Urban Drainage and Flood Control District

Douglas County E-19 Surveys

EAST PLUM CREEK ABOVE HASKINS GULCH
ALERT ID: 2823
LID: HSKC2

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Introduction

HDR Engineering Inc. was contracted by the Urban Drainage and Flood Control District to survey and provide information about various flood warning stream gage sites in a manner consistent with National Weather Service E-19 procedures. On April 7, 2004, HDR personnel surveyed two sites. This report is a summary of the work done and information gathered for the Haskins Gulch gage on East Plum Creek. Included in this report are elevations of critical points in the vicinity of the site, estimates of stages causing flood damage in vicinity of the gage, and a revised rating curve.

Site

The stream gage is located south of Highway 85 on East Plum Creek. The ALERT ID number for this Gage is 2820 while the National Weather Service LID is HSKC2 and is referred to as Haskins Gulch. East Plum Creek has a wide floodplain in the vicinity of this gage. Potential flooding at the gage itself would consist of flooding of the East Plum Creek valley. Figure 1 shows the location of the site on the Douglas County ALERT map.

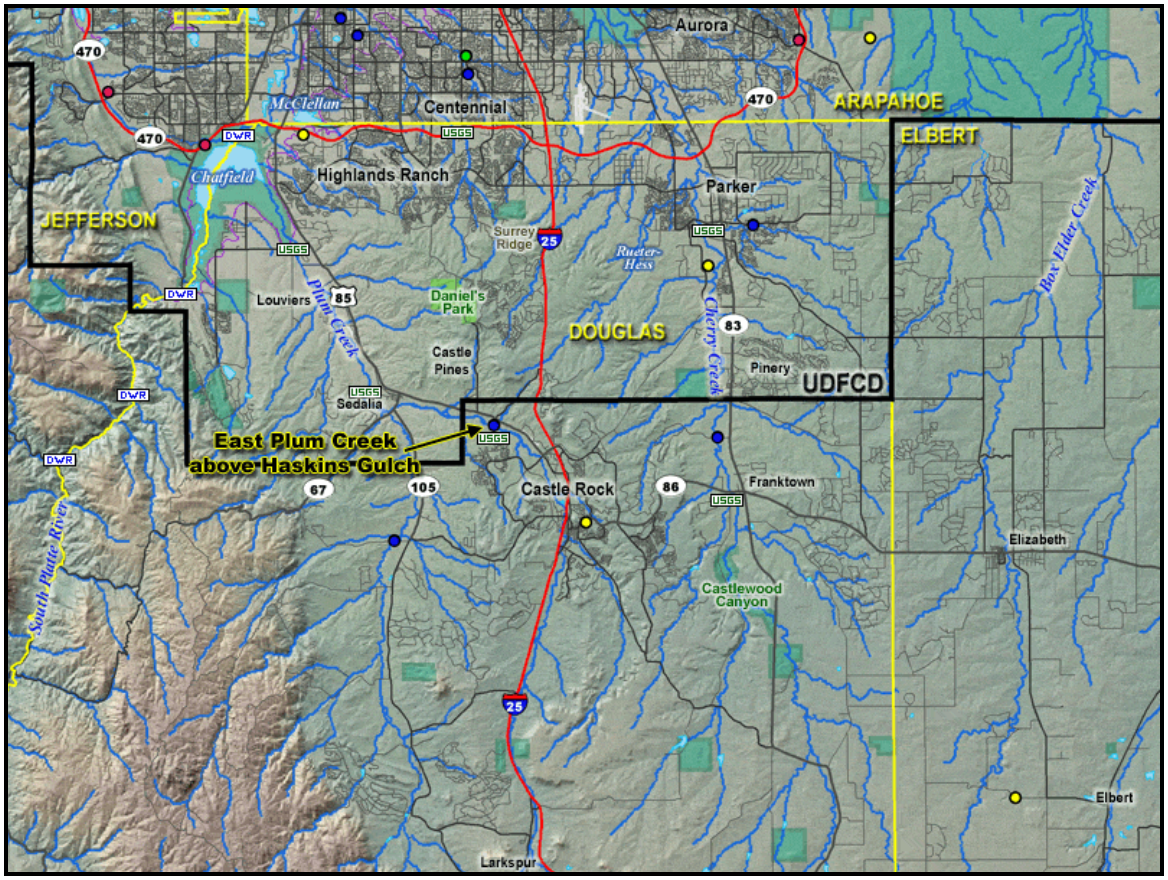

Figure 1 – Location Map

Surveyed locations

Ground elevations were surveyed along a cross section for a rating curve for the site. In addition, the elevations and locations of hazard locations, along with low flow channel water surface elevations up and downstream from the gage. Figure 2 shows locations of the surveyed points in the vicinity of the gage. The base of the ALERT transmitter was surveyed at an elevation of 100.00 for a temporary benchmark. The flow line elevation is 93.34 feet. The low flow channels banks will be overtopped at 2.1 feet above the invert elevation. Based on the water surface elevations in the low flow channel, the estimated channel energy slope is 0.9 percent.

