S5A-CELL CANAL CROSS-SECTION STUDY

Prepared by

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Ecologist

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This report follows the Refuge's in-house project sheet format with the results of the study incorporated into the original project sheet. This study was performed as an in-house study to support Refuge modeling efforts.

Date project sheet prepared: 7 September 2005

Prepared by: Donatto Surratt, Ph.D.

Project at: A.R.M. Loxahatchee NWR

Title of project/Subproject: Cross-section analysis for depth in the S5A-Cell Canal in the northern portion of the Loxahatchee Refuge.

Investigators: Donatto Surratt, Ph.D. (Ecologist)

Project dates: The physical measurements for this project will begin on September 8, 2005 and end on September 9, 2005. The data will be quality assured and entered into the assigned database by September 21, 2005.

Background: Cross-sectional studies have been performed on the L-7 and L-40 canals to determine canal depth at the perimeter of the Refuge (Daroub et al., 2002). The S5A-Cell Canal is the only remaining portion of the perimeter canal system that has not been analyzed for depth and width.

Objectives: To determine the width and depth at 4 to 5 ft intervals from the north bank to the south bank along the 1.9 km length of the canal at ~350 m intervals.

Methods:

First we will drive a whaler up the eastern canal (L-40) to the western end of the S5A-Cell Canal. This will be done to visually observe the banks and the channel for any obvious obstacles that may impede measurements and to start approaching the ideal locations (i.e., solid ground, clearing for tag line cable attachments [rebar], easy of access to the banks, etc.) for tag line attachments on the opposing canal banks. Once we reach the western end of the canal with the mallet/hammer we will hammer the rebar ~1 ft into the soil of the north bank and attach the loose end of the tag line to the rebar. From there we will drive to the southern bank and establish the rebar and secure the tag line to the rebar following the technique employed at the north bank. The tag line is broken into several measurement intervals; 2 feet intervals until the line reaches 50 ft and then it becomes 5 ft intervals. We will measure the canal depths at 4 ft interval until we reach the 50 ft marker and then we will start measuring depths at 5 ft intervals. Depth measurements will begin on the northern bank of the canal and extend to the southern bank. GPS coordinates will be recorded at the north and south banks for each transect.

Depth will be determined with the pre-marked nylon line, which has a secchi disk and weight attached to the loose end. We will know that measurement device has reached bottom by the observation of slack in the line. Once this point is reached, we will pull the line slightly until it is taught and then retrieve the line while counting the markers on the nylon line. The nylon line is marked at every ½ meter. Each measurement will be corrected by adding 16 cm, which accounts for the added length of the weight and the secchi disk. All data will be recorded in the format highlighted in the Data Format section below. The exact procedure described above will be performed again at ~ 350 m until the length of the canal is covered. The 350 m will be determined with the Garmin GPS unit. This will result in 5 cross-sections from the S5A Cell-Canal. Before and after our trip Mike Waldon will record stage heights at the tailwaters of the G-300 and the G-301 and before the trip T. Trent and D. Surratt will record the stage heights at the 1-8C staff gauge.

Results: Five depth-width cross-section graph of the S5A Cell-Canal were generated from the results of this study. This product has been used for modeling purposes. Tables and figures are presented in the appendix below.

Implications for the Refuge: This study is important for quantifying water flow and chemical constituent transport characteristic of the S5A Cell-Canal. Further, the details of this cross-sectional study can aid in further understanding the direction of water flow resulting from S5A discharges.

Future plans: No follow up studies will be performed.

Reports: Presently, this project sheet (including results) is the only report associated with this project and is located on the Refuge sharedrive at S:/WATER PROJECTS/Water Quality/Enhanced WQ Monitoring Project/Canal Cross-section Study/ S5ACell-Canal Cross-section Analysis.doc.

Associated data files: The data derived from this study will be located on the Refuge sharedrive at S:/WATER PROJECTS/Water Quality/Enhanced WQ Monitoring Project/Canal Cross-section Study/ Data-S5ACell-Canal-Transect.xls. We will also back-up the data on 2 CDs, one will be given to M. Waldon and the other will remain with D. Surratt.

