



Australian Runoff Quality Chapters 2, 3, & 7

Stormwater Contaminant Processes and
Pathways, Characteristics, and
Management Targets

Australian Runoff Quality
A guide to Water Sensitive Urban Design





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What's the Problem?

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Chapter 2

Stormwater Contaminant Processes and Pathways

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Waterway Values

ANZECC Guidelines identify six categories of quality-dependent waterway values

- Aquatic ecosystems
- Recreation and aesthetic use
- Drinking water supply
- Primary industry water supply
- Industrial water supply
- Cultural and spiritual values

Major Stormwater Stressors



- Toxicants (heavy metals, hydrocarbons, pesticides, ammonia)
- Nutrients (phosphorus, nitrogen, carbon)
- Oxygen demanding substances (organic material (BOD), ammonia, hydrocarbons, sulphides)
- Physical pollutants (suspended solids)
- Microbial pathogens (viruses, bacteria, protozoa, helminths)
- Aesthetic pollutants (gross pollutants, litter, algal blooms, scums & odours)
- Change in streamflow levels & frequency

Contaminant Mobilisation & Transport Pathways



- Impervious areas
 - High flow rates (water) and delivery rates (contaminants)
 - Leaching and abrasion of the surface
 - Bitumen, concrete, metals
 - Washoff of accumulated material
 - Particles, litter, oils, nutrients, pesticides, etc
- Duplex soils
- Deep porous soils



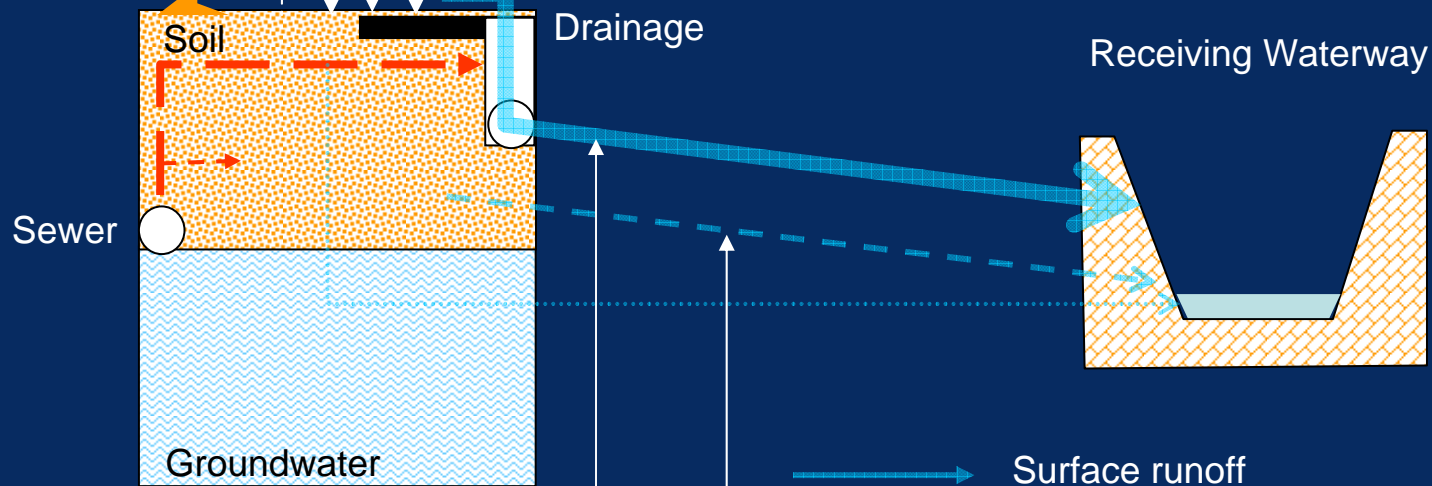
Evapotranspiration

Rainfall

Vegetation

Impervious area

Duplex Soils



Dominant pathway surface runoff high in TSS, adsorbed pollutants, and gross pollutants

Secondary pathway soil interflow relatively low in pollutants typically present in colloidal or dissolved forms

- Surface runoff
- Soil Interflow
- Throughflow/groundwater discharge
- Sewer overflow





