

GRAL 2009: Landfill

The Composition of Leachates from Very Large Landfills: An International Review.

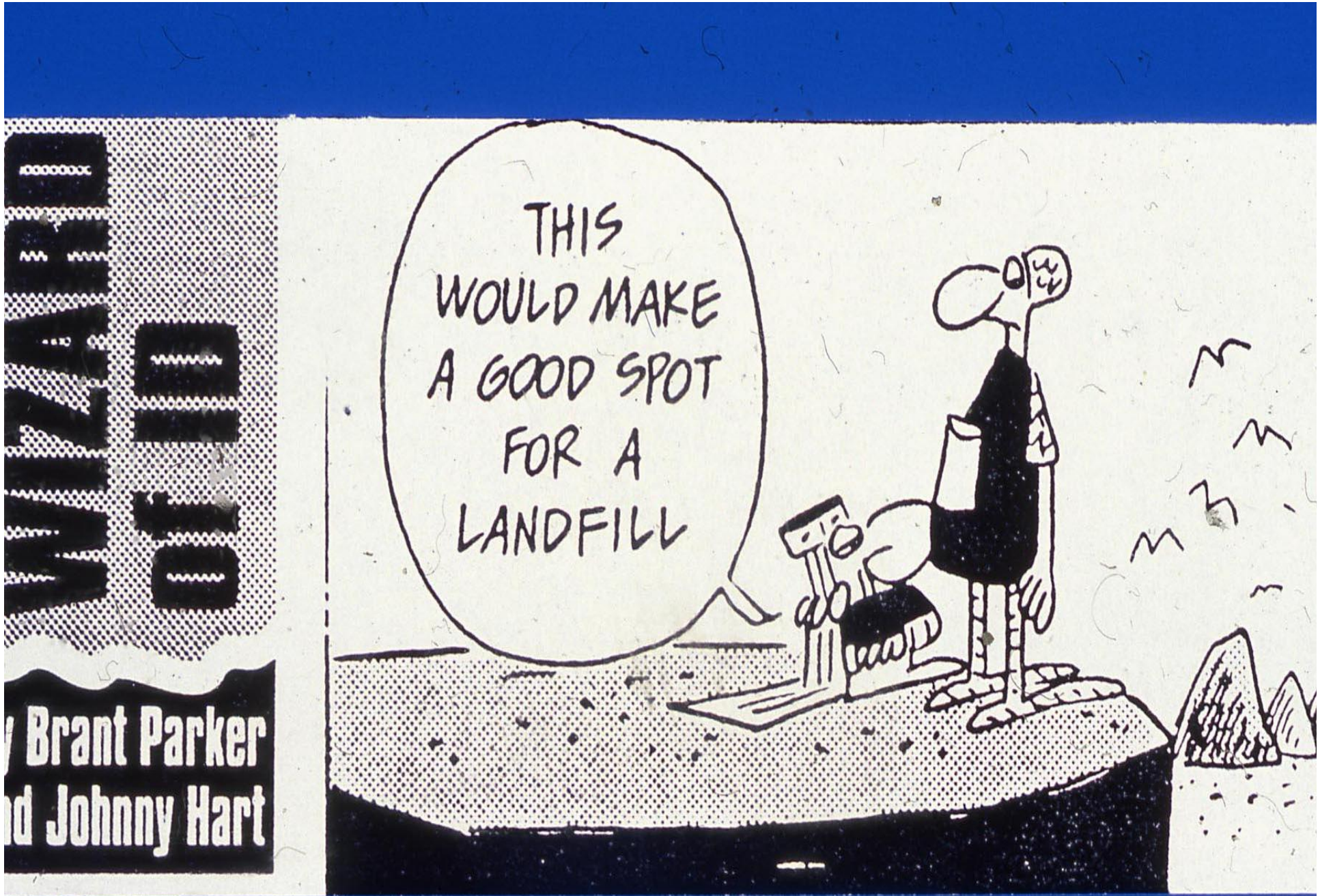
by

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I CAN'T SEE ANY
LANDFILLS



THIS
WOULD MAKE
A GOOD SPOT
FOR A
LANDFILL

Brant Parker
and Johnny Hart







Greenhouse gases?