Resource needs:

Materials

- 1 tag line (rust proof cable with measurement units) for horizontal measurement from bank to bank,
- 1 nylon measuring cable with a weight attached for vertical measurements from surface to consolidated substrate,
- 2 field notebooks (write-in-rain paper) to record data,
- 3 sharpies,
- 1 GPS unit to record measurement coordinates,
- 4 pieces of ~4 ft long rebar, and
- 2 mallets/hammers.

Tiffany Trent and D. Surratt will be in the field one day in a whaler. T. Trent and D. Surratt will log all data during the field trip. D. Surratt will log the data into a Microsoft excel spreadsheet and append it to the assigned file location (see above).

Project Schedule: The physical data collection portion of this project will begin and end on September 8, 2005. The data will be quality assured and entered into the assigned database by September 21, 2005. A draft report will be distributed to the Everglades Program Team no later than September 30, 2005. All equipment is presently available. Data will be entered by T. Trent and D. Surratt and this report serves as both the project sheet and the presentation of results.

Appendix:

Table A1. Summary of collected distances along with associated depths and calculated elevations for the selected points of the identified transects.

*TRANSECT ID	**TRANSECT POINTS (m)	TRANSECT POINTS (ft)	DATE	TIME	LAT	LONG	‡ELEVATION (m)	†AVERAGE STAGE (m)
S5A - W0	0.0	0	8-Sep-05	12:16	26.67439	80.38058	4.1	5.0
	1.2	4	8-Sep-05	12:18	26.67439	80.38058	3.7	5.0
	2.4	8	8-Sep-05	12:20	26.67439	80.38058	3.0	5.0
	3.7	12	8-Sep-05	12:29	26.67439	80.38058	2.5	5.0
	4.9	16	8-Sep-05	12:40	26.67439	80.38058	2.6	5.0
	6.1	20	8-Sep-05	12:51	26.67439	80.38058	2.8	5.0
	7.3	24	8-Sep-05	13:01	26.67439	80.38058	3.0	5.0
	8.5	28	8-Sep-05	12:10	26.67439	80.38058	3.0	5.0
	9.8	32	8-Sep-05	12:02	26.67439	80.38058	3.2	5.0
	11.0	36	8-Sep-05	11:52	26.67439	80.38058	3.1	5.0
	12.5	41	8-Sep-05	11:41	26.67439	80.38058	3.2	5.0
	14.0	46	8-Sep-05	11:30	26.67439	80.38058	3.7	5.0
	15.5	51	8-Sep-05	11:28	26.67439	80.38058	4.2	5.0
	17.1	56	8-Sep-05	11:21	26.67439	80.38058	4.2	5.0
S5A - W1	0.0	0	8-Sep-05	13:30	26.67544	80.37831	4.1	5.0
	1.8	6	8-Sep-05	14:12	26.67544	80.37831	3.7	5.0
	3.0	10	8-Sep-05	14:08	26.67544	80.37831	3.5	5.0
	4.3	14	8-Sep-05	14:05	26.67544	80.37831	3.3	5.0
	5.5	18	8-Sep-05	14:01	26.67544	80.37831	3.1	5.0
	6.7	22	8-Sep-05	13:59	26.67544	80.37831	2.9	5.0
	7.9	26	8-Sep-05	13:55	26.67544	80.37831	2.8	5.0
	9.1	30	8-Sep-05	13:50	26.67544	80.37831	2.8	5.0
	10.4	34	8-Sep-05	13:46	26.67544	80.37831	2.7	5.0
	11.6	38	8-Sep-05	13:44	26.67544	80.37831	2.4	5.0
	12.8	42	8-Sep-05	13:42	26.67544	80.37831	2.5	5.0
	14.3	47	8-Sep-05	13:40	26.67544	80.37831	2.7	5.0
	15.9	52	8-Sep-05	13:38	26.67536	80.37822	4.2	5.0
S5A - W2	0.0	0	8-Sep-05	14:43	26.67764	80.37553	4.5	5.0
	1.5	5	8-Sep-05	14:49	26.67764	80.37553	3.7	5.0
	3.0	10	8-Sep-05	14:51	26.67764	80.37553	2.8	5.0
	4.6	15	8-Sep-05	15:52	26.67764	80.37553	2.9	5.0
	6.1	20	8-Sep-05	14:53	26.67764	80.37553	2.9	5.0
	7.3	24	8-Sep-05	14:54	26.67764	80.37553	3.0	5.0
	8.5	28	8-Sep-05	14:55	26.67764	80.37553	3.0	5.0
	9.8	32	8-Sep-05	14:56	26.67764	80.37553	2.9	5.0
	11.0	36	8-Sep-05	14:58	26.67764	80.37553	3.0	5.0
	12.2	40	8-Sep-05	14:59	26.67764	80.37553	2.9	5.0
	13.4	44	8-Sep-05	15:00	26.67764	80.37553	3.0	5.0
	14.6	48	8-Sep-05	15:01	26.67764	80.37553	3.0	5.0
	15.9	52	8-Sep-05	15:02	26.67764	80.37553	3.1	5.0
	17.1	56	8-Sep-05	15:05	26.67764	80.37553	3.5	5.0
	18.3	60	8-Sep-05	15:06	26.67747	80.37558	3.7	5.0

