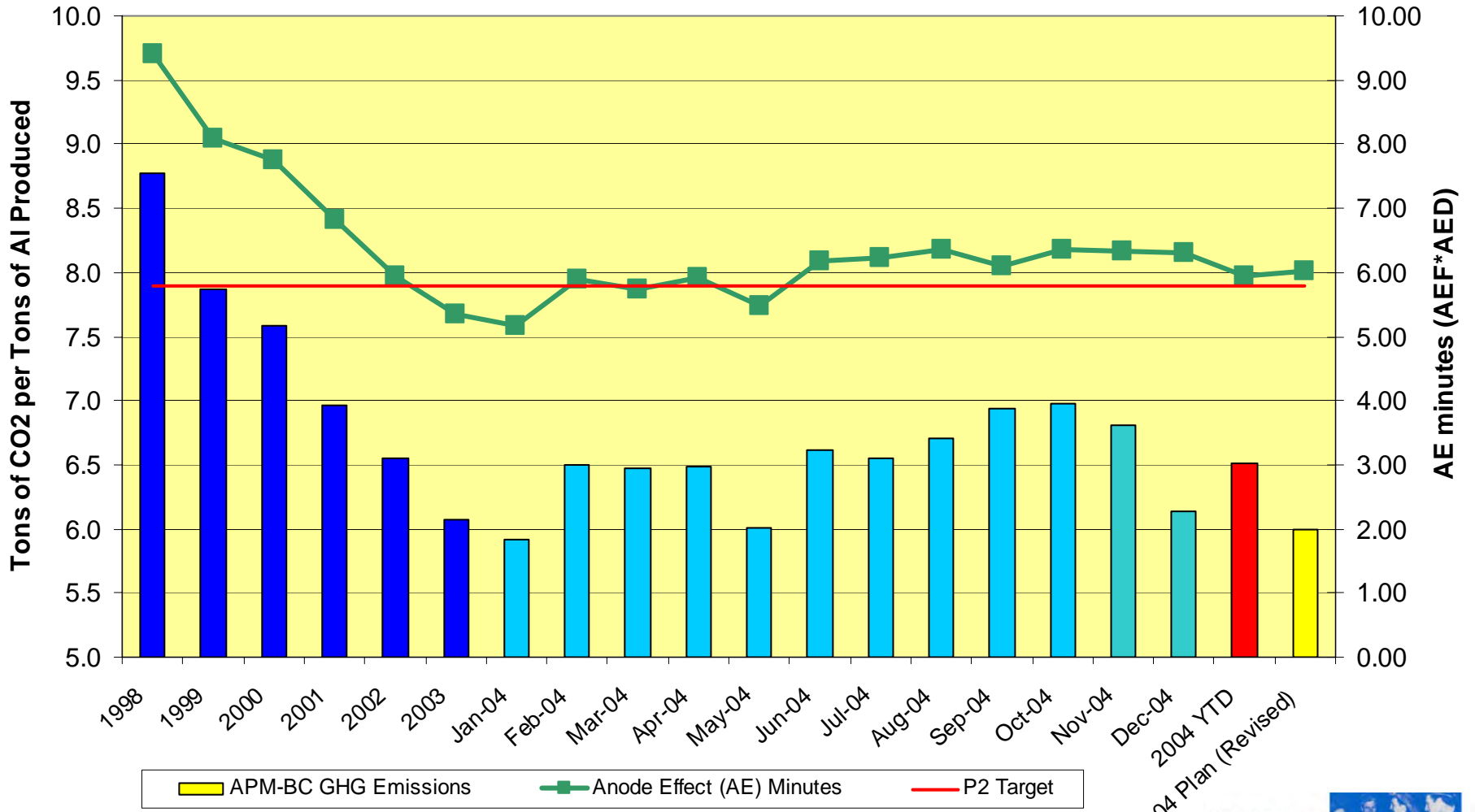


P2 Indicators

Anode Consumption



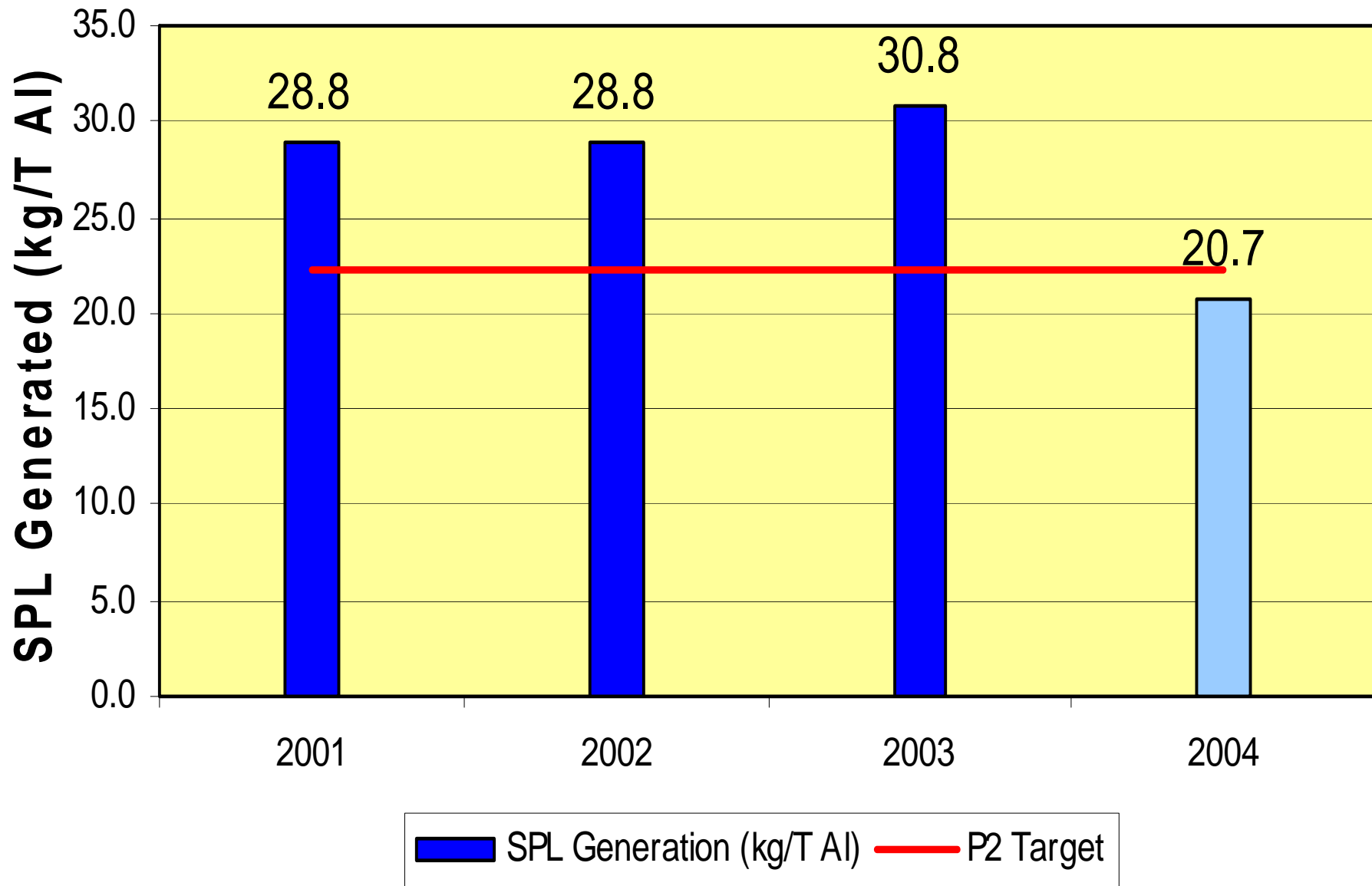
P2 Indicators Greenhouse Gases



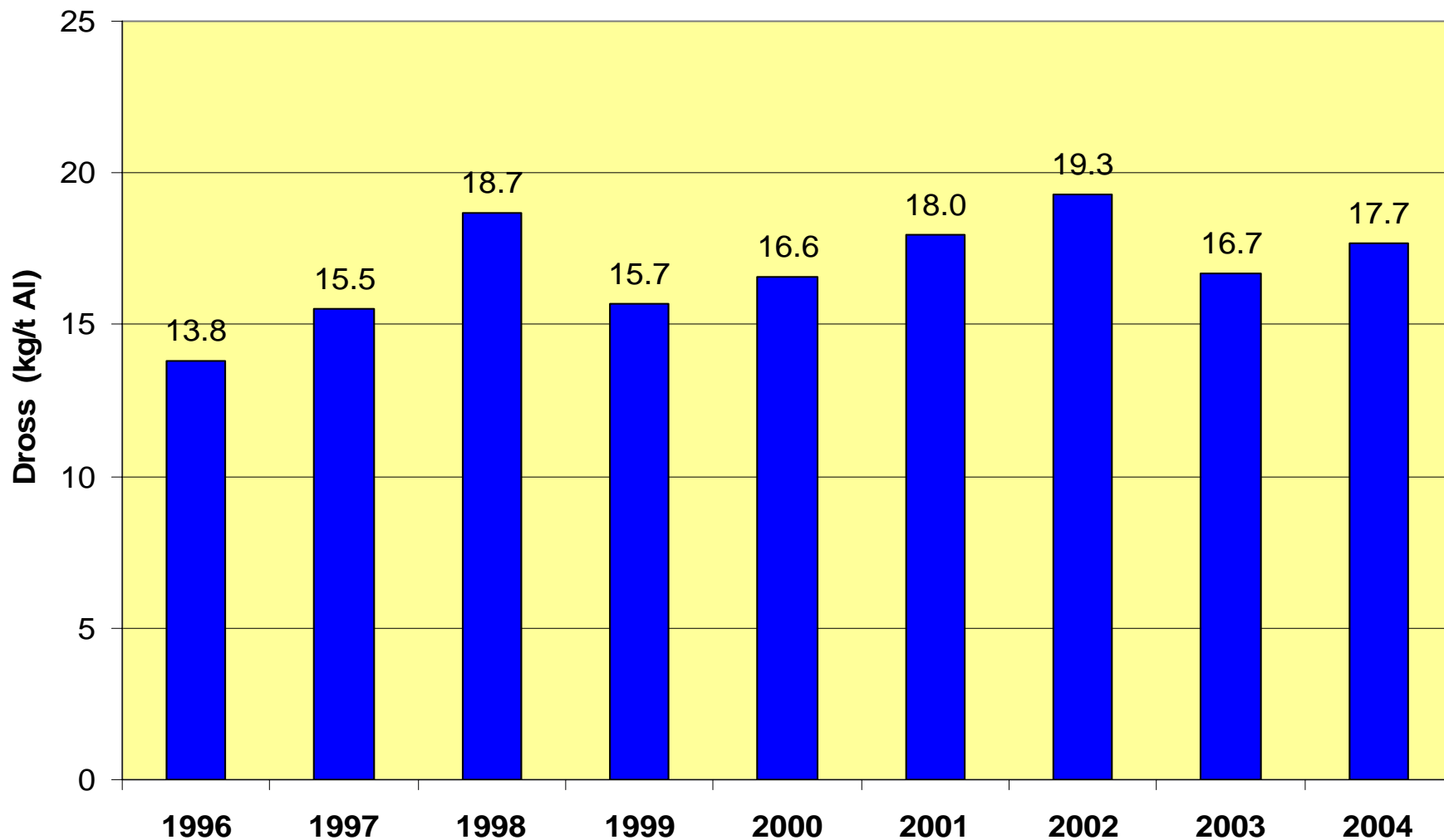
2004 Plan (Revised)

