Regional Storm Water Monitoring in North Central Texas

by
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What is NPDES?

- National Pollutant Discharge Elimination System
- USEPA outfall permitting program
- Storm water designated a point source under this program in 1990
- Cities of 100,000 or greater included in Phase I of program
- Phase II (remaining cities and counties in urbanized areas) exempted until March 2003
Phase I Attributes

- MS4s had to develop and submit comprehensive applications
- MS4s had to negotiate the permit details with USEPA or delegated State
- Wet and dry weather monitoring required
- Required to reduce or eliminate pollutants to the Maximum Extent Practicable
- Permits cover 5 years
Participants in the North Central Texas Regional Monitoring Program

- Seven largest cities - Dallas, Fort Worth, Arlington, Irving, Garland, Mesquite, Plano
- Texas Department of Transportation - Dallas and Fort Worth Districts
- US Geological Survey
- North Central Texas Council of Governments
USGS Assistance with Application Phase Monitoring

- Establish and operate 30 water quality monitoring stations.
- Sample outfalls from small, single land use watersheds w/ automated samplers.
- Collect quantitative data from 7 storm events at each station = 210 indiv. events.
- Monitor for approx. 190 parameters.
- Estimate event mean concentrations and pollutant loads for selected parameters.
- Assist in designing a monitoring program for the permit term.
City Participants in the Regional Strategy for North Central Texas
Most Common Constituents Found for Each Land Use Category

**Residential**
- Arsenic
- COD
- Fecal coliform
- Fecal streptococcus
- Total phosphorus
- Dissolved phosphorus
- Total nitrogen
- TKN

**Industrial**
- Chlordane
- Diazinon
- Cadmium
- Chromium
- Lead
- Nickel
- Phenols
- TSS
- Chloride
- Copper
- Mercury
- Oil & Grease
- Sulfate
- Zinc
- Total phosphorus
- Phenols
- TSS
- Zinc
Designing Permit Term Monitoring

– USGS conducted a network analysis to statistically define the temporal and spatial variability of the water quality data.
– Reduced site redundancy by retaining 15 of the original 30 sites.
– Proposed 7 new sites in 3 new categories.
– Parameter set reduced from 190 to 22 key constituents.
Regional Permit Term Monitoring Program

- Wet weather monitoring
  - 15 existing single land use sites
  - 4 new mixed land use outfall sites
  - 3 new mixed land use in-stream sites
  - total of 350 site-events over 5 years

- Bioassessment monitoring
  - Fort Worth program
  - Dallas program
Regional Permit Term Parameters

- Biochemical Oxygen Demand
- Chemical Oxygen Demand
- Total Suspended Solids
- Total Dissolved Solids
- Cadmium
- Copper
- Lead
- Zinc
- Dissolved Phosphorus
- Total Phosphorus
- Total Kjeldahl Nitrogen
- Nitrates + Nitrites
- Total Nitrogen
- Chromium
- Arsenic
- Fecal coliform bacteria
- Fecal streptococci bact.
- pH
- Diazinon
- Oil & Grease
- Water Temperature
- Total Hardness
Comparison of Permit Term Data

Box-Whisker Plot

Shows actual distribution of the data. The horizontal lines of a box plot mark the minimum, maximum, and the 10th, 25th, 50th (median), 75th, and 90th percentile points.
APPLICATION PHASE VS PERMIT TERM

CHEMICAL OXYGEN DEMAND
Application vs Permit Term (All Landuses Combined)

FECAL COLIFORM
Application vs Permit Term (All Landuses Combined)

OIL & GREASE
Application vs Permit Term (All Landuses Combined)

TOTAL SUSPENDED SOLIDS
Application vs Permit Term (All Landuses Combined)

Arrows denote statistically significant difference
APPLICATION VS PERMIT TERM

TOTAL NITROGEN
Application vs Permit Term (All Landuses Combined)

COPPER
Application vs Permit Term (All Landuses Combined)

TOTAL PHOSPHORUS
Application vs Permit Term (All Landuses Combined)

LEAD
Application vs Permit Term (All Landuses Combined)
LANDUSE COMPARISON (Cumulative Years 1 – 5)

CHEMICAL OXYGEN DEMAND

FECAL COLIFORM

OIL & GREASE

TOTAL SUSPENDED SOLIDS
LANDUSE COMPARISON (Cumulative Years 1 – 5)

**TOTAL NITROGEN**

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**TOTAL PHOSPHORUS**

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PERMIT YEAR COMPARISON (All Land uses Combined)

**CHEMICAL OXYGEN DEMAND**
All Landuses Combined

**FECAL COLIFORM**
All Landuses Combined

**OIL & GREASE**
All Landuses Combined

**TOTAL SUSPENDED SOLIDS**
All Landuses Combined
PERMIT YEAR COMPARISON (All Land uses Combined)

TOTAL NITROGEN
All Landuses Combined

TOTAL PHOSPHORUS
All Landuses Combined

COPPER
All Landuses Combined

LEAD
All Landuses Combined
DFW Annual Rainfall
During Permit Term

Annual Rainfall

Inches

1996-1997 DFW Station
1997-1998 DFW Station
1998-1999 DFW Station
1999-2000 DFW Station
2000-2001 DFW Station
Long Term Average DFW Station (1974-2001)
Future of the Monitoring Program

• Considering a total revision (tentatively approved by TNRCC)
  – More of a large watershed approach
  – Each permittee address local watersheds
  – Move away from automated sampling to grab samples
  – In-stream sampling instead of storm drain outfall sampling
  – Sample minimum of three zones of each watershed (upper/middle/lower)
  – Participants responsible for collecting samples from their watersheds (using existing staff or hiring consultants)
  – All use a common lab for analysis
  – Participants sample one watershed a year and three watersheds per permit term

• Opportunity to involve other entities in the region and to coordinate with current ambient water quality sampling programs