*Transect are order from west to east - W0 is the most west and W4 is the most east

**Transects Points are order from the North bank to South bank in feet

‡Elevation is determined by subtracting the depth at each point along the transect from the average stage height

†Average stage height is determined by averaging the stage heights at the G300, G301, G310, G94C, GA1-8C, and the 1-8C manual reading

Table A1. Continued.

*TRANSECT ID	**TRANSECT POINTS (m)	TRANSECT POINTS (ft)	DATE	TIME	LAT	LONG	‡ELEVATION (m)	†AVERAGE STAGE (m)
S5A - W3	0.9	3	9-Sep-05	11:20	26.67756	80.36647	4.7	5.0
	2.1	7	9-Sep-05	11:22	26.67756	80.36647	3.5	5.0
	3.7	12	9-Sep-05	11:23	26.67756	80.36647	3.7	5.0
	5.2	17	9-Sep-05	11:24	26.67756	80.36647	3.2	5.0
	6.7	22	9-Sep-05	11:26	26.67756	80.36647	3.0	5.0
	7.9	26	9-Sep-05	11:32	26.67756	80.36647	3.0	5.0
	9.1	30	9-Sep-05	11:33	26.67756	80.36647	2.8	5.0
	10.4	34	9-Sep-05	11:36	26.67756	80.36647	2.6	5.0
	11.6	38	9-Sep-05	11:38	26.67756	80.36647	2.8	5.0
	12.8	42	9-Sep-05	11:40	26.67756	80.36647	2.8	5.0
	14.0	46	9-Sep-05	11:42	26.67756	80.36647	2.9	5.0
	15.2	50	9-Sep-05	11:44	26.67756	80.36647	3.0	5.0
	16.5	54	9-Sep-05	11:45	26.67756	80.36647	2.9	5.0
	17.7	58	9-Sep-05	11:47	26.67756	80.36647	3.1	5.0
	18.9	62	9-Sep-05	11:51	26.67756	80.36647	3.5	5.0
	20.1	66	9-Sep-05	11:06	26.67744	80.36644	4.7	5.0
S5A - W4	0.0	0	9-Sep-05	9:41	26.67653	80.36328	4.4	5.0
	1.8	6	9-Sep-05	9:29	26.67653	80.36328	4.0	5.0
	3.0	10	9-Sep-05	10:48	26.67653	80.36328	3.4	5.0
	4.3	14	9-Sep-05	10:45	26.67653	80.36328	3.3	5.0
	5.5	18	9-Sep-05	10:41	26.67653	80.36328	3.2	5.0
	6.7	22	9-Sep-05	10:39	26.67653	80.36328	3.2	5.0
	7.9	26	9-Sep-05	10:36	26.67653	80.36328	3.1	5.0
	9.1	30	9-Sep-05	10:34	26.67653	80.36328	3.0	5.0
	10.4	34	9-Sep-05	10:32	26.67653	80.36328	3.2	5.0
	11.6	38	9-Sep-05	10:30	26.67653	80.36328	3.0	5.0
	12.8	42	9-Sep-05	10:27	26.67653	80.36328	3.0	5.0
	14.0	46	9-Sep-05	10:25	26.67653	80.36328	3.0	5.0
	15.5	51	9-Sep-05	10:20	26.67653	80.36328	2.6	5.0
	17.1	56	9-Sep-05	10:16	26.67653	80.36328	2.9	5.0
	18.6	61	9-Sep-05	10:13	26.67653	80.36328	2.7	5.0
	20.1	66	9-Sep-05	10:09	26.67653	80.36328	3.3	5.0
	21.6	71	9-Sep-05	10:02	26.67653	80.36328	3.8	5.0
	22.9	75	9-Sep-05	9:59	26.67653	80.36328	4.2	5.0
	24.7	81	9-Sep-05	9:58	26.67653	80.36328	4.2	5.0
	26.5	87	9-Sep-05	9:56	26.67636	80.36322	4.5	5.0

