

GRAL 2009: Landfill

Landfill Leachate Generation and Quality

By

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Greenhouse Gas concerns drive our agenda



Politicians are very interested in wastes





Positive proof of global warming.



1800's

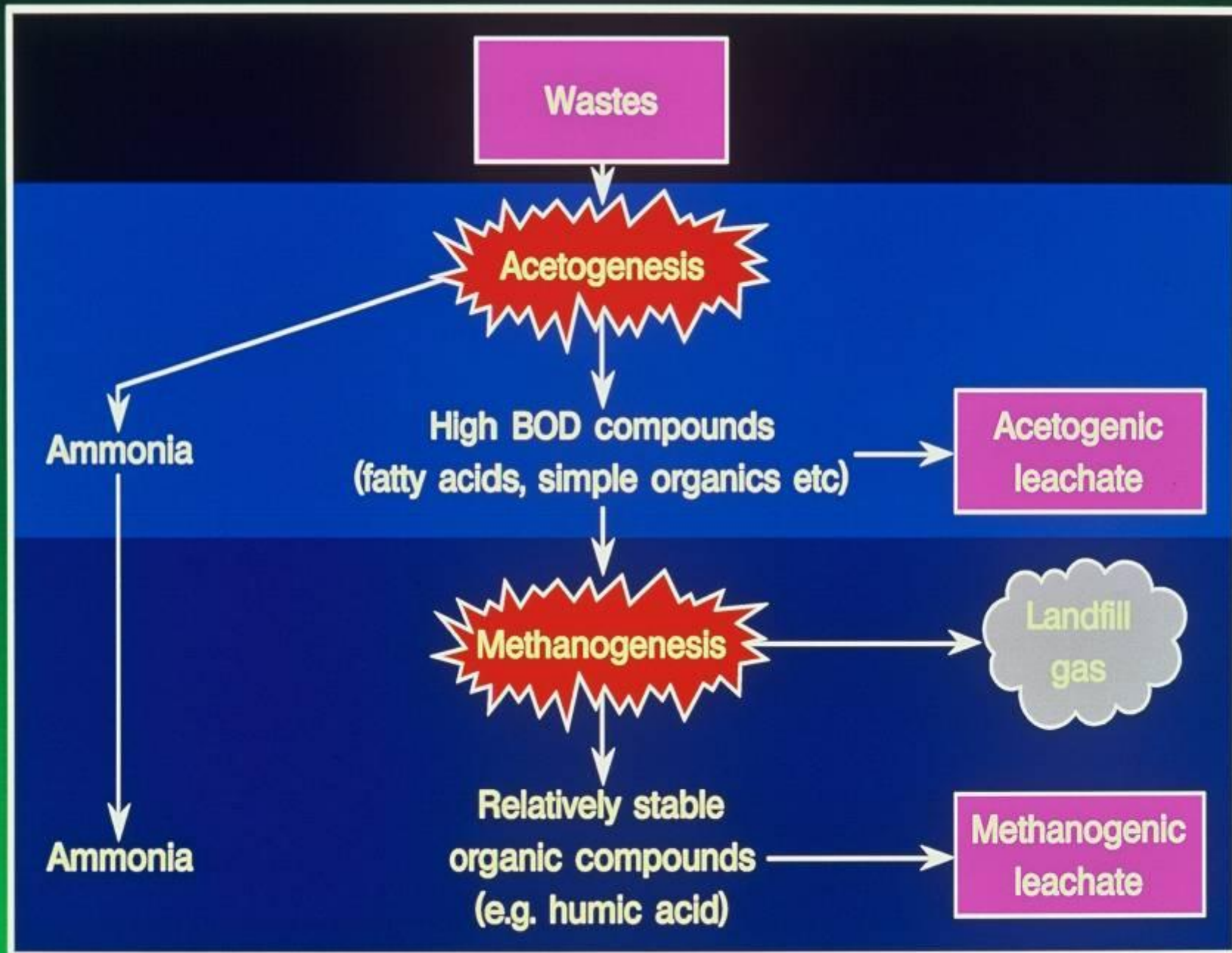
1900's

1950

1970

1980

1990



Leachate Quality - Stangate Landfill

Determinand	May '85	January '86	September '86
pH - value	5.6	6.9	7.6
EC ($\mu\text{S} / \text{cm}$)	52000	-	15300
COD	76000	18000	2600
TOC	24600	5900	850
Total Fatty Acids (as C)	21220	5054	127

(mg / l except pH and EC)

Leachate Quality - Stangate Landfill

Determinand	May '85	January '86	September '86
Ammonia - N	2200	2100	1700
Chloride	2900	2700	2200
Alkalinity (as Ca CO ₃)	14000	11000	9600
Sulphate	1400	< 10	< 10
Iron	1200	120	15

(mg / l)

Waste in Landfill Base (deposited June 1982)