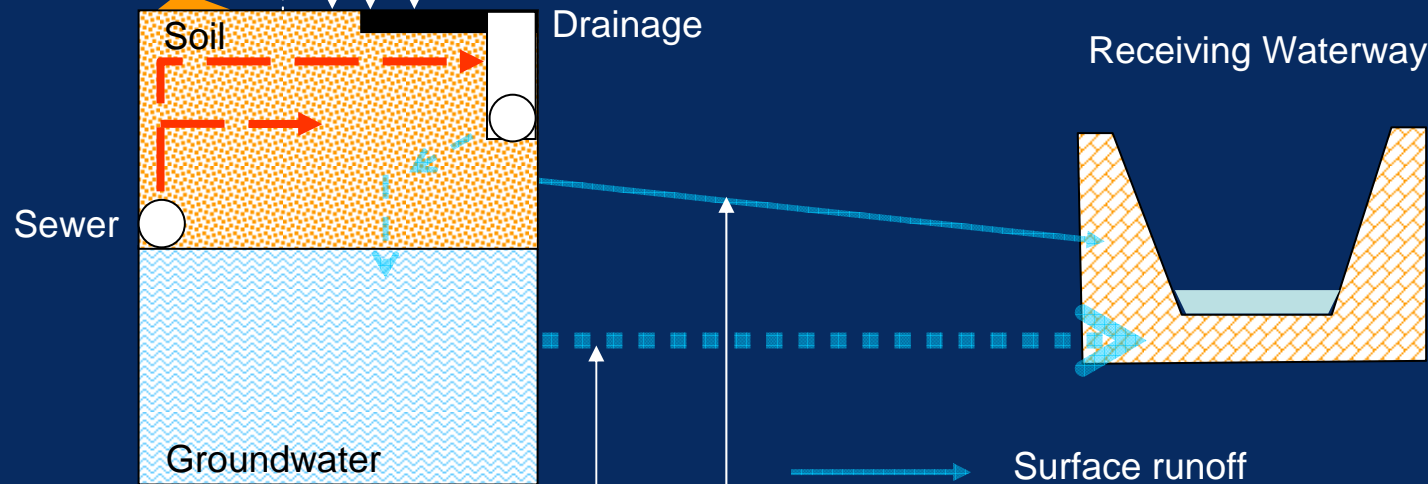
Evapotranspiration

Rainfall

Vegetation

Impervious area

Deep Porous Soils



Dominant pathway groundwater discharge high in dissolved pollutants

Surface runoff from impervious areas High in TSS, adsorbed pollutants, and gross pollutants

- Surface runoff
- Soil Interflow
- Throughflow/groundwater discharge
- Sewer overflow







Chapter 3



Urban Stormwater Pollutant Characteristics

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Processes

- Traditionally described and modelled in terms of buildup and washoff
- Buildup is usually large compared with washoff in a single event
- Washoff is the critical process
- Rainfall pattern (intensity, energy) is the most important storm factor
- Construction activity with disturbed soil is the most important catchment factor