*Transect are order from west to east - W0 is the most west and W4 is the most east
**Transects Points are order from the North bank to South bank in feet
‡Elevation is determined by subtracting the depth at each point along the transect from the average stage height
†Average stage height is determined by averaging the stage heights at the
G300, G301, G310, G94C, GA1-8C, and the 1-8C manual reading

Table A2. Original and corrected depth measurements for the S5A-Cell Canal transects.

FIELD NOTES								
						DATE	9/8/2005	
*TRANSECT ID	**TRANSECT POINTS (ft)	TIME	LAT	LONG		DEPTH (m)	NOTES	‡CORRECTED DEPTH (m)
S5A - W0	0	12:16	26 40 27.8	80 22 50.1		0.75	Pole stuck in N. Bank	0.91
	4	12:18	26 40 27.8	80 22 50.1		1.16		1.32
	8	12:20	26 40 27.8	80 22 50.1		1.83		1.99
	12	12:29	26 40 27.8	80 22 50.1		2.38		2.54
	16	12:40	26 40 27.8	80 22 50.1		2.26		2.42
	20	12:51	26 40 27.8	80 22 50.1		2.04		2.2
	24	13:01	26 40 27.8	80 22 50.1		1.88		2.04
	28	12:10	26 40 27.8	80 22 50.1		1.89		2.05
	32	12:02	26 40 27.8	80 22 50.1		1.6		1.76
	36	11:52	26 40 27.8	80 22 50.1		1.73		1.89
	41	11:41	26 40 27.8	80 22 50.1		1.67		1.83
	46	11:30	26 40 27.8	80 22 50.1		1.12		1.28
	51	11:28	26 40 27.8	80 22 50.1		0.62		0.78
	56	11:21	26 40 27.8	80 22 50.1		0.62	In tree at S. Bank	0.78
S5A - W1	0	13:30	26 40 31.6	80 22 41.9		0.79		0.95
	6	14:12	26 40 31.6	80 22 41.9		1.15		1.31
	10	14:08	26 40 31.6	80 22 41.9		1.33		1.49
	14	14:05	26 40 31.6	80 22 41.9		1.53		1.69
	18	14:01	26 40 31.6	80 22 41.9		1.71		1.87
	22	13:59	26 40 31.6	80 22 41.9		1.9		2.06
	26	13:55	26 40 31.6	80 22 41.9		2		2.16
	30	13:50	26 40 31.6	80 22 41.9		2.02		2.18
	34	13:46	26 40 31.6	80 22 41.9		2.12		2.28
	38	13:44	26 40 31.6	80 22 41.9		2.44		2.6
	42	13:42	26 40 31.6	80 22 41.9		2.39		2.55
	47	13:40	26 40 31.6	80 22 41.9		2.17		2.33
	52	13:38	26 40 31.3	80 22 41.6		0.61		0.77
S5A - W2	0	14:43	26 40 39.5	80 22 31.9		0.37		0.53
	5	14:49	26 40 39.5	80 22 31.9		1.14		1.3
	10	14:51	26 40 39.5	80 22 31.9		2.06		2.22
	15	15:52	26 40 39.5	80 22 31.9		1.96		2.12
	20	14:53	26 40 39.5	80 22 31.9		1.95		2.11
	24	14:54	26 40 39.5	80 22 31.9		1.87		2.03
	28	14:55	26 40 39.5	80 22 31.9		1.82		1.98
	32	14:56	26 40 39.5	80 22 31.9		1.95		2.11
	36	14:58	26 40 39.5	80 22 31.9		1.88		2.04
	40	14:59	26 40 39.5	80 22 31.9		1.93		2.09
	44	15:00	26 40 39.5	80 22 31.9		1.87		2.03
	48	15:01	26 40 39.5	80 22 31.9		1.86		2.02
	52	15:02	26 40 39.5	80 22 31.9		1.78		1.94
	56	15:05	26 40 39.5	80 22 31.9		1.31		1.47
	60	15:06	26 40 38.9	80 22 32.1		1.1		1.26