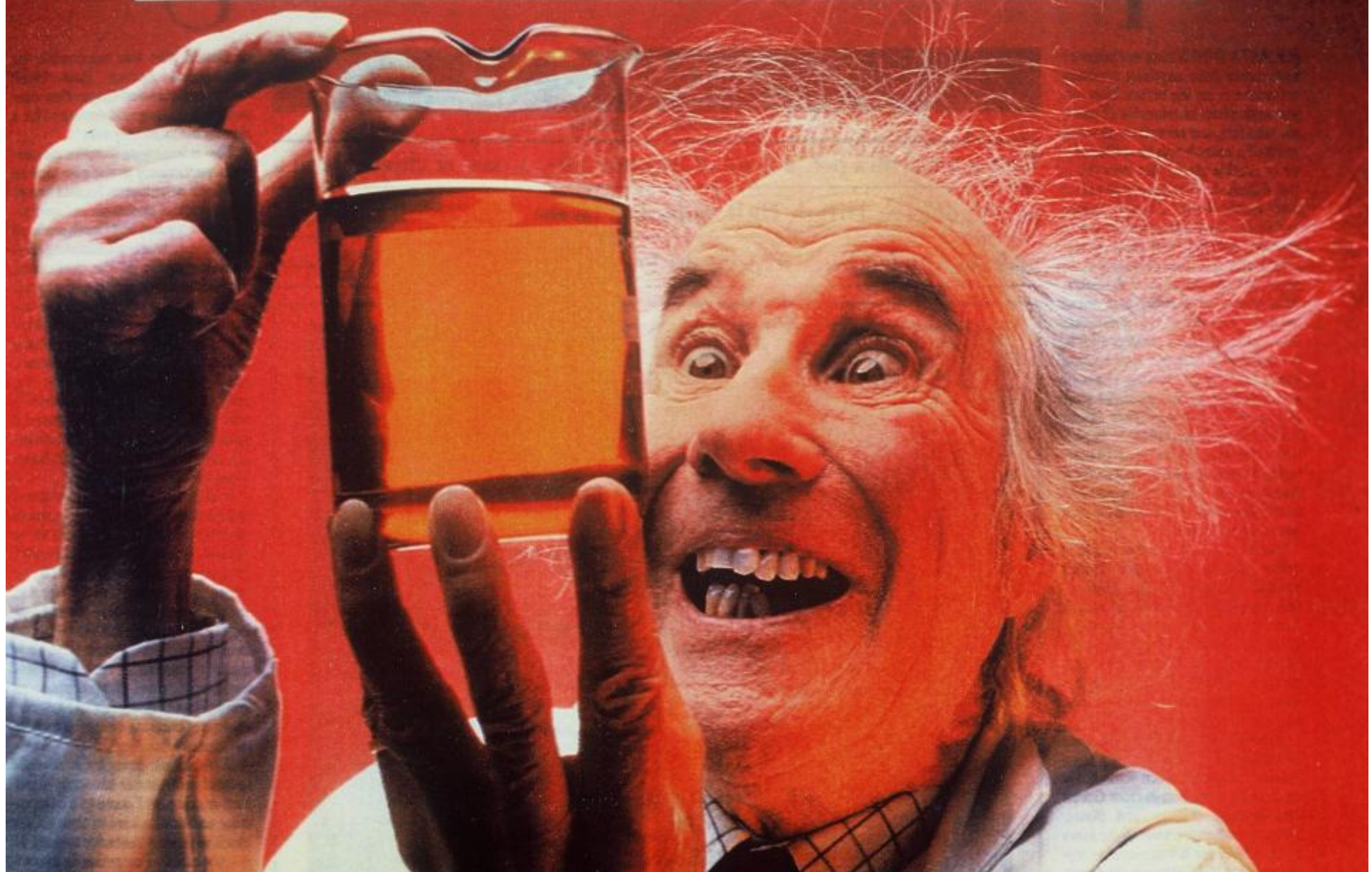
Global warming?

What's that then???

Good health!



The elixir of life



My experience in many countries:

That methanogenic leachates from very large landfills are extremely similar, regardless of:

- Location (temperate, tropical)
- Regional differences in waste inputs
- Annual rainfall rates
- Standards of operation (within limits)

Leachate quality data examined from:

- Hong Kong (old & new sites)
- The United Kingdom
- South Africa
- Mauritius
- New Zealand
- Korea
- Malaysia, Indonesia and Thailand
- Italy and Canada data also referenced



Extremely valuable assistance & data provided by landfill operators in many countries.