P2 Indicators

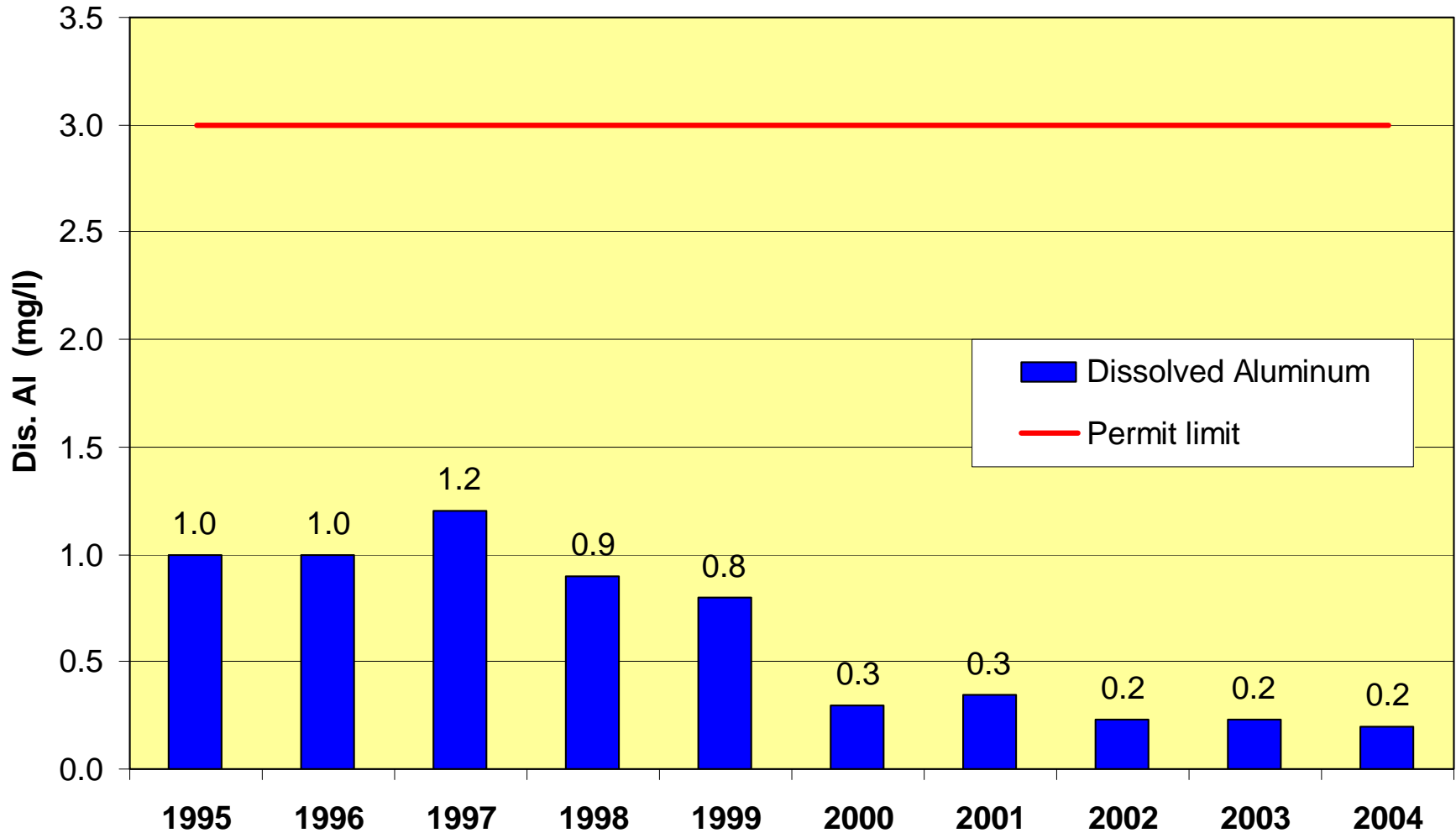
Spent Pot Lining Generation



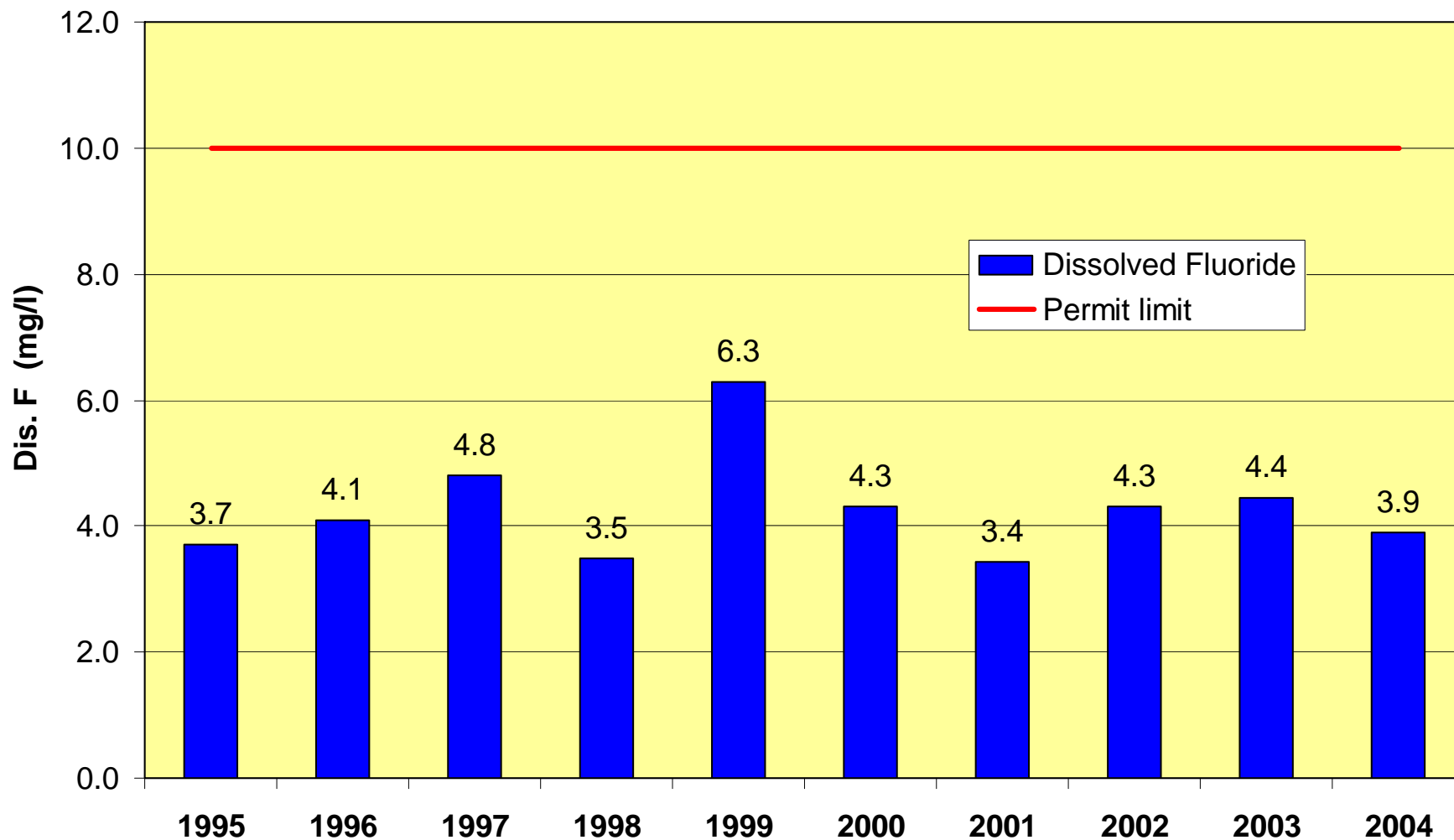
Dross Generation



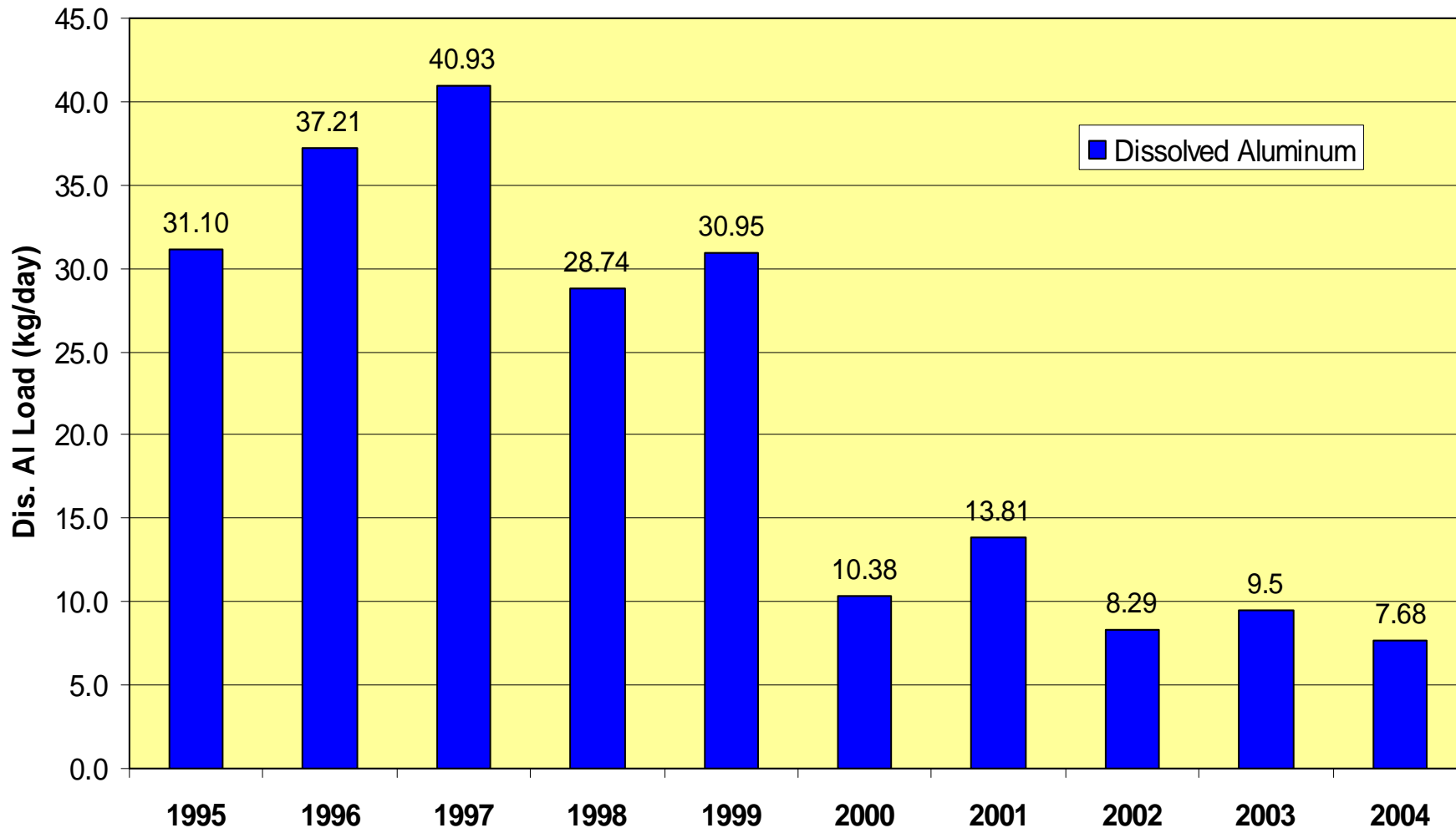
Dissolved Aluminum - B-Lagoon



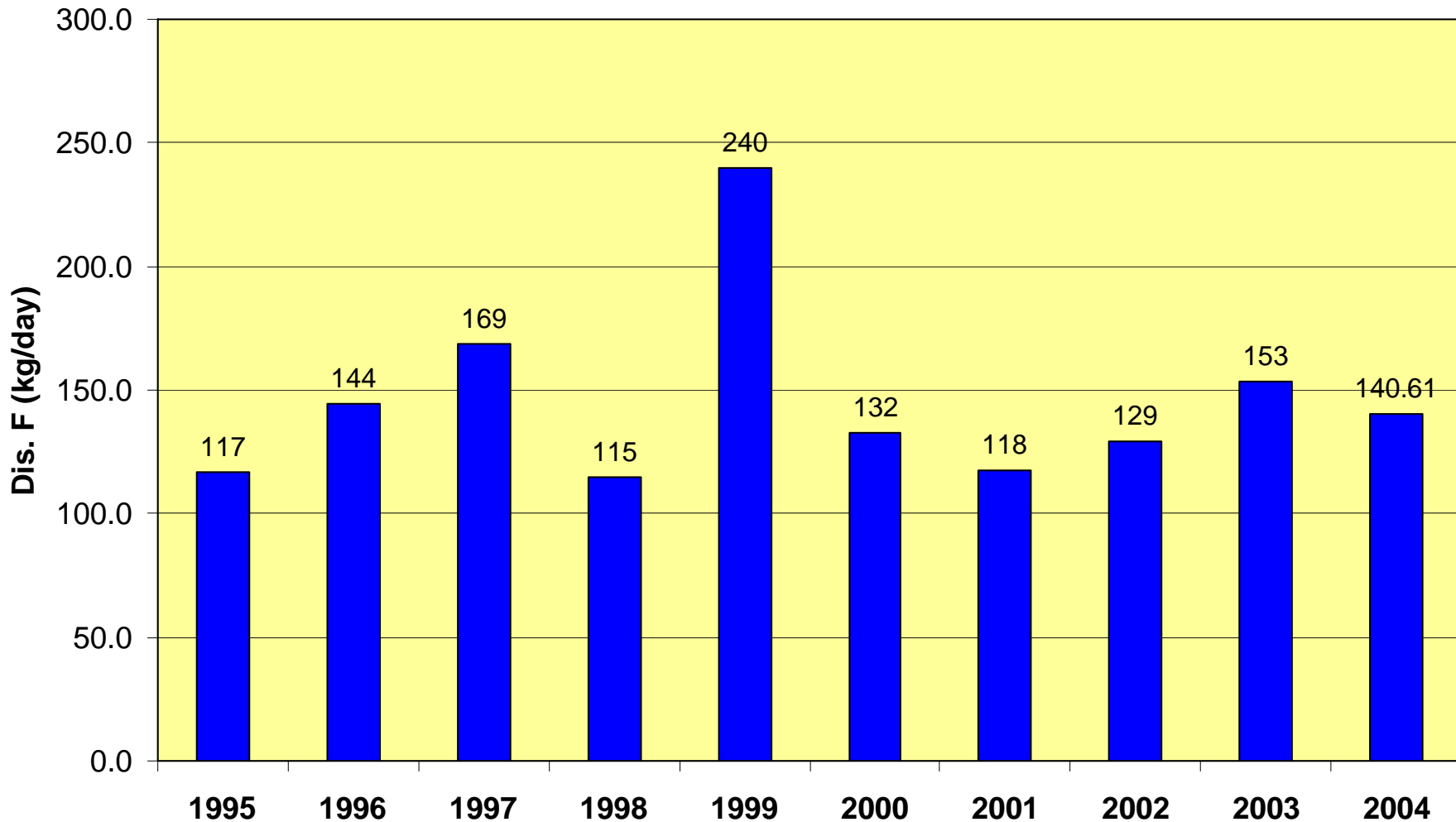
Dissolved Fluoride - B-Lagoon



Dissolved Aluminum Loadings B-Lagoon



Dissolved Fluoride Loadings B-Lagoon



Individual Opportunity Summaries

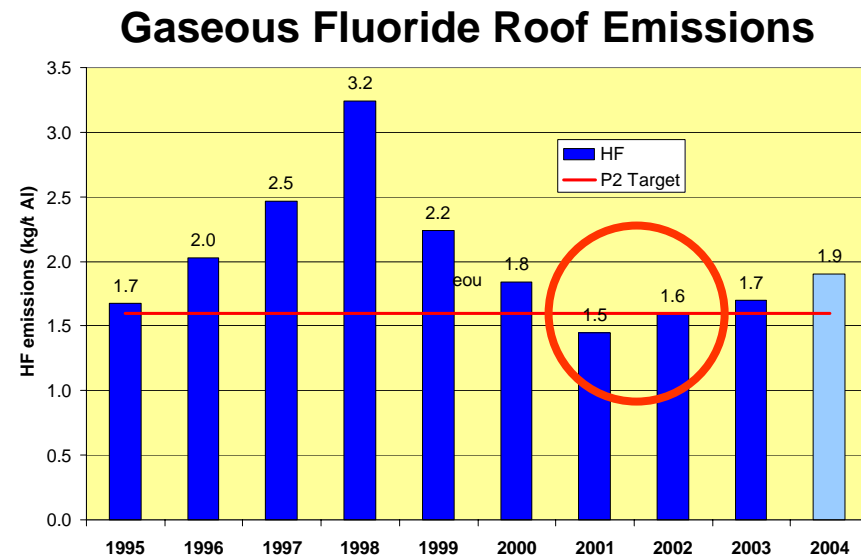
Task 1: Roof Emissions from Pot Lines

Issue: Reduce air emissions generated from the smelting process including hydrogen fluoride (HF) particulates.

Deliverable: Reduce gaseous fluoride roof emissions to
1.6 kg/t.Al

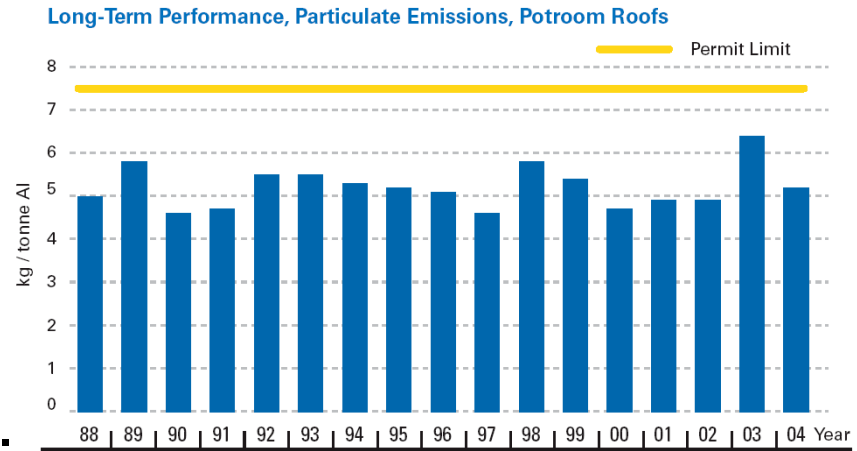
Status: Achieved Dec-2002

- Two consecutive years:
 - 2001 (1.4 kg/t Al) and,
 - 2002 (1.6 kg/t Al)
