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5 August 2009

Samuel S. Stone
Environmental Affairs Coordinator
Peace River Facility
8998 S.W. County Road 769
Arcadia, FL 31269

RE: Horse Creek Stewardship Program
Alkalinity Impact Assessment for May 2009
Developed on behalf of Mosaic

Dear Mr. Stone,

The impact assessment you requested for the Horse Creek Stewardship Program May 2009 sampling event is attached. Please contact us if you have any questions or comments.

Sincerely,

Kristan Robbins
Senior Ecologist/Data Analyst

KMNR\nnc

Enclosure: Alkalinity Impact Assessment May 2009 Exceedance at HCSW-4

File: G:\02476\065\HCSP Monthly reports\Impact Assessments\May09_alk_impactassessment_ltr.doc

ALKALINITY IMPACT ASSESSMENT

MAY 2009 EXCEEDANCE AT HCSW-4

AUGUST 2009

PREPARED BY

Kristan Robbins
Senior Ecologist\Data Analyst

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3905 Crescent Park Dr. ▪ Riverview, FL 33578 ▪ T 813.664.4500 ▪ F 813.664.0440

Background

This report was prepared as a component of the Horse Creek Stewardship Program (HCSP). The HCSP plan document requires that an "impact assessment" be conducted for any trigger level exceedances or water quality trends found while preparing the annual HCSP report. However, this assessment is being proactively provided at the request of Sam Stone of the Peace River Manasota Regional Water Supply Authority (PRMRWSA) based on monthly monitoring data not yet incorporated into an annual report.

As part of the HCSP, Mosaic monitors four locations monthly on Horse Creek for a number of water quality parameters. Most of the monitored parameters have trigger levels that are set to track conditions in the stream. The trigger level for alkalinity is exceeded above 100 mg/L. In May 2009, alkalinity at HCSW-4 at State Road 72 (112 mg/L) exceeded the trigger level. Alkalinity was not collected at the other three stations in May 2009 because water was not flowing at those stations. All of the HCSP alkalinity sampling data is presented below in Table 1 (including June 2009 data).

Table 1. All recorded alkalinity levels at Horse Creek Stewardship Program monthly sampling stations from April 2003 to June 2009.

Date	HCSW-1 State Road 64	HCSW-2 Goose Pond Rd	HCSW-3 State Road 70	HCSW-4 State Road 72
4/30/2003	21	16	24	25
5/27/2003	40	24	23	27
6/19/2003	31	26	22	25
7/14/2003	46	27	26	33
8/28/2003	26	17	18	25
9/25/2003	59	23	27	30
10/29/2003	22	36	38	49
11/20/2003	48	29	30	42
12/16/2003	33	19	29	34
1/29/2004	47	20	23	35
2/24/2004	56	20	21	28
3/16/2004	29	27	32	41
4/14/2004	31	31	31	54
5/26/2004	71	31	36	69
6/29/2004	40	35	32	39
7/27/2004	42	24	22	25
8/30/2004	42	33	33	36
9/29/2004	28	19	18	24
10/27/2004	62	34	33	36
11/18/2004	65	38	44	59
12/15/2004	70	19	34	56
1/26/2005	44	16	16	18
2/24/2005	69	34	41	54
3/30/2005	54	18	18	16
4/27/2005	38	38	42	48

