



Biological Research Associates

Founded 1974

16 July 2007

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 April 2007
Developed on behalf of Mosaic in July 2007

Dear Mr. Stone,

The impact assessment you requested for the Horse Creek Stewardship Program April 2007 sampling event is attached. . Please contact us if you have any questions or comments.

Sincerely,

BIOLOGICAL RESEARCH ASSOCIATES

Kristan Robbins
Ecologist

Douglas J. Durbin, Ph.D
Senior Water Resource Analyst/Technical Director

Enclosure: Alkalinity Impact Assessment April 2007 Exceedance at HCSW-1



Biological Research Associates

Founded 1974

ALKALINITY IMPACT ASSESSMENT
APRIL 2007 EXCEEDANCE AT HCSW-1

Prepared on behalf of:



Prepared by:



July 2007

Kristan Robbins
Ecologist

Douglas J. Durbin, Ph.D
Senior Water Resource Analyst/Technical Director

D:\HC Water Atlas\Horse Creek SP Impact Assessment Reports 2003-2010\2007 Impact Assessments WA\Apr Alk assessment\BRA Apr07_alk assessment 071607.doc

Tampa • Sarasota • Tallahassee • Panama City • Destin • Vero Beach

3910 U.S. Hwy. 301 North, Suite 180 • Tampa, Florida 33619 • (813) 664-4500 • (813) 664-0440 Fax
www.biologicalresearch.com

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 April 2007, alkalinity at HCSW-1 at State Road 64 (120 mg/L) exceeded the trigger level. All of the HCSP alkalinity sampling data is presented below (including May 2007 data), as well as provisional data from ambient monitoring conducted by SWFWMD at the HCSW-1 station from 2000 to 2006.

The April (120 mg/L) and May (170 mg/L) 2007 alkalinity values recorded by Mosaic represent the maximum alkalinity levels observed at HCSW-1 for the duration of the Stewardship Program, initiated in April 2003 (Table 1). The previous maximum alkalinity at HCSW-1 was 95 mg/L, recorded in April 2006. The alkalinity measured at HCSW-4 in April 2007 (85 mg/L) was also high compared to previous values, although not as high as the previously recorded maximum (120 mg/L from May 2006). Alkalinity measurements at other stations were near the program average.

Table 1. Summary statistics of Alkalinity levels at Horse Creek Stewardship Program monthly sampling stations from April 2003 to May 2007.

| | HCSW-1 | HCSW-2 | HCSW-3 | HCSW-4 |
|---------|----------------------|----------------------|----------------------|----------------------|
| | State Road 64 | Goose Pond Rd | State Road 70 | State Road 72 |
| Minimum | 21 | 15 | 15 | 16 |
| Median | 47 | 29 | 31 | 38 |
| Mean | 52 | 28 | 32 | 43 |
| Maximum | 170 | 43 | 61 | 120 |

Table 2. All recorded alkalinity levels at Horse Creek Stewardship Program monthly sampling stations from April 2003 to May 2007.

| Date | HCSW-1 | HCSW-2 | HCSW-3 | HCSW-4 |
|------------|---------------|---------------|---------------|---------------|
| | State Road 64 | Goose Pond Rd | State Road 70 | 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 |
| 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 |

| Date | HCSW-1 | HCSW-2 | HCSW-3 | HCSW-4 |
|------------|--------|--------|--------|--------|
| 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 |