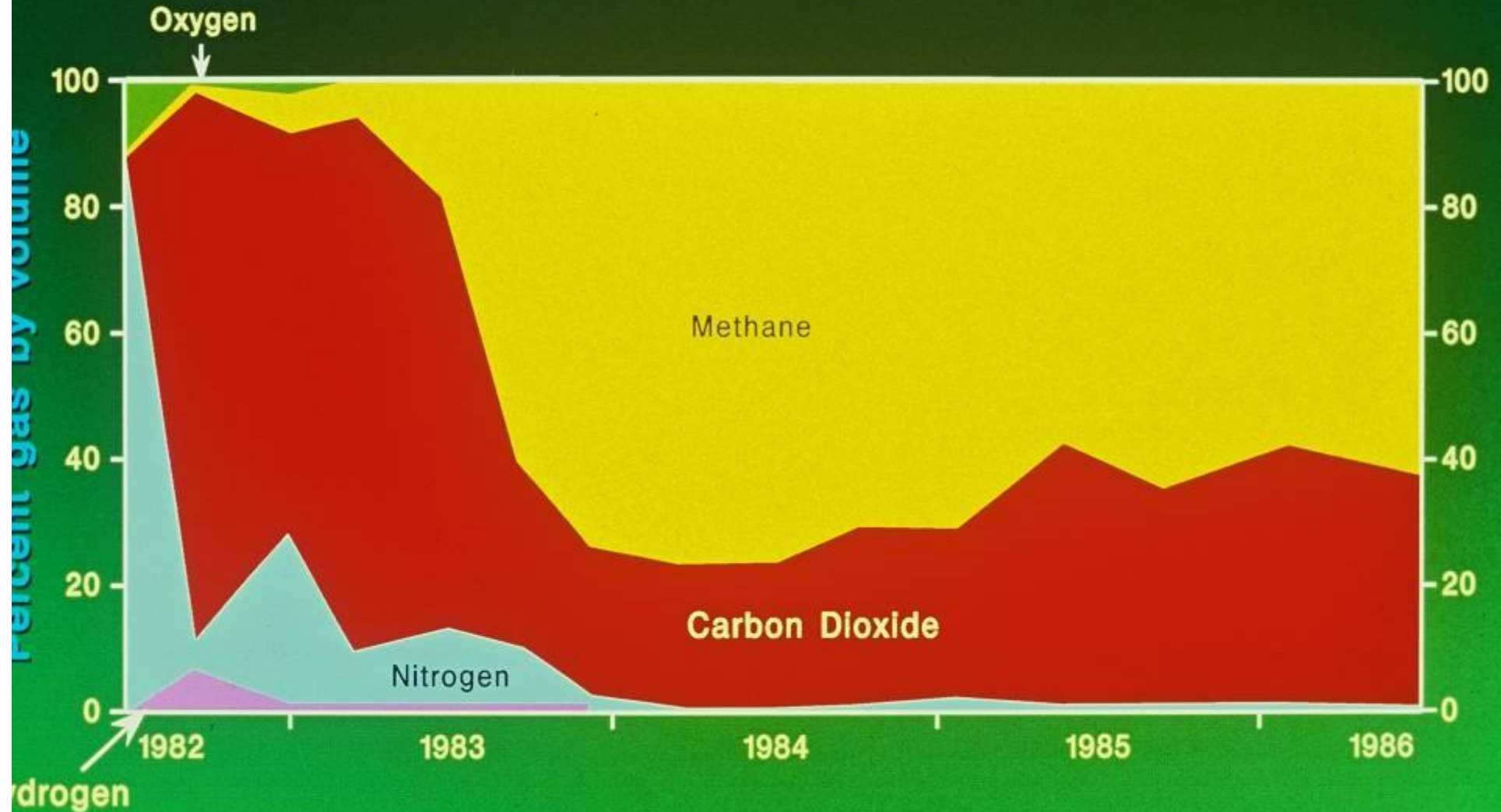




FIGURE 0.1

Distribution of all of the 72 landfill sites
which were sampled and included
in the review study



Landfill Categories

- **Large, high input rate, relatively dry**
- **Large, high input rate, deep, wet, and “bioreactive”**
- **Large, high input rate, deep, wet and “cold”**
- **Small, limited water ingress**
- **Small, some control of water ingress**
- **Small relatively wet**

Landfill Categories (cont)

- **Large, flat and shallow**
- **Sites containing mainly baled wastes**
- **Sites containing mainly pulverised wastes**
- **Valley landfills, with groundwater ingress**
- **Old landfills, often without engineered restoration**