- Not sustained in 2003 and 2004
- Continued effort to reduce fluoride emissions



Task 1: Roof Emissions from Pot Lines

- Particulate emissions were expected to decline with reduced fluoride emissions
- However, trend is not obvious additional effort will be required.



Achievements:

- Line 2A Lithium Bath
- Anode effects reduction program
- HF Continuous Monitor, Lines 3A and 3B
- HF Continuous Monitors for Dry Scrubbers
- Stud management quality
- Studhole paste
- Paste formulation improvements
- Gas collection efficiency
- Liquid level management

Task 17: Coke Use

Issue: To investigate an alternative method of pre-heating the electrolytic cells (“pots”) to reduce coke use and increase Pot Line production.

Deliverable:

- Minimum 10% gain in life of the cathode by January 2002
 - Seal pots within 10 hours of finishing the pre-heat operation.
 - Reduce SPL production through 2005 to 2010 for a 15% decrease by 2010.
-

Status: On Target

- Pot preheat systems are implemented and,
- 100% of new pots are started with the Pre-heat
- Start-up time has been reduced from 72 hrs to 48 hours.
- Process limitations allow for pot sealing 12 - 16 hours after finishing the pre-heat operation.

Summary of P2 Opportunities

Task 1: Roof Emissions from Pot Lines

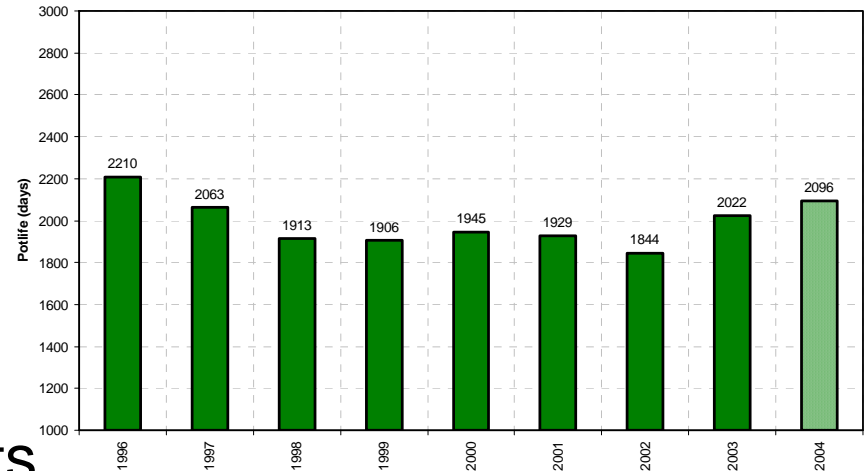
Cathode Life Span

- Gains in cathode life are behind, but steady gains have been made since 2002.
- There is a 5 to 6 year lag between cathode improvements and life span measurements.

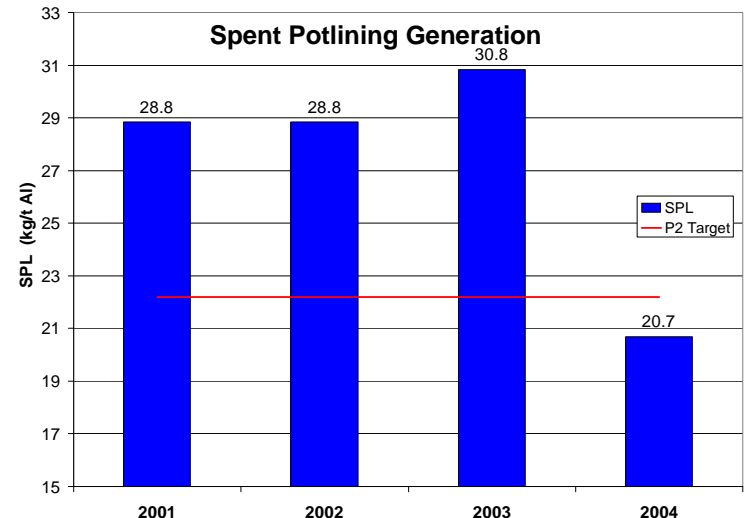
SPL Generation

- Reductions in SPL are on target for 2005.

