

Water Quality Studies



- ▶ Environmental Stakeholder Group and Focus Group requested more studies on water quality
- ▶ Goal of the studies were to answer important questions about:
 - ▷ Salt
 - ▷ Water Quality & Quantity
 - ▷ Drainage Patterns & Outfalls
- ▶ Quentin Road stretches across two watersheds
 - ▷ Arlington Heights Branch of Salt Creek
 - ▷ Unnamed Tributary to Buffalo Creek
- ▶ Detailed Studies for Chlorides
 - ▷ Used USGS Frost Model for chloride analysis
- ▶ Detailed Studies for Metals and Total Suspended Solids (TSS)
 - ▷ Used FHWA's Driscoll Model for analysis within Arlington Heights Branch of Salt Creek watershed
 - ▷ Used USGS Drive Model for analysis within Unnamed Tributary to Buffalo Creek watershed

Salt Spray and Salt Splash



- ▶ Studies indicate that 60 to 80 percent of salt runs off with surface runoff, 15 to 35 percent occurs as splash, and up to 3 percent occurs as aerosol spray.
- ▶ Salt splash and spray exposure distances vary according to several factors, such as roadway slope, drainage, traffic levels, wind and weather conditions, and the intensity and frequency of salt treatments.
- ▶ Splash is greatest within 45 to 60 feet of edge of pavement.
- ▶ Spray can carry for greater distances as dry deposition.
- ▶ The deposition of salt decreases with distance.



Chloride Analysis - USGS Frost Model

- ▶ Developed using multiple and simple linear regression models
- ▶ Approved by the IEPA for use in estimating pollutant loading from roadway projects as part of Clean Water Act Section 401 permitting
- ▶ Predicted chloride loading contributed by Quentin Road within the project limits for each watershed

Results

	Arlington Heights Branch Salt Creek			UNT to Buffalo Creek		
	Existing	Alternative 3C	Alternative 5C	Existing	Alternative 3C	Alternative 5C
Drainage Area (sq. mi.)	3			0.2		
Lane Miles (mi.)	1.08	1.42	1.93	1.5	2.06	2.91
Salt Applied (tons/mi.)	6.7					
Salt Applied (tons)	7.24	9.51	12.93	10.05	13.8	19.5
Annual Maximum of Daily Mean Chloride Concentrations (mg/L)	29	30	32	86	108	142

Conclusions

- None of the predicted downstream concentrations for proposed conditions were above the water quality standard for chloride (500 mg/L).
- No net increase in chlorides with incorporation of Best Management Practices within the larger Salt Creek and Buffalo Creek watersheds.
- The Department is considering alternatives to reduce salt spray along Quentin Road including the reduction of the speed limit.
- The Department acknowledges that there is a difference in the amount of chloride applied for Alternatives 3C and 5C and has presented the results of analysis in the Draft Water Quality Modeling Report.
- Chloride is just one of many criteria for consideration to evaluate the benefits of Alternatives 3C and 5C.

Metals and Total Suspended Solids Analysis

FHWA Driscoll Model – Arlington Heights Branch of Salt Creek



- ▶ The FHWA Driscoll Model is a statistical model
- ▶ Model is approved by the IEPA for use in estimating pollutant loading from roadway projects as part of Clean Water Act Section 401 permitting
- ▶ Predicted Metal and TSS loading contributed by the segment of Quentin Road within the project limits and Arlington Heights Branch of Salt Creek Watershed

Results

Stream / Driscoll Model Scenario	FHWA DRISCOLL RESULTS						
	General Use Water Quality Acute Standard			Future Once-In-Three-Years Stream Pollutant Concentration Without Post-Construction Stormwater BMPs			
	Copper (mg/L)	Lead (mg/L)	Zinc (mg/L)	Copper (mg/L)	Lead (mg/L)	Zinc (mg/L)	TSS (mg/L)
Existing	0.042	0.21	0.268	0.012	0.011	0.043	55
Alternative 3C	0.042	0.21	0.268	0.013	0.012	0.048	61
Alternative 5C	0.042	0.21	0.268	0.015	0.013	0.053	68

Note: There is no General Use Water Quality Standard for TSS

Conclusions

- None of the predicted downstream concentrations for proposed conditions were above the general use acute water quality standards.
- No net increase in Metals and TSS is anticipated with incorporation of Best Management Practices (see Pollutant Reduction Remaining Coefficient) at right

BMP	Pollutant Reduction Remaining Coefficient			
	Copper (Cu)	Lead (Pb)	Zinc (Zn)	TSS
Basin	0.540	0.330	0.370	0.170
Vegetated Swale	0.540	0.330	0.370	0.200
Stormceptor	0.288	0.432	0.288	0.480

Metals and Total Suspended Solids Analysis USGS Driver Model – UNT to Buffalo Creek



- ▶ The USGS Driver Model is a multiple linear regression analysis
- ▶ Model is approved by the IEPA for use in estimating pollutant loading from roadway projects as part of Clean Water Act Section 401 permitting
- ▶ Predicted Metal and Total Suspended Solids (TSS) loading contributed by the segment of Quentin Road within the project limits and Unnamed Tributary to Buffalo Creek Watershed

Results

Stream	General Use Water Quality Acute Standard			USGS DRIVER RESULTS			
	Storm Runoff Mean Pollutant Concentration Without Post-Construction Stormwater BMPs						
	Copper (mg/L)	Lead (mg/L)	Zinc (mg/L)	Copper (mg/L)	Lead (mg/L)	Zinc (mg/L)	TSS (mg/L)
Existing	0.042	0.21	0.268	0.019	0.067	0.191	230.08
Alternative 3C	0.042	0.21	0.268	0.019	0.067	0.195	225.18
Alternative 5C	0.042	0.21	0.268	0.019	0.072	0.198	220.61

Note: There is no General Use Water Quality Standard for TSS

Conclusions

- None of the predicted downstream concentrations for proposed conditions were above the general use acute water quality standards.
- No net increase in Metals and TSS is anticipated with incorporation of Best Management Practices (see Pollutant Reduction Remaining Coefficient).
- Downstream concentrations within Buffalo Creek were predicted by conducting a mass balance of the watershed using the rational method equation

BMP	Pollutant Reduction Remaining Coefficient			
	Copper (Cu)	Lead (Pb)	Zinc (Zn)	TSS
Basin	0.540	0.330	0.370	0.170
Vegetated Swale	0.540	0.330	0.370	0.200
Stormceptor	0.288	0.432	0.288	0.480

Parameter	General Use Water Quality Acute Standard	Existing Concentration in Buffalo Creek	RATIONAL METHOD RESULTS Without Post-Construction Stormwater BMPs	
			Alternative 3C	Alternative 5C
Copper, dissolved (mg/L)	0.042	0.0047	0.0047	0.0047
Lead, dissolved (mg/L)	0.21	0.0076	0.0076	0.0077
Zinc, dissolved (mg/L)	0.268	0.0615	0.0615	0.0615
TSS (mg/L)	---	107	106.89	106.68