# Appendices

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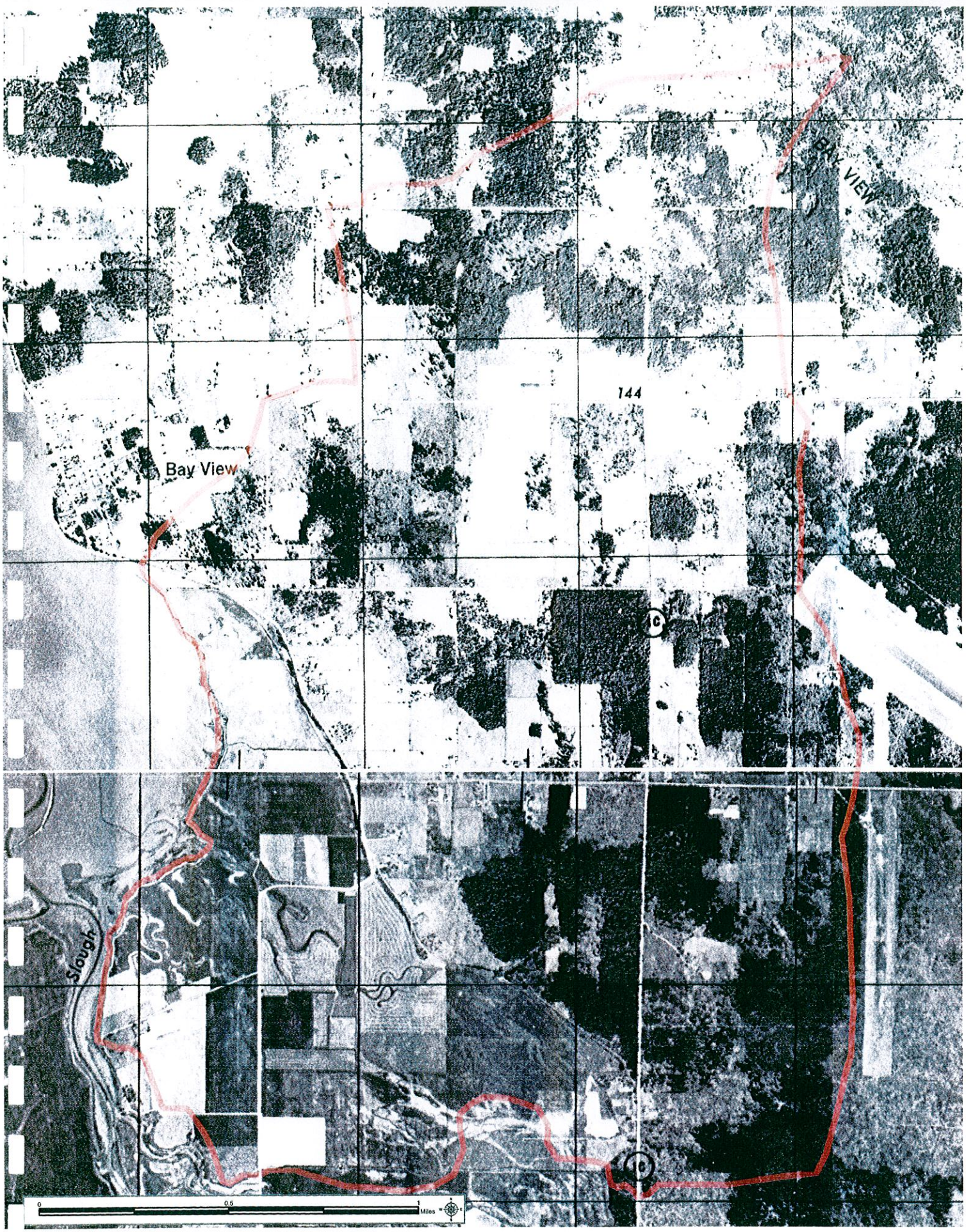
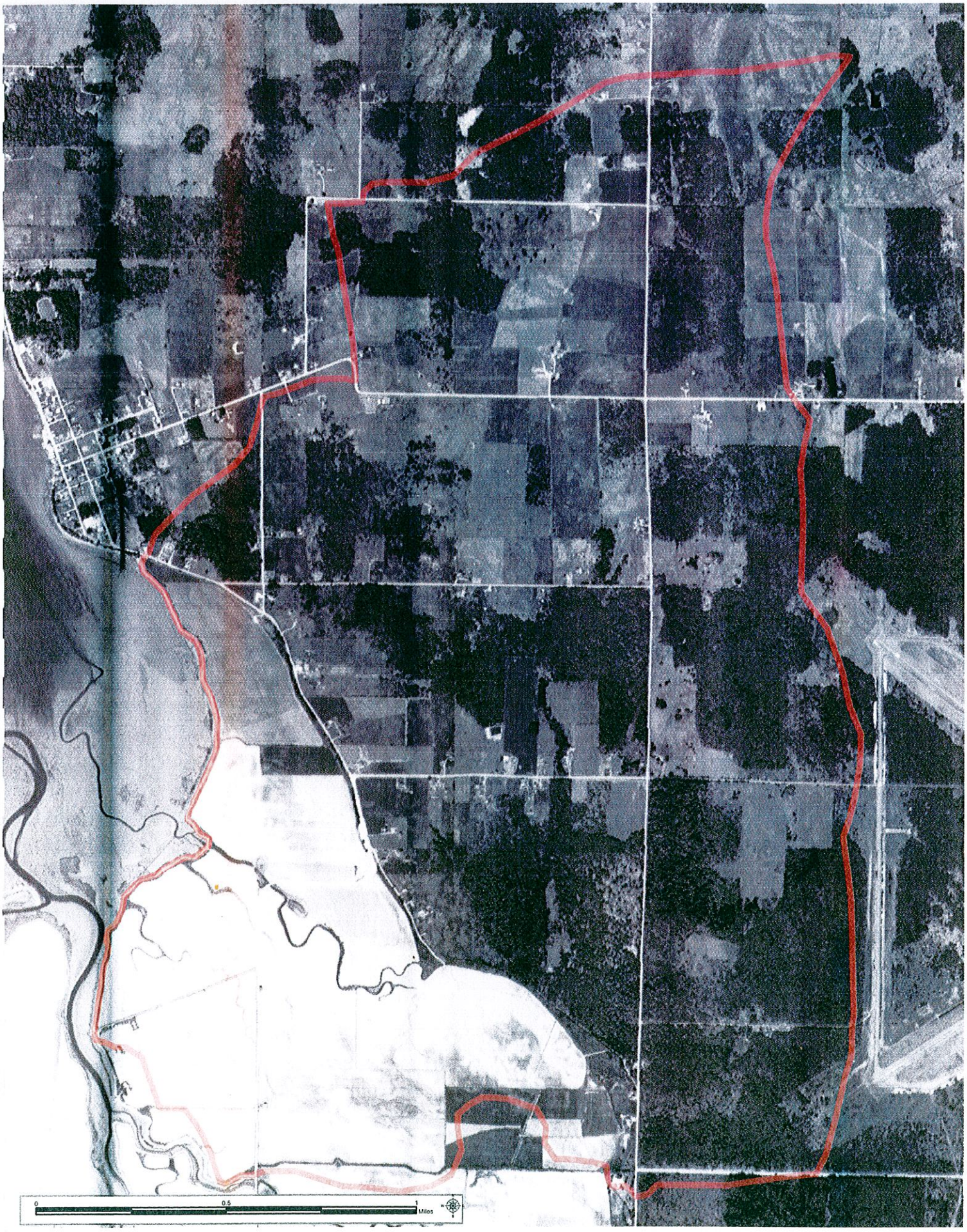
# Appendix 1: **Land Use – Historical Photos**


Historic Photo 1 No Name Watershed Boundary (in red) overlaid on 1937 image (source: US War Department via Skagit County GIS).




Historic Photo 2 No Name Watershed Boundary (in red) overlaid on 1941-1943 mosaic mage (source: COE).




Historic Photo 3 No Name Watershed Boundary (in red) overlaid on 1966 image (source: US Department of Agriculture).

# Appendix 2: **Groundwater/Flow– Supplemental Tables**

## No Name Slough Tidal Influence on Groundwater

| Time | Predicted tide* MLLW (ft) | Predicted tide* NGVD 1929 | WSE at Sampling Locations* Channel at tidegate | pumphouse pond | PZ1 deep | Ditch at PZ1 | PZ6 deep | Notes |
|---|---|---|---|---|---|---|---|---|
| 12-Jun-03 | | | | | | | | |
| 9:00 AM | -1.1 | -5.6 | | | -1.99 | -2.58 | | salinity in PZ = 0.1 ppt, salinity in ditch = 27.2 ppt |
| 9:30 AM | -1.4 | -5.9 | -3.62 | -1.74 | | | | about 6" depth of flow in outfalls |
| 10:00 AM | -1.7 | -6.2 | | | -2.02 | -2.73 | | noticeable flow out of ditches and slough |
| 10:20 AM | -1.8 | -6.3 | | | | | | Predicted low tide of -1.8 MLLW = -6.3 NGVD / MSL) |
| 11:30 AM | -0.5 | -5.0 | | | -2.07 | -2.91 | | |
| 11:50 AM | -0.2 | -4.7 | -3.97 | -2.98 | | | | sal. at pumphouse = 27.0 ppt, large school stickleback |
| 1:00 PM | 1.8 | -2.7 | | | -2.13 | -3.05 | -1.03 | |
| 1:15 PM | 2.0 | -2.5 | -3.80 | -3.13 | | | | Slough still flowing out of tidegates and ditches |
| 1:50 PM | 3.6 | -1.1 | | | -2.21 | -3.09 | -1.03 | Several 3"-4" crabs in ditch, slight flow out of tidegates |
| 2:10 PM | 4.0 | -0.5 | -2.02 | -3.10 | | | | Still slight flow out of south perimeter ditch |
| 2:45 PM | 5.2 | 0.7 | | | -2.23 | -3.06 | -1.04 | |
| 3:00 PM | 5.5 | 1.0 | -0.05 | -3.09 | | | | Still slight flow out of south perimeter ditch |
| 3:25 PM | 6.0 | 1.5 | | | -2.23 | -3.03 | -1.04 | |
| 3:35 PM | 6.4 | 1.9 | 1.35 | -3.05 | | | | Saw a river otter catch a fish a few feet off the tidegate |
| 3:50 PM | 6.6 | 2.1 | | | -2.22 | -3.01 | -1.04 | Moderate flow into north ditch from the collapsed tidegate |
| 5:38 PM | 7.9 | 3.4 | 3.5 | | | | | Predicted high tide of 7.9' MLLW = 3.4' above NGVD / MSL |
| 7:15 PM | 7.5 | 3.0 | | | -2.07 | -2.85 | -1.04 | Flow into north ditch from two northern tidegates |
| 7:30 PM | 7.4 | 2.9 | 2.10 | -2.85 | | | | |
| 8:00 PM | 7.2 | 2.7 | | | -2.07 | -2.80 | -1.04 | |

*Tide chart for Padilla Bay. Assumes MLLW + 4.5' = MSL

| High Tide | | Low Tide | |
|---|---|---|---|
| 2:34 AM | 8.9' | 10:20 AM | -1.8' |
| 5:38 PM | 7.9' | 10:16 PM | 6.0' |

*All w.s.e. are measured relative to MSL, as determined at BM 80-70-B. Subtract 4.5' for MLLW

**No Name Slough**
**Initial Groundwater Monitoring**

**Purpose**
Padilla Bay National Estuarine Research Reserve (PBNERR) and the Skagit Conservation District (SCD) will measure variations in salinity and water surface elevation over the course of one year in the shallow groundwater in the vicinity of No Name Slough and its upland tributary. To do this, PBNERR and SCD will install a series of shallow peizometers at lowland and upland sites. Water surface elevation and/or salinity will be measured at each location on a monthly basis during 2003.

**Method**
Two types of peizometers will be installed. At each sampling location, a 1.25 inch diameter, slotted PVC pipe will be installed to a depth of about 3 feet to measure water surface elevation. (Depths at upland sites are anticipated to be about 2 feet, which is the depth of the relatively impermeable clay layer). Holes will be bored to this depth with a hand auger, the pipes will be installed, the hole will be backfilled, and the top 4" sealed with bentonite. The top of the pipe will be capped and a protective casing will be placed around it. The ground surface elevation and rim of the PVC pipe will be surveyed relative to the project site benchmark. Water surface elevation will be measured from the rim of the pipe to 0.01 foot accuracy using a "Solinst" electronic water level meter.

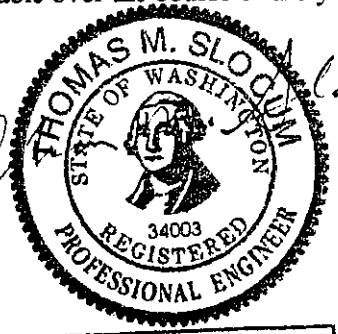
At the lowland sampling locations, a second peizometer will be installed to a depth of about 8 to 10 feet in order to measure salinity. The peizometers will be either a 1.25 inch PVC pipe (installed by augering) or a 1.25 inch stainless steel well point (installed by driving with a sledge hammer), depending on soil conditions. As with the shallow peizometers, holes will be backfilled and sealed with bentonite, a protective casing installed, the tops will be capped, and rim elevations surveyed. Water samples will be collected from the pipes on a monthly basis, during a high tide, by means of suction applied to a Tygon tube. Salinity will be measured using either a refractometer or a electronic conductivity meter. Salinity will also be measured in samples from nearby surface ditches and in Padilla Bay for reference.

**Sampling Locations**
Three sampling transects will be established. Transect One, consisting of sampling locations #1, #2, and #3, will be located on the Washington Dept. of Ecology's Peth Farm northern field and neighboring field to the east, running inland from just inside the dike to Bayview Edison Road (see attached map). The locations are designed to test how distance from the shoreline (dike) affects salinity and water surface elevation.

Transect Two will consist of two locations (#4 and #5) outside of the dike along No Name Slough, between the tide gate and Bayview Edison Road. The locations are designed to test how distance from the tidegate affects salinity and water surface elevation.

Transect Three (measuring water surface elevation only) will run northward up the tributary creek drainage. Station #6 will be at the field near where the creek hits the flats, Station #7 at a forested location on the hillside, and Station #8 at a pasture location on the hillside. The locations are designed to test how differences in ground cover affect the water table over the course of the year.