	HCSW-1	HCSW-2	HCSW-3	HCSW-4
5/25/2005	70	33	30	31
6/22/2005	41	28	25	24
7/27/2005	54	27	24	28
8/23/2005	47	27	24	16
9/29/2005	32	38	42	48
10/27/2005	24	18	15	17
11/17/2005	58	33	31	28
12/20/2005	54	29	42	35
1/30/2006	80	30	42	48
2/23/2006	70	29	31	38
3/28/2006	81	36	54	61
4/27/2006	95	38	61	95
5/25/2006		37		120
6/29/2006	48	43	27	42
7/27/2006	44	16	16	37
8/21/2006	69	34	20	35
9/27/2006	43	34	31	32
10/19/2006	63	40	44	52
11/9/2006	49	40	58	63
12/13/2006	22	36	60	89
1/23/2007	36	22	37	59
2/14/2007	51	15	30	41
3/14/2007	34	17	34	63
4/25/2007	120	26	36	85
5/16/2007	170	30	31	54
6/20/2007	140	21	21	48
7/18/2007	92	44	28	51
8/27/2007	84	24	29	22
9/26/2007	77	32	26	29
10/29/2007	82	38	41	57
11/29/2007	85	28	43	68
12/17/2007	49	26	47	60
1/30/2008	48	22	40	64
2/26/2008	59	24	34	56
3/27/2008	62	24	32	48
4/23/2008	90	24	35	54
5/29/2008		14	40	71
6/26/2008	22	25	41	45
7/31/2008	39.5	31.5	33.5	40
8/26/2008	80.5	27.5	31	33

	HCSW-1	HCSW-2	HCSW-3	HCSW-4
9/30/2008	78.5	35.5	29.5	29.5
10/16/2008	73	41	43.5	48
11/12/2008	59	41	48.5	65.5
12/4/2008	49.5	38	48	71
1/5/2009	44.5	33.5	44	70.5
2/2/2009	37	28.5	39	61.5
3/4/2009	45.5	23.5	34.5	62.5
4/1/2009	54	27	37	70
5/4/2009				112
6/3/2009	90.5	18.5	19.5	27

The trigger level for alkalinity has been exceeded five times during the HCSP: April to June 2007 at HCSW-1, May 2006 at HCSW-4, and May 2009 at HCSW-4 (Table 1, Figure 1). All of the exceedances occurred during periods of low rainfall, streamflow, and NPDES discharge (Figures 2 and 3). When alkalinity measurements from the HCSP were compared to USGS water quantity at HCSW-4, alkalinity data at HCSW-4 were found to be significantly, negatively correlated with monthly average daily streamflow and gauge height (Table 2). Alkalinity measurements at or near 100 mg/L were recorded when the average monthly streamflow was below 3 CFS (Figure 3).

In addition, alkalinity measurements at HCSW-4 were significantly negatively correlated with total monthly rainfall and average monthly NPDES discharge (Table 2). If the effects of rainfall are removed from average monthly NPDES discharge via linear regression, then the residuals of NPDES discharge are no longer related to alkalinity at HCSW-4 ($r^2 = 0.03$). Similarly, streamflow at HCSW-4 is not related to alkalinity once the effects of rainfall are removed ($r^2 = 0.03$). Low rainfall is the most important predictor of high alkalinity in Horse Creek.