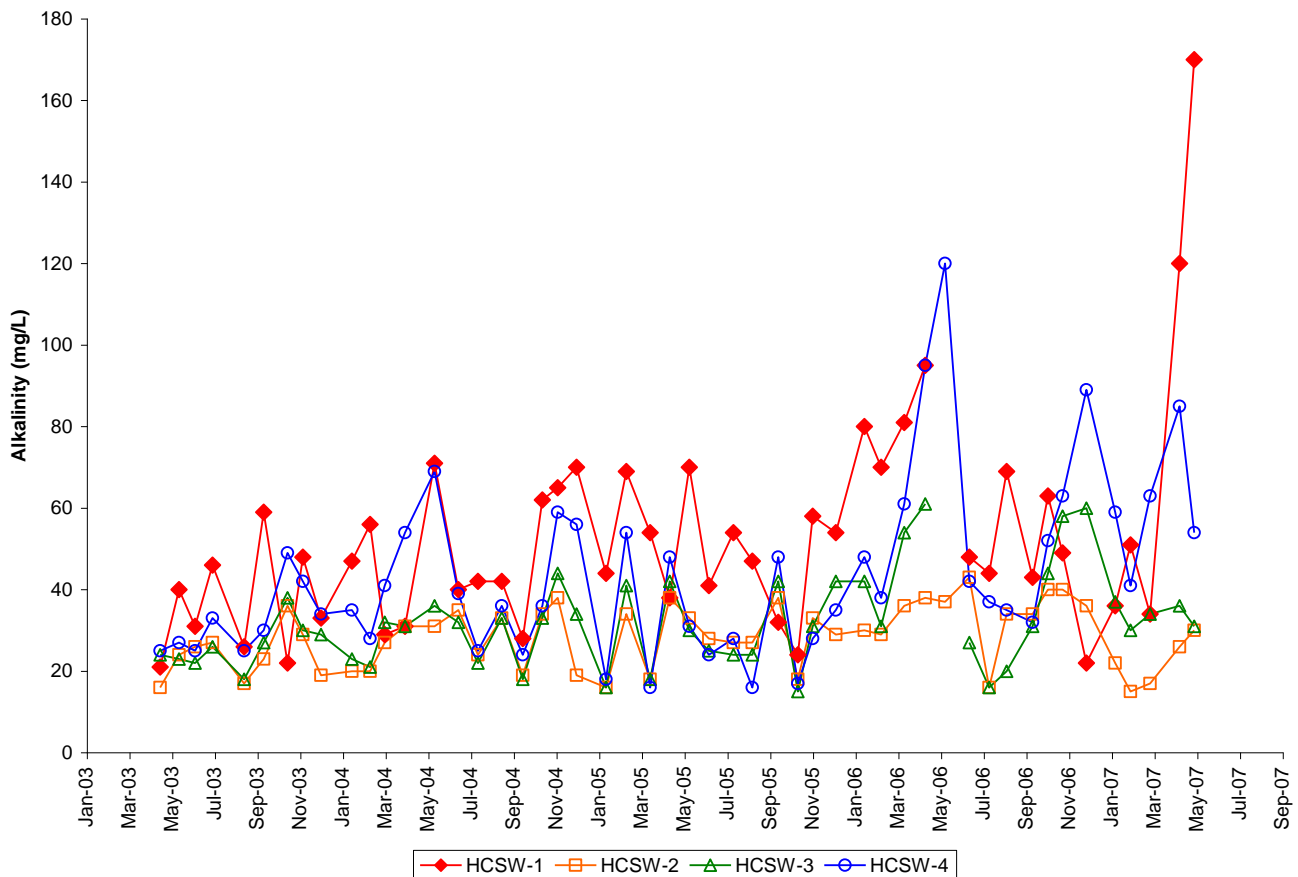


Figure 1. Measured alkalinity at Horse Creek Stewardship Program monthly sampling stations from April 2003 to May 2007.

The Southwest Florida Water Management District (SWFWMD) also conducts ambient monitoring at two sites on Horse Creek for monthly water quality: Horse Creek near Myakka Head (same as HCSW-1) and Horse Creek near Arcadia (same as HCSW-4). In the period 2000 to 2006, eight of the highest ten alkalinity measurements recorded by SWFWMD at HCSW-1 were recorded in the months of March – June (Figure 2). Similarly, during the HCSP program, six of the highest nine measurements were recorded by Mosaic in March – May (Figure 2). For both SWFWMD and the HCSP, most of the high alkalinity measurements were recorded at the end of the dry season, after long periods of low streamflow (Figure 2).