Plan prepared by: Thomas Slocum, PE
SCD District Engineer
December 10, 2002




EXPIRES 3-3-04

**COMPUTATION SHEET**
NRCS-ENG-523 Rev. 10-97

**U. S. DEPARTMENT OF AGRICULTURE**
**NATURAL RESOURCES CONSERVATION SERVICE**

| STATE | | PROJECT No Name Watershed Characterization | | |
|---|---|---|---|---|
| BY TMJ | DATE 11/5/03 | CHECKED BY | DATE | JOB NO. |
| SUBJECT Calc. of "K" and "n" values for 3 peizometers | | | | SHEET ____ OF ____ |

① Hydraulic Conductivity

Using method in Freeze and Cherry, pp. 340-341, plotted $\log(H-h/H-H_o)$ versus time from the peizometer bailing tests to determine "$T_o$" (see graphs and data tables)

| Peizometer | ESTimated $T_o$ (hours) |
|---|---|
| # 2 | 0.62 hrs |
| # 6 | 9 hrs |
| # 9B | 0.1 to 0.18 hrs |

Radius of peizometer = 3/4" $\therefore r^2 = 0.0039\ ft^2$

Assume L (slotted length of peiz.) = 18" for each PZ (not sure of this, but at least it is consistent)

From formula: $K = \dfrac{r^2 \ln(\frac{L}{R})}{2L\,T_o}$ $\quad \ln(\frac{L}{R}) = \ln(\frac{1.5'}{0.0625'}) = 3.18$

For PZ 2: $K = (0039\ ft^2)(3.18)/2(1.5')(0.62\ hrs) = 6.7 \times 10^{-3}\ ft/hr = 6.1 \times 10^{-7}\ m/sec$

For PZ 6, $K = 0.0124/(2)(1.5)(9) = 4.6 \times 10^{-4}\ ft/hr = 4.2 \times 10^{-8}\ m/sec.$

For PZ 9B $K = (0.124)/(2)(1.5)(0.1) = 4.1 \times 10^{-2}\ ft/hr = 3.7 \times 10^{-6}\ m/sec.$
(range) $K = 0.124/2(1.5)(0.183) = 2.3 \times 10^{-2}\ ft/hr = 2.1 \times 10^{-6}\ m/sec$

② Soil Porosity

Using method in Freeze + Cherry, P. 337,

$n = 1 - \dfrac{\text{bulk density}}{\text{particle density}}$ $\quad$ Bulk density = $\dfrac{\text{oven dried mass}}{\text{field volume}}$

Particle density = 2.65 g/cm³ (assumed)

| | PZ 2 sample | PZ 6 sample | PZ 9B sample |
|---|---|---|---|
| bulk density | 124.1 g / 0.116 l = 1.07 g/cm³ | 110.9 g/0.116 l = 0.96 g/cm³ | 151.3 g/0.116 l = 1.30 g/cm³ |
| $n = 1 - \frac{\rho_B}{2.65}$ | 1 - (1.07/2.65) | 1 - (0.96/2.65) | 1 - (1.30/2.65) |
| $n$ | = 0.60 | = 0.64 | = 0.51 |

## Peizometer Bail Test Results

Assume datum = 6' below rim elevation = 0.00'

Date: November 4, 2003

**PZ2**

| time t (minutes) | wse (ft bel. rim) | "height" h (abv. datum) | H-h/H-$H_0$ |
|---|---|---|---|
| 0 | 5.11 | 0.89 | 1.00 |
| 2 | 5.08 | 0.92 | 0.89 |
| 4 | 5.05 | 0.95 | 0.78 |
| 6 | 5.04 | 0.96 | 0.74 |
| 8 | 5.02 | 0.98 | 0.67 |
| 11 | 5.01 | 0.99 | 0.63 |
| 14 | 4.98 | 1.02 | 0.52 |
| 17 | 4.96 | 1.04 | 0.44 |
| 21 | 4.95 | 1.05 | 0.41 |
| 24 | 4.95 | 1.05 | 0.41 |
| 27 | 4.94 | 1.06 | 0.37 |
| 30 | 4.93 | 1.07 | 0.33 |
| 34 | 4.92 | 1.08 | 0.30 |
| 38 | 4.91 | 1.09 | 0.26 |
| 41 | 4.90 | 1.10 | 0.22 |
| 44 | 4.89 | 1.11 | 0.19 |
| 69 | 4.87 | 1.13 | 0.11 |
| **$H_0$ =** | **5.11** | **0.89** | |
| **H =** | **4.84** | **1.16** | |

**PZ6**

| time (minutes) | wse (ft bel. rim) | "height" (abv. datum) | H-h/H-$H_0$ |
|---|---|---|---|
| 0 | 5.45 | 0.55 | 1.00 |
| 1 | 5.46 | 0.54 | 1.00 |
| 3 | 5.44 | 0.56 | 1.00 |
| 5 | 5.44 | 0.56 | 1.00 |
| 9 | 5.44 | 0.56 | 1.00 |
| 15 | 5.44 | 0.56 | 1.00 |
| 23 | 5.43 | 0.57 | 0.99 |
| 33 | 5.43 | 0.57 | 0.99 |
| 40 | 5.43 | 0.57 | 0.99 |
| 55 | 5.40 | 0.60 | 0.98 |
| 180 | 5.42 | 0.58 | 0.99 |
| 260 | 5.42 | 0.58 | 0.99 |
| 1345 | 2.66 * | 3.34 | 0.00 |
| **$H_0$ =** | **5.45** | **0.55** | |
| **H =** | **2.66** | **3.34** | |

**PZ9B**

| time (minutes) | wse (ft bel. rim) | "height" (abv. datum) | H-h/H-$H_0$ |
|---|---|---|---|
| 0 | 4.36 | 1.64 | 1.00 |
| 2 | 4.25 | 1.75 | 0.88 |
| 4 | 4.14 | 1.86 | 0.75 |
| 6 | 3.99 | 2.01 | 0.58 |
| 8 | 3.82 | 2.18 | 0.39 |
| 10 | 3.75 | 2.25 | 0.31 |
| 12 | 3.71 | 2.29 | 0.26 |
| 14 | 3.68 | 2.32 | 0.23 |
| 16 | 3.65 | 2.35 | 0.19 |
| 18 | 3.63 | 2.37 | 0.17 |
| 21 | 3.61 | 2.39 | 0.15 |
| 24 | 3.59 | 2.41 | 0.13 |
| 27 | 3.58 | 2.42 | 0.11 |
| 30 | 3.56 | 2.44 | 0.09 |
| 34 | 3.55 | 2.45 | 0.08 |
| 40 | 3.54 | 2.46 | 0.07 |
| 218 | 3.48 | 2.52 | 0.00 |
| **$H_0$ =** | **4.36** | **1.64** | |
| **H =** | **3.48** | **2.52** | |

* Elev. actually was 2.52' above original H. Don McM said he thinks the water might be affected by freezing temps.

# Appendix 3: **Surface Water Hydrology – Supplemental Data Tables**

# No Name Slough Watershed Culvert Inventory - January 2004

## Eastern Watershed

| ID No. | Diam. (in) | Material | Comment |
|---|---|---|---|
| 12.1 | 12 | CPP | |
| 12.2 | 12 | CPP | |
| 12.3 | 24 | CPP | SW12, s = 0.0023 ft/ft |
| 10.1 | 12 | Concrete | |
| 10.2 | 12 | Concrete | |
| 10.3 | 12 | CPP | |
| 10.4 | 18 | Concrete | SW10W, s = 0.0275 ft/ft |
| 10.5 | 24 | Concrete | |
| 10.6 | 24 | Concrete | SW10E, s = 0.0048 ft/ft |
| 9.1 | 36 | Concrete | SW9, s = 0.0001 ft/ft |
| 9.2 | 12 | Concrete | |
| 8.1 | 18 | CMP | Subdivision Drain |
| 8.2 | 36 | Concrete | SW 8W, s = 0.0177 ft/ft |
| 8.2 | 36 | Concrete | SW8E, s = 0.0168 ft/ft |
| 8.3 | 15 | Ceramic | |
| 7.1 | 8 | Concrete | |
| 7.3 | 12 | Concrete | SW7N |
| 7.3 | 18 | Concrete | SW7S, s = 0.0248 ft/ft |
| 6.1 | 24 | Steel | SW5, s = 0.0167 ft/ft |
| 5.1 | 12 | Concrete | Mostly buried |
| 5.2 | ? | Concrete | Buried |
| 5.3 | 4' x 2' box | Concrete | Start of trib. |
| 5.4 | 18 | CMP | Side ditch |
| 5.5 | 18 | Concrete | North (higher) |
| 5.5 | 24 | Concrete | South (lower) |
| 4.1 | 24 | CPP | North of 2 |
| 4.1 | 18 | Concrete | South of 2 |
| 4.2 | 30 | CPP | SW4, s = 0360 ft/ft (Pali |
| 4.3 | 18 | CMP | Partially buried |

## Western Watershed

| ID No | Diam. (in.) | Material | Comment |
|---|---|---|---|
| 1.1 | 12 | Concrete | |
| 1.2 | 18 | CMP | Trailer Park |
| 1.3 | 24 | Concrete | SW1, s = 0.0189 ft/ft |
| 1.4 | 18 | Concrete | |
| 1.5 | 18 | CPP | Long run |
| 2.1 | 12 | Concrete | |
| 2.2 | 18 | Concrete | Buried |
| 2.3 | 12 | Concrete | |
| 2.4 | 18 | CPP | SW2N, s = 0.0325 ft/ft |
| 2.5 | 18 | CPP | |
| 2.6 | 12 | CPP | |
| 2.7 | 12 | CPP | |
| 2.8 | 18 | CPP | |
| 2.9 | 18 | CMP | |
| 2.10 | 12 | Concrete | |
| 2.11 | 12 | Concrete | |
| 2.12 | 18 | CMP | |
| 2.13 | 18 | CMP | SW2S, s = 0.0210 ft/ft |
| 2.14 | 12 | Concrete | To CB |
| 2.15 | 12 | Concrete | |
| 2.16 | 18 | CPP | |
| 2.17 | 12 | Concrete | |
| 3.1 | 120 | CMP | Peth |
| 3.2 | 30 | Concrete | |
| 3.3 | 72 | CMP | BE Road |
| 3.4 | 18 | Concrete | BE Road |
| 3.5 | 4 | CMP | Egbers |
| 3.6 | 36 | CMP | Cross ditch |
| 3.7 | 36" x 28" box | Concrete | Dahlstedt |
| 3.8 | 24? | | Farm road |
| 3.9 | 24 | Concrete | Mostly buried |
| 3.10 | 18 | Concrete | BE Road |
| TG1 | ? | Concrete | |
| TG2 | 48 | CPP | |
| TG3 | 48 | Concrete | |
| TG4 | 48 | Concrete | |

Materials:
CMP = corrugated metal pipe
CPP = corrugated plastic pipe

This inventory does not include driveway culverts, of which there are many.
Invert slopes were measured only at culverts where flow was monitored in 2003 (indicated as "SW")

## No Name Slough Surface Runoff Monitoring
## Culvert Flow Calculation Worksheet

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Jan. 23 '03 | 0.56" | 10:30-12:00 | DH/TS |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | 2.0 | (no data) | | | | | | |
| SW 2N | 1.5 | (no data) | | | | | | |
| SW 2S | 1.5 | (no data) | | | | | | |
| SW 4 | 2.5 | 0.28 | 0.97 | 0.11 | 0.0470 | 0.29 | 0.28 | |
| SW 5 | 2.0 | 0.60 | 2.20 | 0.31 | 0.2074 | 0.80 | 1.75 | |
| SW 7a | 1.5 | (no data) | | | | | | |
| SW 8 E | 3.0 | (no data) | | | | | | |
| SW 8 W | 3.0 | (no data) | | | | | | |
| SW 9 | 3.0 | 1.10 | 1.70 | 0.37 | 0.2642 | 2.38 | 4.04 | |
| SW 10E | 2.0 | 1.40 | 0.90 | 0.70 | 0.5872 | 2.35 | 2.11 | |
| SW 10W | 1.5 | 0.45 | 2.50 | 0.30 | 0.1982 | 0.45 | 1.11 | |
| SW 12 | 2.0 | 1.10 | 0.80 | 0.55 | 0.4426 | 1.77 | 1.42 | |

Comments:
Rain ended at about 8:00 and weather cleared. Flows fell throughout morning.
Culvert 10W was backwatered slightly

| Date: | Rain previous 36 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Jan. 29 '03 | 0.17" | 9:00-11:30 | DW/Heidi |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | 2.0 | 0.43 | 1.97 | 0.22 | 0.1281 | 0.51 | 1.01 | inlet* |
| SW 2N | 1.5 | 0.30 | 1.41 | 0.20 | 0.1118 | 0.25 | 0.35 | |
| SW 2S | 1.5 | 0.16 | 5.14 | 0.11 | 0.0470 | 0.11 | 0.54 | |
| SW 4 | 2.5 | 0.33 | 1.05 | 0.13 | 0.0600 | 0.38 | 0.39 | |
| SW 5 | 2.0 | 0.82 | 3.08 | 0.42 | 0.3130 | 1.20 | 3.70 | |
| SW 7a | 1.5 | 0.16 | 3.84 | 0.11 | 0.0470 | 0.11 | 0.41 | |
| SW 8 E | 3.0 | 0.33 | 2.69 | 0.11 | 0.0470 | 0.42 | 1.14 | |
| SW 8 W | 3.0 | 0.39 | 2.62 | 0.13 | 0.0600 | 0.54 | 1.41 | |
| SW8 creek | | | | | | | 2.46 | |
| SW 9 | 3.0 | 0.62 | 1.08 | 0.21 | 0.1199 | 1.08 | 1.17 | |
| SW 10E | 2.0 | 1.05 | 0.33 | 0.53 | 0.4227 | 1.69 | 0.56 | |
| SW 10W | 1.5 | 0.00 | 0.00 | 0.00 | 0.0000 | 0.00 | 0.00 | ? |
| SW 12 | 2.0 | 0.72 | 0.59 | 0.36 | 0.2546 | 1.02 | 0.60 | |

Comments:
*SW1 outlet = 1.58 cfs. SW10W should not be 0 cfs
SW8 creek = "Bayview Downstream" (?) measured 2.46 cfs . Consistent with SW8 culvert Qs.