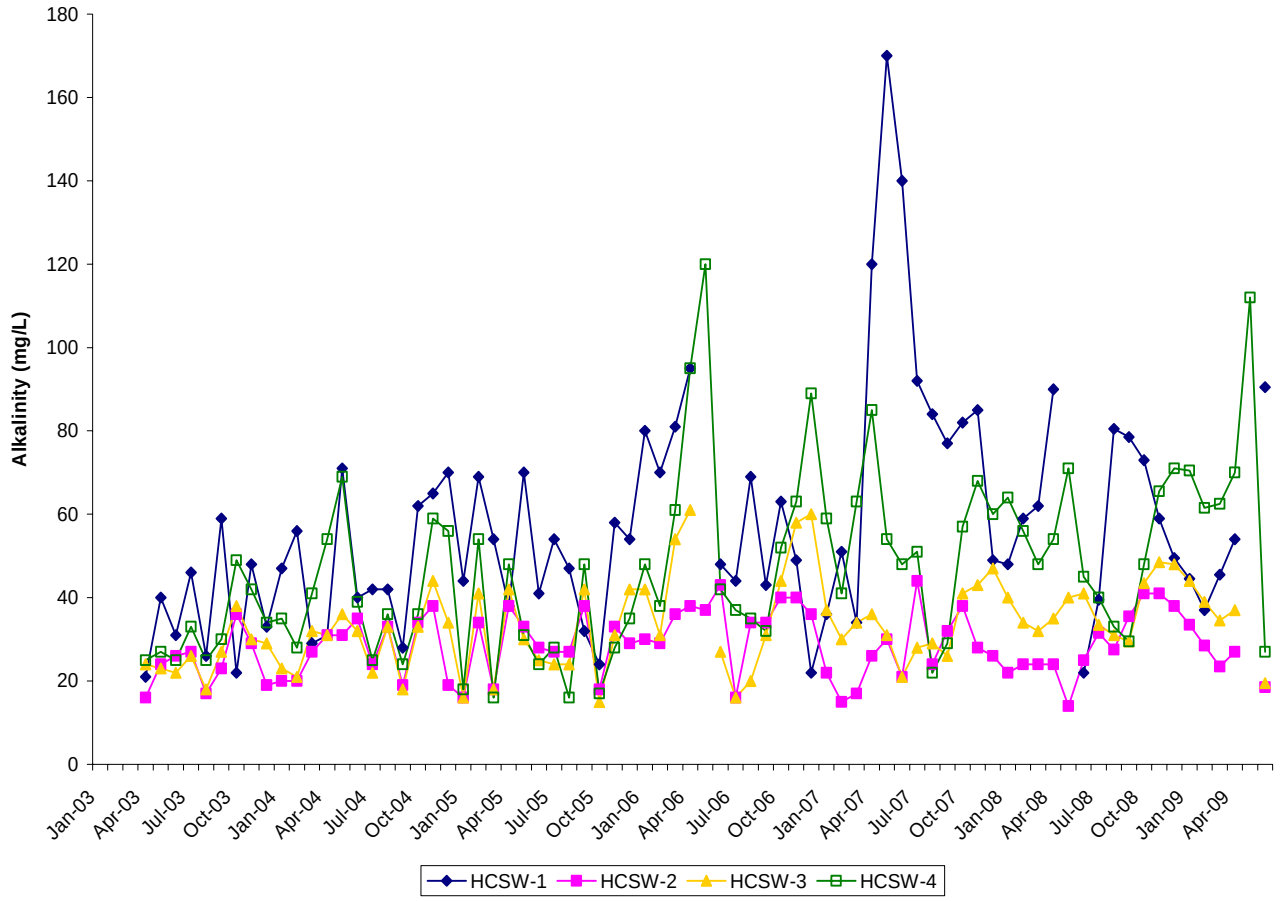

Figure 1. Measured alkalinity at Horse Creek Stewardship Program monthly sampling stations from April 2003 to June 2009.