Average Potlife
1996 - October 31, 2004



Year Failed



Task 21: Anode Quality

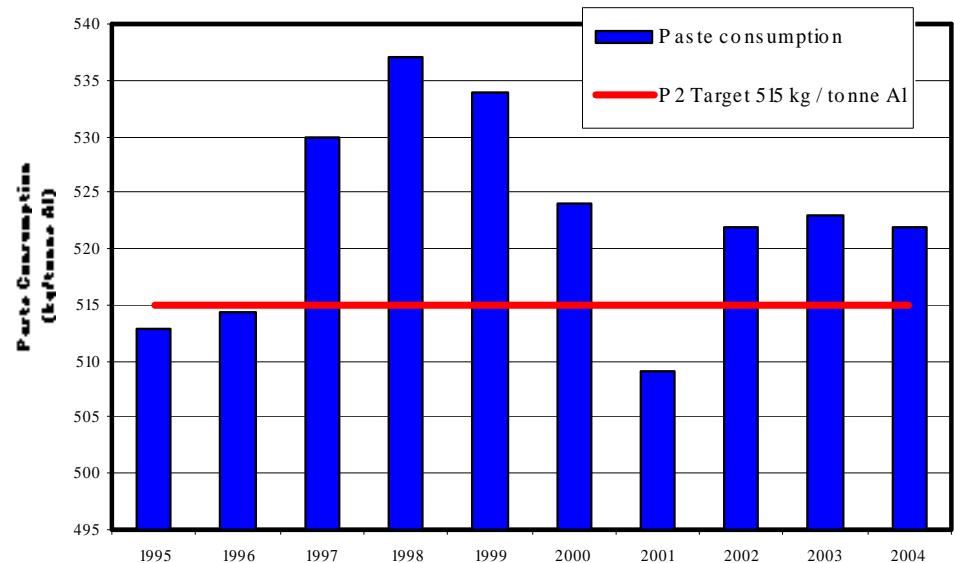
Issue: Poor anode quality contributes to anode carbon losses. decreases the efficiency of the gas collection system and increases HF, tar fumes and particulate emissions.

Deliverable: Ongoing improvement of anode carbon quality will be optimized by January 2003. Anticipate 4% reduction in carbon consumption by Jan-03.

Status: Continuing Effort

- P2 target achieved in 2001, but not sustained.
- Investment in to increase paste density using higher content of finer aggregate fractions
- High softening point pitch

Paste Consumption 1995 - 2004



Summary of P2 Opportunities

Task 30: Green House Gases (GHGs)

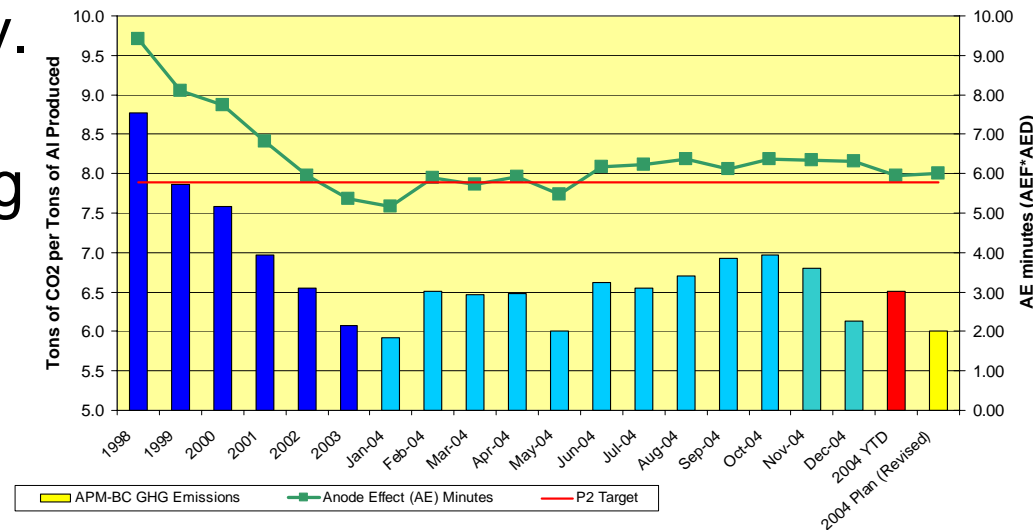
Issue: To reduce the amount of GHGs (CO₂, CO, CF₄ and C₂F₆) that are produced from the Pot Lines.

Deliverable: A 10% reduction in GHG emission levels by 2004.

Status: Complete

- GHGs emissions reduced beyond 10% , approximately 20% reduction.
- Achieved largely by reducing anode effect minutes
- Supported by Alcan Target Program.
- Continuing work on reducing anode effects.

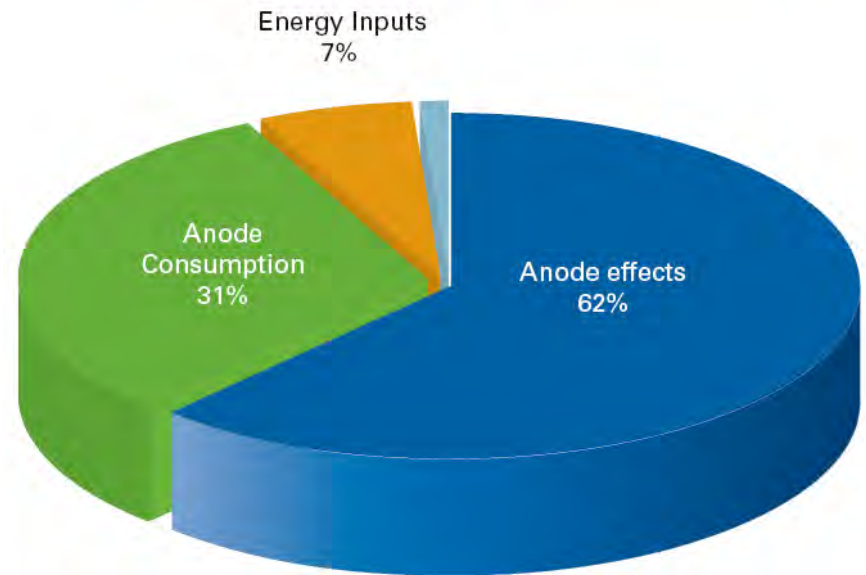
GHG emissions - Tonnes of CO₂ Equiv./Tonnes Al (Kitimat Works + Kemano) and AE minutes (AEF*AE). 2004 plan - 275000 mt.



Task 30: Green House Gases (GHGs)

- Anode effects contribute 60% of the GHGs emitted in the smelting process.
- Developing technology to predict an anode effect before it occurs and respond with treatment to prevent the anode effect.

Breakdown of Smelting GHG Emissions, 2004



Total Smelting GHG Emissions:
1.33 million tonnes (CO₂ equivalency)

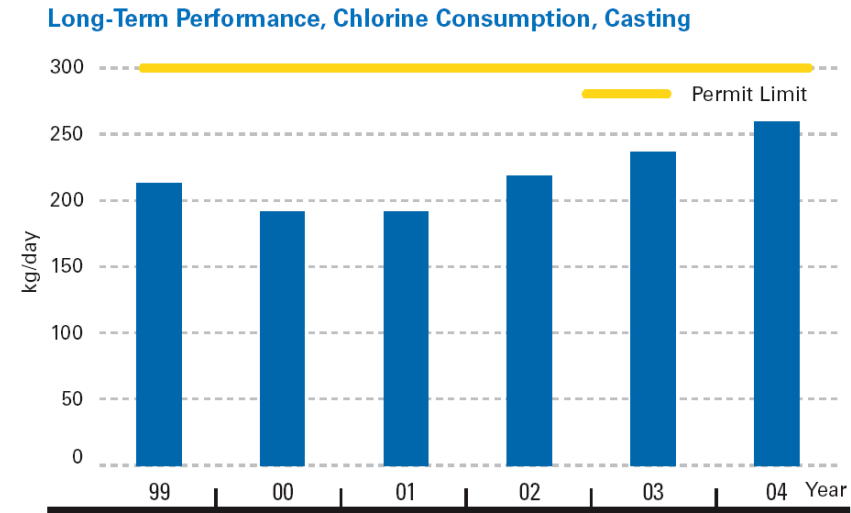
Task 38 Chlorine Emissions

Issue: Reduce the amount of chlorine gas used in the Casting operations to protect the environment and reduce costs.

Deliverable: Maintain consumption rate of chlorine gas below 300kg/day while accommodating the production of higher grade Aluminum products.

Status: Complete

- A sustained achievement based on research starting in 1995-1997.
- Optimized the chlorine gas mix from 20%+/-5% to 15%+/-2%
- Additional trials were done on metal alloy quality to minimize the amount of chlorine required flux the metal.



Task 48: Ozone Depleting Substances

Issue: To eliminate over a prescribed timeframe ozone depleting substances on the Kitimat Works site.

Deliverable: Replace all Halon 1301 by December 2000, all Halon 1211 by December 2002 and both R22 and R12 by 2010.