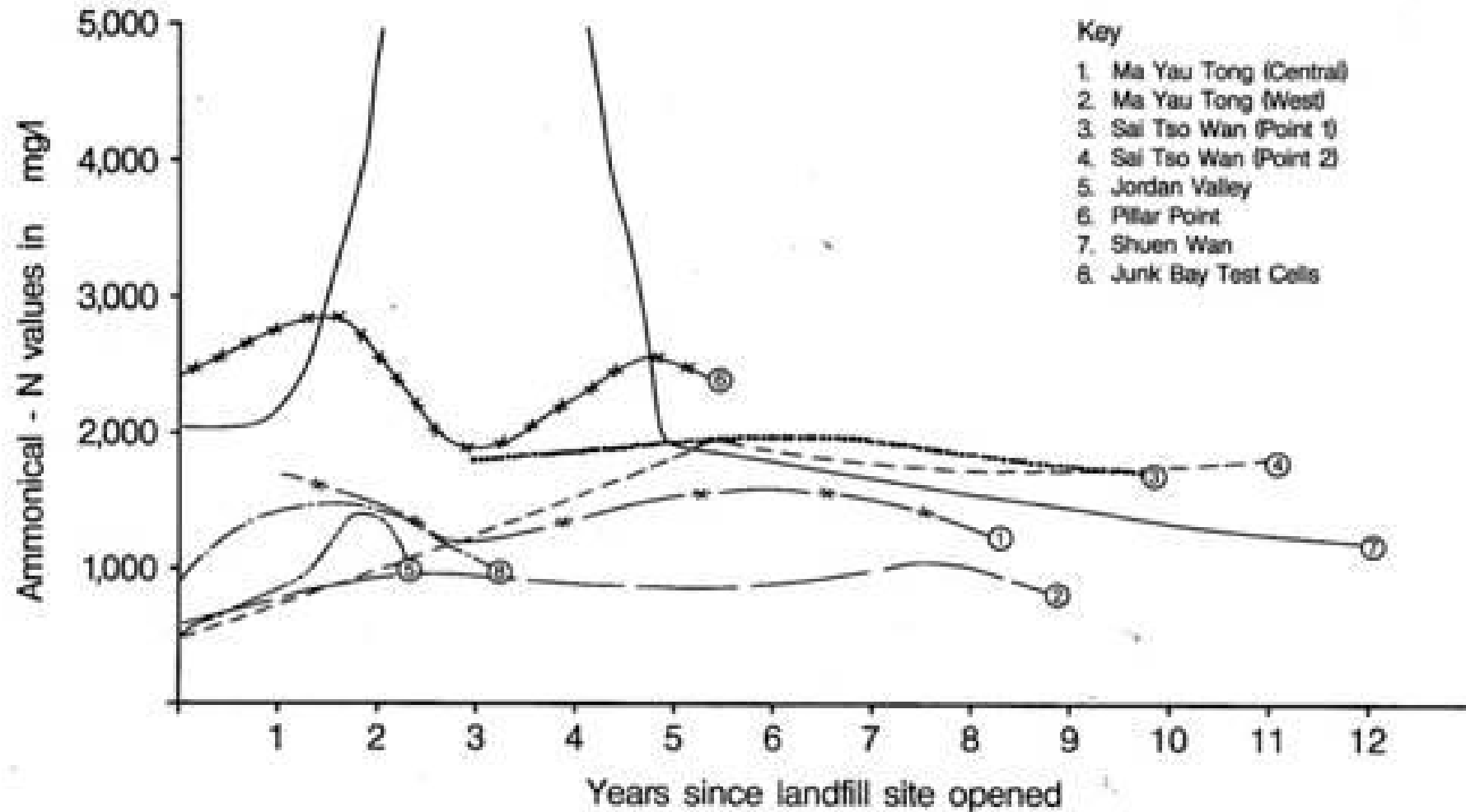
Hong Kong: Old landfill sites



Hong Kong: Old landfill sites



Figure 2: Trends in concentrations of ammoniacal nitrogen in leachates from Hong Kong landfills (Robinson and Luo, 1991)



Hong Kong: New generation sites - NENT



NENT: Landfill partially filled





Figure 3: COD in raw leachates at the new NENT Landfill in Hong Kong (after Chen et al, 1997)