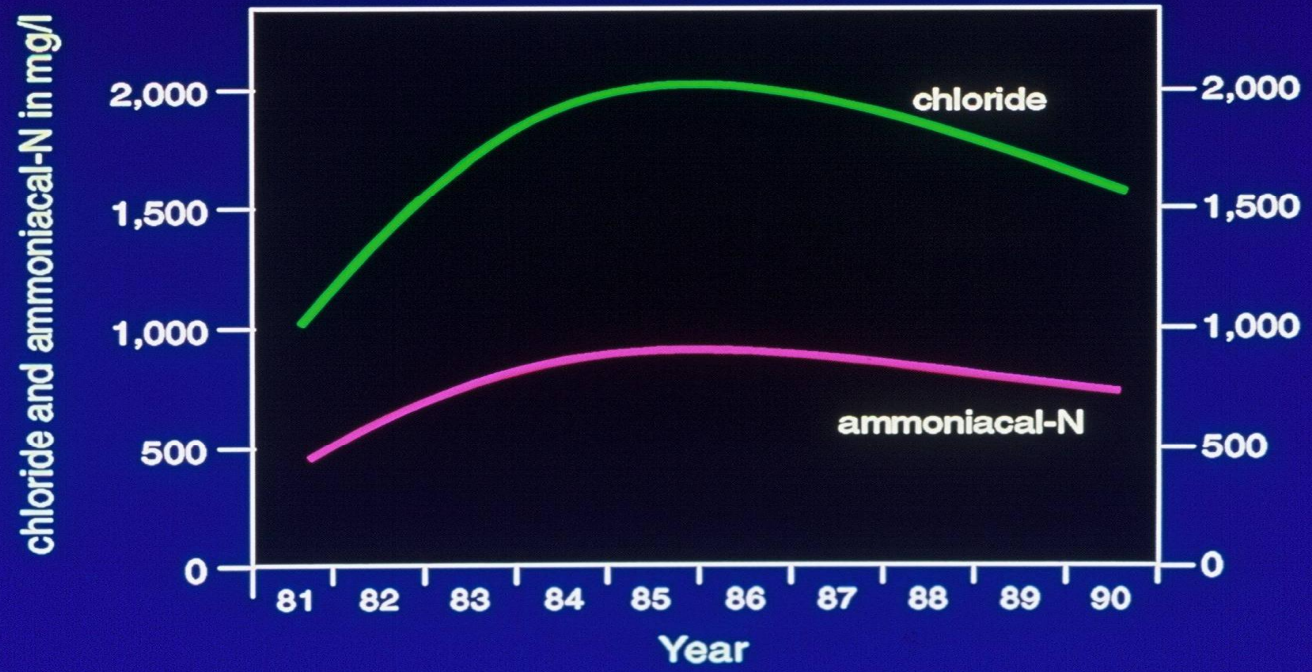
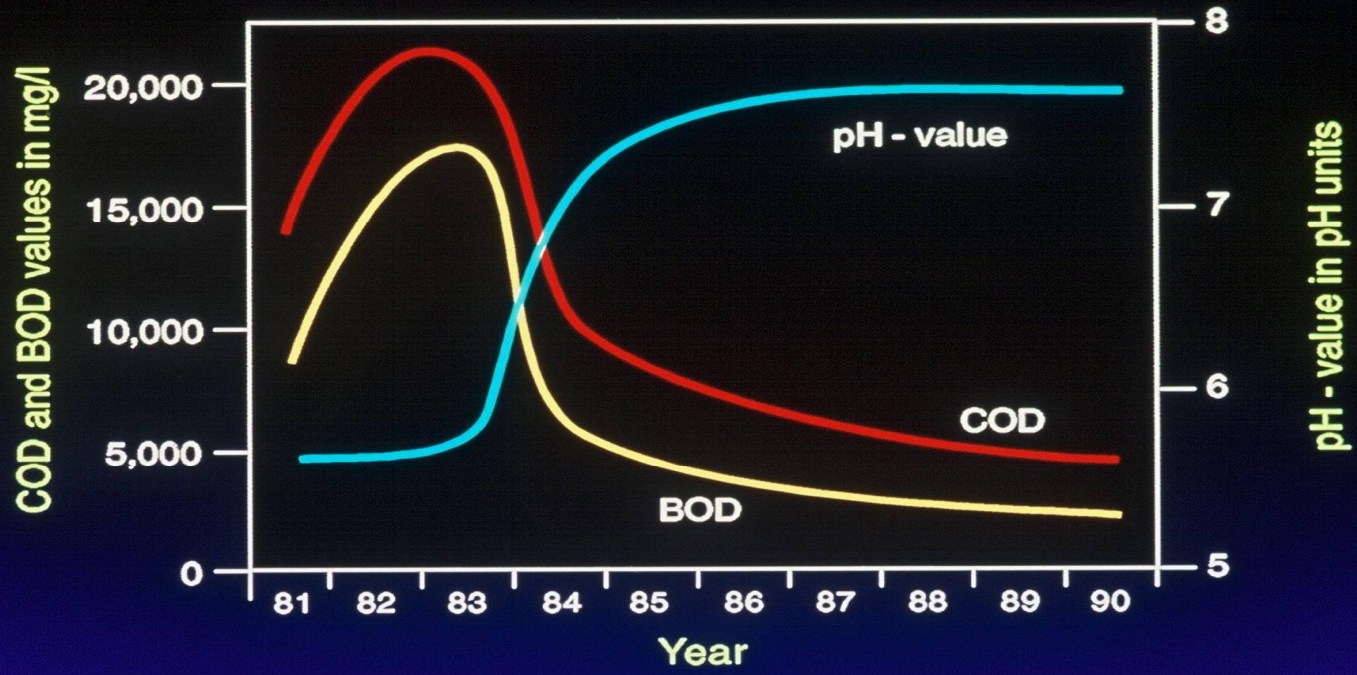
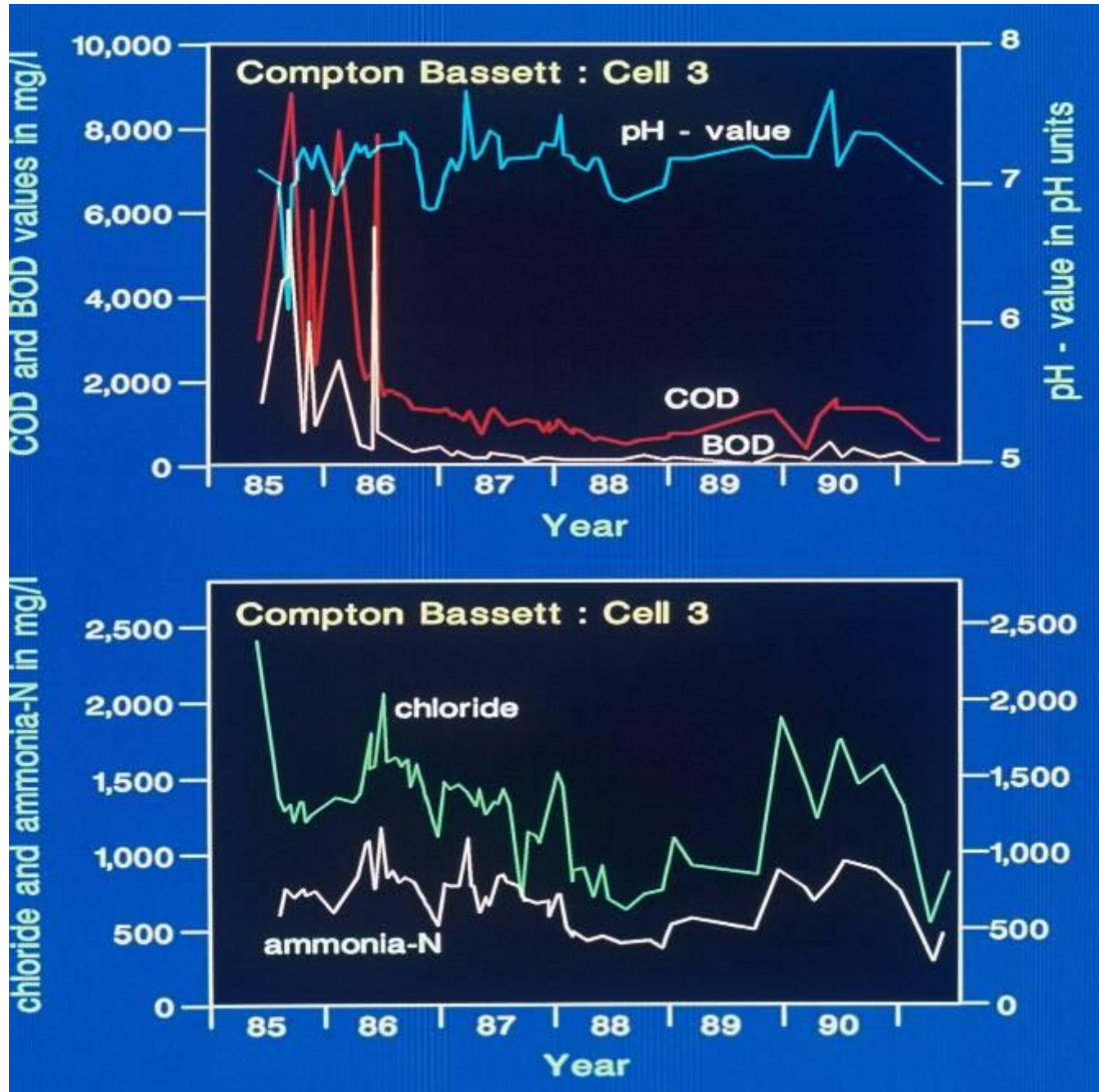