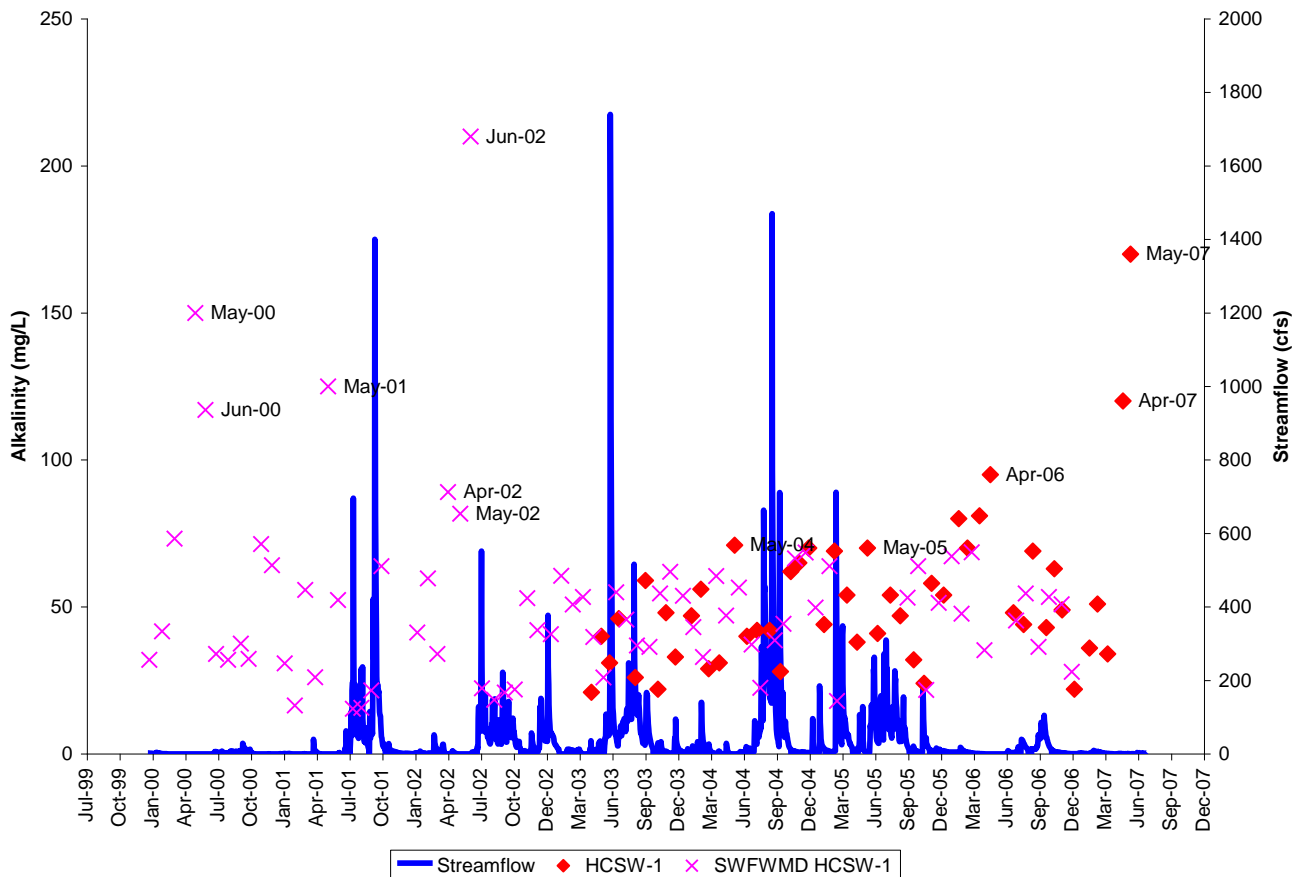


Figure 2. Measured alkalinity at Horse Creek Stewardship Program monthly sampling stations from April 2003 to May 2007, along with provisional SWFWMD sampling from January 2000 to December 2006 and USGS streamflow measurements.

When alkalinity measurements from the HCSP and SWFWMD were compared to USGS water quantity at HCSW-1, both sets of alkalinity data were found to be significantly, but weakly, negatively correlated with average daily streamflow and gauge height on the day of alkalinity measurement (Table 3 and 4). When the streamflow and gauge height was averaged over the 30-days prior to the alkalinity measurement, then the strength of the correlation between them and alkalinity was improved (Table 3 and 4). The correlation between alkalinity measurements for the HCSP (-0.71) and SWFWMD (-0.87) and 30-day gauge height was especially strong; alkalinity measurements at or near 100 mg/L were recorded when the average gauge height of the previous month was below 9.5 ft (Figures 3 and 4). (The minimum gauge height at HCSW-1 from 2000 to May 2007 was 8.34 ft.)