Stormwater Quality Literature Review

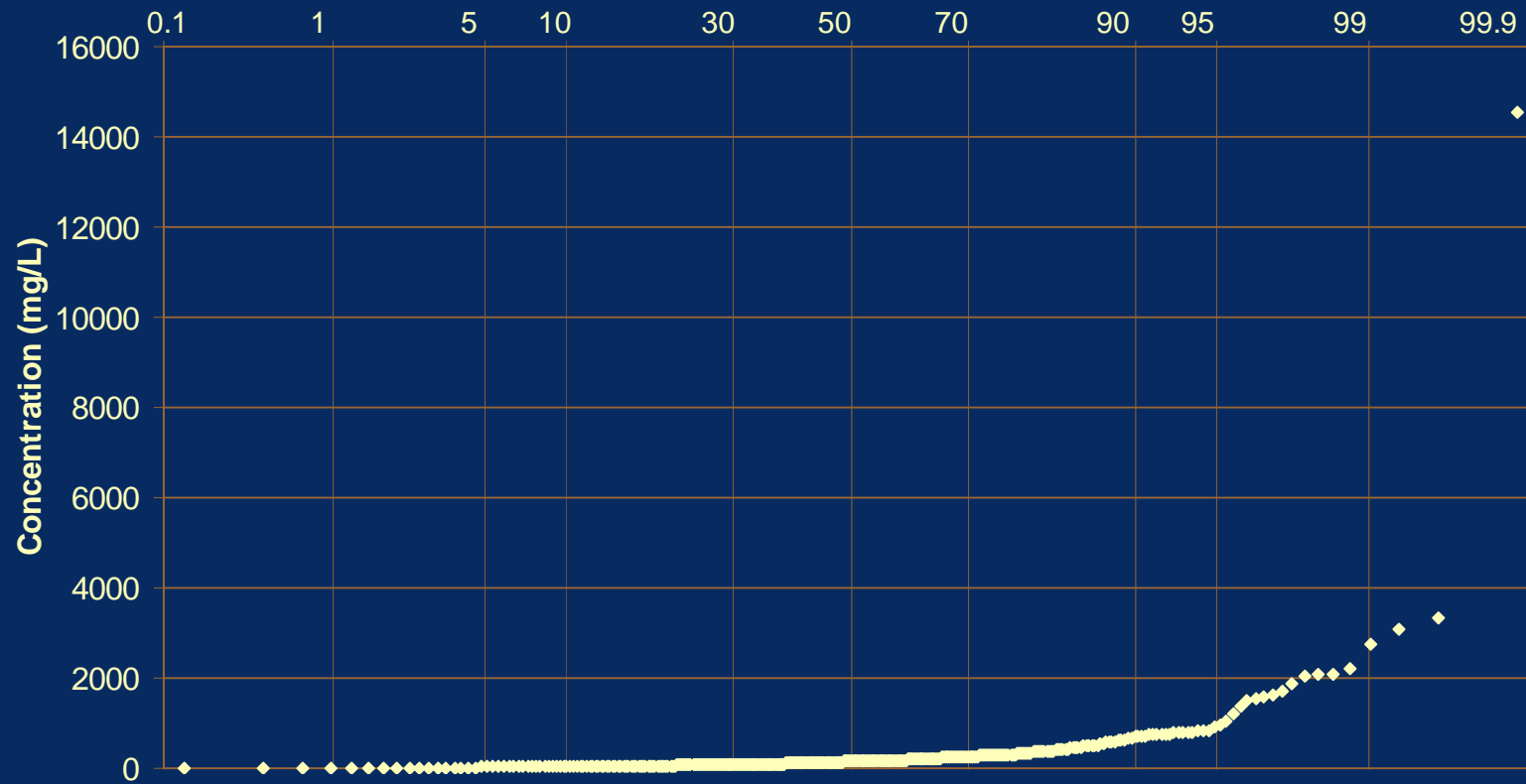


- An analysis of published stormwater quality data
 - 508 data records (site means)
 - 21 quality parameters (3 today)
- Concentration vs land use and catchment characteristics