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Feb. 21 '03 | 0.47" | 13:00-15:30 | DW/Gwen |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | 2.0 | 0.72 | 2.76 | 0.36 | 0.2546 | 1.02 | 2.81 | inlet* |
| SW 2N | 1.5 | 0.56 | 2.43 | 0.37 | 0.2642 | 0.59 | 1.44 | |
| SW 2S | 1.5 | 0.33 | 5.94 | 0.22 | 0.1281 | 0.29 | 1.71 | |
| SW 4 | 2.5 | 0.49 | 1.41 | 0.20 | 0.1118 | 0.70 | 0.99 | |
| SW 5 | 2.0 | 0.46 | 8.72 | 0.23 | 0.1365 | 0.52 | 4.57 | |
| SW 7a | 1.5 | 1.31 | 3.48 | 0.87 | 0.7254 | 1.63 | 5.68 | |
| SW 8 E | 3.0 | (no data) | | | | | | |
| SW 8 W | 3.0 | (no data) | | | | | | |
| SW8 creek | | | | | | | 21.46 | |
| SW 9 | 3.0 | 1.64 | 3.08 | 0.55 | 0.4426 | 3.98 | 12.27 | |
| SW 10E | 2.0 | 1.64 | 2.16 | 0.82 | 0.6893 | 2.76 | 5.96 | |
| SW 10W | 1.5 | 0.26 | 3.48 | 0.17 | 0.0885 | 0.20 | 0.69 | |
| SW 12 | 2.0 | 1.15 | 1.80 | 0.58 | 0.4723 | 1.89 | 3.40 | |

Comments:
*SW1 outfall = 4.57 cfs
SW8 creek = "Bayview downstream" (?) measured 21.43 cfs Assume SW8 culvert =
SW creek - SW7a = 15.78 cfs

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Mar. 25 '03 | 0* | 9:30 - 11:30 | TS/DH |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | 2.0 | 0.10 | 2.80 | 0.05 | 0.0147 | 0.06 | 0.16 | outlet* |
| SW 2N | 1.5 | (no data) | | | | | | |
| SW 2S | 1.5 | 0.06 | 0.00 | 0.04 | | 0.00 | 0.04 | by bucket |
| SW 4 | 2.5 | 0.10 | 0.00 | 0.04 | 0.1118 | 0.70 | 0.00 | TLTM |
| SW 5 | 2.0 | 0.25 | 0.55 | 0.13 | 0.1365 | 0.52 | 0.29 | |
| SW 7a | 1.5 | 0.10 | 3.18 | 0.07 | 0.0242 | 0.05 | 0.17 | |
| SW 8 E | 3.0 | 0.13 | 0.95 | 0.04 | 0.0105 | 0.09 | 0.09 | |
| SW 8 W | 3.0 | 0.25 | 2.50 | 0.08 | 0.0294 | 0.26 | 0.66 | |
| SW 9 | 3.0 | 0.53 | 0.60 | 0.18 | 0.0961 | 0.86 | 0.52 | at outlet |
| SW 10E | 2.0 | 0.75 | 0.20 | 0.38 | 0.2739 | 1.10 | 0.22 | at inlet |
| SW 10W | 1.5 | 0.29 | 0.60 | 0.19 | 0.1039 | 0.23 | 0.14 | at inlet |
| SW 12 | 2.0 | | 2.50 | | | 0.20 | 0.52 | ditch** |

Comments:
*Base flow for a rainy month - about 2.1" so far this month. SW1 measured with bucket and watch was 0.10 cfs. **Flow in culvert TLTM. Flow is at cross section of ditch 5' ds of outlet.

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Mar. 26 '03 | 0.11" | 9:45 - 10:45 | TS |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | 2.0 | 0.10 | 3.27 | 0.052 | 0.015 | 0.06 | 0.20 | outlet |
| SW 2N | 1.5 | 0.04 | 1.19 | 0.028 | 0.006 | 0.01 | 0.02 | outlet |
| SW 2S | 1.5 | 0.08 | 2.25 | 0.055 | 0.017 | 0.04 | 0.09 | outlet |
| SW 4 | 2.5 | 0.17 | 0.12 | 0.067 | 0.022 | 0.14 | 0.02 | inlet* |
| SW 5 | 2.0 | 0.25 | 2.10 | 0.128 | 0.059 | 0.23 | 0.48 | inlet* |
| SW 7a | 1.5 | 0.13 | 3.65 | 0.083 | 0.031 | 0.07 | 0.25 | outlet |
| SW 8 E | 3.0 | 0.19 | 1.81 | 0.063 | 0.021 | 0.19 | 0.34 | inlet |
| SW 8 W | 3.0 | 0.29 | 2.65 | 0.097 | 0.040 | 0.36 | 0.95 | inlet |
| SW 9 | 3.0 | 0.65 | 1.00 | 0.215 | 0.124 | 1.12 | 1.12 | inlet |
| SW 10E | 2.0 | 0.83 | 0.55 | 0.417 | 0.300 | 1.20 | 0.66 | inlet |
| SW 10W | 1.5 | 0.33 | 0.45 | 0.220 | 0.128 | 0.29 | 0.13 | inlet |
| SW 12 | 2.0 | 0.85 | 0.27 | 0.427 | 0.320 | 0.20 | 0.05 | outlet* |

Comments:
*Very little flow in SW4. SW5 inlet Q calc. as 0.43 cfs. Velocity measurement at SW12 may be inaccurate (low). Flow appeared to be about same as much as measured in ditch x/s on 3/25 (i.e. 0.52 cfs).

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Mar. 31 '03 | 0.34" | | DW |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | 2.0 | 0.16 | 4.66 | 0.080 | 0.029 | 0.12 | 0.55 | |
| SW 2N | 1.5 | 0.07 | 3.54 | 0.047 | 0.013 | 0.03 | 0.10 | |
| SW 2S | 1.5 | 0.11 | 3.41 | 0.073 | 0.026 | 0.06 | 0.20 | |
| SW3 | 4.0 | 2.90 | 0.72 | 0.725 | 0.610 | 9.76 | 7.03 | at culvert |
| SW 4 | 2.5 | 0.26 | 0.59 | 0.104 | 0.043 | 0.27 | 0.16 | |
| SW 5 | 2.0 | 0.33 | 1.15 | 0.168 | 0.088 | 0.34 | 0.39 | |
| SW 7a | 1.5 | 0.23 | 5.08 | 0.153 | 0.076 | 0.17 | 0.87 | |
| SW 8 E | 3.0 | 0.59 | 2.33 | 0.197 | 0.111 | 1.00 | 2.33 | |
| SW 8 W | 3.0 | | | 0.000 | | 0.00 | 0.00 | |
| SW 9 | 3.0 | 0.92 | 1.18 | 0.307 | 0.206 | 1.85 | 2.19 | |
| SW 10E | 2.0 | | | 0.000 | | 0.00 | 0.00 | |
| SW 10W | 1.5 | 0.43 | 1.57 | 0.287 | 0.186 | 0.42 | 0.66 | |
| SW 12 | 2.0 | 0.95 | 0.66 | 0.475 | 0.368 | 0.20 | 0.13 | |

Comments:
SW8W flow hitting culvert at angle - too turbulent to measure
SW10E flow too low to measure

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Apr. 3, '03 | 0.28" | 9:30 - 11:30 | TS/DH |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 4 | 2.5 | 0.42 | 1.33 | 0.17 | 0.0885 | 0.55 | 0.74 | inlet |
| SW 5 | 2.0 | 0.63 | 3.00 | 0.32 | 0.2167 | 0.83 | 2.50 | inlet |
| SW 7a | 1.5 | 0.25 | 5.90 | 0.17 | 0.0885 | 0.20 | 1.17 | outlet |
| SW8* | 3.0 | | | | | | 6.98 | creek x/s |
| SW3* | 3.0 | 1.50 | 1.38 | | | 9.00 | 12.40 | creek x/s |

Comments:
*Based on avg. v and area of measured creek cross sections
Sum of flows at (SW4+SW5+SW7a+SW8) = 11.39 cfs, which is 92% of flow at SW3.
We observed approx. 0.5 cfs additional flow in small tribs to the creek in the forested reach between the slough and Bayview Road., which would bring the balance up to 96% of SW3.

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| May 6, '03 | 0.00 | 1:30 - 3:30 | DH/TS |

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | 2.0 | | | 0.000 | 0.001 | | 0.14 | outlet |
| SW 2N | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.00 | dry |
| SW 2S | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.00 | dry |
| SW3 | 4.0 | 0.11 | 0.40 | | | 0.27 | 0.11 | creek x/s |
| SW 4 | 2.5 | TLTM | TLTM | | | | | TLTM |
| SW 5 | 2.0 | 0.17 | 0.50 | | | 0.20 | 0.10 | creek x/s |
| SW 7a | 1.5 | 0.02 | 1.16 | 0.014 | 0.002 | 0.01 | 0.01 | |
| SW 8 E | 3.0 | | | | | | | |
| SW 8 W | 3.0 | 0.10 | 1.39 | | | 0.05 | 0.07 | creek x/s |
| SW 9 | 3.0 | | | | | | 0.05 | creek x/s |
| SW 10E | 2.0 | 0.54 | 0.00 | 0.270 | 0.171 | 0.68 | 0.00 | inlet |
| SW 10W | 1.5 | 0.04 | 0.42 | 0.028 | 0.006 | 0.01 | 0.01 | inlet |
| SW 12 | 2.0 | 0.67 | 0.00 | 0.335 | 0.231 | 0.20 | 0.00 | outlet |

Sum of flows at (SW4+SW5+SW7a+SW8) = 11.39 cfs, which is 92% of flow at SW3.
We observed approx. 0.5 cfs additional flow in small tribs to the creek in the forested reach between the slough and Bayview Road., which would bring the balance up to 96% of SW3.

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| May 21 '03 | 0 | 10:00 - 3:00 | TS/DH/SS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.02 | 1.43 | 0.010 | 0.001 | 0.01 | 0.007 | outlet |
| SW 2S | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 4.0 | 1.20 | 0.01 | 0.300 | 0.198 | 3.17 | 0.025 | culvert |
| SW3 | | 0.04 | 0.59 | | | 0.03 | 0.017 | main crk x/s |
| SW 4 | | 0.02 | 0.31 | | | 0.02 | 0.006 | trib. x/s |
| SW 5 | 2.5 | TLTM | TLTM | | | | <0.002 | |
| SW 7a | 2.0 | TLTM | TLTM | | | ? | 0.007 | culvert |
| SW 8 E | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| SW 8 W | 3.0 | | | | | | | |
| SW 9 | 3.0 | 0.08 | 0.33 | | | 0.09 | 0.031 | creek x/s |
| SW9E | 3.0 | 0.13 | 0.07 | | | 0.31 | 0.022 | creek x/s |
| SW 10E | | 0.01 | 0.50 | | | 0.00 | 0.002 | E. ditch x/s |
| SW 10W | 2.0 | 0.54 | 0.07 | 0.270 | 0.171 | 0.68 | 0.046 | inlet |
| SW 12 | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | inlet |
| Comments: | 2.0 | 0.04 | 0.50 | | | 0.06 | 0.029 | x/s |

Dry weather, a little rain 2 days before. Most flows measured by floating a small leaf thru cross section.
SW3 cu lvert - velocity estimated, since no measurable flow.
SW8 measured at GPS loc. 057 (Schaffers); SW3 measured x/s at main channel and east trib.

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| June 6 '03 | 0.00 | 9:30-11:30 | TS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | | trickle | | | ? | <0.002 | outlet |
| SW 2S | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW 4 | 4.0 | TLTM | TLTM | | | trickle | <0.002 | creek x/s |
| SW 5 | 2.5 | TLTM | TLTM | | | trickle | <0.001 | TLTM |
| SW 7a | 2.0 | 0.00 | 0.00 | | | 0.00 | 0.000 | dry |
| SW 8 E | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW 8 W | 3.0 | | | | | | | |
| SW 9 | 3.0 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW 10E | 3.0 | TLTM | TLTM | | | trickle | <0.002 | ditch* |
| SW 10W | 2.0 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW 12 | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| Hot day, no | 2.0 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |

Small flow in main creek at SW3, standing water but no flow in east trib. Sm.fish seen in creek.
Standing water in pools, but entrance to culverts dry.
SW9 main stem of creek dry, trickle in east roadside ditch. SW4 trickle from SE culvert/ditch.

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| July 10, '03 | 0 | 1:00-1:30 | TS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW 2S | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 4.0 | | | 0.000 | | 0.00 | 0.000 | culvert |
| SW3 | | | TLTM | | | | TLTM | main crk x/s |
| SW 4 | | | TLTM | | | | TLTM | trib. x/s |
| SW 5 | 2.5 | 0.00 | 0.00 | | | | 0.000 | dry |
| SW 7a | 2.0 | 0.00 | 0.00 | | | | 0.000 | dry |
| SW 8 E | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| SW 8 W | 3.0 | | | | | | | |
| SW 9 | 3.0 | 0.02 | 0.87 | | | 0.01 | 0.010 | creek x/s |
| SW9E | 3.0 | 0.00 | 0.00 | | | 0.00 | 0.000 | dry |
| SW 10E | | 0.04 | 1.50 | | | 0.02 | 0.036 | E. ditch x/s |
| SW 10W | 2.0 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| SW 12 | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| Comments: | 2.0 | 0.00 | 0.00 | | 0.000 | 0.00 | 0.000 | dry |

Very dry weather. Flowing water observed only in main creek channel below Marihugh Road and in ditch along the north side of Marihugh Road. Flows measured by floating a twig through a cross section of flow.

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Aug. 12, '03 | 0 | 9:00-1:00 | TS, DH |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW 2S | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 4.0 | 0.10 | 0.00 | 0.025 | | 0.00 | 0.000 | culvert |
| SW3 | | 0.00 | 0.00 | | | | 0.000 | main crk x/s |
| SW 4 | | 0.00 | 0.00 | | | | 0.000 | trib. x/s |
| SW 5 | 2.5 | 0.00 | 0.00 | | | | 0.000 | dry |
| SW 7a | 2.0 | 0.00 | 0.00 | | | | 0.000 | dry |
| SW 8 E | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| SW 8 W | 3.0 | | | | | | | |
| SW 9 | 3.0 | 0.00 | 0.00 | | | 0.01 | 0.000 | creek x/s |
| SW9E | 3.0 | 0.00 | 0.00 | | | 0.00 | 0.000 | dry |
| SW 10E | | 0.00 | 0.00 | | | 0.00 | 0.000 | E. ditch x/s |
| SW 10W | 2.0 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| SW 12 | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| Comments: | 2.0 | 0.00 | 0.00 | | 0.000 | 0.00 | 0.000 | dry |

0.5 on staff guage at Egbert culvert (SW3) = +/- culvert invert elevation.
0.5" rain about 3 days ago, but otherwise no rain since May.
Creek bed at confluence dry, but some pools in wetland area above. A large pool at small tributary confluence/edge of cedar forest upstream. Depth about 1.0'. No fish observed in pool.