Table 3. Pearson’s correlation between alkalinity levels measured during Horse Creek Stewardship Program monthly sampling stations from April 2003 to May 2007 and USGS daily and previous 30-day average streamflow and gauge height (provisional data from USGS website).

| | Daily Streamflow | Daily Gauge Height | Previous 30-day Streamflow | Previous 30-day Gauge Height |
|-------|------------------|--------------------|----------------------------|------------------------------|
| | (cfs) | (ft) | (cfs) | (ft) |
| r^2 | -0.32 | -0.36 | -0.44 | -0.71 |
| p | 0.02 | 0.01 | 0.002 | 0.0001 |
| N | 49 | 47 | 49 | 49 |

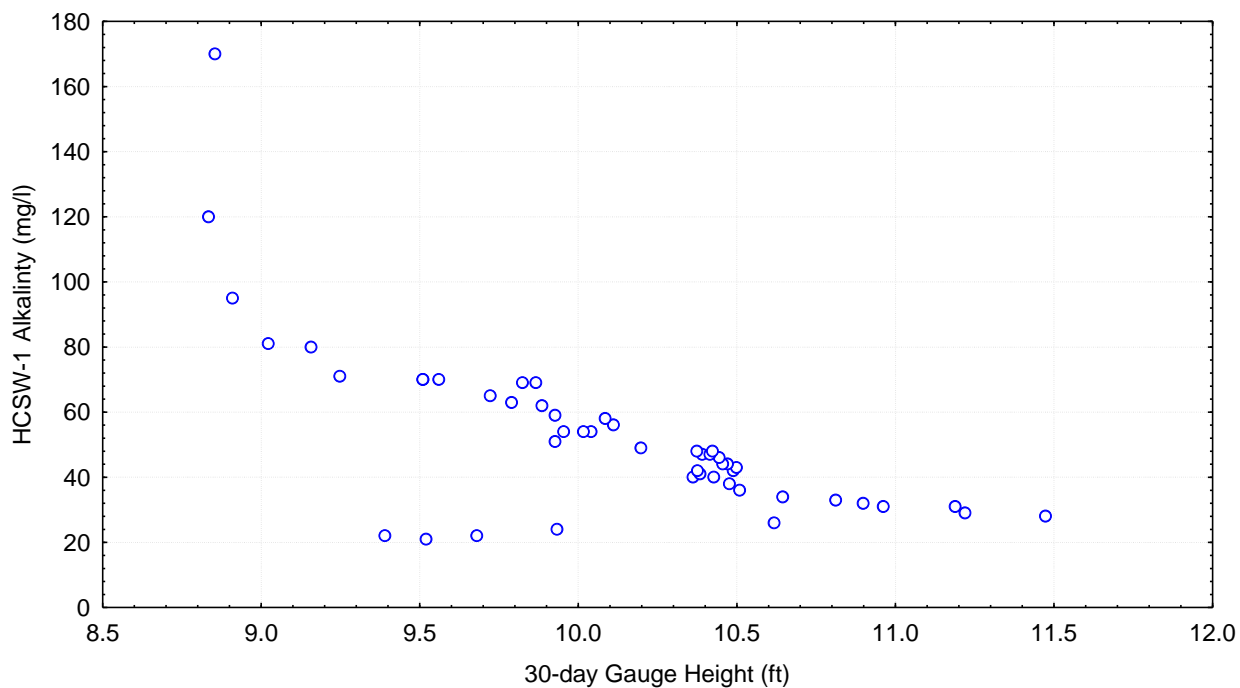


Figure 3. Measured alkalinity at HCSW-1 monthly sampling from April 2003 to May 2007, along with provisional USGS average gauge height from previous 30-days.