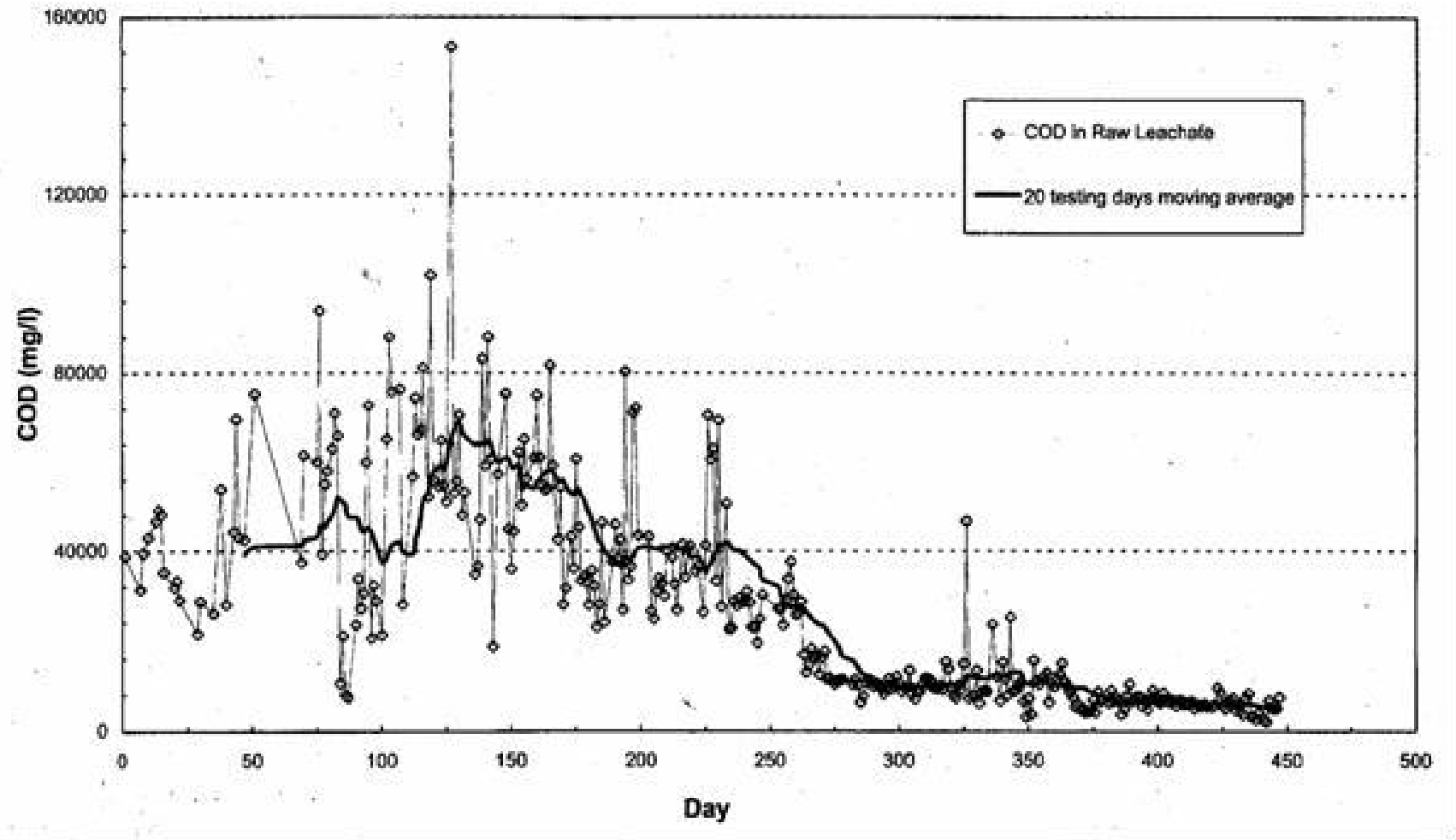
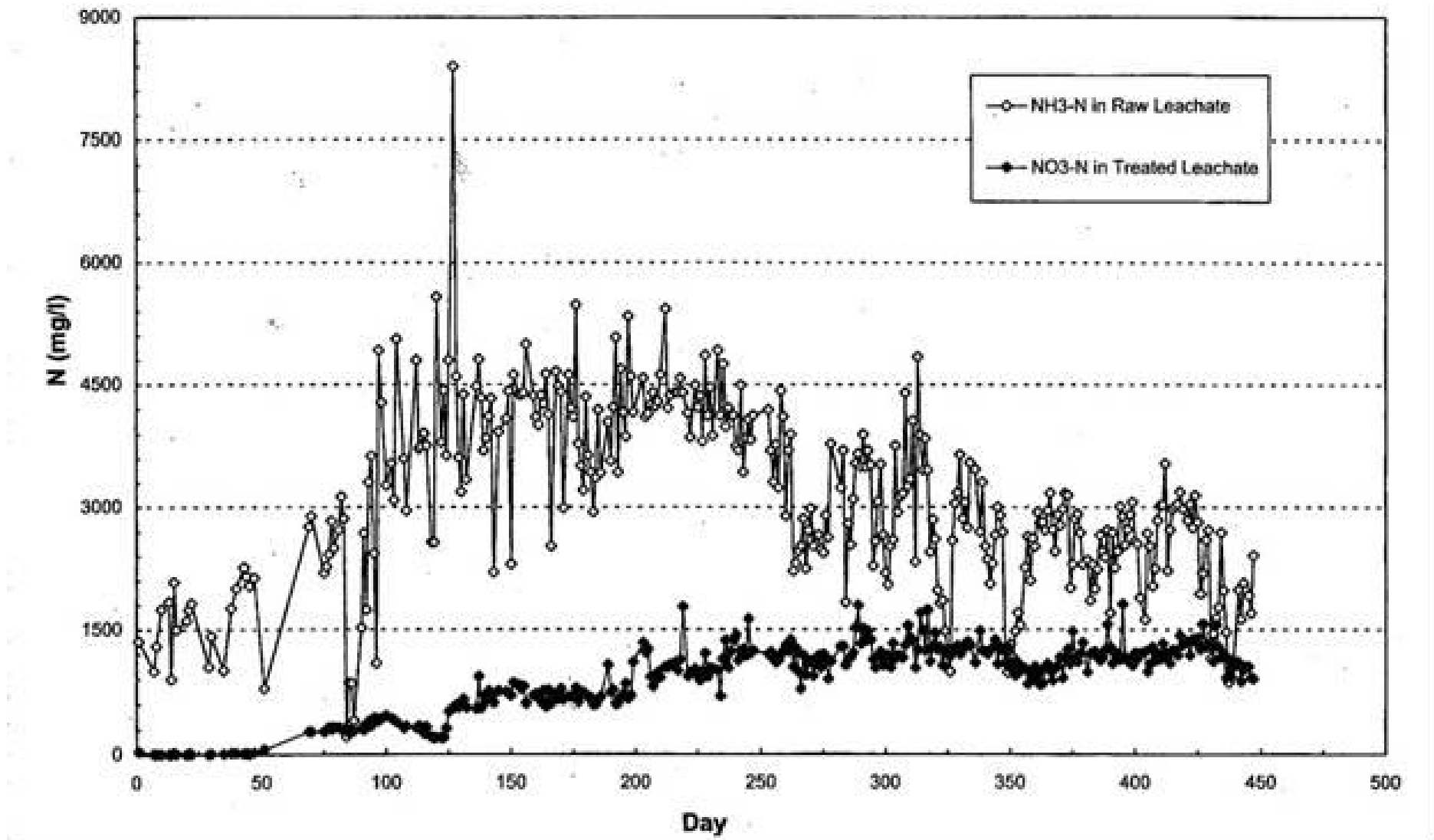