Figure 1.2a

Composition of leachate in cell 3 at Compton Bassett Landfill, 1 May 1985 to 1 June 1991



***Detailed Analytical Suite
Sanitary Parameters etc***

- **Temperature**
- **pH value**
- **Alkalinity**
- **Conductivity**
- **COD**
- **BOD (20 day)**
- **BOD (5 day)**
- **TOC**
- **Fatty Acids**
- **Ammonia-N**
- **Kjeldahl-N**
- **Nitrate-N**
- **Nitrite-N**
- **Sulphate**
- **Phosphate**
- **Chloride**
- **Tritium**

Detailed Analytical Suite Metals

- **Boron**
- **Sodium**
- **Magnesium**
- **Aluminium**
- **Silicon**
- **Potassium**
- **Calcium**
- **Vanadium**
- **Chromium**
- **Manganese**
- **Iron**
- **Nickel**
- **Copper**
- **Zinc**
- **Arsenic**
- **Cadmium**
- **Tin**
- **Mercury**
- **Lead**

Detailed Analytical Suite Organic Parameters

- **Cyanide**
- **Monohydric phenols**
- **Dichlorvos**
- **Malathion**
- **Parathion**
- **Parathion-methyl**
- **Fenitrothion**
- **Fenthion**
- **Azinphos-ethyl**
- **Azinphos-methyl**
- **Gamma-HCH (lindane)**
- **Aldrin**
- **Dieldrin**
- **Endrin**
- **P',P' – DDT**
- **PCB (as Arochlor 1254)**
- **Endosulphan-B**
- **Trifluralin**

Levels of Cadmium in Domestic Refuse Leachates

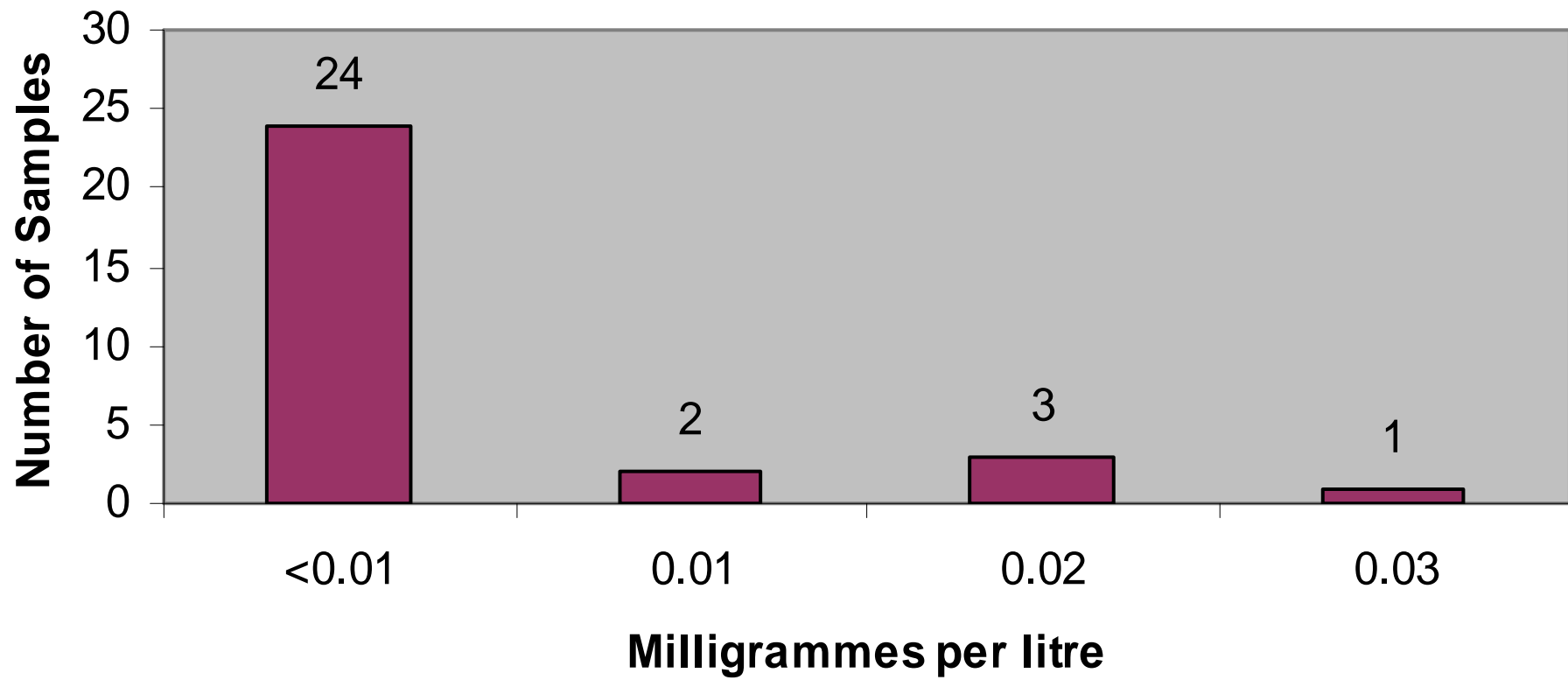


FIGURE 2

Distribution of the 30 landfill sites from which leachate samples were obtained for very detailed analysis :





Landfill 'danger to sex health'

THE sex change chemicals causing a baby milk scare could seep into the ecosystem through dumps, an environmentalist claimed yesterday.

After giving evidence to the Larne super-dump inquiry, Professor Chris Baines said the chemicals, known as phthalates, are present in plastics found at most landfill sites.

Professor Baines gave evidence yesterday on



INDEPENDENT

35p

(Irish Republic 45p)

7 June 1995

Scientists deny pollution causes genitals to shrink

BY STEVE CONNOR
Science Correspondent

Three of the world's leading experts on male fertility have condemned environmental activists for claiming that pollution is causing sperm counts to fall and penises to shrink.

The scientists say it is premature to state that

Green groups believe falling sperm counts, rising levels of testicular cancer, congenital defects of the male genitalia and smaller penises are the result of organochlorine chemicals being released into the environment.