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Oct. 7, '03 | 0.45" | 12:30-1:30 | TS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.02 | 0.00 | 0.010 | | 0.00 | 0.8 gpm | trickle |
| SW 2S | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 1.5 | 0.00 | 0.00 | 0.000 | | 0.00 | 0.000 | dry |
| SW3 | 4.0 | 0.10 | 0.00 | 0.025 | | 0.00 | 0.000 | culvert |
| SW3 | | 0.00 | 0.00 | | | | 0.000 | main crk x/s |
| SW 4 | | 0.00 | 0.00 | | | | 0.000 | trib. x/s |
| SW 5 | 2.5 | 0.02 | 0.00 | | | | 0.000 | dry |
| SW 7a | 2.0 | 0.05 | 1.52 | 0.026 | 0.006 | 0.02 | 0.033 | |
| SW 8 E | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| SW 8 W | 3.0 | 0.00 | 0.00 | | | | 0.000 | culvert |
| SW 9 | 3.0 | 0.00 | 0.00 | | | 0.01 | 0.000 | culvert |
| SW9E | 3.0 | 0.00 | 0.00 | | | 0.00 | 0.000 | dry |
| SW 10E | | 0.00 | 0.00 | | | 0.00 | 0.000 | E. ditch x/s |
| SW 10W | 2.0 | 0.02 | 0.00 | 0.010 | 0.000 | 0.00 | 0.000 | |
| SW 12 | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| Comments: | 2.0 | 0.17 | 0.00 | | 0.000 | 0.00 | 0.000 | st. water |

standing water in ditch at SW12, SW 10E, culvert at SW4, but no flow
heavy rain overnight.
Creek bed at confluence dry. Livestock tracks and manure in bed. Otter tracks in mud along field edge.
Puddles in creek bed above Bayview Road, dry above Marihugh Road.

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Oct.14, '03 | 0 | 12:00-3:30 | TS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.01 | TLTM | 0.005 | | 0.00 | 0.000 | trickle |
| SW 2S | 1.5 | 0.00 | TLTM | 0.000 | | 0.00 | 0.000 | trickle |
| SW3 | 1.5 | 0.00 | TLTM | 0.000 | | 0.00 | 0.000 | trickle |
| SW3 | 4.0 | 0.20 | 0.00 | 0.050 | | 0.00 | 0.000 | culvert |
| SW3 | | 0.10 | 0.00 | | | | 0.000 | main crk x/s |
| SW 4 | | 0.10 | 0.00 | | | | 0.000 | trib. x/s |
| SW 5 | 2.5 | 0.00 | 0.00 | | | | 0.000 | dry |
| SW 7a | 2.0 | 0.00 | 0.00 | 0.000 | 0.006 | 0.00 | 0.015 | Paccar |
| SW 8 E | 1.5 | 0.00 | 0.00 | 0.000 | 0.000 | 0.00 | 0.000 | dry |
| SW 8 W | 3.0 | 0.00 | 0.00 | | | | 0.000 | culvert |
| SW 9 | 3.0 | 0.00 | 0.00 | | | 0.01 | 0.000 | culvert |
| SW9E | 3.0 | 0.00 | 0.00 | | | 0.00 | 0.000 | dry |
| SW 10E | | 0.00 | 0.00 | | | 0.00 | 0.000 | dry |
| SW 10W | 2.0 | 0.33 | 0.00 | 0.165 | 0.000 | 0.00 | 0.000 | st. water |
| SW 12 | 1.5 | 0.08 | 0.00 | 0.053 | 0.000 | 0.00 | 0.000 | st. water |
| Comments: | 2.0 | 0.33 | 0.00 | 0.165 | 0.000 | 0.00 | 0.000 | st. water |

Only measurable flow was directly at Paccar outfall to roadside ditch.
Puddles in creek beds at confluence. Livestock tracks and manure in bed.
Puddles in creek bed above Bayview Road, dry above Marihugh Road.

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Oct. 17, '03 | 0.50" | 9:30-11:00 | TS, DW |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.15 | 1.32 | 0.073 | 0.026 | 0.10 | 0.136 | inlet |
| SW 2S | 1.5 | 0.08 | 3.05 | 0.053 | 0.016 | 0.04 | 0.110 | outlet |
| SW3 | 1.5 | 0.03 | 0.94 | 0.020 | 0.004 | 0.01 | 0.008 | outlet |
| SW3 | 4.0 | | 0.00 | 0.000 | | 0.00 | | culvert |
| SW3 | | 0.90 | 0.64 | | | 3.60 | 2.304 | main crk x/s |
| SW 4 | | | 0.00 | | 0.026 | 0.00 | | trib. x/s |
| SW 5 | 2.5 | 0.35 | 0.45 | 0.140 | 0.069 | 0.43 | 0.194 | outlet |
| SW 7a | 2.0 | 0.54 | 1.70 | 0.276 | 0.176 | 0.68 | 1.152 | outlet |
| SW 8 E | 1.5 | 0.04 | 1.68 | 0.027 | 0.006 | 0.01 | 0.023 | outlet |
| SW 8 W | 3.0 | 0.08 | 0.50 | 0.027 | 0.006 | 0.05 | 0.027 | culvert |
| SW 9 | 3.0 | 0.23 | 2.16 | 0.077 | 0.028 | 0.25 | 0.540 | culvert |
| SW9E | 3.0 | 0.42 | 0.30 | 0.069 | 0.026 | 0.23 | 0.070 | inlet |
| SW 10E | | 0.13 | 0.35 | | | 0.05 | 0.019 | E. ditch x/s |
| SW 10W | 2.0 | 0.33 | 0.42 | | | 0.44 | 0.185 | ditch x/s |
| SW 12 | 1.5 | 0.21 | 0.72 | 0.140 | 0.069 | 0.15 | 0.111 | dry |
| Comments: | 2.0 | 0.83 | 0.18 | 0.415 | 0.308 | 1.23 | 0.222 | outlet |

SW12 - flow from ditch along west side of F to M Rd. is flowing into JW Rd. ditch just d.s. from culvert. (not sampled). Heavy rain overnight.
WSE at staff guage at Egbert culvert = 2.32'.

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Oct. 20, '03 | 0.64" | 9:30-11:00 | TS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/$D^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.21 | 6.35 | 0.105 | 0.044 | 0.18 | 1.118 | outlet |
| SW 2S | 1.5 | 0.15 | 5.97 | 0.100 | 0.041 | 0.09 | 0.549 | outlet |
| SW3 | 1.5 | 0.13 | 4.45 | 0.083 | 0.031 | 0.07 | 0.311 | outlet |
| SW3 | 4.0 | | | 0.000 | | | | culvert |
| SW3 | | 1.50 | 0.84 | | | 6.50 | 5.460 | main crk x/s |
| SW 4 | | | | | | | | trib. x/s |
| SW 5 | 2.5 | 0.42 | 1.29 | 0.168 | 0.087 | 0.54 | 0.701 | outlet |
| SW 7a | 2.0 | 1.29 | 3.62 | 0.658 | 0.548 | 2.11 | 7.621 | outlet |
| SW 8 E | 1.5 | 0.19 | 4.54 | 0.127 | 0.058 | 0.13 | 0.592 | outlet |
| SW 8 W | 3.0 | 0.27 | 1.80 | 0.090 | 0.035 | 0.32 | 0.567 | culvert |
| SW 9 | 3.0 | 0.33 | 3.21 | 0.110 | 0.047 | 0.42 | 1.358 | culvert |
| SW9E | 3.0 | 0.67 | 0.57 | 0.223 | 0.131 | 1.18 | 0.670 | inlet |
| SW 10E | | 0.25 | 1.39 | | | 0.19 | 0.264 | E. ditch x/s |
| SW 10W | 2.0 | 1.25 | 0.44 | 0.625 | 0.517 | 2.07 | 0.910 | inlet |
| SW 12 | 1.5 | 0.38 | 0.90 | 0.253 | 0.156 | 0.35 | 0.316 | inlet |
| SW12 | 2.0 | 1.13 | 0.37 | 0.565 | 0.458 | 1.83 | 0.677 | outlet |
| Comments: | | 0.33 | 1.38 | | | 0.33 | 0.455 | FtoM ditch |

SW8 water wse = 0.66' on staff.
WSE at staff guage at Egbert culvert Try sampling at SW8 culvert outlet - flow seems too low.

## Culvert Flow Monitoring (cont.)

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Nov. 18 '03 | 1.06" | 10:30 - 12:00 | TS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/D$^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.75 | 15.00 | 0.375 | 0.270 | 1.08 | 16.18 | outlet |
| SW 2S | 1.5 | 0.33 | 13.34 | 0.220 | 0.128 | 0.29 | 3.84 | outlet |
| SW3 | 1.5 | 0.29 | 8.26 | 0.193 | 0.106 | 0.24 | 1.98 | outlet |
| SW3 | 4.0 | 4.00 | 2.10 | 1.000 | 0.785 | 12.57 | 26.39 | culvert |
| SW3 | | | | | | | | main crk x/s |
| SW 4 | | | | | | | | trib. x/s |
| SW 5 | 2.5 | 0.60 | 1.78 | 0.240 | 0.145 | 0.91 | 1.61 | outlet |
| SW 7a | 2.0 | 1.45 | 5.00 | 0.740 | 0.623 | 2.39 | 11.97 | outlet |
| SW 8 E | 1.5 | 0.29 | 7.05 | 0.193 | 0.106 | 0.24 | 1.69 | outlet |
| SW 8 W | 3.0 | 0.27 | 1.80 | 0.090 | | 0.00 | 0.00 | culvert |
| SW8 | 3.0 | 0.33 | 3.21 | 0.110 | | 0.00 | 0.00 | culvert |
| SW 9 | | 1.70 | 3.80 | | | 8.5 | 32.30 | creek x/s* |
| SW9E | 3.0 | 1.90 | 4.64 | 0.633 | 0.524 | 4.72 | 21.89 | outlet |
| SW 10E | | 0.30 | 2.30 | | | 0.54 | 1.24 | E. ditch x/s |
| SW 10W | 2.0 | 1.00 | 3.86 | | | 3.50 | 13.51 | ditch x/s |
| SW 12 | 1.5 | 0.80 | 2.40 | | | 2.00 | 4.80 | ditch x/s |
| SW12 | 2.0 | 1.58 | 1.90 | 0.790 | 0.666 | 2.66 | 5.06 | outlet |
| | | 0.33 | 2.75 | | | 0.33 | 0.91 | FtoM ditch |

Comments:

SW8 measured at cross section at Schaffer's. WSE = 2.1' on staff. Culverts too turbulent to measure.

I. Because of stream depth, floating debris.

WSE at staff guage at Egbert culvert = 4.35'.Outlet v = 1.8, inlet v = 2.4. Inlet surcharged.

wse less than 1' below TOB/field edge. Pumps running. WSE at Peth culvert at 3.7' on staff.

Flooding in Dahlsted field in vicinity of "triangle."

Culvert 10E, 12 surcharging. Excess from 10E overflows to another culvert beneath driveway, then under JW road to creek.

Ditch on south side of Marihugh Road at SW9 has about same flow (?) as north side ditch.

| Date: | Rain previous 24 hrs. | Time of Sampling: | Name: |
|---|---|---|---|
| Dec. 9 '03 | 0.0" | 10:00 - 12:00 | TS |

| Station | Culv. diam | Flow depth | measured | d/D | Area/D$^2$ | Flow Area | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | "D" (ft) | "d" (ft) | v (ft/sec) | | (from table) | (sf) | | |
| SW 2N | 2.0 | 0.17 | 0.93 | 0.085 | 0.022 | 0.09 | 0.08 | outlet |
| SW 2S | 1.5 | 0.08 | 2.10 | 0.055 | 0.017 | 0.04 | 0.08 | outlet |
| SW3 | 1.5 | 0.07 | 2.90 | 0.049 | 0.014 | 0.03 | 0.09 | outlet |
| SW3 | 4.0 | 2.00 | 1.30 | 0.500 | 0.393 | 6.28 | 8.17 | culv inlet |
| SW3 | | 0.90 | 0.88 | | | 3.87 | 3.41 | main crk x/s |
| SW 4 | | | | | | | | trib. x/s |
| SW 5 | 2.5 | 0.31 | 0.75 | 0.124 | 0.056 | 0.35 | 0.26 | outlet |
| SW 7S | 2.0 | 0.33 | 1.16 | 0.168 | 0.087 | 0.33 | 0.39 | outlet |
| SW7N | 1.5 | 0.17 | 4.45 | 0.113 | 0.049 | 0.11 | 0.49 | outlet |
| SW 8 E | 1.0 | 0.25 | 1.16 | 0.250 | 0.154 | 0.15 | 0.18 | outlet |
| SW 8 W | 3.0 | 0.23 | 1.90 | 0.077 | 0.028 | 0.25 | 0.48 | culvert |
| SW8 | 3.0 | 0.33 | 3.30 | 0.110 | 0.047 | 0.42 | 1.40 | culvert |

## Culvert Flow Monitoring (cont.)

Dec. 9 '03 (continued)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SW 9 | | | | | | | | creek x/s |
| SW9E | 3.0 | 0.58 | 0.93 | 0.193 | 0.106 | 0.95 | 0.89 | inlet |
| SW 10E | | 0.08 | 0.90 | | | 0.04 | 0.04 | E. ditch x/s |
| SW 10W | 2.0 | 0.81 | 0.57 | 0.405 | 0.298 | 1.19 | 0.68 | inlet |
| SW 12 | 1.5 | 0.29 | 1.44 | 0.193 | 0.106 | 0.24 | 0.34 | ditch x/s |
| SW12 | 2.0 | | 1.05 | 0.000 | | 0.21 | 0.22 | inlet ditch |
| | | | | | | | 0.02 | FtoM ditch |

Comments:

Hasn't rained significantly for a few days, so this represents winter base flow. Station 7S is same as 7A. Station 7N is the culvert under Fto M road north of Marihugh Road

SW3: not sure why the large discrepency. Probably the creek cross section is more accurate due to turbulence at the culvert inlet.