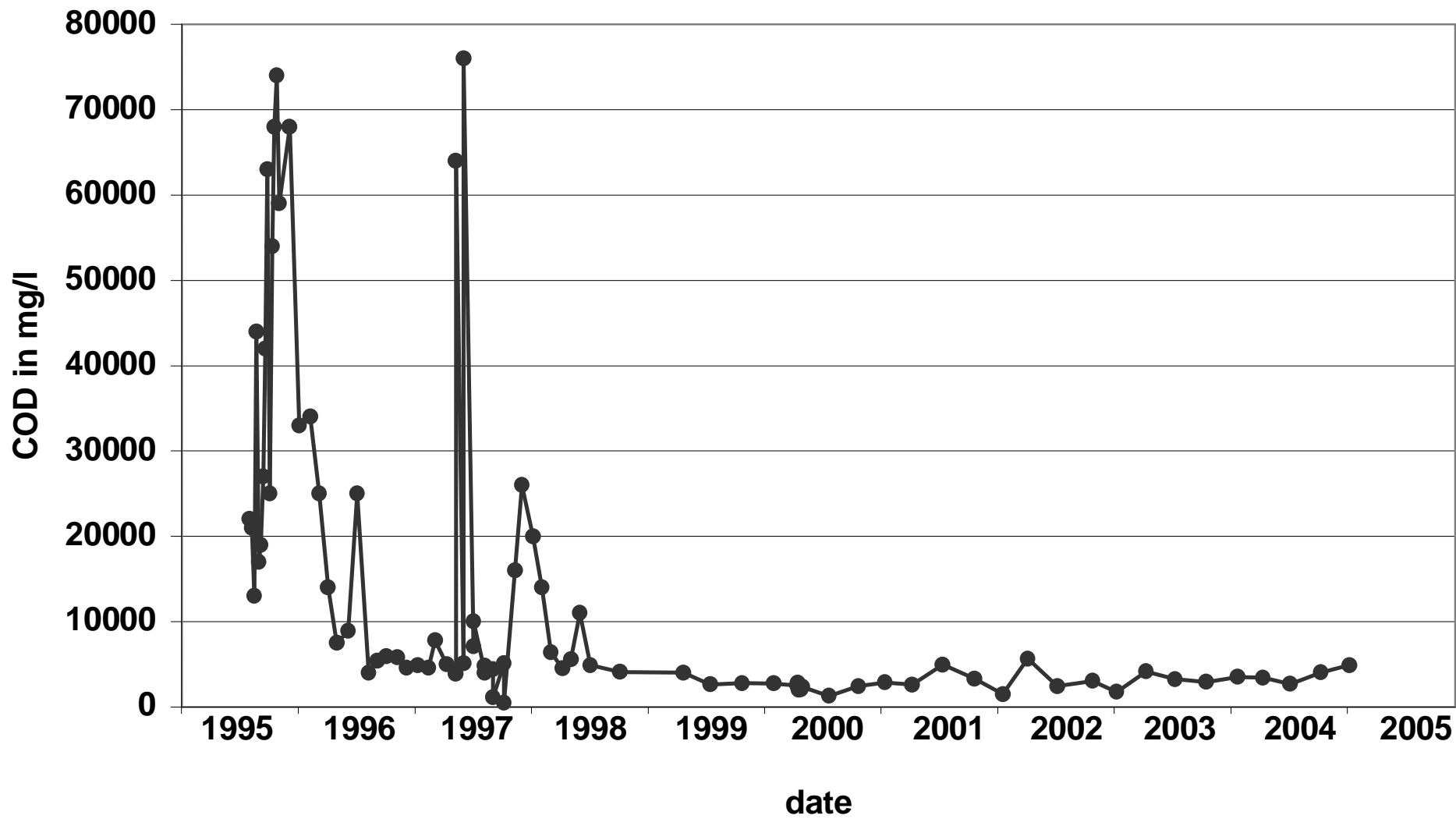