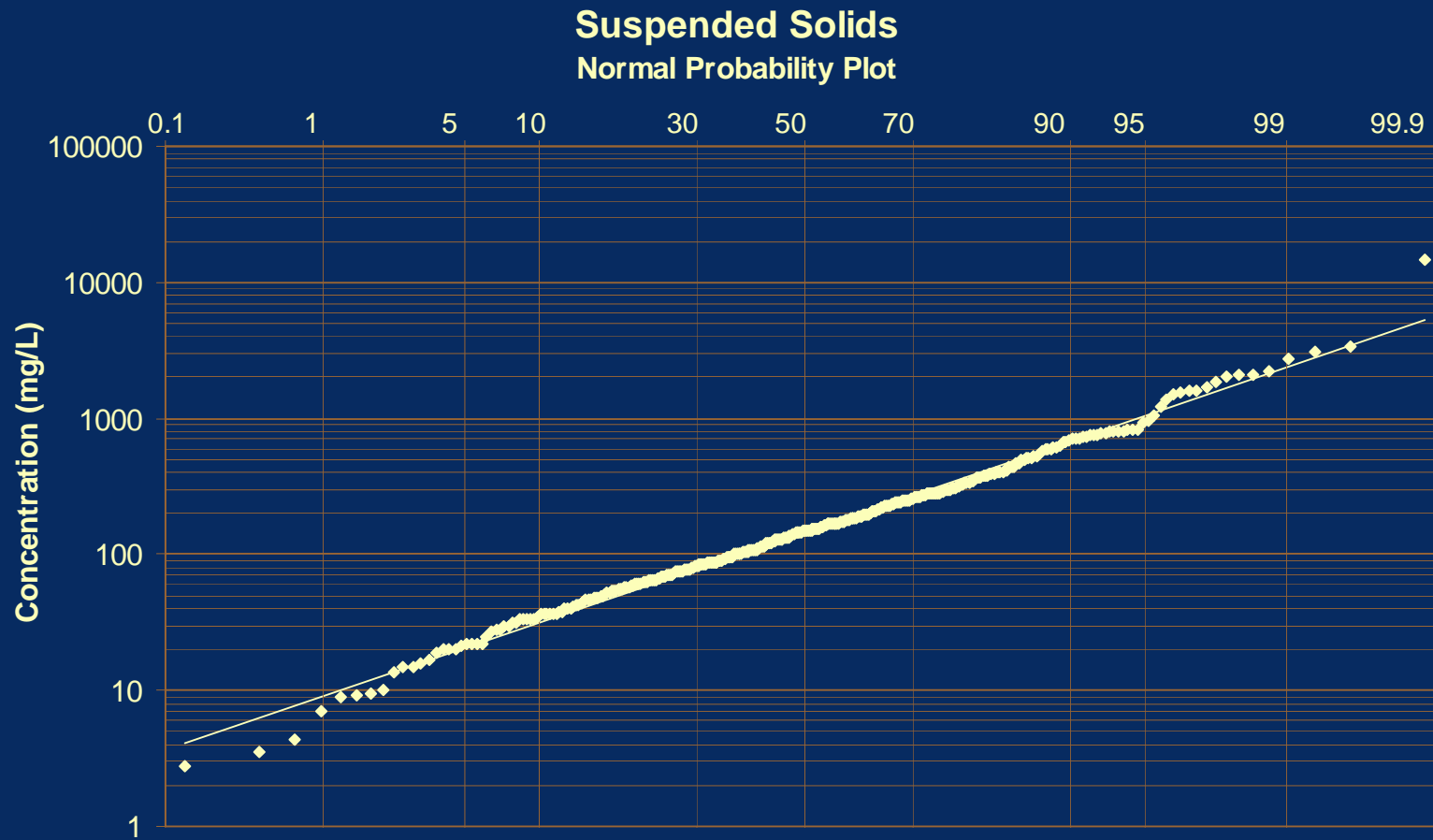
Suspended Solids Normal Probability Plot