Table 4. Pearson's correlation between alkalinity levels measured during by SWFWMD monthly sampling from January 2000 to December 2006 and USGS daily and previous 30-day average streamflow and gauge height (provisional data from USGS website).

| | Daily Streamflow (cfs) | Daily Gauge Height (ft) | Previous 30-day Streamflow (cfs) | Previous 30-day Gauge Height (ft) |
|----------------|---------------------------|----------------------------|-------------------------------------|--------------------------------------|
| r ² | -0.35 | -0.44 | -0.51 | -0.87 |
| p | 0.002 | 0.0001 | 0.0001 | 0.001 |
| N | 74 | 69 | 73 | 73 |

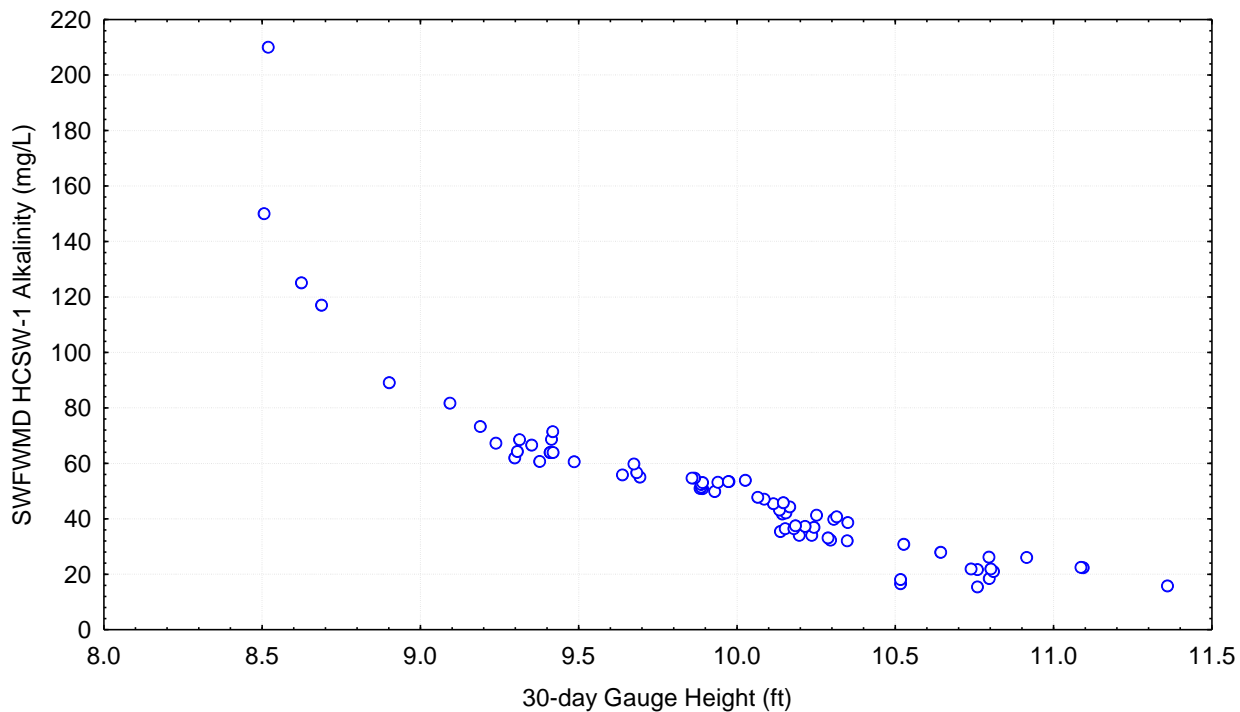


Figure 4. Measured alkalinity at SWFWMD monthly sampling from January 2000 to December 2006 along with provisional USGS average gauge height from previous 30-days.

The history of alkalinity measurements recorded throughout the HCSP, as well as independent measurements taken by SWFWMD, indicate that the 25 April 2007 HCSW-1 alkalinity measurement is representative of a seasonal pattern. HCSW-1 alkalinity measurements taken in the months immediately preceding the wet season are often higher than measurements from other months, especially when the gauge height from the previous 30-days has been very low. It is likely that seasonal increases in

alkalinity at this station are a result of lack of dilution because of low streamflow, gauge height, and rainfall. Alkalinity should decline again at HCSW-1 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-1 is representative of seasonal peaks in alkalinity that occur at the end of the dry season, as seen in data from 2000 to 2007. In addition, Mosaic has not mined any land in the Horse Creek basin, nor discharged water from mining operations in the basin for more than eight months prior to the April 2007 sampling event.