Advertisements from the
est Green

evidence to show that this is correct. Our hypothesis is based on evidence too limited to allow firm conclusions to be drawn.

They continued: "It is premature to call for



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FLY KILLER
COMPLETE PROTECTION
FROM FLIES AND FLYING INSECTS
FOR UP TO 4 MONTHS



Effective products
you needn't worry about using



USE ONLY IN POSITIONS INACCESSIBLE TO CHILDREN &
THIS MATERIAL AND ITS CONTAINER must be dis
READ ALL PRECAUTIONS BEFORE USE. HSE NO. 4

PRECAUTIONS

- **WASH HANDS** after handling.
- **KEEP IN A SAFE PLACE.**
- **KEEP OUT OF REACH OF CHILDREN.**

Active ingredient -
contains dichlorvos 20% w/w.
Average net contents 73g.

This product is approved under
The Control of Pesticides Regulations 1986
for use as directed. HSE No. 4717.

Ashe Ltd
Distributed by

DAILY EXPRESS



BRITAIN'S BIGGEST WEEKEND PACKAGE. TODAY 120 PAGES

The World's Greatest Newspaper

SATURDAY APRIL 20, 2002 50p

Insect-killing products banned over cancer fear



LORD WHITTY: Waiting to hear extent of risk

SHOPS were yesterday ordered to immediately clear their shelves of almost 50 makes of insect killer amid fears they could cause cancer.

The Government cannot rule out a link between the long-term use of certain fly, moth, wasp and cockroach killing products and skin, liver and breast cancer.

The 47 products, some from household names such as Boots, Superdrug and Vapona, are now suspended following the move by ministers acting

By **Sarah Westcott**
Consumer Editor

on scientific advice. The decision makes it illegal to sell, advertise or supply any of the products concerned.

Health chiefs stressed it was a precautionary move until further chemical tests have been conducted. The Department for Environment, Food and Rural Affairs said: "This decision will minimise the exposure of householders

and those who work with pesticides from a remote but potentially significant risk to their health."

The decision follows advice from the independent Advisory Committee on Pesticides which said it could not rule out a cancer risk from a chemical called dichlorvos which all the products contain.

Dr Alan Whitehead, Health and Safety Minister, said: "This is a responsible precautionary step, and one

which has been taken in the light of careful consideration of independent scientific advice."

There are fears that long-term exposure to the chemical, which is also found in some horticultural products, could be linked to the three types of cancer.

Production of Vapona sprays is understood to have already been halted by United States makers Sara Lee.

ACP chairman Professor David Coggon added: "It is

not illegal to continue to store or use the products, as long as this is done safely."

Food and Farming Minister Lord Whitty said the suspension would stay until "acceptable data" on the cancer-causing potential was given to the ACP and it was "acceptably" safe. Scientists are "reassessing" the risk agricultural and non-agricultural pesticide products present to consumers, workers and the environment.

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Loving husband in anniversary tragedy **Romantic Len, 86, crushed by dustcart**

A MAN of 86 out shopping for a 35th wedding anniversary present for his wife was crushed by a dustcart.

But the accident could not stop Leonard Redfern, of Warwick Road, Thorpe Bay, handing to his wife Olive a pink coral necklace he had bought as he lay in

Southend Hospital with two broken hips, a broken ankle, a fractured pelvis and a broken thumb.

The old romantic had his accident with the dustcart in a service road behind Marks and Spencer, in Southend High Street.

Transport

He was walking to catch a bus after buying the present. He was pinned under the cart, and police say he is lucky not to have lost his legs.

Olive, 64, had to make a mad dash from the Chelsea Flower Show to be by his side.

She said last night: "They called me over the loudspeaker and even tried to arrange transport across London.

"But he's OK, a little shocked and with quite a few broken bones, but he's tough.

"I told him a few days ago our 35th anniversary on June 7 is our coral or jade one. He must have gone out specially to buy the necklace.

"When I arrived at the hospital, he held it out and just said: 'Here's your coral!'"

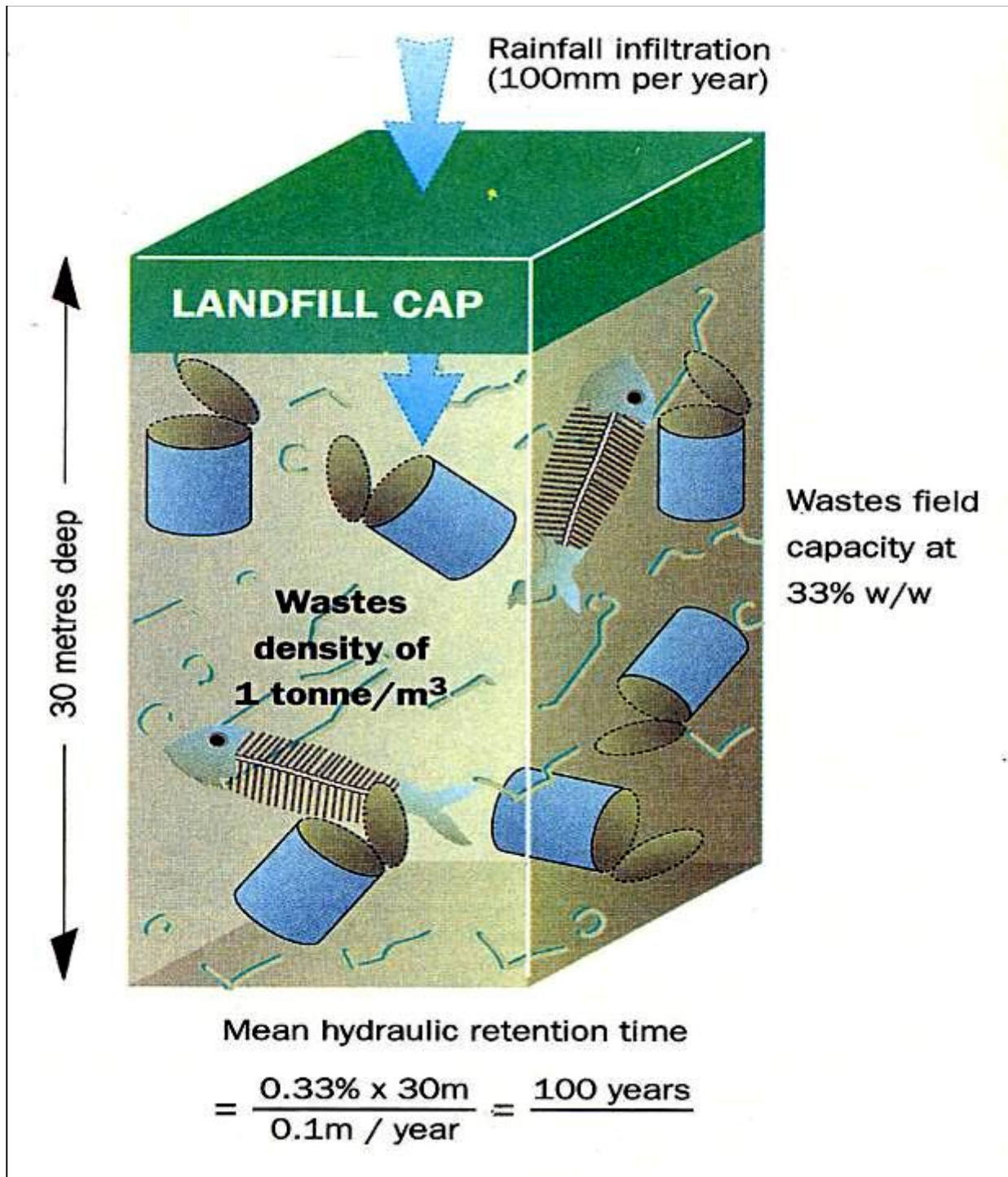
"Now we won't be able to celebrate because he'll be in traction for about six weeks."