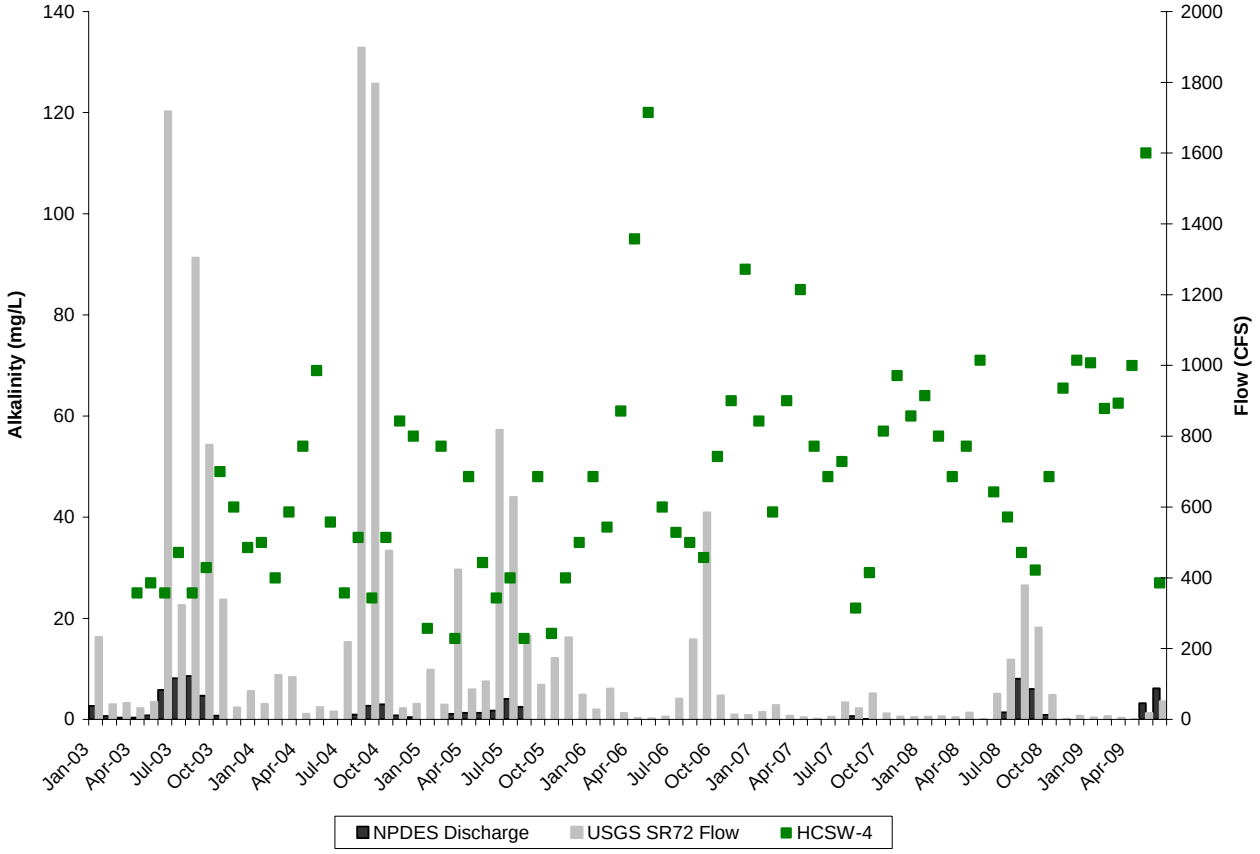

Figure 2. Measured alkalinity at Horse Creek Stewardship Program monthly sampling stations from April 2003 to June 2009, along with monthly average NPDES discharge and USGS streamflow.