*Transect are order from west to east - W0 is the most west and W4 is the most east

**Transects Points are order from the North bank to South bank in feet

‡Corrected Depth = Depth value plus a correction factor of 0.16 m.

The correction factor was the weight length+weight teather length+secchi disk thickness.

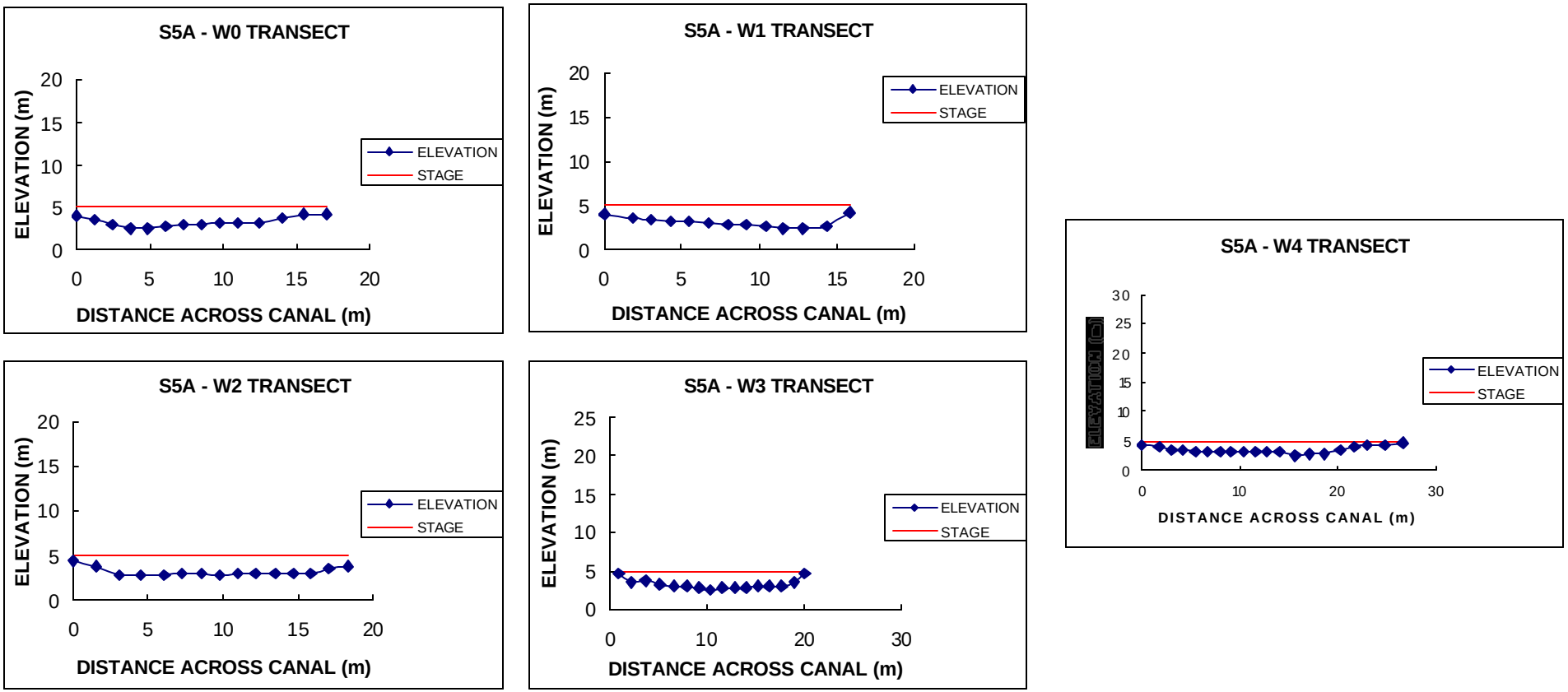
Table A2. Continued.