Active

Olive said of her husband: "He is still very active man for his age.

"We're all hoping this doesn't slow him down too much."

The dustcart was driven by Mr Denn Henderson, 30, of Cunningham Close, Shoebury.





The brontosaurus

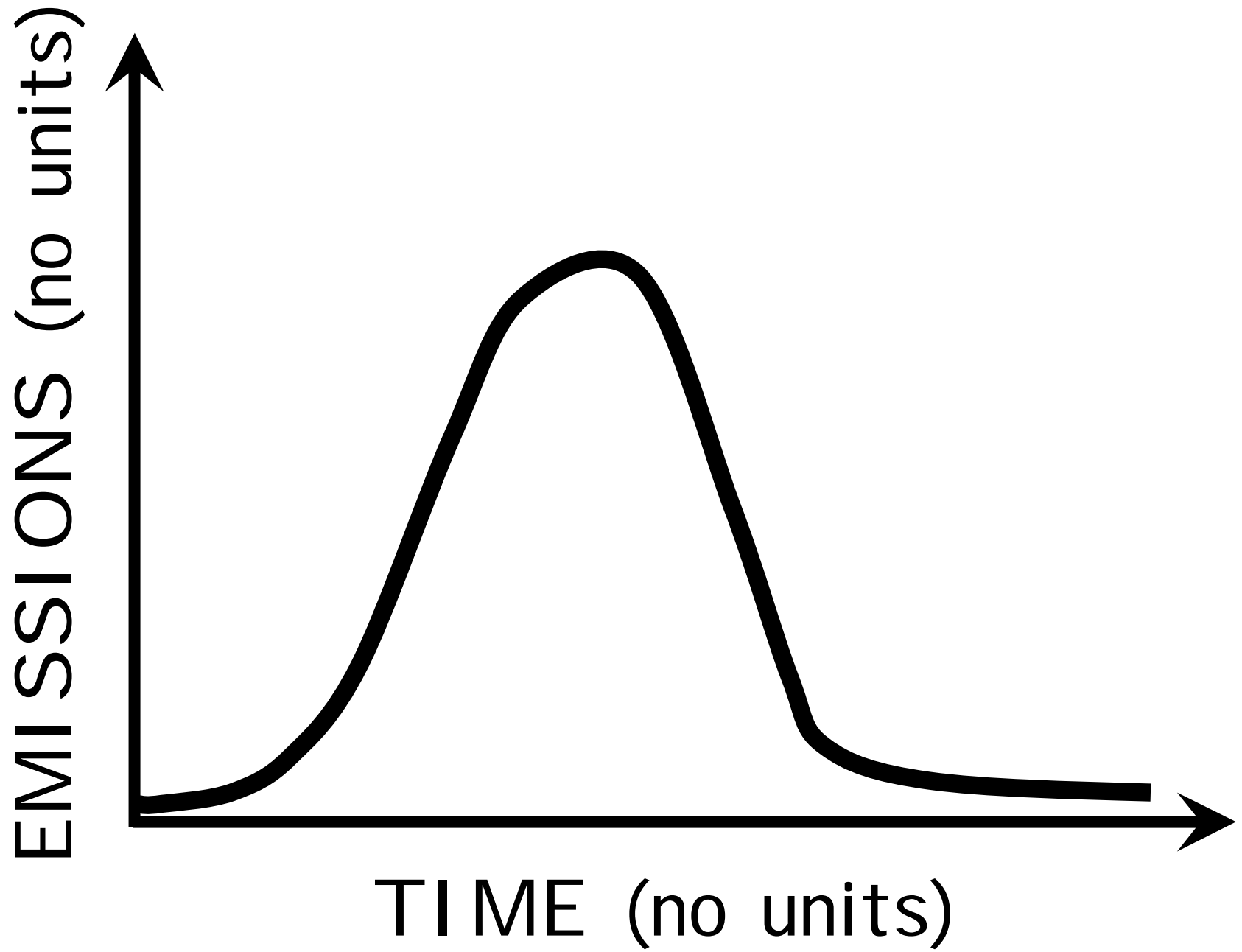