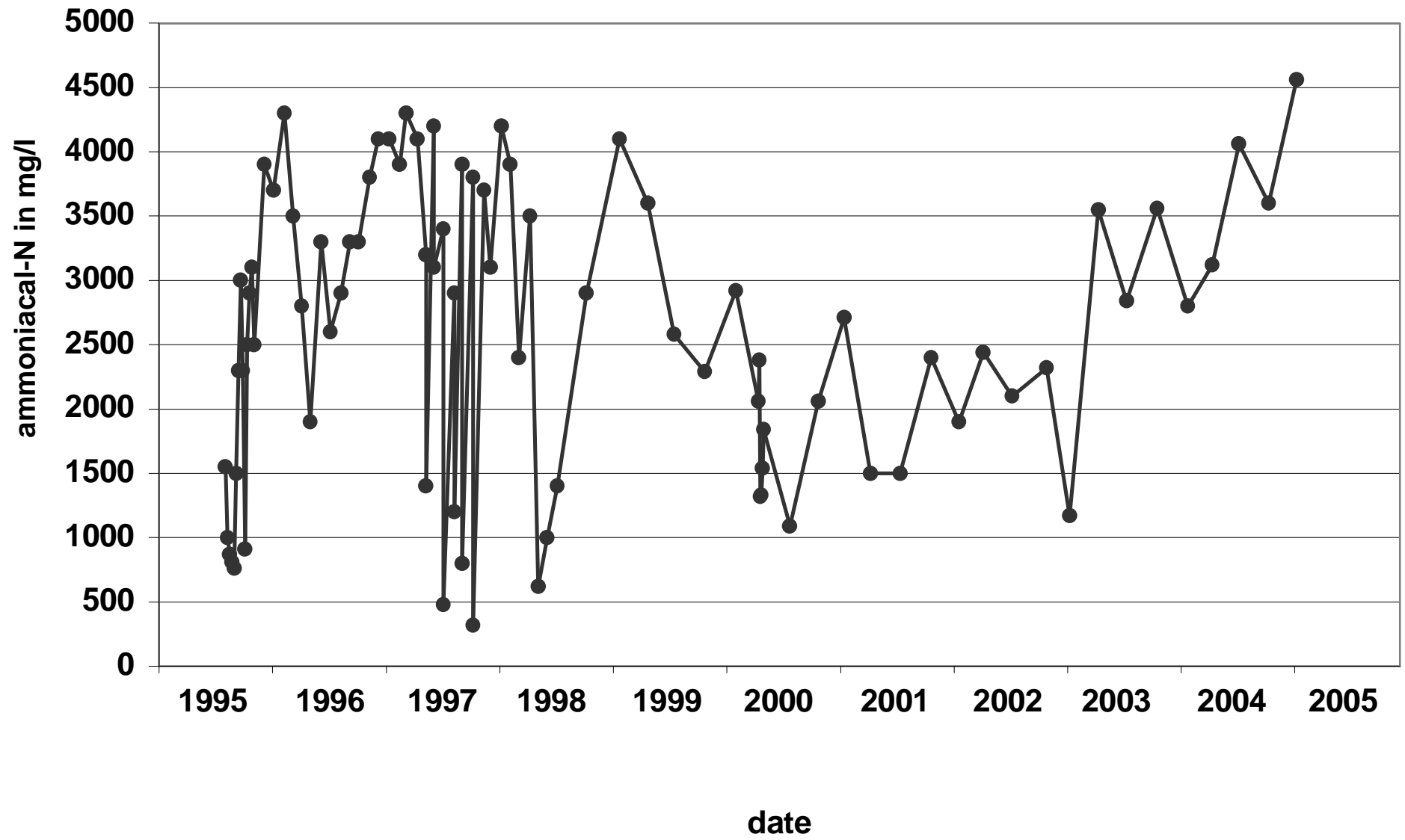
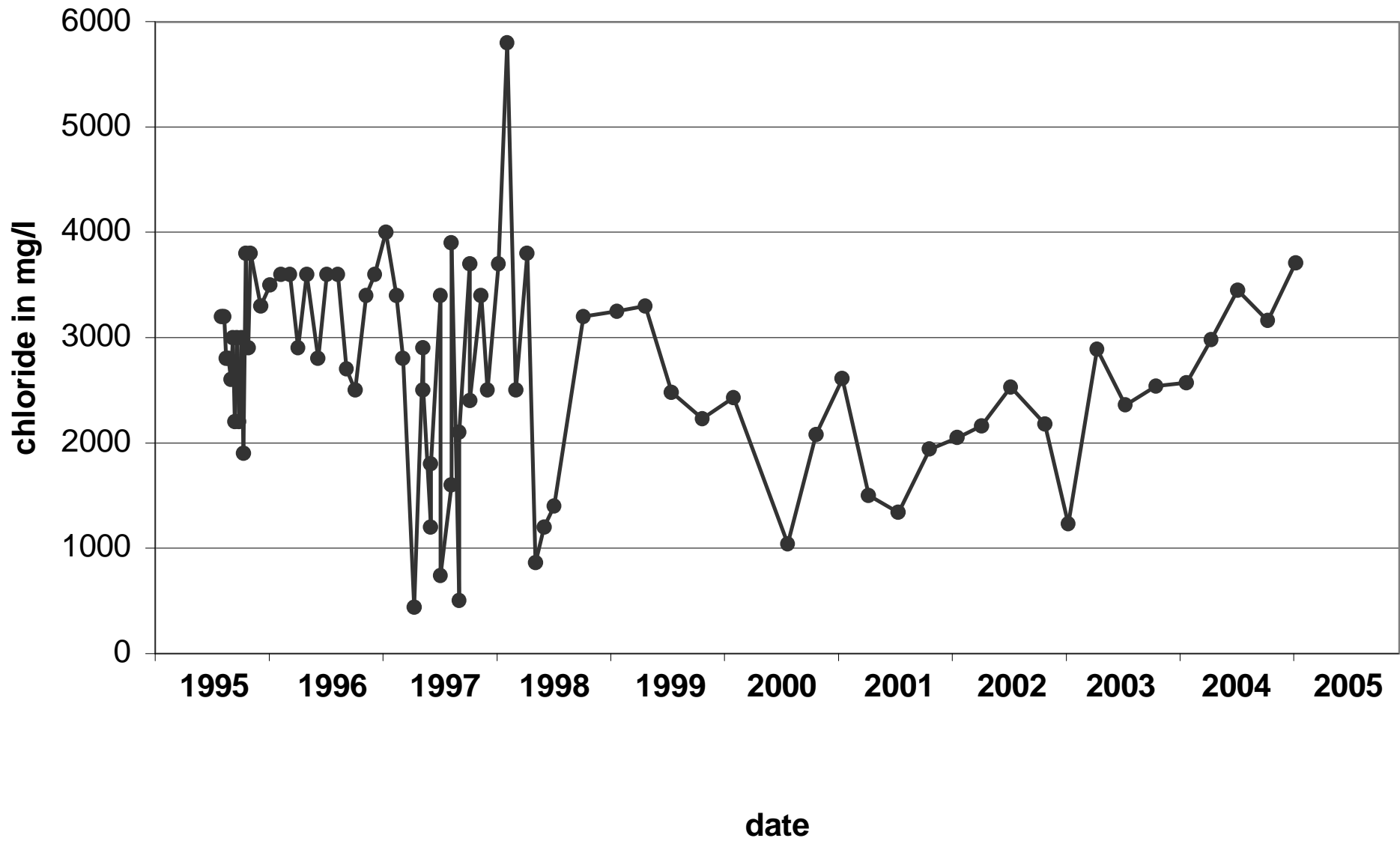