Date: 27-Jan-04 | Rain previous 24 hrs. | Time of Sampling: 8:30-10:30 | Name: TS/DM

| Station | Culv. diam "D" (ft) | Flow depth "d" (ft) | measured v (ft/sec) | d/D | Area/$D^2$ (from table) | Flow Area (sf) | Flow (cfs) | Comments |
|---|---|---|---|---|---|---|---|---|
| SW 1 | | | | | | | | |
| SW 2N | 2.0 | 0.29 | 11.05 | 0.145 | 0.071 | 0.28 | 3.14 | outlet |
| SW 2S | 1.5 | 0.16 | 11.57 | 0.107 | 0.045 | 0.10 | 1.17 | outlet |
| SW3 | 1.5 | 0.23 | 10.50 | 0.153 | 0.076 | 0.17 | 1.80 | outlet |
| SW3 | 4.0 | 3.55 | 3.00 | 0.888 | 0.737 | 11.79 | 35.38 | culv outlet |
| SW3 | | | | | | | | main crk x/s |
| SW 4 | | | | | | | | trib. x/s |
| SW 5 | 2.5 | 0.54 | 2.31 | 0.216 | 0.125 | 0.78 | 1.80 | inlet |
| SW 7S | 2.0 | 0.58 | 4.71 | 0.296 | 0.195 | 0.75 | 3.53 | inlet |
| SW7N | 1.5 | 0.40 | 13.03 | 0.267 | 0.165 | 0.37 | 4.84 | outlet |
| SW 8 E | 1.0 | 0.50 | 6.06 | 0.500 | 0.393 | 0.39 | 2.38 | outlet |
| SW 8 W | 3.0 | | | 0.000 | | | 0.00 | culvert |
| SW8 | 3.0 | | | 0.000 | | | 0.00 | culvert |
| SW 9 | | | 5.04 | | | 4.5 | 22.68 | creek x/s |
| SW9E | 3.0 | 1.38 | 5.34 | 0.460 | 0.351 | 3.16 | 16.87 | outlet |
| SW 10E | | | 3.74 | | | 0.11 | 0.41 | E. ditch x/s |
| SW 10W | 2.0 | 1.63 | 1.92 | 0.815 | 0.684 | 2.74 | 5.25 | outlet |
| SW 12 | 1.5 | | 3.36 | 0.000 | | 1.34 | 4.50 | ditch x/s |
| SW12 | 2.0 | 1.17 | 1.26 | 0.585 | 0.477 | 1.91 | 2.40 | outlet |
| | | | | | | | | FtoM ditch |

Comments:

Rained all night but not hard. SW 8 cross section is approximate. Too much turbulence to measure at culverts.

No Name Creek Sta. 0+20 (run) Evaluation by Tom Slocum. 7/10/03

## STREAM CHANNEL STABILITY FIELD EVALUATION FORM

| Problem Rated | Excellent | Points | Good | s | Fair | Points | Poor | Point | Points |
|---|---|---|---|---|---|---|---|---|---|
| **Upper Banks** | | | | | | | | | |
| Landform | Bank Slope gradient <30% | 2 | Bank Slope gradient 30-40% | (4) | Bank Slope gradient 40-60% | 6 | Bank Slope gradient 60% + | 8 | |
| Mass Wasting or Failure (existing or potential) | No evidence of past or any potential for future mass wasting into channel. | 3 | Infrequent and/or very small. Mostly healed over. Low future potential. | (6) | Moderate frequency & size, with some raw spots eroded by water during high flows. | 9 | Frequent or large, causing sediment nearly year long OR imminent danger of same. | 12 | |
| Debris Jam Potential (Floatable Objects) | Essentially absent from immediate channel area. | 2 | Present but mostly small twigs and limbs. | (4) | Present, volume and size are both increasing. | 6 | Moderate to heavy amounts predominantly larger sizes. | 8 | |
| Vegetative Bank Protection | 90% plus plant density. Vigor and variety suggests a deep, dense, soil binding root mass. | (3) | 70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass. | 6 | 50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass. | 9 | < 50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass. | 12 | |
| **Lower Banks** | | | | | | | | | |
| Channel Capacity Width to Depth ratio = (W/D) | Ample for present plus some increases. Peak flows contained. W/D ratio < 7. | 1 | Adequate. Overbank flows rare. W/D ratio = 8-15. | (2) | Barely contains present peaks. Occasional overbank floods. W/D ratio = 15-25. | 3 | Inadequate. Overbank flows common. W/D ratio >25. | 4 | |
| Bank Rock Content | 65% + with large, angular boulders 12 inches plus and numerous. | 2 | 40-65%, mostly small boulders to cobbles 6-12 inches. | 4 | 20-40%, with most in the 3-6 inch diameter class. | 6 | < 20% rock fragments of gravel sizes 1-3 inches or less. | 8 | |
| Obstructions Flow Deflectors or Sediment Traps | Rocks and old logs firmly embedded. Flow pattern without cutting or deposition. Pools and riffles stable. | 2 | Some present causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm. | (4) | Moderately frequent, moderately unstable obstructions and deflectors move with high water causing bank cutting and filling of pools. | 6 | Frequent obstructions and deflectors cause bank erosion year long. Sediment traps full, channel migration occuring. | 8 | |
| Cutting | Little or none evident. Infrequent raw banks less than 6 inches high generally. | 4 | Some, intermittently at outcurves and constrictions. Raw banks may be up to 12 inches. | 8 | Significant, cuts 12-24 inch high. Root mat overhangs and sloughing evident. | (12) | Almost continous cuts, some over 24 inches high. Failure of overhangs frequent. | 16 | |
| Deposition | Little or no enlargement of channel or point bars. | 4 | Some new increase in bar formation, mostly from coarse gravels. | (8) | Moderate deposition of new gravel and coarse sand on old and some new bars. | 12 | Extensive deposits of predominately fine particles. Accelerated bar formation. | 16 | |
| **Channel Bottom** | | | | | | | | | |
| Rock Angularity | Sharp edges and corners, plane surfaces roughened. | 1 | Rounded corners and edges, surfaces smooth and flat. | (2) | Corners and edges well rounded in two dimensions. | 3 | Well rounded in all dimensions, surfaces smooth. | 4 | |
| Brightness | Surfaces dull, darkened, or stained, Generally not bright. | 1 | Mostly, dull but may have up to 35% bright surfaces. | (2) | Mixture, 50-50% dull and bright ± 15% (i.e. 35-65%). | 3 | Predominantly bright, 65% +, exposed or scoured surfaces. | | |
| Consolidation or Particle Packing | Assorted sizes tightly packed and/or overlapping. | 2 | Moderately packed with some overlapping. | (4) | Mostly a loose assortment with no apparent overlap. | 6 | No packing evident. Loose assortment, easily moved. | 8 | |
| Bottom Size Distribution & Percent Stable Materials | No change in sizes evident. Stable materials 80-100%. | 4 | Distribution shift slight. Stable materials 50-80%. | (8) | Moderate change in sizes. Stable materials 20-50%. | 12 | Marked distribution change. Stable materials 0-20%. | 16 | |
| Scouring and Deposition | Less than 5% of the bottom affected by scouring and deposition. | 6 | 5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. | (12) | 30-50% affected. Deposits and scour at obstructions, constrictions, and bends. Some filling of pools. | 18 | More than 50% of the bottom in a state of flux or change nearly year long. | 24 | |
| Clinging Aquatic Vegetation (Moss and Algae) | Abundant. Growth largely, moss-like, dark perennial. In swift water also. | 1 | Common. Algal forms in low velocity and pool areas. Moss here also and swifter waters. | 2 | Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick. | 3 | Perennial types scarce or absent. Yellow-green, short term bloom may be present. | (4) | |

| Reach Score of: 0-30 Excellent | 39-51 High Good | 77-89 High Fair | 115-127 High Poor | |
|---|---|---|---|---|
| | 52-64 Medium Good | 90-102 Medium Fair | 128-139 Medium Poor | |
| | 65-76 Low Good | 103-114 Low Fair | 140-152 Low Poor | Total Score: 81 |

No Name Creek Sta. 1+50 (riffle) T. Slocum 7/10/03

## STREAM CHANNEL STABILITY FIELD EVALUATION FORM

| Problem Rated | Excellent | Points | Good | Points | Fair | Points | Poor | Points | Points |
|---|---|---|---|---|---|---|---|---|---|
| **Upper Banks** | | | | | | | | | |
| Landform | Bank Slope gradient <30% | (2) | Bank Slope gradient 30-40% | 4 | Bank Slope gradient 40-60% | 6 | Bank Slope gradient 60% + | 8 | |
| Mass Wasting or Failure (existing or potential) | No evidence of past or any potential for future mass wasting into channel. | 3 | Infrequent and/or very small. Mostly healed over. Low future potential. | (6) | Moderate frequency & size, with some raw spots eroded by water during high flows. | 9 | Frequent or large, causing sediment nearly year long OR imminent danger of same. | 12 | |
| Debris Jam Potential (Floatable Objects) | Essentially absent from immediate channel area. | 2 | Present but mostly small twigs and limbs. | (4) | Present, volume and size are both increasing. | 6 | Moderate to heavy amounts predominantly larger sizes. | 8 | |
| Vegetative Bank Protection | 90% plus plant density. Vigor and variety suggests a deep, dense, soil binding root mass. | (3) | 70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass. | 6 | 50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass. | 9 | < 50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass. | 12 | |
| **Lower Banks** | | | | | | | | | |
| Channel Capacity Width to Depth ratio = (W/D) | Ample for present plus some increases. Peak flows contained. W/D ratio < 7. | 1 | Adequate. Overbank flows rare. W/D ratio = 8-15. | 2 | Barely contains present peaks. Occasional overbank floods. W/D ratio = 15-25. | (3) | Inadequate. Overbank flows common. W/D ratio >25. | 4 | |
| Bank Rock Content | 65% + with large, angular boulders 12 inches plus and numerous. | 2 | 40-65%, mostly small boulders to cobbles 6-12 inches. | 4 | 20-40%, with most in the 3-6 inch diameter class. | (6) | < 20% rock fragments of gravel sizes 1-3 inches or less. | 8 | |
| Obstructions Flow Deflectors or Sediment Traps | Rocks and old logs firmly embedded. Flow pattern without cutting or deposition. Pools and riffles stable. | 2 | Some present causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm. | (4) | Moderately frequent, moderately unstable obstructions and deflectors move with high water causing bank cutting and filling of pools. | 6 | Frequent obstructions and deflectors cause bank erosion year long. Sediment traps full, channel migration occuring. | 8 | |
| Cutting | Little or none evident. Infrequent raw banks less than 6 inches high generally. | 4 | Some, intermittently at outcurves and constrictions. Raw banks may be up to 12 inches. | 8 | Significant, cuts 12-24 inch high. Root mat overhangs and sloughing evident. | (12) | Almost continous cuts, some over 24 inches high. Failure of overhangs frequent. | 16 | |
| Deposition | Little or no enlargement of channel or point bars. | 4 | Some new increase in bar formation, mostly from coarse gravels. | 8 | Moderate deposition of new gravel and coarse sand on old and some new bars. | (12) | Extensive deposits of predominately fine particles. Accelerated bar formation. | 16 | |
| **Channel Bottom** | | | | | | | | | |
| Rock Angularity | Sharp edges and corners, plane surfaces roughened. | 1 | Rounded corners and edges, surfaces smooth and flat. | 2 | Corners and edges well rounded in two dimensions. | (3) | Well rounded in all dimensions, surfaces smooth. | 4 | |
| Brightness | Surfaces dull, darkened, or stained, Generally not bright. | 1 | Mostly, dull but may have up to 35% bright surfaces. | 2 | Mixture, 50-50% dull and bright ± 15% (i.e. 35-65%). | (3) | Predominantly bright, 65% +, exposed or scoured surfaces. | | |
| Consolidation or Particle Packing | Assorted sizes tightly packed and/or overlapping. | 2 | Moderately packed with some overlapping. | 4 | Mostly a loose assortment with no apparent overlap. | (6) | No packing evident. Loose assortment, easily moved. | 8 | |
| Bottom Size Distribution & Percent Stable Materials | No change in sizes evident. Stable materials 80-100%. | 4 | Distribution shift slight. Stable materials 50-80%. | (8) | Moderate change in sizes. Stable materials 20-50%. | 12 | Marked distribution change. Stable materials 0-20%. | 16 | |
| Scouring and Deposition | Less than 5% of the bottom affected by scouring and deposition. | 6 | 5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. | (12) | 30-50% affected. Deposits and scour at obstructions, constrictions, and bends. Some filling of pools. | 18 | More than 50% of the bottom in a state of flux or change nearly year long. | 24 | |
| Clinging Aquatic Vegetation (Moss and Algae) | Abundant. Growth largely, moss-like, dark perennial. In swift water also. | 1 | Common. Algal forms in low velocity and pool areas. Moss here also and swifter waters. | 2 | Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick. | 3 | Perennial types scarce or absent. Yellow-green, short term bloom may be present. | (4) | |
| Reach Score of: 0-30 Excellent | | | 39-51 High Good<br>52-64 Medium Good<br>65-76 Low Good | | 77-89 High Fair<br>90-102 Medium Fair<br>103-114 Low Fair | | 115-127 High Poor<br>128-139 Medium Poor<br>140-152 Low Poor | Total Score: | 88 |

No Name Creek Sta. 2+50: Run then pool. An old clear cut area above right bank. 7/10/03