Suspended Solids
Normal Probability Plot

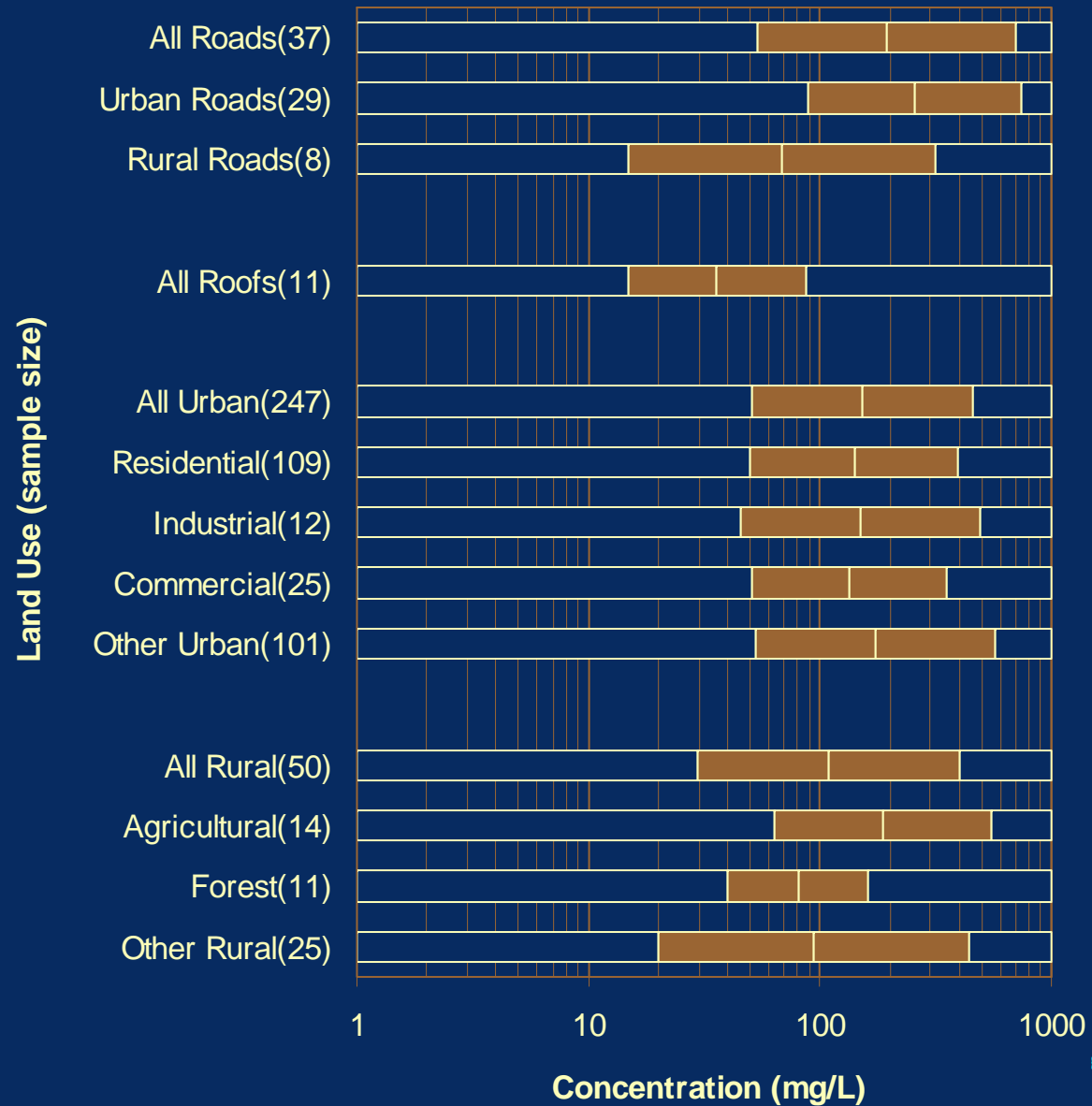


Suspended Solids Log-Normal Probability Plot



Suspended Solids

Suspended Solids
Mean \pm 1 Standard Deviation



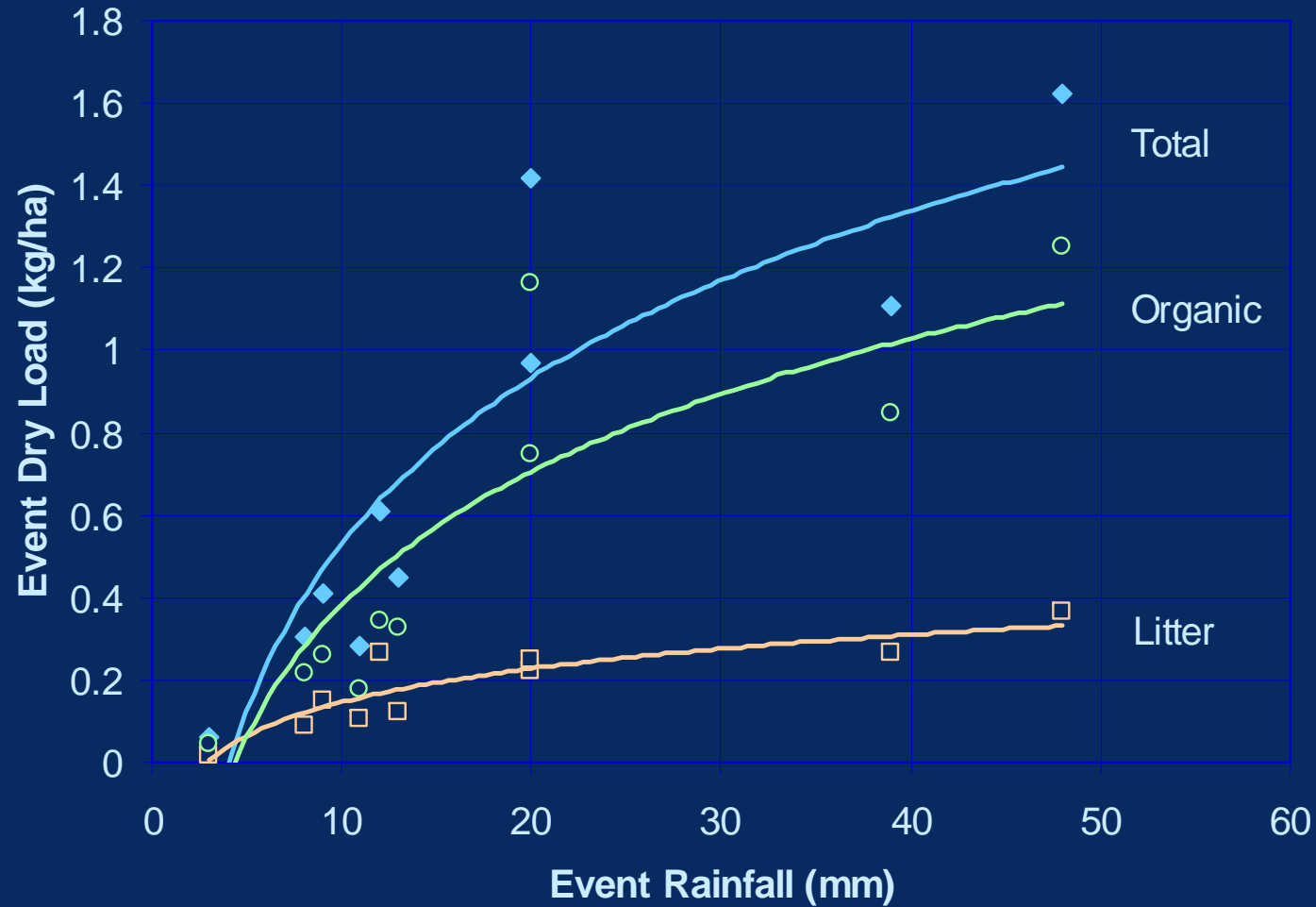
Gross Pollutants

- Larger particles of natural and artificial material
- Distinctive features are larger size and/or lower density
- Very difficult to sample accurately
- Natural organic matter is the larger fraction
- Litter fraction is mostly plastic, then paper, then glass/metal/other
- Wide variation between catchments

Gross Pollutants



Gross Pollutants







Chapter 7



Establishing Stormwater Management Targets to Protect Receiving Waters

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Assessment Framework

- National Water Quality Management Strategy (NWQMS)
- Guidelines for Fresh and Marine Water Quality 2000 (ANZECC Guidelines)
- Australian Guidelines for Water Quality Monitoring and Reporting 2000

