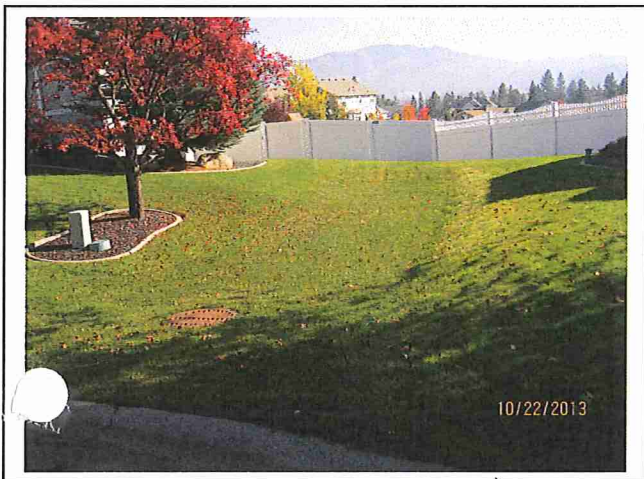


# 2013 DEMONSTRATION SWALES TECHNICAL REPORT



October 2013

**Methodology:** A twelve-inch, dry soil, core sampler was used. Four samples were taken from each swale at selective corners to incorporate a composite representation of the soil. The four samples were then combined. Field samples were site tested for soil moisture. Each sample was divided. Half was placed in sampling jars and taken to Test America Laboratory to be analyzed for hydrocarbons. The remaining soil was placed in zip lock bags and sent to Northwest Agricultural Consultants to be analyzed for Cation Exchange Capacity (CEC), Organic Matter, Free Lime, and pH.

**North Side Swales – sampled 10/22/13** – Average soil samples were a depth of ten inches. Measured precipitation for the month of October was 0.09in. No rain within the past 24 hours. Twenty four core soil samples were taken, four from each of the six north side swales. Swales are identified as the following:

Swale Name: N1  
Location: 12303 N. Denver Dr.  
Type: Grassed swale  
Soil Observations: Bottom one inch of all core samples appeared to be lighter in color than the upper portion, typical of north side native sand bottom three inches of sample. Moisture reading was 30%.

Swale Name: N2  
Location: 12017 N. Morton Dr.  
Type: Grassed swale  
Soil Observations: Samples were extremely wet and light brown to dark brown in color, sticky, clay like soil. Moisture reading was 48%.

Swale Name: N3  
Location: 12025 N. Morton Dr.  
Type: Grassed swale  
Soil Observations: All four samples were sandy soil, shades of light to dark brown. Samples were slightly damp. Moisture reading was 42%.

Swale Name: N4  
Location: 906/912 Chatham Ct.  
Type: Plant swale  
Soil Observations: All four samples dark in color. Little evidence of engineered soil. Moisture reading was lower at 28%.

Swale Name: N5  
Location: 1116/1124 E. Chantel Dr.  
Type: Plant swale  
Soil Observations: The bottom two inches of each core sample was native sandy soil, lighter in color, and course grained. Samples were moderately dry. Moisture reading was 38%.

Swale Name: N6  
Location: 12321 N. Denver Dr.  
Type: Plant swale

Soil Observations: Four inches of gravel on top, remaining brown gravelly soil. . Moisture reading was 40%.

**Southeast Swales – sampled 10/22/13** – Average soil samples were ten inches in depth. Measured precipitation for the month of October was 0.09 in. No rain within the past 24 hours. Twenty four core soil samples were taken, four from each of the six southeast swales. Swales are identified as the following:

Swale Name: SE1  
Location: 17324 E. Galaxy Ln. / 2421 S. Sumner Ln.  
Type: Grass swale  
Soil Observations: Core sampler only able to collect six to eight inches of soil. The engineered soil was prevalent and very dark in color. Moisture reading was 35%.

Swale Name: SE2  
Location: 17606/17602 E. Ridge Ct.  
Type: Plant swale  
Soil Observations: Soil extremely dark in color. Decorative rock mulch is sparse and low in some spots. Moisture reading was 50%.

Swale Name: SE3  
Location: 1134/1138 S. Moen Rd.  
Type: Grass/Plant swale  
Soil Observations: Left side (1138) samples were dark treatment soil, able to push sampler into soil. Right side (1134) showed a lighter clay soil and evidence of ground compaction. Soil was moist. Moisture reading was 54%.

Swale Name: SE4  
Location: 18115 E. 11<sup>th</sup> Ave.  
Type: Grass swale  
Soil Observations: Soil extremely wet and dark in color. Soil moisture content much lower than previous, reading was at 57%.

Swale Name: SE5  
Location: 18418/18506 E. 11<sup>th</sup> Ave.  
Type: Plant swale  
Soil Observations: Soil was dark in color. Plants look healthy and large. Soil was moist with a reading of 52%.

Swale Name: SE6  
Location: 11<sup>th</sup> Avenue Common Area  
Type: Plant swale  
Soil Observations: No standing water. Soil was dark in color. Plants look great. Soil was moist with a reading of 60%.