Summary of three sites: Range of scores = 81-88 = "moderate" channel stability

## STREAM CHANNEL STABILITY FIELD EVALUATION FORM

| Problem Rated | Excellent | Points | Good | Points | Fair | Points | Poor | Points | Points |
|---|---|---|---|---|---|---|---|---|---|
| **Upper Banks** | | | | | | | | | |
| Landform | Bank Slope gradient <30% | (2) | Bank Slope gradient 30-40% | 4 | Bank Slope gradient 40-60% | 6 | Bank Slope gradient 60% + | 8 | |
| Mass Wasting or Failure (existing or potential) | No evidence of past or any potential for future mass wasting into channel. | 3 | Infrequent and/or very small. Mostly healed over. Low future potential. | (6) | Moderate frequency & size, with some raw spots eroded by water during high flows. | 9 | Frequent or large, causing sediment nearly year long OR imminent danger of same. | 12 | |
| Debris Jam Potential (Floatable Objects) | Essentially absent from immediate channel area. | 2 | Present but mostly small twigs and limbs. | 4 | Present, volume and size are both increasing. | (6) | Moderate to heavy amounts predominantly larger sizes. | 8 | |
| Vegetative Bank Protection | 90% plus plant density. Vigor and variety suggests a deep, dense, soil binding root mass. | 3 | 70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass. | (6) | 50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass. | 9 | < 50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass. | 12 | |
| **Lower Banks** | | | | | | | | | |
| Channel Capacity Width to Depth ratio = (W/D) | Ample for present plus some increases. Peak flows contained. W/D ratio < 7. | (1) | Adequate. Overbank flows rare. W/D ratio = 8-15. | 2 | Barely contains present peaks. Occasional overbank floods. W/D ratio = 15-25. | 3 | Inadequate. Overbank flows common. W/D ratio >25. | 4 | |
| Bank Rock Content | 65% + with large, angular boulders 12 inches plus and numerous. | 2 | 40-65%, mostly small boulders to cobbles 6-12 inches. | 4 | 20-40%, with most in the 3-6 inch diameter class. | (6) | < 20% rock fragments of gravel sizes 1-3 inches or less. | 8 | |
| Obstructions Flow Deflectors or Sediment Traps | Rocks and old logs firmly embedded. Flow pattern without cutting or deposition. Pools and riffles stable. | 2 | Some present causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm. | (4) | Moderately frequent, moderately unstable obstructions and deflectors move with high water causing bank cutting and filling of pools. | 6 | Frequent obstructions and deflectors cause bank erosion year long. Sediment traps full, channel migration occuring. | 8 | |
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| Deposition | Little or no enlargement of channel or point bars. | 4 | Some new increase in bar formation, mostly from coarse gravels. | 8 | Moderate deposition of new gravel and coarse sand on old and some new bars. | (12) | Extensive deposits of predominately fine particles. Accelerated bar formation. | 16 | |
| **Channel Bottom** | | | | | | | | | |
| Rock Angularity | Sharp edges and corners, plane surfaces roughened. | 1 | Rounded corners and edges, surfaces smooth and flat. | 2 | Corners and edges well rounded in two dimensions. | (3) | Well rounded in all dimensions, surfaces smooth. | 4 | |
| Brightness | Surfaces dull, darkened, or stained, Generally not bright. | (1) | Mostly, dull but may have up to 35% bright surfaces. | 2 | Mixture, 50-50% dull and bright ± 15% (i.e. 35-65%). | 3 | Predominantly bright, 65% +, exposed or scoured surfaces. | | |
| Consolidation or Particle Packing | Assorted sizes tightly packed and/or overlapping. | 2 | Moderately packed with some overlapping. | (4) | Mostly a loose assortment with no apparent overlap. | 6 | No packing evident. Loose assortment, easily moved. | 8 | |
| Bottom Size Distribution & Percent Stable Materials | No change in sizes evident. Stable materials 80-100%. | 4 | Distribution shift slight. Stable materials 50-80%. | (8) | Moderate change in sizes. Stable materials 20-50%. | 12 | Marked distribution change. Stable materials 0-20%. | 16 | |
| Scouring and Deposition | Less than 5% of the bottom affected by scouring and deposition. | 6 | 5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. | (12) | 30-50% affected. Deposits and scour at obstructions, constrictions, and bends. Some filling of pools. | 18 | More than 50% of the bottom in a state of flux or change nearly year long. | 24 | |
| Clinging Aquatic Vegetation (Moss and Algae) | Abundant. Growth largely, moss-like, dark perennial. In swift water also. | 1 | Common. Algal forms in low velocity and pool areas. Moss here also and swifter waters. | 2 | Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick. | 3 | Perennial types scarce or absent. Yellow-green, short term bloom may be present. | (4) | |

| Reach Score of: 0-30 Excellent | 39-51 High Good | 77-89 High Fair | 115-127 High Poor | Total Score: 87 |
|---|---|---|---|---|
| | 52-64 Medium Good | 90-102 Medium Fair | 128-139 Medium Poor | |
| | 65-76 Low Good | 103-114 Low Fair | 140-152 Low Poor | |

## No Name Creek Bank Full Flow Estimates

Reach #1: Sta. 0+38 downstream of Bayview Road. This is the middle of a short run.
Assume BM = 50.00 = left bank elevation. Date 10/28/03 - just after heavy rain

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.0 | 4.44 | 50.00 | Top of left bank | 11.5 | 7.60 | 46.84 | toe of cut |
| 1.0 | 4.40 | 50.04 | Top of cut bank | 12.2 | 7.05 | 47.39 | OHWM R? |
| 1.5 | 7.38 | 47.06 | OHWM L? | 13.3 | 5.55 | 48.89 | top of cut |
| 2.0 | 7.92 | 46.52 | Toe of cut | 14.5 | 5.00 | 49.44 | TOB R |
| 2.3 | 8.15 | 46.29 | w.e.l./w.s.e. | 19.0 | 5.70 | 48.74 | low point |
| 4.0 | 8.61 | 45.83 | thalweg | 21.0 | 5.20 | 49.24 | F/P |
| 5.0 | 8.50 | 45.94 | thalweg | 29.0 | 4.75 | 49.69 | Toe of slope |
| 7.7 | 8.11 | 46.33 | w.e.r. | | | | |

Banks consist mostly of clay with cobble. Thalweg is clay with small cobbles.
Channel slope Sta. 0+16 to 0+63 (extent of run) = 0.42/47 = 0.009 ft/ft
Hydraulic gradient Sta. 0+25 to 0+50 = 0.0036 ft/ft (some backwatering by debris jam at Sta. 0+60)
Channel cross section at OHWM = 9.5 sf
Flow measured 10/28/03 = 1.77 cfs. Depth at thalweg = 0.9' feet.
Cross section flow area = 3.93 sf Hydraulic radius = 0.38'
Mannings "n" = 0.104. This is too high - probably because of backwatering. Instead assume n = 0.05, which was calculated for the riffle at Sta. 1+05.
Extrapolate to bank full area, $Q_{BF}$ = 21.8 cfs

Reach #2: Sta. 64+26 on the "Flats" (a run 4 feet downstream of the foot bridge).
Assume BM = dot at bridge = 1.64' above MSL. FS to BM = 4.22 Date 10/24/03
Elev. = (4.22+1.64) - FS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.0 | 2.71 | 3.15 | TOB L / field edge | 11.0 | 7.20 | -1.34 | w.e.r. |
| 1.0 | 3.23 | 2.63 | bank slope | 11.0 | 7.36 | -1.50 | w.s.e. |
| 3.0 | 4.25 | 1.61 | bank slope | 11.7 | 5.25 | 0.61 | OHWM R? |
| 4.0 | 4.85 | 1.01 | edge of dredged chan. | 11.8 | 4.93 | 0.93 | chan. edge |
| 4.1 | 5.25 | 0.61 | OHWM L? | 14.0 | 4.80 | 1.06 | F/P |
| 5.0 | 7.40 | -1.54 | w.e.l. | 17.0 | 3.80 | 2.06 | terrace toe |
| 9.0 | 7.52 | -1.66 | thalweg | | | | |

Banks consist mostly of silt. Thalweg is coarse sand.
Slope Sta. 64+ 30 to 63+55 (extent of coarse sand bottom) = 0.34/75 = 0.0045 ft/ft
Hydraulic gradient Sta. 64+26 to 56+25 (site to Egbers Culvert) = 0.0007 ft/ft.
Channel cross section at OHWM = 14.6 sf
Flow measured 10/28/03 = 5.55 cfs. Depth at thalweg =1.38 feet. Avg. v = 0.65 fps
Cross section flow area = 8.60 sf Hydraulic radius = 0.93'
Mannings "n" = 0.057. Probably a bit high due to backwatering
Extrapolate to bank full area, $Q_{BF}$ = 12.0. Q to overtop channel at lowest bank elev. = 18.0 cfs.

## No Name Creek Post-Flood Cross Sections

Reach #1: Sta. 0+38 downstream of Bayview Road. This is the middle of a short run.
Assume BM = 50.00 = left bank elevation. Date 1/08/04 - after 11/18/03 flood

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.0 | 4.45 | 50.00 | Top of left bank | 7.0 | 8.53 | 45.92 | chan. bed |
| 0.5 | | | inside edge of undercut | 8.0 | 8.45 | 46.00 | " |
| 1.2 | 4.40 | 50.05 | Top of cut bank | 9.0 | 8.30 | 46.15 | " |
| 1.4 | 6.92 | 47.53 | OHWM L? | 10.5 | 7.67 | 46.78 | wer sand |
| 1.5 | 7.32 | | eroded below here | 11.7 | 7.57 | 46.88 | toe of bank |
| 1.9 | 7.71 | 46.74 | w.e.l./w.s.e. | 12.2 | 6.98 | 47.47 | OHWM R? |
| 2.4 | 8.32 | 46.13 | toe of bank | 13.5 | 5.35 | 49.10 | top of cut |
| 4.0 | 8.55 | 45.90 | thalweg | 15.5 | 5.05 | 49.40 | crest |
| 5.0 | 8.60 | 45.85 | thalweg | 18.0 | 5.65 | 48.80 | dip in F/P |
| 6.0 | 8.54 | 45.91 | channel bottom | 29.0 | 4.75 | 49.70 | toe of slope |

Hydraulic gradient at riffle just above cross section (Sta. 0-10 to 0+14.5) = 7.61-7.02/24.5 = 0.024 ft/ft

Reach #2: Sta. 64+26 on the "Flats" (a run 4 feet downstream of the foot bridge).
Assume BM = 1.64' above MSL = dot on center of footbridge. Date 1/8/04 - after 11/18/03 flood
FS to BM =4.86. So subtract FS from (4.86+1.64) = 6.50

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.0 | 3.74 | 2.76 | gse at stake | 10.0 | 8.04 | -1.54 | chan. btm |
| 4.0 | 5.35 | 1.15 | top of bank/cut | 11.2 | 7.25 | -0.75 | w.e.r. |
| 4.5 | 6.28 | 0.22 | wse at w.e.l. | 11.9 | 5.50 | 1.00 | TOB R |
| 4.5 | 7.60 | -1.10 | bottom at w.e.l. | 14.2 | 5.55 | 0.95 | gse at stake |
| 6.0 | 8.11 | -1.61 | channel bottom | | | | |
| 7.0 | 8.16 | -1.66 | channel bottom | | 4.80 | 1.70 | recent high |
| 8.0 | 8.02 | -1.52 | channel bottom | | | | water mark |
| | 7.78 | -1.28 | thalweg E. Fork 10' upstream | | | -1.65 | 10/24/03 |
| | 7.90 | -1.40 | thalweg E. Fork at u.s. side of confl | | | | |
| | 8.90 | -2.40 | thalweg at d.s. side of confluence | | | -2.27 | 10/24/03 |
| | 7.24 | -0.74 | thalweg at bridge | | | -1.80 | 10/24/03 |

Thalweg at bridge in Nov.'02 = -1.80'

# Appendix 4: **Habitat – Supplemental Tables and Figures**

## No Name Watershed Characterization

1. NRCS Stream Visual Assessment Protocol

| Parameter | Reach 1 | Reach 2, 3, and 4 | Lowland |
|---|---|---|---|
| Channel Condition | 2 | 8 | 2 |
| Hydrologic Alteration | 2 | 4 | 7 |
| Riparian Zone | 3 | 10 | 1 |
| Bank Stability | 7 | 3 | 7 |
| Water Appearance | 7 | 7 | 7 |
| Nutrient Enrichment | 7 | 7 | 5 |
| Barriers to Fish Movement | 1 | 7 | 7 |
| In-stream Fish Cover | 3 | 5 | 1 |
| Pools | 1 | 5 | NA |
| Invertebrate Habitat | 3 | 7 | 3 |
| Canopy Cover | 4 | 8 | 1 |
| Riffle Embeddedness | 3 | 8 | NA |
| Total | 43 | 79 | 41 |
| Total/# parameters | 3.6 (poor) | 6.6 (fair) | 4.1 (poor) |

Scores give a general indication of the environmental condition of the reach vis a vis the natural, un-impacted condition. Scoring done by T. Slocum, November 2003.

2. ESA "Path B" Environmental Baseline Conditions[1]

| Parameter | Reach 1 | Reach 2, 3, and 4 | Lowland |
|---|---|---|---|
| Physical Channel Features | FAR | FAR | FAR |
| Biological Features | NPF | FAR | NPF |
| Land Use Characteristics | FAR | PFC | PFC |

FAR = "Functioning at Risk"
NPF = "Not Properly Functioning"
PFC = "Properly Functioning Condition"

[1] Derived from NOAA Fisheries ESA biological assessment guidance. See attached data sheets for breakdown.