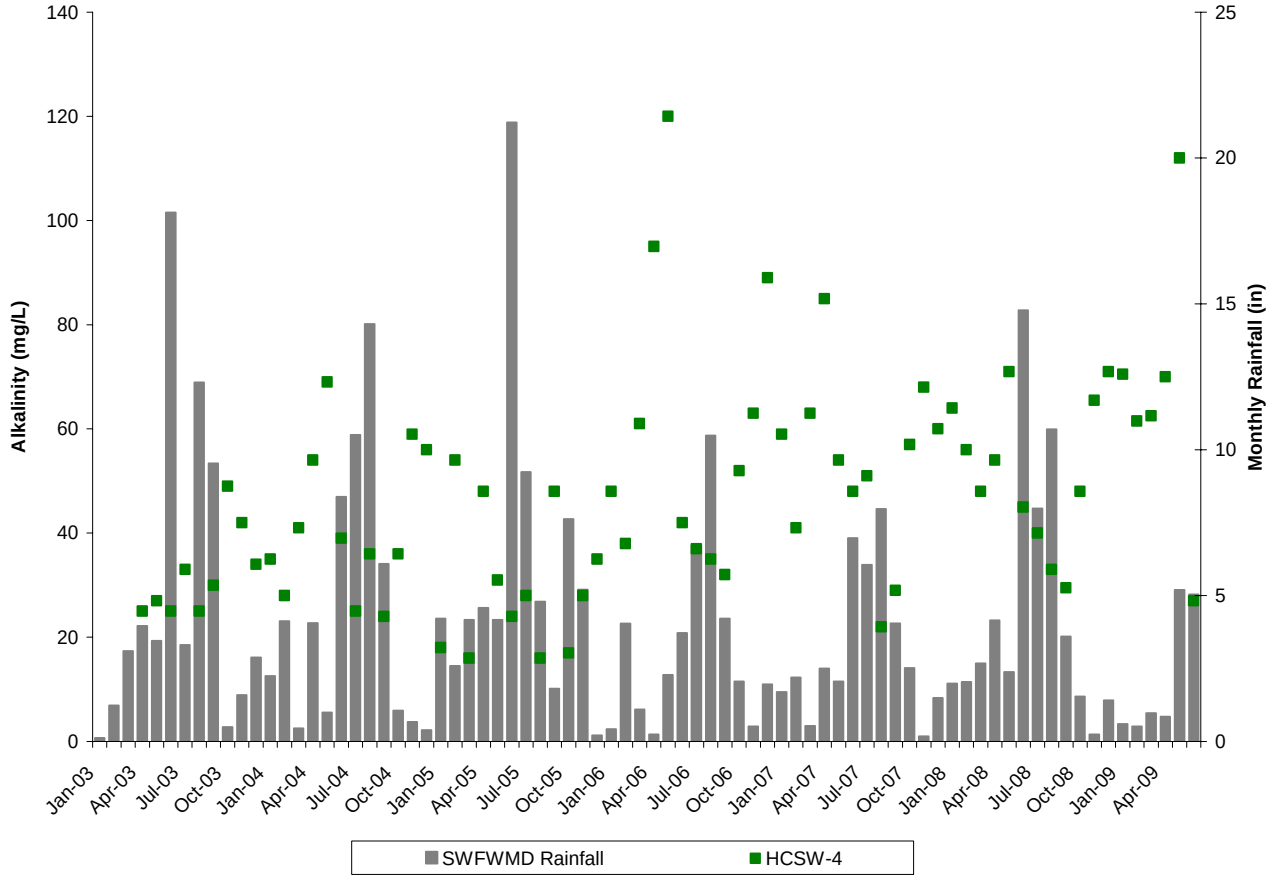

Figure 3. **Measured alkalinity at Horse Creek Stewardship Program monthly sampling stations from April 2003 to June 2009, along with SWFWMD total monthly rainfall measurements.**

Table 2. **Spearman's correlation between alkalinity levels measured during Horse Creek Stewardship Program monthly sampling stations from April 2003 to June 2009 and SWFWMD rainfall, Mosaic NPDES discharge, and USGS monthly average streamflow and gauge height (provisional data from USGS website).**

	Average Monthly USGS Streamflow	Average Monthly USGS Gauge Height	Total Monthly SWFWMD Rainfall	Average Monthly NPDES Discharge
	(cfs)	(ft)	(in)	(ft)
r^2	-0.79	-0.78	-0.65	-0.48
p	< 0.001	< 0.001	< 0.001	< 0.001
N	75	75	75	75