Status: Complete

- Halon 1211 was used in portable fire extinguishers plant-wide.
- Halon 1301 was used in computer rooms.
- Halon was replaced with CO2 or dry powder extinguishers
- Recycled, 1397 lbs Halon 1301
- 2162 lbs Halon 1211 was shipped out on May 9, 2001.
- R22 and R12 replacement is on target, through retirement of old fridges and air conditioners.



Summary of P2 Opportunities

Task 53: Use of Natural Gas

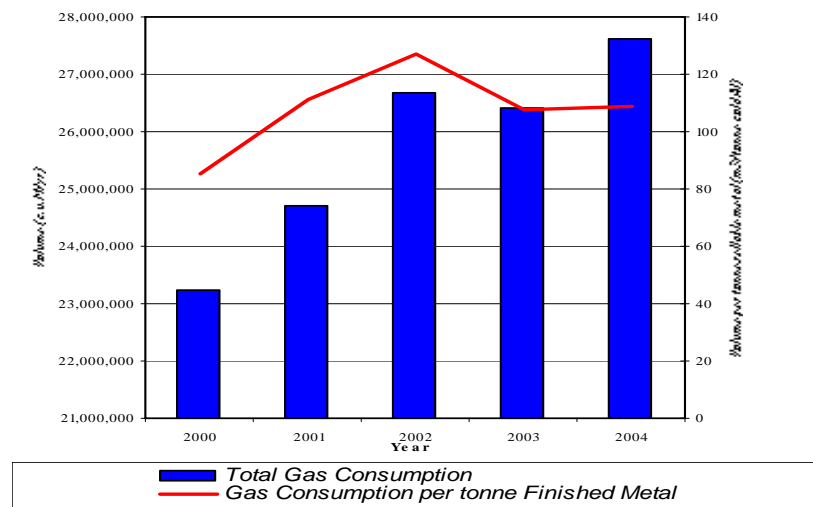
Issue: Improve the efficiency of natural gas consumption at Kitimat Works.

Deliverable: Improve energy efficiency by 20% in the consumption of natural gas by Jan-02.

Status: Continuing Effort

- Eight meters installed in major consuming areas of the Plant.
- Consumption baseline is being calculated.
- Efficiency measures need to be developed from the baseline and product mix.
- Projects have been implemented in Casting to improve furnace efficiency

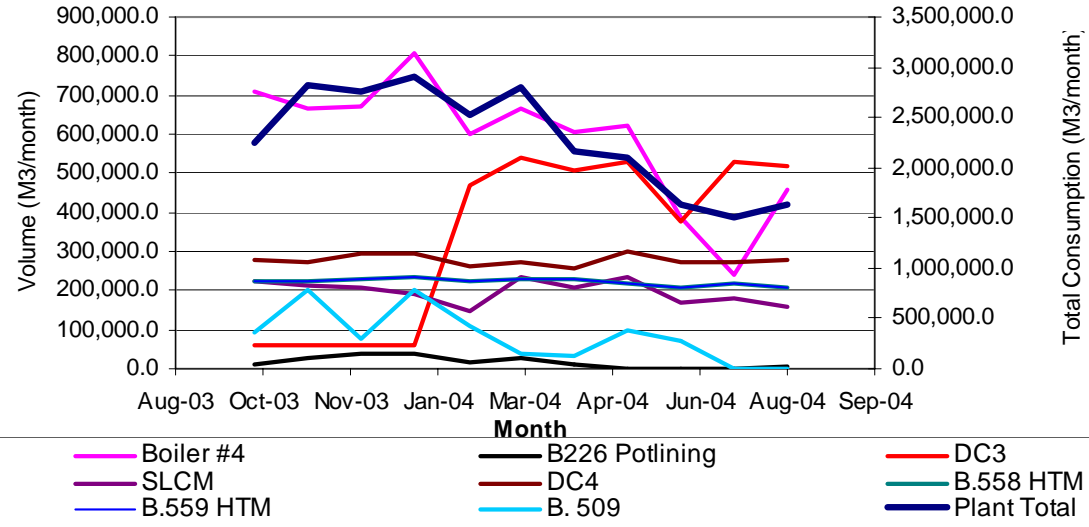
Total Annual Natural Gas Consumption, Kitimat Works (2000 - September 2004)



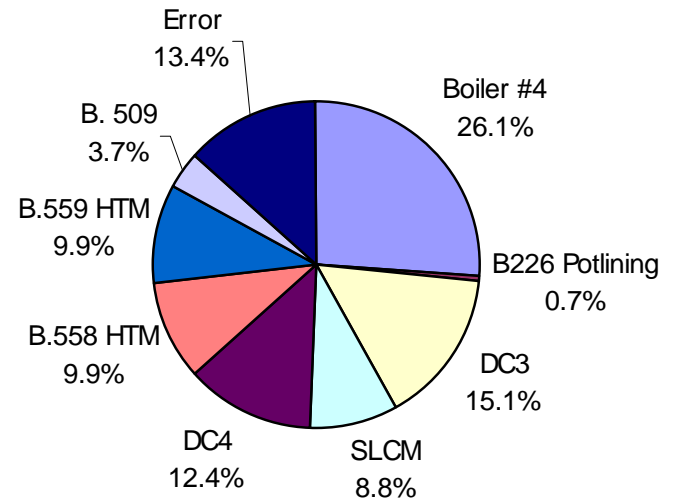
Task 53: Use of Natural Gas

Example of Consumption Baseline Data

Natural Gas Consumption, Kitimat Works



Average Percent Gas Consumption by Area



Summary of P2 Opportunities

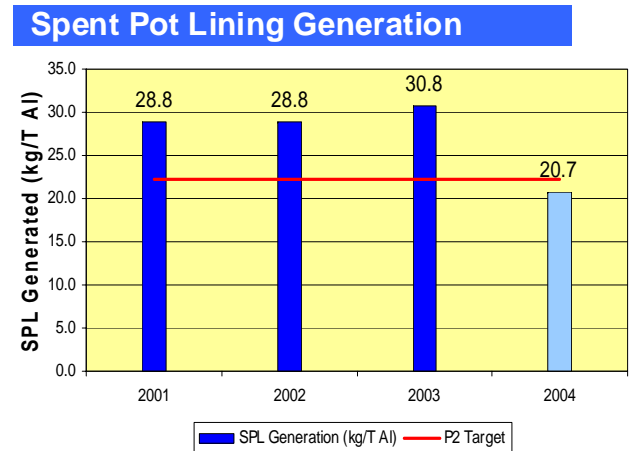
Task 57: Spent Pot Lining (SPL)

Issue: Design and build a stronger, longer lasting cathode shell. Decide to recover energy, materials or stabilize spent pot lining (SPL) for disposal.

Deliverable: Reduce SPL by 15% (0.026 to 0.022 tonnes/t.Al). Replace the existing shell with a new shell that will last 2500 days by January 2000. Decide to recover the energy, incinerate or neutralize the SPL.

Status: Continuing Effort

- Pot shell replacement program is implemented.
- Expect to see results starting in 2005.
- Reducing SPL generation is behind, but reductions should follow improvements with pot shell life.



Task 57: Spent Pot Lining (SPL)

- SPL is presently shipped to Waste Management in Oregon.
- Energy recovery from SPL in cement kilns is still being explored.
- Positive test results with Lafarge, Kamloops BC in June, 2004.
- Province has requested a second 90 day test, which is presently underway.

Summary of P2 Opportunities

Task 66: Dust and Steel Shot from Skirt Blasting

Issue: Decide on recovering energy and material value from this residual or continue to contain it in a licensed landfill.

Deliverable: Implement preferred option to recover the energy and/or reuse or recycle the material or continue to send to a licensed landfill.

Status: Complete

- A business decision was made to dispose of the dust and steel shot in a licensed landfill.
- No feasible use for the material was identified, due to the high sulphur content (12%).



Task 69: Duct Scrapings

Issue: Decide on recovering energy from residual material, recycle the material, or continue to contain it in a licensed landfill.

Deliverable: Implement preferred option after the June, 2002 decision to recover the energy, recycle the material or continue to send to landfill.

Status: Complete

- Duct scrapings from lines 1 & 2, 3-5
- Decision made to treat waste and send to a secure landfill.
- The Scrapings were stabilized on site to fix the soluble metals, then sent to a secure landfill.
- Current project to ship the duct scrapings in bags and stabilize waste at the landfill, due to dust and hygiene issues in the Plant.

Summary of P2 Opportunities

Task 69: Duct Scrapings

Bagged duct scrapings staged for waiting for stabilization



Stabilization facility
(to be decommissioned)

Task 71: Special Waste from Sandblasting

Issue: Identify the residual from sandblasting operations on site and ensure that they do not have the opportunity to enter the storm sewer during storm events.