Field Data Form No Name Slough on Flats

| Unit No. | River Miles (length of survey unit): | Dates Visited: 5/21/01 | Survey Team: Steve, Jenny |
|---|---|---|---|
| **Total Points=** | **Group One-Functional Criteria (1pt)** | **Group Two-Functional Criteria (2pts)** | **Group Three-Functional Criteria (3pts)** |
| **Physical Features** | No Riffles ✓<br>No Pools ✓<br>>50% Rip Rap —<br>>50% Erosion —<br>No Accretion —<br><80 ft.width of CMZ ✓<br>No **federal** listed CTE species and habitat documented. —<br>Low overwintering habitat ✓<br>**Total** 4 | 1%-5% Riffles —<br>1%-5% Pools —<br>30%-50% Rip Rap —<br>30%-50% Erosion ✓<br>0%-50% Accretion —<br>80-200ft width of CMZ —<br>**State** Priority Habitat or Species Documented ✓<br>Moderate overwintering habitat —<br>**Total** 6 | >5% Riffles —<br>>5% Pools —<br><30% Rip Rap ✓<br><30% Erosion —<br>>50% Accretion —<br>>200ft width. of CMZ —<br>**Federal** CTE species and habitat documented. —<br>High overwintering habitat —<br>**Total** 3 |
| **Total= 13** (FAIR) | | | |
| **Biological Features** | <10% LWD present ✓<br><12"dbh trees within the CMZ ✓<br>No side channels ✓<br>No rearing/ feeding habitat ✓<br>Plant diversity includes herb and shrub layer only ✓<br>No wetlands indicated ✓<br>**Total** 6 | 10%-30% LWD —<br>12"-20" dbh within the CMZ —<br>Potential restoration of side channels —<br>Potential rearing/ feeding habitat —<br>Plant diversity herbs, shrubs, deciduous trees —<br>Wetlands, PEMC or PSSC —<br>**Total** | >30% LWD —<br>>20" dbh within the CMZ —<br>Side channels —<br>Rearing/feeding habitat —<br>Plant diversity herbs, shrubs, mixed deciduous & conifer trees —<br>Wetland, PFOC —<br>**Total** |
| **Total = 6** (NPF) | | | |
| **Land Use And Man-Made Features** | No tributaries present —<br><30% of areas zoned for Open Space (OP) or Community Park(CP) ✓<br>>80% impervious surfaces —<br>No instream structures ✓<br>More than one outfall from public facilities —<br>>50% of areas zoned DT, CI, GC,PO, P, MF-LO, or MF-MH —<br>**Total** 2 | Tributaries with fish ladders or barriers present ✓<br>30% - 70% areas zoned Open Space(OS) or Community Park (CP) —<br>50% - 80% impervious surfaces —<br>Instream structures creating low habitat value —<br>One outfall from public facilities —<br>>50% zoned SF-HIGH —<br>**Total** 2 | Tributaries with no fish barriers or ladders present —<br>>70% of areas zoned Open Space or Community Park (CP) —<br><50% impervious surface ✓<br>Instream structures Creating moderate habitat value —<br>No outfalls from public facilities ✓<br>>50%Areas zoned SF-MED, AG, OS or CP ✓<br>**Total** 9 |
| **Total= 13** (PFC) | | | |

CMZ=Channel Migration Zone, CTE=Federal Candidate, Threatened, Endangered Species, dbh=diameter at breast height, NWI=National Wetland Inventory, PEMC=Palustrine emergent seasonally flooded, PSSC, Palustrine scrub-shrub seasonally flooded, PFOC=Palustrine forested seasonally flooded, AG = Agriculture w/density transfer (1-2.5du/ac), SF-MED=Medium Density Single Family (3-4.5du/ac), MF-LO=Multi-family low density (11.5-13.5du/ac), SF-HI=Single Family High Density (5-7.5 du/ac.)MF-MH=Multi-Family Medium-High Density(10-30du/ac.), PO=Professional Office, DT/SP=Downtown Retail/Support Commercial, CI=Commercial/Industrial.

Check list for documenting environmental baseline conditions and effects of proposed action(s) on relevant indicators for CTE species

Reach: Slough in flats Watershed: No name

| Pathways:Indicators | Environmental Baseline Conditions | | | Effects of the Action | | |
|---|---|---|---|---|---|---|
| | Properly Functioning (PFC) | Functioning At Risk (FAR) | Not Properly Functioning (NPF) | Restore | Maintain | Degrade |
| **Water Quality** | | | | | | |
| Temperature | | | ✓ | | | |
| Sediment | | ✓ | | | | |
| Chemical Contamination/Nutrients | ✓ | | | | | |
| **Habitat Access** | | | | | | |
| Physical Barriers | | | ✓ | | | |
| **Habitat Elements** | | | | | | |
| Substrate Embeddedness | | | ✓ | | | |
| Large Woody Debris | | | ✓ | | | |
| Pool Frequency | | | ✓ | | | |
| Pool Quality | | | ✓ | | | |
| Off-Channel Habitat | | | ✓ | | | |
| Refugia | | | ✓ | | | |
| **Channel Conditions and Dynamics** | | | | | | |
| Width/Depth Ratio | | ✓ | | | | |
| Streambank Condition | | ✓ | | | | |
| Floodplain Connectivity | | | ✓ (pump) | | | |
| **Flow/Hydrology** | | | | | | |
| Change in Peak/Base Flows | | ✓ | | | | |
| Drainage Network Increase | | ? | | | | |
| **Watershed Conditions** | | | | | | |
| Road Density and Location | ✓ | | | | | |
| Disturbance History | | | ✓ | | | |
| Riparian Reserves | | | ✓ | | | |

Note: This table was taken from A Guide to Biological Assessments 1999 prepared by National Marine Fisheries Service.

Field Data Form — No Name Creek: Reaches 2, 3 + 4

| Unit No. | River Miles (length of survey unit): | Dates Visited: 5/21/03 | Survey Team: Stotz, Henry |
|---|---|---|---|
| **Total Points=** | **Group One-Functional Criteria (1pt)** | **Group Two-Functional Criteria (2pts)** | **Group Three-Functional Criteria (3pts)** |
| **Physical Features** | No Riffles —<br>No Pools —<br>>50% Rip Rap —<br>>50% Erosion —<br>No Accretion ✓<br><80 ft.width of CMZ ✓<br>No **federal** listed CTE species and habitat documented. ✓<br>Low overwintering habitat ✓<br>**Total** 1 | 1%-5% Riffles —<br>1%-5% Pools —<br>30%-50% Rip Rap —<br>30%-50% Erosion ✓<br>0%-50% Accretion ✓<br>80-200ft width of CMZ —<br>**State** Priority Habitat or Species Documented —<br>Moderate overwintering habitat —<br>**Total** 8 | >5% Riffles ✓<br>>5% Pools ✓<br><30% Rip Rap ✓<br><30% Erosion —<br>>50% Accretion —<br>>200ft width. of CMZ —<br>**Federal** CTE species and habitat documented. —<br>High overwintering habitat —<br>**Total** 9 |
| **Total= 16** (FAR) | | | |
| **Biological Features** | <10% LWD present —<br><12"dbh trees within the CMZ —<br>No side channels ✓<br>No rearing/ feeding habitat —<br>Plant diversity includes herb and shrub layer only —<br>No wetlands indicated —<br>**Total** 1 | 10%-30% LWD ✓<br>12"-20" dbh within the CMZ ✓<br>Potential restoration of side channels —<br>Potential rearing/ feeding habitat ✓<br>Plant diversity herbs, shrubs, deciduous trees —<br>Wetlands, PEMC or PSSC ✓<br>**Total** 8 | >30% LWD —<br>>20" dbh within the CMZ —<br>Side channels —<br>Rearing/feeding habitat —<br>Plant diversity herbs, shrubs, mixed deciduous & conifer trees ✓<br>Wetland, PFOC —<br>**Total** 3 |
| **Total = 12** (FAR) | | | |
| **Land Use And Man-Made Features** | No tributaries present ✓<br><30% of areas zoned for Open Space (OP) or Community Park(CP) ✓<br>>80% impervious surfaces —<br>No instream structures —<br>More than one outfall from public facilities —<br>>50% of areas zoned DT, CI, GC,PO, P, MF-LO, or MF-MH —<br>**Total** 2 | Tributaries with fish ladders or barriers present —<br>30% - 70% areas zoned Open Space(OS) or Community Park (CP) —<br>50% - 80% impervious surfaces —<br>Instream structures creating low habitat value ✓<br>One outfall from public facilities —<br>>50% zoned SF-HIGH —<br>**Total** 2 | Tributaries with no fish barriers or ladders present —<br>>70% of areas zoned Open Space or Community Park (CP) —<br><50% impervious surface ✓<br>Instream structures Creating moderate habitat value —<br>No outfalls from public facilities ✓<br>>50%Areas zoned SF-MED, AG, OS or CP ✓<br>**Total** 9 |
| **Total= 17** (PFC) | | | |

CMZ=Channel Migration Zone, CTE=Federal Candidate, Threatened, Endangered Species, dbh=diameter at breast height, NWI=National Wetland Inventory, PEMC=Palustrine emergent seasonally flooded, PSSC, Palustrine scrub-shrub seasonally flooded, PFOC=Palustrine forested seasonally flooded, AG = Agriculture w/density transfer (1-2.5du/ac), SF-MED=Medium Density Single Family (3-4.5du/ac), MF-LO=Multi-family low density (11.5-13.5du/ac), SF-HI=Single Family High Density (5-7.5 du/ac.)MF-MH=Multi-Family Medium-High Density(10-30du/ac.), PO=Professional Office, DT/SP=Downtown Retail/Support Commercial, CI=Commercial/Industrial.

Check list for documenting environmental baseline conditions and effects of proposed action(s) on relevant indicators for CTE species

Reach: #2, 3, 5 4 & creek Watershed: Nuname

| | Environmental Baseline Conditions | | | Effects of the Action | | |
|---|---|---|---|---|---|---|
| Pathways:Indicators | Properly Functioning (PFC) | Functioning At Risk (FAR) | Not Properly Functioning (NPF) | Restore | Maintain | Degrade |
| **Water Quality** | | | | | | |
| Temperature | | ✓ | | | | |
| Sediment | | ✓ | | | | |
| Chemical Contamination/Nutrients | ✓ | | | | | |
| **Habitat Access** | | | | | | |
| Physical Barriers | | | ✓ | | | |
| **Habitat Elements** | | | | | | |
| Substrate Embeddedness | | ✓ | | | | |
| Large Woody Debris | ✓ | | | | | |
| Pool Frequency | ✓ | | | | | |
| Pool Quality | ✓ | | | | | |
| Off-Channel Habitat | | | ✓ | | | |
| Refugia | | | ✓ | | | |
| **Channel Conditions and Dynamics** | | | | | | |
| Width/Depth Ratio | | | ✓ | | | |
| Streambank Condition | | ✓ | | | | |
| Floodplain Connectivity | | ✓ (lower in each) | | | | |
| **Flow/Hydrology** | | | | | | |
| Change in Peak/Base Flows | | ✓ | | | | |
| Drainage Network Increase | | ? | | | | |
| **Watershed Conditions** | | | | | | |
| Road Density and Location | ✓ | | | | | |
| Disturbance History | ✓ | | | | | |
| Riparian Reserves | ✓ | | | | | |

Note: This table was taken from A Guide to Biological Assessments 1999 prepared by National Marine Fisheries Service.

No Name Creek Reach #1

Field Data Form

| Unit No. | River Miles (length of survey unit): | Dates Visited: 5/21/03 | Survey Team: Mann, Healy |
|---|---|---|---|
| **Total Points=** | **Group One-Functional Criteria (1pt)** | **Group Two-Functional Criteria (2pts)** | **Group Three-Functional Criteria (3pts)** |
| **Physical Features** | No Riffles ✓<br>No Pools ✓<br>>50% Rip Rap ___<br>>50% Erosion ✓<br>No Accretion ✓<br>80 ft.width of CMZ ✓<br>No **federal** listed CTE species and habitat documented. ✓<br>Low overwintering habitat ✓ | 1%-5% Riffles ___<br>1%-5% Pools ___<br>30%-50% Rip Rap ___<br>30%-50% Erosion ___<br>0%-50% Accretion ___<br>80-200ft width of CMZ ___<br>**State** Priority Habitat or Species Documented ___<br>Moderate overwintering habitat ___ | >5% Riffles ___<br>>5% Pools ___<br><30% Rip Rap ✓<br><30% Erosion ___<br>>50% Accretion ___<br>>200ft width. of CMZ ___<br>**Federal** CTE species and habitat documented. ___<br>High overwintering habitat ___ |
| **Total=** 8 (FAR) | **Total** 6 | **Total** | **Total** 2 |
| **Biological Features** (NPF) | <10% LWD present ✓<br><12"dbh trees within the CMZ ✓<br>No side channels ✓<br>No rearing/ feeding habitat ✓<br>Plant diversity includes herb and shrub layer only ✓<br>No wetlands indicated ✓ | 10%-30% LWD ___<br>12"-20" dbh within the CMZ ___<br>Potential restoration of side channels ___<br>Potential rearing/ feeding habitat ___<br>Plant diversity herbs, shrubs, deciduous trees ___<br>Wetlands, PEMC or PSSC ___ | >30% LWD ___<br>>20" dbh within the CMZ ___<br>Side channels ___<br>Rearing/feeding habitat ___<br>Plant diversity herbs, shrubs, mixed deciduous & conifer trees ___<br>Wetland, PFOC ___ |
| **Total =** 6 | **Total** | **Total** | **Total** |
| **Land Use And Man-Made Features** (FAR) | No tributaries present ✓<br><30% of areas zoned for Open Space (OP) or Community Park(CP) ✓<br>>80% impervious surfaces ___<br>No instream structures ✓<br>More than one outfall from public facilities ___<br>>50% of areas zoned DT, CI, GC,PO, P, MF-LO, or MF-MH ___ | Tributaries with fish ladders or barriers present ___<br>30% - 70% areas zoned Open Space(OS) or Community Park (CP) ___<br>50% - 80% impervious surfaces ___<br>Instream structures creating low habitat value ___<br>One outfall from public facilities ___<br>>50% zoned SF-HIGH ___ | Tributaries with no fish barriers or ladders present ___<br>>70% of areas zoned Open Space or Community Park (CP) ___<br><50% impervious surface ✓<br>Instream structures Creating moderate habitat value ___<br>No outfalls from public facilities ✓<br>>50%Areas zoned SF-MED, AG, OS or CP ✓ |
| **Total=** 12 | **Total** 3 | **Total** | **Total** 9 |

CMZ=Channel Migration Zone, CTE=Federal Candidate, Threatened, Endangered Species, dbh=diameter at breast height, NWI=National Wetland Inventory, PEMC=Palustrine emergent seasonally flooded, PSSC, Palustrine scrub-shrub seasonally flooded, PFOC=Palustrine forested seasonally flooded, AG = Agriculture w/density transfer (1-2.5du/ac), SF-MED=Medium Density Single Family (3-4.5du/ac), MF-LO=Multi-family low density (11.5-13.5du/ac), SF-HI=Single Family High Density (5-7.5 du/ac.)MF-MH=Multi-Family Medium-High Density(10-30du/ac.), PO=Professional Office, DT/SP=Downtown Retail/Support Commercial, CI=Commercial/Industrial.