Waterway Ecosystem Health

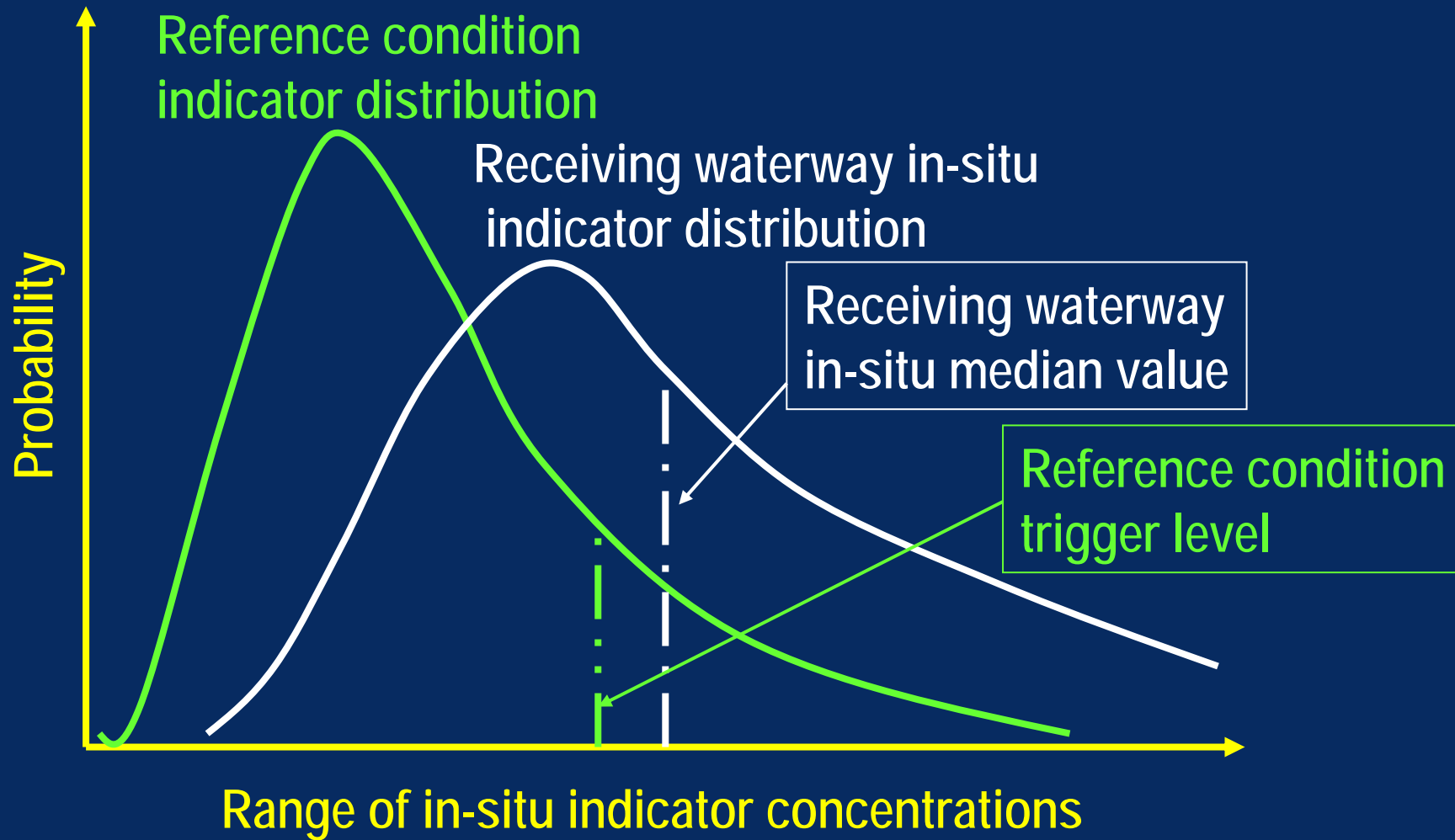


- Waterway ecosystem health and environmental values depend on:
 - Protection of waterway morphology
 - Protection of aquatic habitat (riparian and instream)
 - Protection of water quality
 - Maintenance of flow patterns that sustain diversity and life cycles of biota
- Connectivity is a key indicator of urban waterway impairment (Walsh 2000)

Application

- In-situ water quality trigger level of the receiving water
- Derived from percentile values of the regional reference ecosystem
 - Pristine – no change
 - Slightly to moderately modified – 20/80%ile
 - Highly modified – 10/90%ile
- Estimate receiving water quality using simplified models (Appendix B)
- Find Permissible Average Annual Export Load from complying case

Example



Performance Monitoring

- Need to define purpose and objectives of a monitoring program to meet information needs
 - Monitoring objectives
 - Study design
 - Field sampling program
 - Laboratory analysis
 - Data analysis and interpretation