FIELD NOTES

*TRANSECT ID	**TRANSECT POINTS (ft)	TIME	LAT	LONG	DATE DEPTH (m)	9/8/2005 NOTES	‡CORRECTED DEPTH (m)
S5A - W3	3	11:20	26 40 39.2	80 21 59.3	0.15	Bank blocked by trees and vegetation	0.31
	7	11:22	26 40 39.2	80 21 59.3	1.33		1.49
	12	11:23	26 40 39.2	80 21 59.3	1.12		1.28
	17	11:24	26 40 39.2	80 21 59.3	1.67		1.83
	22	11:26	26 40 39.2	80 21 59.3	1.86		2.02
	26	11:32	26 40 39.2	80 21 59.3	1.86		2.02
	30	11:33	26 40 39.2	80 21 59.3	2		2.16
	34	11:36	26 40 39.2	80 21 59.3	2.27		2.43
	38	11:38	26 40 39.2	80 21 59.3	2		2.16
	42	11:40	26 40 39.2	80 21 59.3	2		2.16
	46	11:42	26 40 39.2	80 21 59.3	1.96		2.12
	50	11:44	26 40 39.2	80 21 59.3	1.88		2.04
	54	11:45	26 40 39.2	80 21 59.3	1.9		2.06
	58	11:47	26 40 39.2	80 21 59.3	1.72		1.88
	62	11:51	26 40 39.2	80 21 59.3	1.36		1.52
	66	11:06	26 40 38.8	80 21 59.2	0.16	No bank just vegetation	0.32
S5A - W4	0	9:41	26 40 35.5	80 21 47.8	0.44	tossed depth finder to bank / blocked by tree cover	0.6
	6	9:29	26 40 35.5	80 21 47.8	0.84		1
	10	10:48	26 40 35.5	80 21 47.8	1.44		1.6
	14	10:45	26 40 35.5	80 21 47.8	1.5		1.66
	18	10:41	26 40 35.5	80 21 47.8	1.67		1.83
	22	10:39	26 40 35.5	80 21 47.8	1.66		1.82
	26	10:36	26 40 35.5	80 21 47.8	1.77		1.93
	30	10:34	26 40 35.5	80 21 47.8	1.89		2.05
	34	10:32	26 40 35.5	80 21 47.8	1.64		1.8
	38	10:30	26 40 35.5	80 21 47.8	1.81		1.97
	42	10:27	26 40 35.5	80 21 47.8	1.86		2.02
	46	10:25	26 40 35.5	80 21 47.8	1.83		1.99
	51	10:20	26 40 35.5	80 21 47.8	2.29		2.45
	56	10:16	26 40 35.5	80 21 47.8	1.94		2.1
	61	10:13	26 40 35.5	80 21 47.8	2.13		2.29
	66	10:09	26 40 35.5	80 21 47.8	1.54		1.7
	71	10:02	26 40 35.5	80 21 47.8	1.01		1.17
	75	9:59	26 40 35.5	80 21 47.8	0.68		0.84
	81	9:58	26 40 35.5	80 21 47.8	0.64		0.8
	87	9:56	26 40 34.9	80 21 47.6	0.39	No bank found - tied off deep in trees	0.55

*Transect are order from west to east - W0 is the most west and W4 is the most east
**Transects Points are order from the North bank to South bank in feet
‡Corrected Depth = Depth value plus a correction factor of 0.16 m.
The correction factor was the weight length+weight teather length+secchi disk thickness.

Figure A1. Graphs representing the elevations (blue diamonds) and the average stage height (red line) for the five transects along the S5A-Cell Canal.



Reference:

Daroub S., Stuck J.D., Rice R.W., Lang T.A., Diaz O.A., 2002. "Implementation and Verification of BMPs for Reducing Loading in the EAA and Everglades Agricultural Area BMPs for Reducing Particulate Phosphorus Transport." *Phase 10 Annual Report, WM 754*, Everglades Research and Education Center, Institute of Food and Agricultural Sciences, University of Florida, Belle Glade.