Figure 4: Concentrations of ammoniacal-N in raw leachates at the new NENT Landfill in Hong Kong (after Chen et al, 1997) (values for nitrate-N in treated effluent are not of interest for this report)













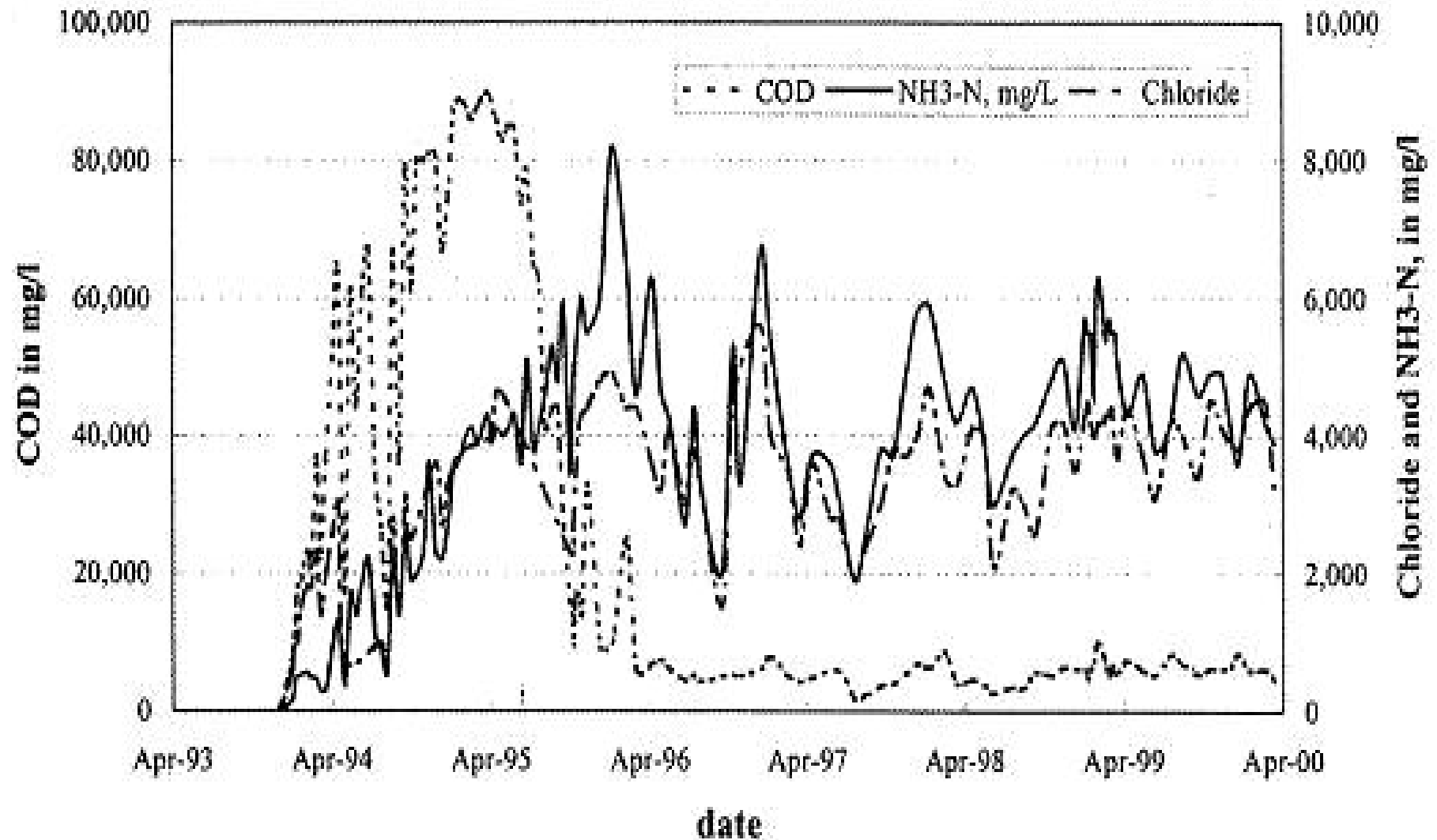
Hong Kong: SENT Landfill







Summary of general leachate quality in Phase 1 of WENT Landfill, Hong Kong (after Knox, 2001)



Many very large landfills in the UK



Several very large landfills in Ireland



UK Landfill Leachates: Typical Large Landfills

Site	COD	ammoniacal-N	chloride
• Arpley	8260	2110	5200
• Llanddulas	3140	1240	2950
• Winterton	2620	1460	4300
• Site X	4600	1590	2920
• Site Y	1760	1100	1750
• Site Z	6940	1760	5110

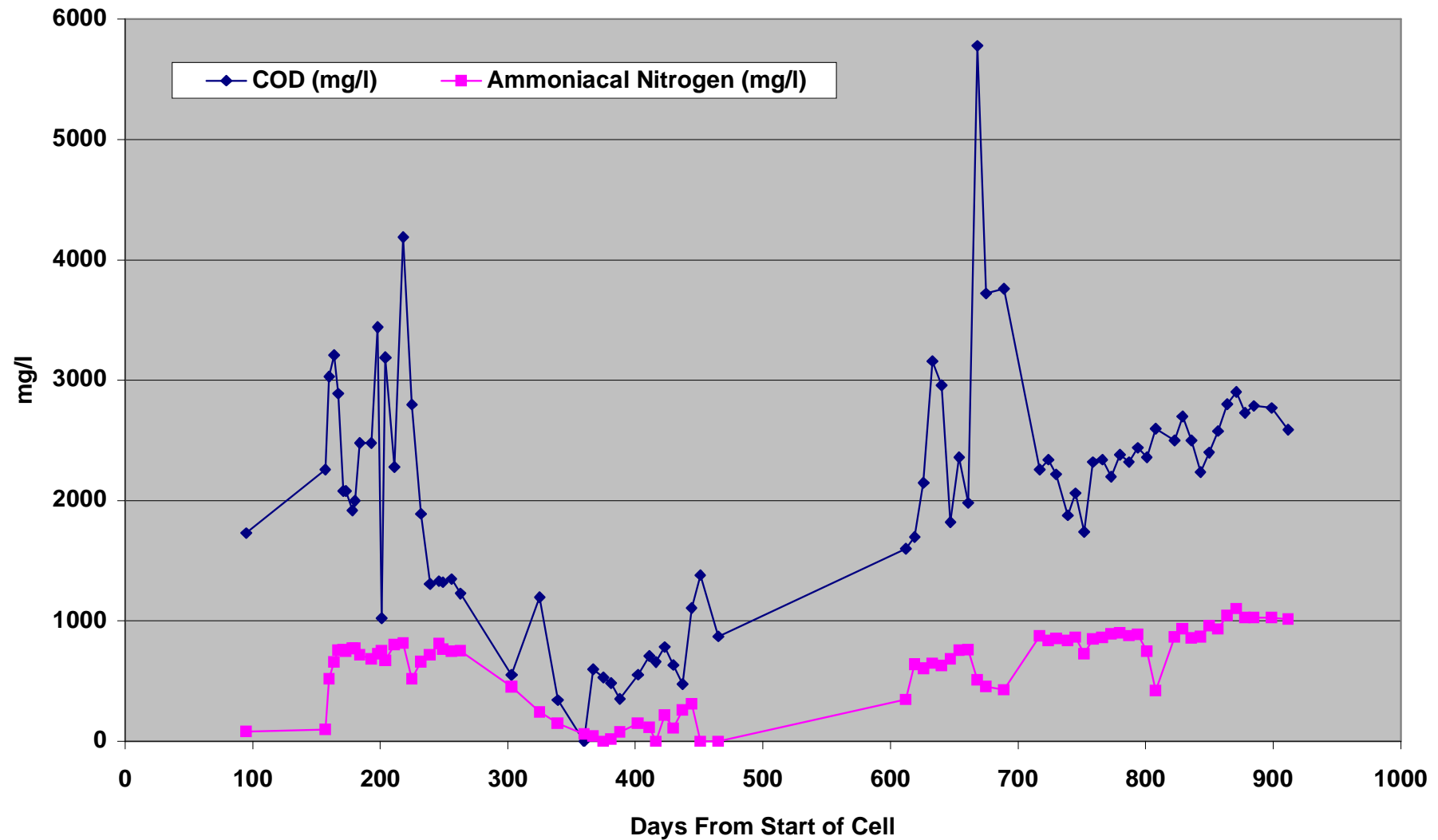
**Data also included
from landfills in
Korea, Malaysia,
New Zealand,
Thailand and
Indonesia**





**South Africa:
Bisasar Road,
Durban**

COD and ammoniacal-N in leachates from the new “Randles Cell” at Bisasar Road Landfill, Durban, South Africa (opened in early 1999)