Check list for documenting environmental baseline conditions and effects of proposed action(s) on relevant indicators for CTE species

Reach: #1 of Creek Watershed: NoName

| Pathways:Indicators | Environmental Baseline Conditions | | | Effects of the Action | | |
|---|---|---|---|---|---|---|
| | Properly Functioning (PFC) | Functioning At Risk (FAR) | Not Properly Functioning (NPF) | Restore | Maintain | Degrade |
| **Water Quality** | | | | | | |
| Temperature | | ✓ | | | | |
| Sediment | | ✓ | | | | |
| Chemical Contamination/Nutrients | ✓ | | | | | |
| **Habitat Access** | | | | | | |
| Physical Barriers | ✓ | | | | | |
| **Habitat Elements** | | | | | | |
| Substrate Embeddedness | | ✓ | | | | |
| Large Woody Debris | | | ✓ | | | |
| Pool Frequency | | | ✓ | | | |
| Pool Quality | | | ✓ | | | |
| Off-Channel Habitat | | | ✓ | | | |
| Refugia | | | ✓ | | | |
| **Channel Conditions and Dynamics** | | | | | | |
| Width/Depth Ratio | | ✓ | | | | |
| Streambank Condition | | ✓ | | | | |
| Floodplain Connectivity | | | ✓ | | | |
| **Flow/Hydrology** | | | | | | |
| Change in Peak/Base Flows | | ✓ | | | | |
| Drainage Network Increase | | ? | | | | |
| **Watershed Conditions** | | | | | | |
| Road Density and Location | ✓ | | | | | |
| Disturbance History | | ✓ | | | | |
| Riparian Reserves | | | ✓ | | | |

Note: This table was taken from A Guide to Biological Assessments 1999 prepared by National Marine Fisheries Service.

Functioning (PFC), Functioning At Risk (FAR) and Not Properly Functioning (NPF). These ratings were applied to the three categories of features surveyed in each unit based upon quantitative parameters by utilizing the maximum points possible in each category for each group of functional criteria. The quantitative parameters and the corresponding EBC ratings are listed below in Table 1.

Table 1. Ratings for Environmental Baseline Conditions (EBCs)

| | **Not Properly Functioning (NPF)** | **Functioning at Risk (FAR)** | **Properly Functioning (PFC)** |
|---|---|---|---|
| **Physical Features** | 0-8 points | 9-16 points | 17-24 points |
| **Biological and Land Use/Man-made Features** | 0-6 points | 7-12 points | 13-18 points |

All three features for each survey unit were totaled and documented in Table 2 and EBC ratings are indicated per survey unit for each feature.

Table 2. Summary of Field Data Forms (See Attachment E)

| | **Unit One** | **Unit Two** | **Unit Three** | **Unit Four** | **Unit Five** | **Unit Six** |
|---|---|---|---|---|---|---|
| **Approximate Length of Unit** | 1.75 miles | 1 mile | 1.79 mile | 0.80 mile | 1 mile | .80 mile |
| **Physical Features** | 22 = PFC | 17 = PFC | 20 = PFC | 19 = PFC | 9 = FAR | 17 = PFC |
| **Biological Features** | 16 = PFC | 10 = FAR | 17 = PFC | 18 = PFC | 8 = FAR | 16 = PFC |
| **Land Use Man-made Features** | 14 = PFC | 14 = PFC | 14 = PFC | 14 = PFC | 9 = FAR | 11 = FAR |
| **Total Points** | 52 | 41 | 51 | 51 | 26 | 44 |

Following is a description of the inventory items in the order that they appear on the field data forms. The descriptions below include an explanation of why they were included in this survey and a brief description of what was observed through our field

# No Name Creek Field Observations May 21, 2003

Confluence of main creek with east ditch
Flow measured in main creek at 0.017 cfs, in east ditch = 0.006 cfs.

Location No. 004
30' upstream of confluence. Sediment is coarse sand and fine gravel. Bank-full width (BFW) = 11.5', Bank-full depth = about 2.0'.

Loc. 005
Swampy area. Reed canary grass, skunk cabbage, salmon berry, nettle. Possible beaver pond location? BFW 5' to 8'. BFD about 3'. Current water depth 1.0'. Sand and silt bottom.

Loc. 009
Upstream edge of wetland/forest edge. Mature cedar, maple, fir, alder in riparian area. A few riffles dropping down to flat section in wetland. BFW = 10', BFD = 2'. Substrate is coarse sand, with finer sand at small bars. A few salmonid fry observed.

Loc. 011
Confluence of small trib from east (left). Trib channel (dry) is 2' wide by 18' deep. Large overhanging cedar and small pool with sandy bottom at confluence. Large fir just upstream.

Main channel about 40' upstream, BFW = 11', BFD = 3.5'. Substrate is fine sand and silt. Several pools in this reach up to 18" deep. Flat channel slope. Pools probably fed by groundwater inputs. Racoon (?) tracks.

Loc. 015
5' diameter old growth cedar log across pool, forms pool with overhanging banks. Current water depth 3'. Large maple and fir along banks. Just upstream of pool, BFW = 9', BFD = 3.5'. Small flow observed in channel. Bank scour on outside curves, substrate is sand to small cobble, depending on location in channel. Saw a bald eagle.

Loc. 017
Small riffle. Substrate coarse sand. Current flow = 0.006 cfs. Some flow probably seeping into the soil.

Loc. 018
Old growth fir log across channel forms a pool.

Loc. 020
Old growth root wad across channel forms a pool. Above LWD is a bar of coarse sand. Small overflow side channel on right side (flows around root wad). Small fish observed (sp. unknown). Large standing old growth cedar on bank.

Loc. 021
Open patch in forest cover, salmon berry thicket. Flat slope in channel. BFW about 6', BFW about 4'. Substrate sand and silt. Current water depth about 18", small fish observed.

Loc. 022
Downstream end of a long pool. Current water depth 18".

Loc. 023
Coarse sand bar at upstream end of pool. Flow measured at 0.040 cfs.

Loc. 028
Large log across channel causes flow to spread out over floodplain on right side. Vine maple on floodplain/side channel. BFW 11' to 14', BFD about 2'.

Loc. 03 (?)
Sharp bend in creek. Deep pool with shaded overhanging bank. Current water depth 2'. Observed about 12 salmonid fry. Substrate is coarse sand and fine gravel over a clay hardpan. Alders, large fir and cedar in riparian area. Skunk cabbage suggests significant groundwater seepage.

Loc. 032.
Gravel meander bar. Flow measured at 0.033 cfs.

↑

Loc. 033
Large log over creek. Pool downstream of log, coarse sand to medium gravel bar upstream. Salmonid fry observed in pool.

Reach #4

Loc. 034
2'-deep pool and small cobble bar above a LWD jam. Cobble substrate in channel becoming silt just above jam. Several (10 – 15) 3" – 4" salmonid juveniles seen in pool.

Reach #3

↓

Loc. 035
Small cobble bar just above Loc. 034. BFW = 16', BFD = 18". Particle size on bar $D_{50}$ = 38mm (= "very coarse gravel"). Salmonid fry in pool just u.s. of here.

Loc. 036
Small cobble bar and 18" deep pool with salmonid fry.

Loc. 038
Outside of curve d.s. of a cobble bar. Eroding clay bank. Steep hillside. Small LWD jam just u.s. Flow measured at 0.060 cfs.

Loc. 039
Shallow (6" deep) pool with 1 salmonid fry, substrate is silt to large gravel.

Loc. 041
Riffle, substrate $D_{50}$ = 64mm ("small cobble"). BFW = 15', BFD = 2' to 2.5'.

Loc. 042
Dry side channel. Substrate in main channel $D_{50}$ = 100 mm (small cobble). Saw 1 salmonid fry. About 50 feet upstream is a large cedar log across the channel. Immediately upstream is a gravel bar and small pool.

Loc. 043
Small pool. BFW = 11', BFD = 3'. No fish observed.

Loc. 044
LWD jam with small cobble bar immediately upstream. Saw one salmonid fry in the channel.

Loc. 045
LWD with deep pool immediately downstream. Water depth 18", silt and cobble substrate, saw unidentified fish. Dry side channel on left side.

Loc. 046
Flow in channel measured at 0.019 cfs. Pool just upstream had 1 salmonid fry.

Loc. 048
Channel constricted by a stump. BFW = 9', BFD = 18". Substrate is large cobble. LWD jam about 30' upstream.

Loc. 050
BFW = 18', BFD = 18". Substrate is small cobble in center of channel and gravel on sides.

Loc. 052
↑
At hydrology monitoring station. BFW = 14', BFD = 3'. Substrate is large cobble.

Loc. 053
Reach #3 Pool below Bayview Road culvert outlet

Reach #2 Loc. 057
Schaffer property. BFW = 12', BFD = 2', substrate is small cobble. Flow measured at 0.031 cfs.

↓
Loc. 058
Home-made plank bank protection on right bank below Schaffer house. BFW = 10', BFD = 18", substrate is coarse gravel to small cobble.

Loc. 060
LWD jam across creek. Pool immediately downstream with 2.5' deep water. LWD has accumulated a gravel bar upstream so that BFD here is about 6". Flow in channel seeps into gravel (disappears) about 10 upstream of LWD jam. Narrow riparian corridor of mature cedars.

Locs. 061 - 063.
Channel has greater sinuosity than below Bayview Road. Modest pools and undercut banks at old stumps.

Loc. 064
Substrate is clay hardpan with small cobble bars. No fish seen upstream of Bayview Road.

Loc. 65
Channel incised 3' to 7' with substrate mostly clay hardpan with cobble on top, typical diameter about 300 mm.

Loc. 068
Fence line across creek. Debris jam fully blocking channel. Stone fly and caddis fly seen in pool below jam. Large cedar on right bank with alder and fir on left bank. Upstream of jam the channel BFW = 15', BFD = 2' to 2.5', with substrate of fine silt and sand over gravel.

Loc. 070
Second fence line across creek.

Loc. 072
Incised channel, vertical banks 4' high. Hardpan substrate, with cobble point bars. Park-like riparian area with mature cedar and fir. Flow measured at 0.029 cfs.

Loc. 074
Channel is a regular box shape with BFW = 13' and BFD = 18". Substrate is hardpan with sporadic large cobble.

Loc. 075
Fence line. Riparian area logged north (upstream) of here, with small alder, salmon berry, blackberry, nettle. BFW = 8', BFD = 18". Substrate is gravel embedded in the hardpan.

Loc. 076
Small LWD jam. Gravel substrate. Riparian area back to mature, park-like forest.

Loc. 077
Fence line at Greg John's property line.

Loc. 082
Wide, flat flood plain. BFW > 20', BFD = 12" to 18" upstream of a small LWD jam. Some small pools and gravel riffle/bars.

Loc. 083
Downstream end of cleared area. Logged over on left bank, growing up in alders, grasses, and blackberry. House and lawn on right bank. Reed canary grass and blackberry in channel.

Loc. 085
Rock rip rap on right bank adjacent to house. Foot bridge with ecology block abutments.

Loc. 087
Small tributary from left bank. LWD in channel. BFW = 4', BFD = 2' (floodplain much wider).

Loc. 089
Debris jam with large overhanging cedar. Mature second growth (alder, maple, cedar) on banks. BFW = 11', BFD = 2.5', substrate is sand/silt (upstream of the jam).

Loc. 091
BFW = 15', BFD = 2.5', small cobble point bar at bend in channel.

Loc. 094
Both banks choked with blackberry. More or less opposite a house on right bank.

end of Reach #2

# Appendix 5: **Synopsis of the Major Water Quality Studies in No Name Slough**

## Water Quality Studies in No Name Slough

A short synopsis is provided below for five monitoring projects or studies on No Name Slough from which data were extracted or summarized for this characterization report.

Dugger, Phil, and Douglas Bulthuis, unpublished data. *Weekly water quality sampling at up to 17 sites in No Name Slough.* This project is an ongoing water quality monitoring study in No Name Slough. About 15 sites have been identified where water quality is measured each week. The study began in 1996 and is continuing. During the course of the study a few sample sites have been abandoned and a few others added as data from the monitoring was used to refine the design of the study. At each site, temperature, salinity, conductivity, dissolved oxygen and water depth are measured with field instruments. Over the seven years of the study a variety of YSI field instruments have been used. During 2004, a YSI 85 that measures all of the above parameters (except depth) has been used. In addition a water sample is collected and turbidity measured in the laboratory with a turbidimeter, usually within 24 hours of sampling. A variety of student interns, Washington Conservation Corps, AmeriCorps and volunteers have conducted the monitoring with a turnover every one to two years. In 2000, Phil Dugger checked and corrected obvious errors of all of the 1999 – mid 2000 data and produced a variety of graphs to summarize the data. A selection of these graphs have been slightly modified and included in this characterization report.

Skagit Stream Team. 2003. *Henry 2003 citizen monitoring water quality summary: Nookachamps, Samish, and Padilla Bay watersheds.* Testing directed specifically at the No Name Slough watershed has been ongoing since 1998 by trained local volunteers participating in SCD's and PBNERR's "Skagit Stream Team" Program have monitored water quality, including fecal coliform organisms, at four sites in the No Name Slough watershed bi-weekly from September to June since 1998. Results of the Stream Team monitoring have indicated violations of the fresh and marine Water Quality Criteria for fecal coliforms on a regular basis. Further details of this study can be found in Henry 2003.

Weinman, David, Jennifer Linkhart, David Henry, and Douglas Bulthuis. 2004. *Short-term fluctuations and seasonal patterns of depth and temperature in No Name Slough, 2000-2003.* This project is an ongoing monitoring of water depth and temperature every 15 minutes at four sites in No Name Slough. Sites were established in 2000 and 2001 to provide a basis for estimating flow in No Name and tributaries. At each site a pressure transducer with sensors for height and temperature has been established. Starlogger dataloggers store an instantaneous measurement every 15 minutes and a 15 minute average. Starloggers are checked regularly to insure continuous operation and the data are downloaded each month. Further details of this study can be found in Weinman et al. 2004.

Bulthuis 1996b. *Nutrients and suspended solids in Padilla Bay and its watershed during 1995-96.* In this completed study, water samples were collected weekly near the time of daytime low tide, when maximum flow out of the tidegates would be expected. Total suspended solids, turbidity, inorganic nitrogen, and dissolved phosphate were determined in all samples. Samples were collected weekly from No Name Sough and Joe Leary Slough from April 1995 to April 1996. Further details of this study can be found in Bulthuis 1996b.

Bulthuis, Douglas and Robin Cottrell unpublished data. *Thirty minute water quality data at the No Name Slough tidegates*. This ongoing monitoring project measures water depth, temperature, salinity, dissolved oxygen, pH, and turbidity every 30 minutes with a water quality datasonde. The sonde is exchanged about every 2-3 weeks, cleaned, recalibrated, data downloaded, and redeployed. An instrument was deployed at a fixed depth just above the bottom sediment at the pumphouse on No Name Slough from 1997 through 2002. (During 2003, the instrument was redeployed to a floating position by the Padilla Demonstration Farm culvert over No Name Slough.) Only data collected at the pumphouse is presented in this report. Data from 1996 and 1997 can be accessed via the National Estuarine Research Reserve website: http://cdmo.baruch.sc.edu/. The website includes metadata which give further details about the methods used in this monitoring program.