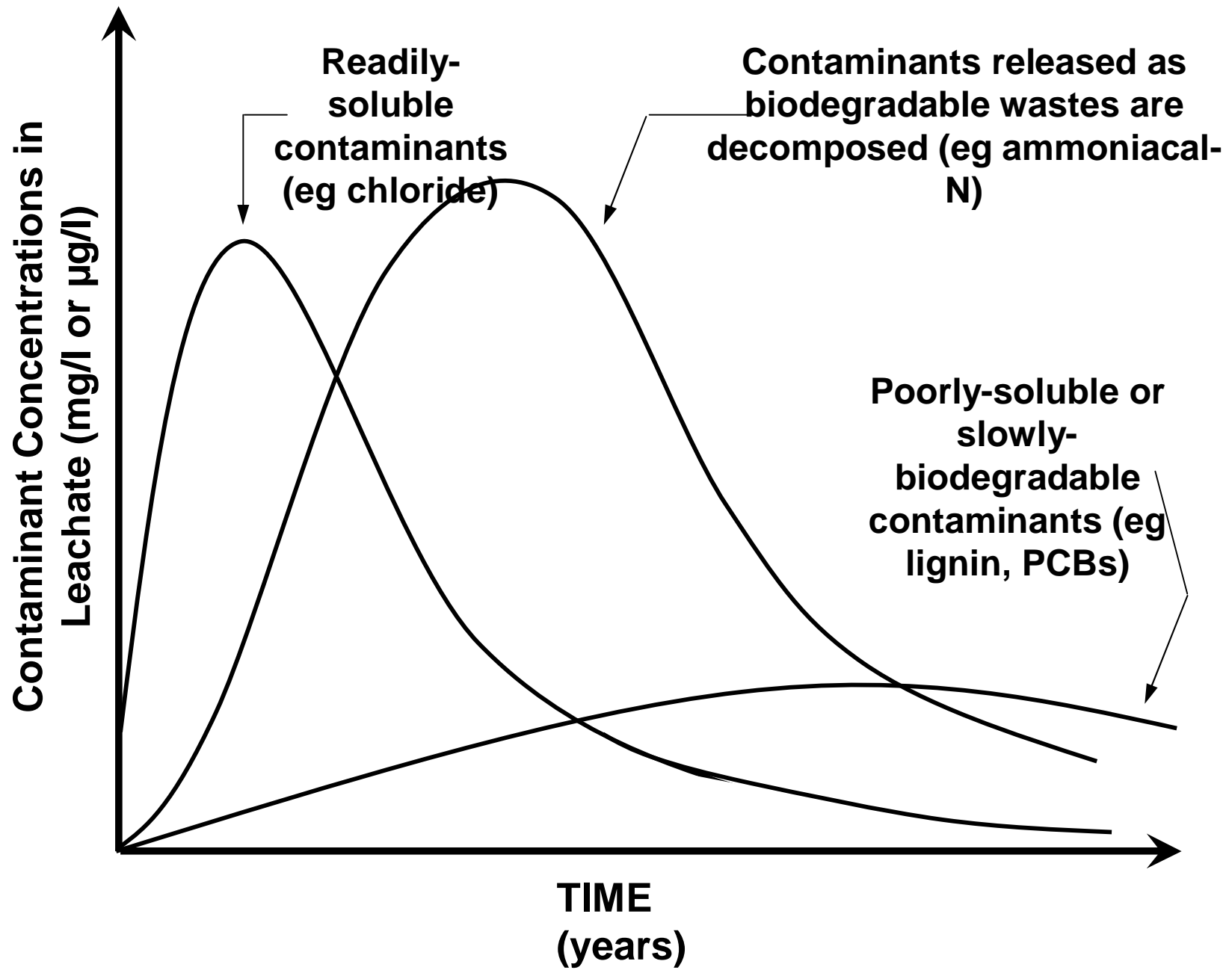


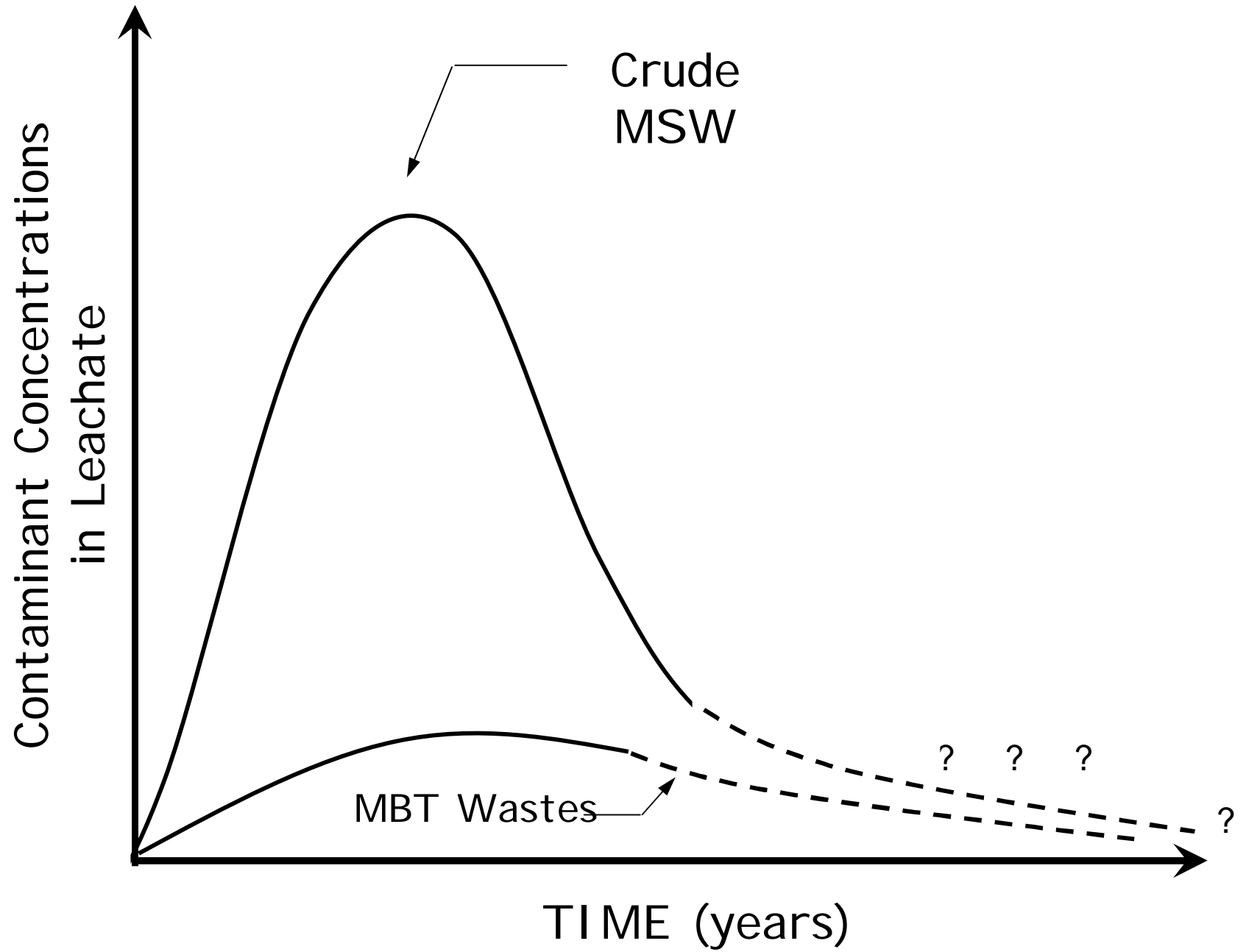
Theory on Brontosauruses
By Ann Elk (Miss)

“All brontosauruses are thin at one end, much much thicker in the middle,

and then thin again at the far end”.