South Africa: Mariannhill, Durban







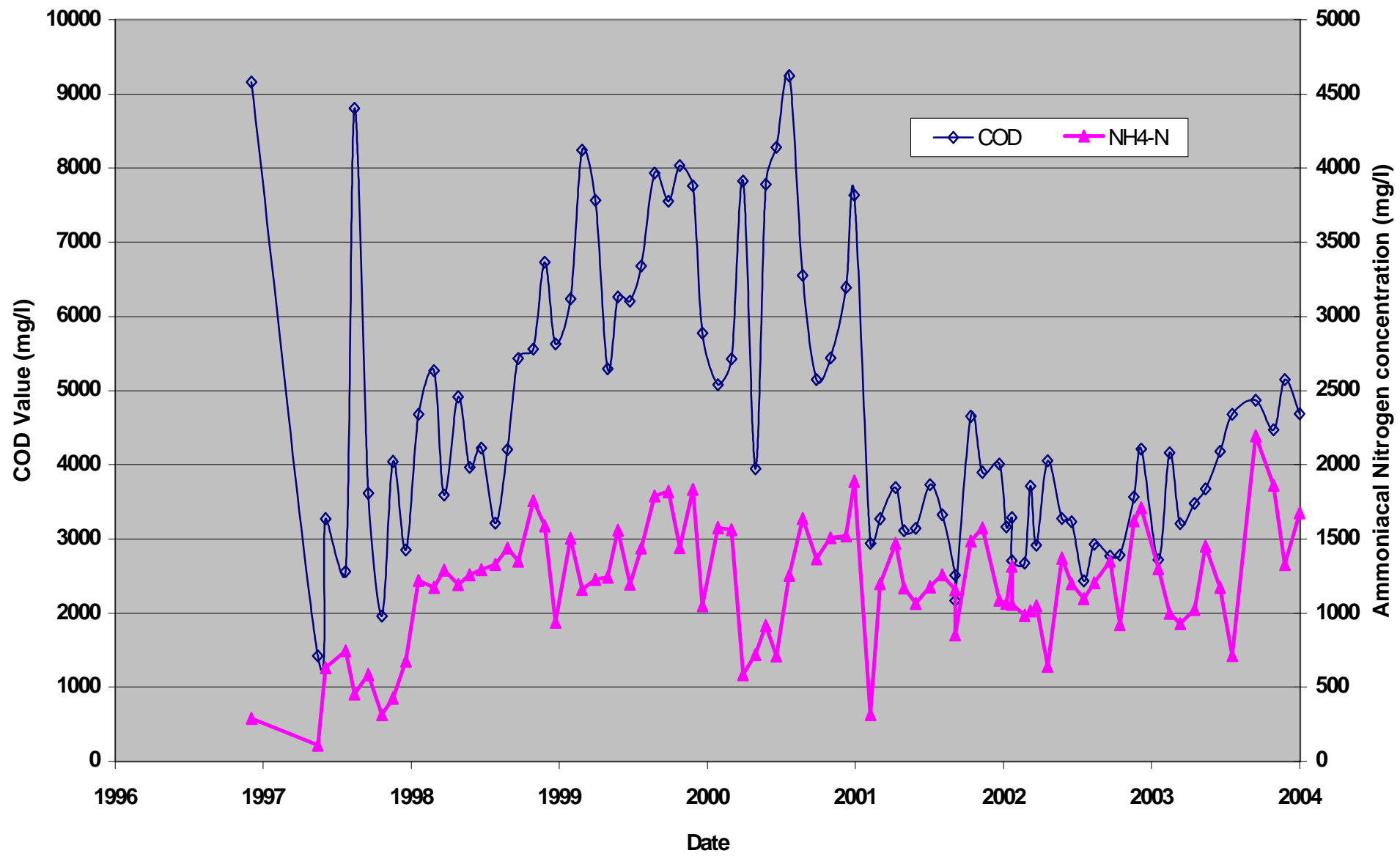
Mare Chicose Landfill, Mauritius

- First received wastes during 1996
- Receives 1000 tonnes/day of MSW
- 50 metres deep
- Annual rainfall 3000 mm
- Intensive tropical storms
- Leachate to STW at present

Mean Values for Leachate Quality at Mare Chicose

Determinand	10/98- 9/99	10/99- 9/00	10/00- 9/01	10/01- 4/02	MEAN
COD	4031	6659	6739	4925	5683
BOD ₅	1606	1069	1046	1300	1249
ammoniacal-N	1080	1436	1460	1138	1299
chloride	2850	3974	3790	3932	3594
chromium	0.16	0.48	0.23	0.26	0.28
zinc	1.53	3.04	3.07	2.46	2.53
alkalinity	5659	6998	6696	7155	6834
Notes • All results in mg/l, alkalinity as CaCO ₃ :					

Results for COD and ammoniacal-N in raw leachate at Mare Chicose, September 1998 to March 2002







Conclusions (1)

- Leachate quality at very large landfills is remarkably similar throughout the World
- This holds true for tropical or temperate climates, and for developed and developing countries
- Acetogenic phases of decomposition are generally of shorter duration (< 12 months) in tropical climates, than in temperate ones (1-3 years)

Conclusions (2)

- Detailed prediction of acetogenic leachate quality at very large landfills is made more difficult by:
 - Leachate quality is in transition
 - Especially in tropical climates, precise changes in leachate quality are sensitive to specific rainfall patterns
 - At such sites the greatest risk to leachate management is poor control of heavy rainfall events at an early stage

Conclusions (3)

- Because methanogenic leachate quality will predominate at very large landfills for most of their life, including many decades after closure this paper has concentrated on defining these types of leachates
- Data have been obtained and compiled from many very large landfills in several countries

Conclusions (4)

- **Methanogenic leachates characterised by:**
 - **COD values between 2000-8000 mg/l**
 - **BOD values much lower (<1000 mg/l)**
 - **Heavy metals lower than in sewage**
 - **Very high concentrations of ammoniacal-N (1000-4000 mg/l)**
 - **(occasional levels of chromium >1 mg/l)**