2013 Demonstration Swale Soil Test Results  
Oct- 2013 North side Swales

Location	CEC Meg/100g 15 to 25	Hydrocarbons are gas, diesel, heavy oil (mg/kg, dry)						pH	% OM	Free Lime %	% Moisture
		gasoline (MRL)	gasoline (actual)	diesel (MRL)	diesel (actual)	heavy oil (MRL)	heavy oil (actual)				
Acceptable range	15 to 25				<500		6.5 - 7.2	5% - 10%	0% to 2+%	35% to 50%	
N1	16.9	10.0	NT	12.0	30.4	29.9	6.6	8.11%	ND	30%	
N2	17.2	10.0	NT	12.4	15.6	31.1	7.1	9.82%	2.65%	48%	
N3	14.1	10.0	NT	11.4	ND	28.4	7.5	7.16%	2.54%	42%	
N4	8.0	10.0	NT	10.8	ND	27.0	7.4	1.78%	2.63%	28%	
N5	13.8	10.0	NT	11.6	13.2	29.1	7.0	5.50%	ND	38%	
N6	19.7	10.0	NT	12.0	19.8	30.0	7.1	9.27%	1.11%	40%	
average	14.9	10.0	NT	11.7	* 13.1	29.3	7.1	6.9%	1.5%	37.6%	
Southeast Swales											
Hydrocarbons are gas, diesel, heavy oil (mg/kg, dry)											
Location	CEC Meg/100g 15 to 25	gasoline (MRL)	gasoline (actual)	diesel (MRL)	diesel (actual)	heavy oil (MRL)	heavy oil (actual)	pH	% OM	Free Lime%	% Moisture
Acceptable range	15 to 25				<500			6.5 - 7.2	5% - 10%	0% to 2+%	35% to 50%
SE1	19.3	10.0	NT	12.5	ND	31.3	43.6	6.8	9.22%	ND	35%
SE2	15.6	10.0	NT	12.0	23.5	30.1	104.0	6.8	8.10%	ND	50%
SE3	18.0	10.0	NT	12.2	ND	30.4	30.8	6.6	7.15%	ND	54%
SE4	16.5	10.0	NT	12.2	15.0	30.5	67.0	6.6	6.94%	ND	57%
SE5	8.8	10.0	NT	10.9	ND	27.2	47.4	7.9	2.30%	3.37%	52%
SE6	15.2	10.0	NT	11.8	ND	29.4	46.2	6.9	5.70%	ND	60%
average	18.6	10.0	NT	11.9	* 6.4	29.8	* 56.5	6.9	6.56%	.56%	51.3%

mg/kg dry.

MR  
L = Method  
Reporting  
Limit ND  
= Not  
Detected

NT  
= Not  
Tested \*

Values may  
not reflect  
accurate  
amounts due  
to the  
laboratory  
data qualifier  
methods'  
inability to  
duplicate  
results per  
industry  
standards.

\* Ac  
ording to the  
Washington  
State Model  
Toxics  
Control Act,  
clean-up  
regulation  
levels of soil  
for diesel,  
and heavy oil  
is 2000

## Conclusions:

- Average **Cation Exchange Capacity (CEC)** values for the engineered, "Garrison" soil placed in the swales should have a range of 15 to 25 meq/100g (milliequivalent of hydrogen per 100 grams).
  - The **north side swales average 14.9meq/100g**, and the **southeast swales average 18.6meq/100g**. The average CEC values for 2013 show the north side swales remained the same, and the southeast swales decreased an average of 1% compared to the 2012 values.
  - 2013 average CEC values show a decrease this year. The north side swales N3 & N4 increased significantly, also indicated by low organic matter readings.
  - Values for **organic matter (OM)** average **6.9% for the north side**, and **6.5% for the southeast**, which is an average total increase of 0.4% from the 2013 totals. An acceptable range for organic matter in treatment soil should be between 5% and 10%. The goal for water quality treatment is for organic matter and CEC values to continue to increase. Fortunately, the average values for organic matter increased in 2013.
  - Acceptable values for treatment soil pH should be between 6.5 and 7.2. The **average pH value for 2013 is 7.0**, indicating a near neutral soil. pH is a measurement of the soil acidity or alkalinity, and is used as a general indicator of available nutrients in the soil, presence of free lime (calcium carbonate), excess sodium, and excess hydrogen.
  - Free Lime or "Calcium Carbonate" present in the soil usually indicates a pH of 7.3 to 8.3. The absence of free lime in soil will produce a lower pH below 7.0. Presence of free lime means a less acid (or more alkaline) soil which promotes the availability of nutrients from the organic matter.
  - **Average diesel values for 2013** show an increase in the north side swales from **9.8 mg/kg in 2012 to 13.1 mg/kg in 2013**, and a significant decrease in the southeast swales from **14.3 mg/kg in 2012 to 6.4 mg/kg in 2013**.
  - **Average heavy oil values for 2013** show an increase in the **north side swales from 46.6 mg/kg in 2012 to 71.3 mg/kg in 2013**; and a significant decrease for the southeast swales from **82.0 mg/kg in 2012 to 56.5 mg/kg in 2013**.
  - Diesel and heavy oil values that reach 2000mg/kg dry indicate contaminated soil that will need to be cleaned up according to the Washington State Model Toxics Control Act.
  - Soil moisture tests show **north side swales with average soil moisture of 37.6%**, which is a slight decrease from the 2012 average value of 40.0%. **Southeast swales show an average of 51.3%**, which is a decrease from the 2012 average value of 57.3%.
  - Some swales showed individual signs of decreased moisture such as: **SE2**, which previously had a moisture reading of **72%**, decreased this year by **22%**, for a total of **50% soil moisture**.
  - Three locations, **SE3, SE4, SE6** appear to have excessive irrigation applied to their swales. Water conservation and proper irrigation practices will again be addressed in the yearly letter to swale demonstration participants.