Deliverable: All sandblasting residual from site is classified, recorded, bagged and sent to an appropriate landfill.

Status: Complete, June-1999

- Sandblast waste classified as SPL and collected by a contractor who sends carbon material back to Alcan for disposal.

Task 73: Disposal of Dry Cell Shop Batteries

Issue: To inform Kitimat Works employees of the Plant's battery recycling program.

Deliverable: Collect 75% of the dry cell batteries brought onto the smelter by June-00 and 85% by 2004.

Status: Complete

- Battery collection program established in 2000.
- Collected batteries were shipped in 2001 to Aldergrove (NuLife) for recycling.
- Another shipment expected to be sent out by end of 2004, which includes batteries from community.
- Need to work on developing metrics for measuring program success.



Summary of P2 Opportunities

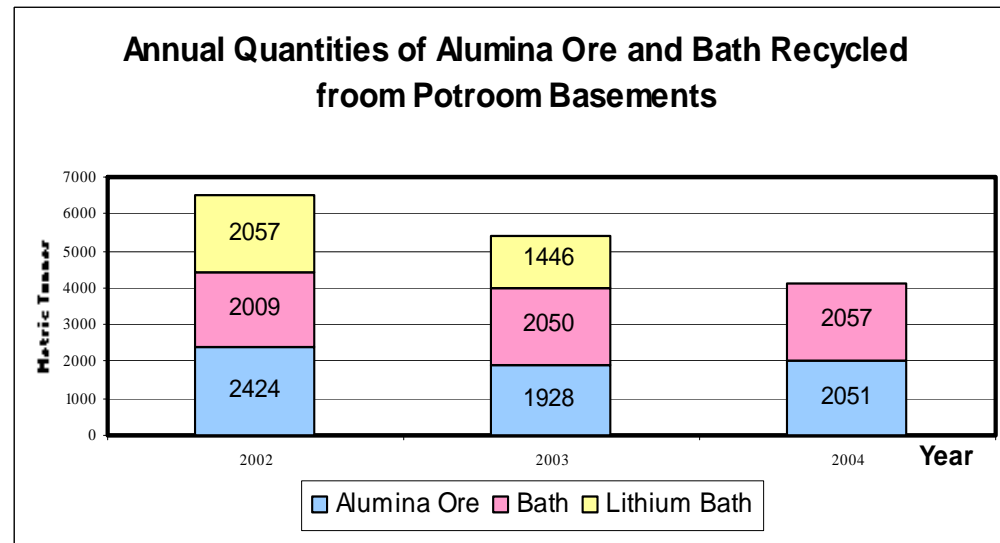
Task 81: Ore in Basement

Issue: To reduce the loss of ore from the basement as it is considered to be a potential contributing cause to the dissolved aluminum and fluoride in the effluent.

Deliverable: Recover and recycle 750 tonnes of alumina ore annually by December 1999.

Status: Complete, December 1999

- Excess of 2000 tonnes collected in 1999.
- 4000 - 6000 tonnes collected annually.
- Investment made in 2003 to recycle ore back into the feed lines at 1-2% rate.



Task 85: Alumina Losses from the Wharf

Issue: To reduce the amount of alumina lost to the environment from wharf unloading operations.

Deliverable: Reduce the amount of alumina losses to 0.2% (from 0.8%) by January 2003.

Status: Complete, February 2001

- A new Alumina unloader was purchased, \$17.6 million
- An estimated 4300 tonnes of alumina ore is conserved.
- Alumina losses are now too small to quantify



Task 89: Caustic Soda and Tuckers Etch

Issue: To reduce the amount of hydrofluoric, nitric and hydrochloric acid that is being discharged to the sanitary sewer system.

Deliverable: Expect to reduce the loadings of dissolved aluminum and fluoride in the effluent from the Metallurgical Laboratory by >80% by June 2000.

Status: Complete, 2001 & 2002

- Collection of effluents started in 2001 with caustics sent to a contractor for neutralization and disposal.
- 2002 a collection and containment facility was built.
- Caustics and etching are collected in 206 liter barrels that are shipped to Clean Harbours, Vancouver for neutralization and disposal.

Summary of P2 Opportunities

Task 89: Caustic Soda and Tuckers Etch

Caustic and Etching collection facility



206 liter barrels used to store and transport collecting caustic and etching solutions



Individual Information GAP Summaries

Task 1: Material Losses from the Smelter Operations

Issue: To continue to identify material losses from the smelter's as part of the process of continuous improvement.

Deliverable: A more complete understanding of the significant Kitimat Work's inputs, recoverables and outputs.

Status: Complete

- Limited details on task
- Comprehensive process maps from Kitimat Works Operational Review
- Natural Resource Management Program from EHS First Directive systematically examines inputs and outputs for opportunities to improve.

Air Emissions - PAH

Issue: To identify the fate and effects of PAH air emissions from the smelter.

Deliverable: Delineate fate and effects of PAHs from the smelter on the ambient environment.

Status: Complete Completed March-2001

- Limited information on task completion
- A technical report was produced from the scientific study conducted
- NOAA study in progress for PAH effects in the Marine Environment.

Task 10: Air Emissions - Metals

Issue: To identify the type and quantity of metals being emitted from the Casting areas and the Pot Rooms

Deliverable: An understanding of the quantity and type of metals if any, being emitted from the smelter.

Status: Completed 2001

- Completed internally, using Air-Tech to obtain samples and measurements.
- Results presented to the PAC Oct, 2002.

Summary of P2 Information Gaps

Task 10: Air Emissions - Metals

Pot Room Results:

Gaseous metals :

Laboratory analysis

16 metals of 32 are Under Detection Limit

From the 16 quantifiable metals

71.3% is Silicon (ore, pitch and coke)

14.5 % is Boron

3.8 % is Calcium (part of the process)

1.7 % is Aluminum (metal in the pot)

8.7 % is others

Particulate metals :

48% of the particulates consist of metals.

16 metals of 32 are Under Detection Limit

15 metals of 32 are quantifiable.

1 metal has not been analyzed.

73.7 % is Aluminum (metal in the pot)

21.4 % is Sodium (electrolithic bath)

2.5 % is Iron (contaminant of Aluminum)

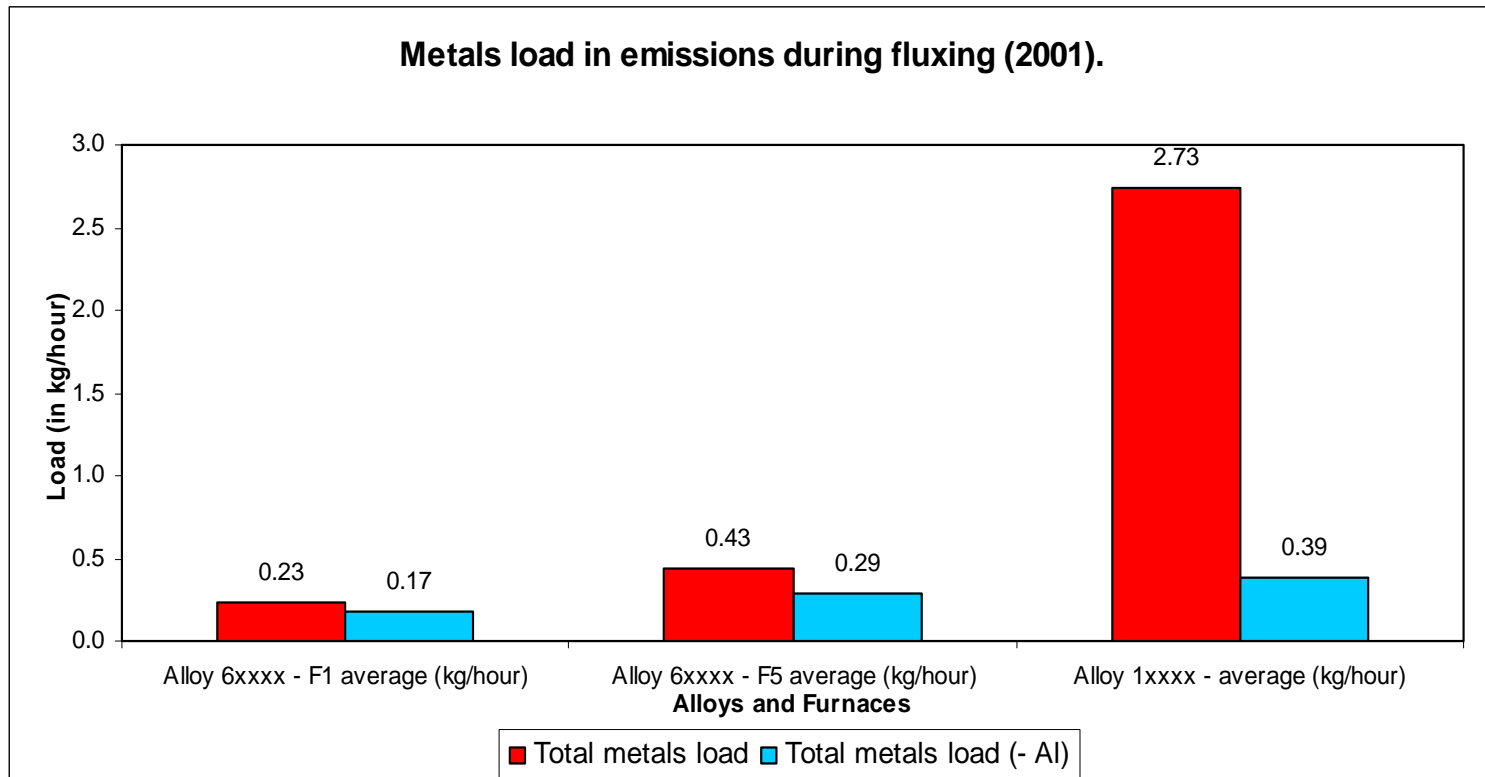
1.3 % is Calcium (part of the process)