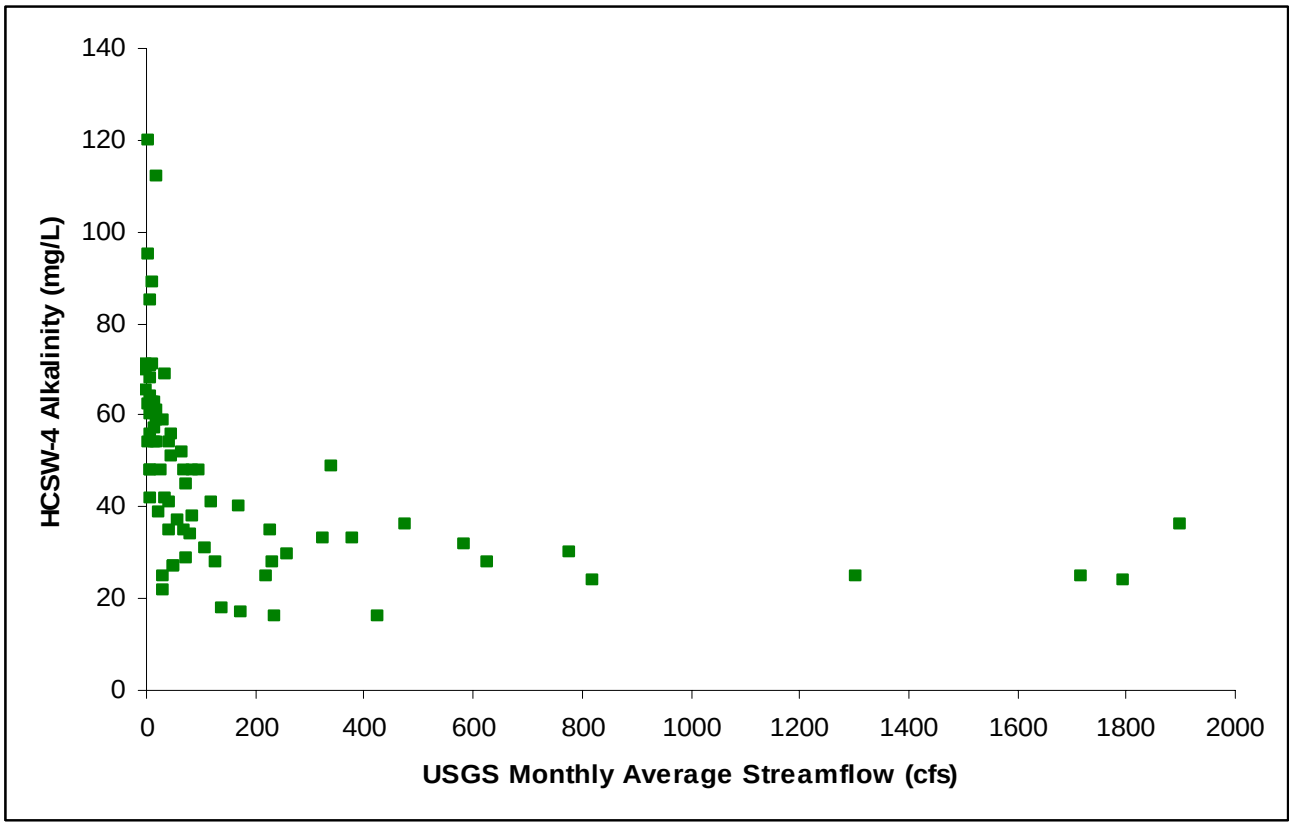

Figure 4. Measured alkalinity at HCSW-4 monthly sampling from April 2003 to June 2009, along with monthly average USGS average streamflow at Horse Creek Near SR 72.

The history of alkalinity measurements recorded throughout the HCSP indicate that the May 2009 HCSW-4 alkalinity measurement is representative of a seasonal pattern. HCSW-4 alkalinity measurements taken in the dry months immediately preceding the wet season are often higher that measurements from other months, especially when the streamflow and rainfall from the previous month has been very low. It is likely that seasonal increases in alkalinity at in Horse Creek are a result of lack of dilution because of low streamflow, gauge height, and rainfall. Alkalinity should decline again at HCSW-4 after the summer rains begin.

In conclusion, there is no evidence that the elevated alkalinity levels recorded by Mosaic staff in Horse Creek were caused by mining operations. High alkalinity at HCSW-4 is representative of seasonal peaks in alkalinity that occur at the end of the dry season, as seen in data from 2003 to 2009. Alkalinity is very strongly affected by seasonal changes in water quantity that are unrelated to mining operations.