On-site treatment systems

T1 = methane stripping

T2 = engineered wetlands/ reed beds

T3 = biological treatment

**T4 = biological treatment + polishing
(various)**













Examples of removal by treatment (%)

	Mecoprop	Nickel
Methane stripping	50	0
Reed bed	95	0
Biological	99	20
Biological + polishing	99.5	20

Daily discharge flows (m³/d) below which reporting would be unnecessary

	mecoprop	toluene
Raw	259	129
T1	498	172
T2	4981	129
T3	24907	644
T4	49813	644



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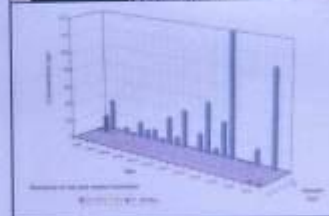
FINAL REPORT

Pollution Inventory
discharges to sewer or surface
waters from landfill leachates

Ref: REGCON 70 May 2001

Enviros Aspinwall
Walford Manor
Baschurch
Shrewsbury
Shropshire
SY4 2HH

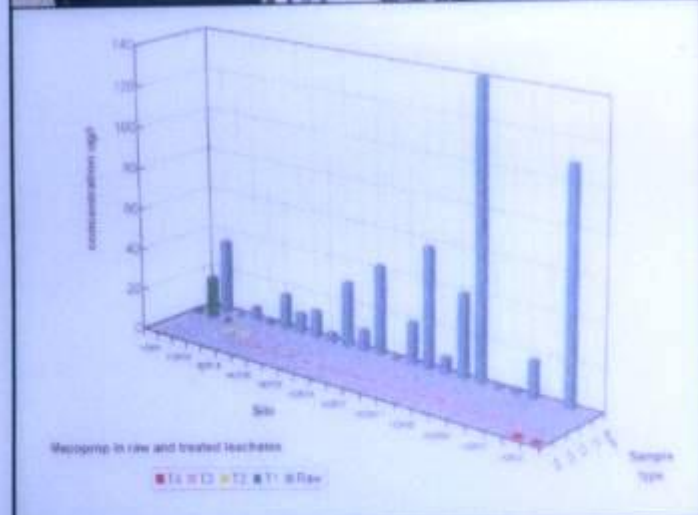
Knox Associates
Barnston Lodge
50 Lucknow Avenue
Mapperley Park
Nottingham
NG3 5BB



Comparison of reporting levels with reduction levels achieved in this study

Pollutant	Reporting level		Reduction level achieved in this study	
	mg/l	ppm	mg/l	ppm
Ammonia	1.0	10	0.1	1
Biochemical Oxygen Demand	10	100	1	10
Chemical Oxygen Demand	10	100	1	10
Copper	0.1	1	0.01	0.1
Lead	0.1	1	0.01	0.1
Nitrate	10	100	1	10
Nitrite	1	10	0.1	1
Phosphate	0.1	1	0.01	0.1
Sulphate	10	100	1	10
Total Dissolved Solids	10	100	1	10
Total Suspended Solids	10	100	1	10
Zinc	0.1	1	0.01	0.1



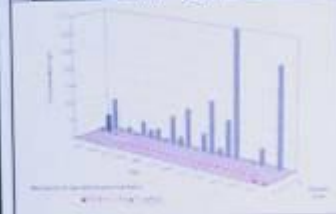


**ENVIRONMENT
AGENCY**

FINAL REPORT

Pollution Inventory discharges to sewer or surface waters from landfill leachates

Ref: REGCON 70 May 2001



ENVIRONMENT
AGENCY

FINAL REPORT

Updating the Landfill Leachate Pollution Inventory Tool

R&D Technical Report
No. PI - 496 / TR (2)
March 2003

Enviros
Shrewsbury Business Park
Shrewsbury
Shropshire
SY2 6LG

Knox Associates
Barnston Lodge
50 Lucknow Avenue
Mapperley Park
Nottingham NG3 5BB

Comparison of reporting limits with detection limits achieved in this study

Parameter	Reporting limit		Detection limit	
	mg/l	µg/l	mg/l	µg/l
Ammonia	1.0	100	0.1	10
Barium	1.0	100	0.1	10
Boron	1.0	100	0.1	10
Calcium	1.0	100	0.1	10
Chloride	1.0	100	0.1	10
Copper	1.0	100	0.1	10
Fluoride	1.0	100	0.1	10
Iron	1.0	100	0.1	10
Lead	1.0	100	0.1	10
Magnesium	1.0	100	0.1	10
Manganese	1.0	100	0.1	10
Nickel	1.0	100	0.1	10
Phosphate	1.0	100	0.1	10
Potassium	1.0	100	0.1	10
Sulphate	1.0	100	0.1	10
Zinc	1.0	100	0.1	10



Conclusions

- **EPER lists 26 substances for reporting**
- **UK PI requires reporting of 65 substances**
- **Only 12 of 65 substances in >5% of leachates**

Conclusions

- **For typical UK landfill discharge flows, several of these 12 are below reporting thresholds, even in raw leachates**
- **Many others are removed well by treatment**

Conclusion

- **Substances likely to have to be reported most often in raw leachate are:**
 - **Zinc (in acetogenic leachates)**
 - **Xylenes**
 - **Toluene**
 - **Mecoprop**

Make sure you complete your reports



DENNIS *the* MENACE AND GNASHER

CONTINUED FROM FRONT PAGE

Presently—

COO! LEACHATE!



LEACHATE



BUSTERS