0.6 % is Nickel (contaminant of Aluminum)

0.5 % is others

Task 10: Air Emissions - Metals

- Casting metal emissions are different from the potrooms
- Variable depending on the metal alloy being produced.
- Alloys high in magnesium have the lowest metal emissions



Task 13: Air Emissions - Sulphur Dioxide

Issue: To identify the fate and effects of sulphur dioxide and those opportunities to reduce the amount of sulphur dioxide emissions from the smelter.

Deliverable: Delineation fate and effects of SO₂ on the ambient environment. A prioritized list of options to reduce SO₂ emissions that make human health, environmental, social and economic sense.

Status: Complete 2002

- Completed plume modeling with Trinity Consulting
The model found at maximum loading rate (27 t/day), SO₂ concentrations in the Kitimat residential area do not exceed Level B ambient air quality objectives, and only exceed Level A objectives for the 1-hour averaging period.
- Long-standing and ongoing ambient-air monitoring and vegetation sampling programs, specific to sulphur dioxide, confirm an absence of environmental impacts associated sulphur.

Task 17: Biological Pathways of Hydrogen Fluoride

Issue: To identify the biological pathways of Hydrogen Fluoride and its effect on terrestrial species.

Deliverable: Better understanding of the biological pathway of Hydrogen Fluoride and its effects on certain terrestrial species.

Status:

- Dillon Consulting was retained to complete a study of fluoride effects on small mammals around the Smelter site.
- Study found some elevated fluoride levels in the deer mice used in the study.
- No obvious signs of fluorosis in the sampled deer mice.
- Study concluded that there is a healthy population of deer mice around the Smelter site.

Task 21: Spent Pot Lining (SPL) Landfill

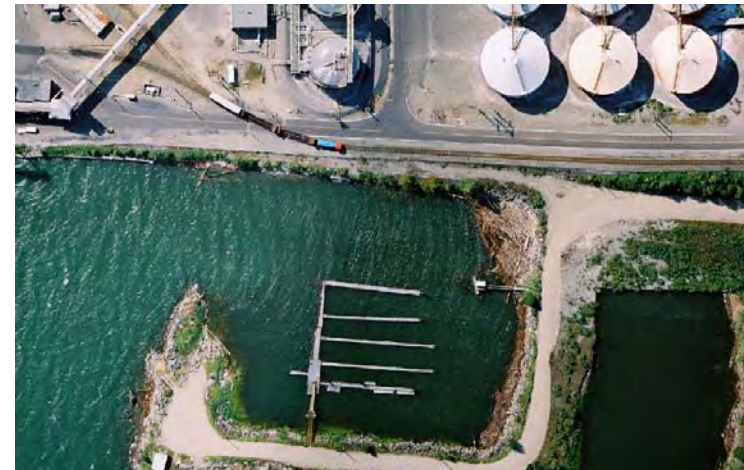
Issue: To identify the potential impact of the SPL Landfill on the ambient environment.

Deliverable: An understanding of the SPL Landfill contaminants' impact on the ambient environment.

Status: Complete 2001

- Literature review, Tier 1 ecological risk assessment
- Base estimates on concentration, exposure, route intake (pathways)
- Found generally low risk associated with contaminants
- Moderate risks to some macrophytes
- Report observed reductions in contaminants:
 - Aluminum – 48%,
 - fluoride – 36%,
 - cyanide – 95%,
 - iron – 76%

Study area of Ecorisk Assessment



Task 23: Dredged Spoils & Overburden from the (SPL) Landfill

Issue: To identify the appropriate technique to remediate the dredged spoils and overburden from the SPL Landfill.

Deliverable: The identification of the appropriate technique to remediate the dredged spoils and overburden from the SPL Landfill.

Status: Continuing Effort

- Bioremediation options explored but found not feasible due to the nature of the solid pencil pitch.
- Project developed to characterize the waste cells.
- Identified that the cell contains BC Special waste (PAH)
- Screening of pencil pitch resulted in a 150% decrease in PAH waste levels of the cell, to levels below special waste criteria.
- Second cell, is scheduled for characterization in 2006.
- SPL Overburden cell is scheduled for characterization in 2007.

Summary of P2 Information Gaps

Task 25: Dissolved Aluminum & Fluoride in Effluent & Storm Water

Issue: To identify potential sources of dissolved aluminum and fluoride entering the B and D Lagoons.

Deliverable: A prioritized list of other possible sources of dissolved aluminum and fluoride.

Status: Complete

- Mass balance work was completed from 1999 - 2003
- Involved construction of weirs and monitoring station on the inflows to B-Lagoon.
- Construction of a weir on F-Lagoon (2003)
- Continued work with water release inventory (2004)
- Wet and dry period balances
- Main findings:
 - ~50% of fluoride and 100% of cyanide originates from the J-Stream Stormsewer (SPL Landfill)
 - Contaminant loading is similar between lines 3-5 and 7&8.

Summary of P2 Information Gaps

Task 25: Dissolved Aluminum & Fluoride in Effluent & Storm Water

- B-Lagoon is efficient in removing solids and PAHs
- Source Identification:
 - Fugitive dusts
 - Dissolution of corrugated Al roof sheet
 - Leaching of process materials and waste:
 - alumina (9.3% of D-Al loading to b-lagoon)
 - dry scrubber products (x% losses, 2.9% of D-Al loading to b-lagoon)
 - bath (5% losses, 0.000024% D-Al loading to b-lagoon)
 - dross (2% losses, 0.3% of D-Al loading to b-lagoon)
 - SPL (2% losses, 0.3% of D-Al loading to b-lagoon)

Additional work to reduce contaminant loading:

- J-Stream stormsewer closure,
- Conveyor transfer points corrections,
- Alumina fluoride bin 23 dust collector
- Basement cleaning, and
- Recycling facility for spilled ore and bath.



Task 28: Runoff from Aluminum Siding

Issue: Determine if aluminum siding on plant buildings is a significant source of dissolved aluminum.

Deliverable: Determination percentage impact of aluminum siding runoff on dissolved aluminum in the B and D lagoon.

Status: Complete

- Experiment done measuring dissolved aluminum in aluminum clad roof and steel tar coated roof.
- Dissolved aluminum results:
Tar coated roof (59.9 ppm) Aluminum cladding (31.6 ppm)
- Study concluded that aluminum cladding was not a significant contributor of dissolved aluminum to B-lagoon.

Task 32: Effluent Treatment

Issue: Identify opportunities to treat effluent over the long-term in the lagoons which have a limited life expectancy.

Deliverable: Determine the applicability of using of cattails and other techniques to remove dissolved aluminum and filter particulate matter.

Status: Continuing Effort

- Study was completed by Boojum Consulting
- Review of biological polishing opportunities for B-Lagoon
- Cattail trial in D-lagoon to remove solids and dissolved aluminum
- Boojum concluded that cattails would be effective biological controls in B-Lagoon

Task 32: Effluent Treatment

- Trial of cattails in D Lagoon did not yield results sufficient enough to further develop.
- Current project exploring options to increase B-Lagoons capacity.
- Hydrological model being developed to design options
- Interim measures planned in 2005 to improve capacity



Closure

Significant improvements in environmental performance have been realized since the start of the P2 Program.

Additional benefits:

- Stakeholder Relationships
- Shift in culture and attitudes

PAC has made an important contribution

THANK YOU!

Closure - Key Learnings

- Key Learnings:
 - Need to improve document control
 - Closure reports of projects
 - Review opportunities for continued relevance and priority
 - Need to develop the scope for the P2 Opportunity before assigning targets.
 - P2 Plan should not identify methods of delivering as the scope of the issue and best approach are not sufficiently clear during the plan development.