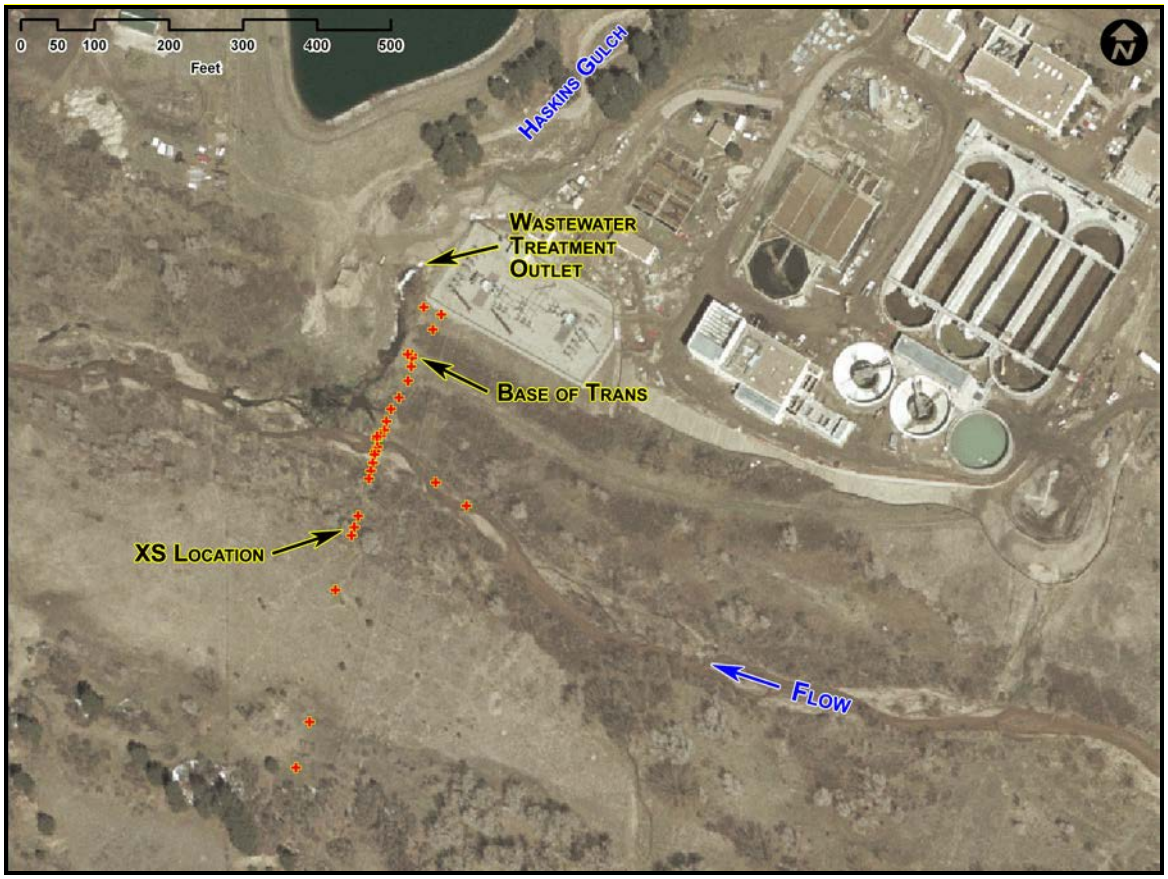

Figure 2 – Surveyed Points (Aerial - DRCOG 2004)

Rating Curve Development

Hydraulics for the existing bridge were evaluated using the HEC River Analysis System (HEC-RAS) program developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center[1]. HEC-RAS uses the standard step method to calculate water surface profiles. The following assumptions are used by HEC-RAS in computing water surface profiles:

- Steady flow;
- Gradually varied flow;
- One-dimensional flow;
- Channel slopes are small, less than 1:10

A rating curve was established for the gage using the surveyed cross-sections and the Army Corps of Engineers computer program HEC-RAS. The resulting rating curve from the analysis is in Table 1.

Q (cfs)	Depth (ft)	Comment
26900	10.35	500-YR DISCHARGE
16200	9.07	100-YR DISCHARGE
12100	8.54	50-YR DISCHARGE
10000	8.20	
8000	7.47	
5850	6.53	10-YR DISCHARGE
4000	5.74	
3000	5.21	
2000	4.87	
1000	4.14	
500	2.98	
300	2.38	OUT OF BANK
200	1.96	
100	1.41	
50	1.04	
25	0.80	
10	0.58	
5	0.45	
1	0.25	
0.1	0.10	

Table 1 – Rating Curve

[1] U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS Water Surface Profiles, Computer Program, Davis, California, March 2001.

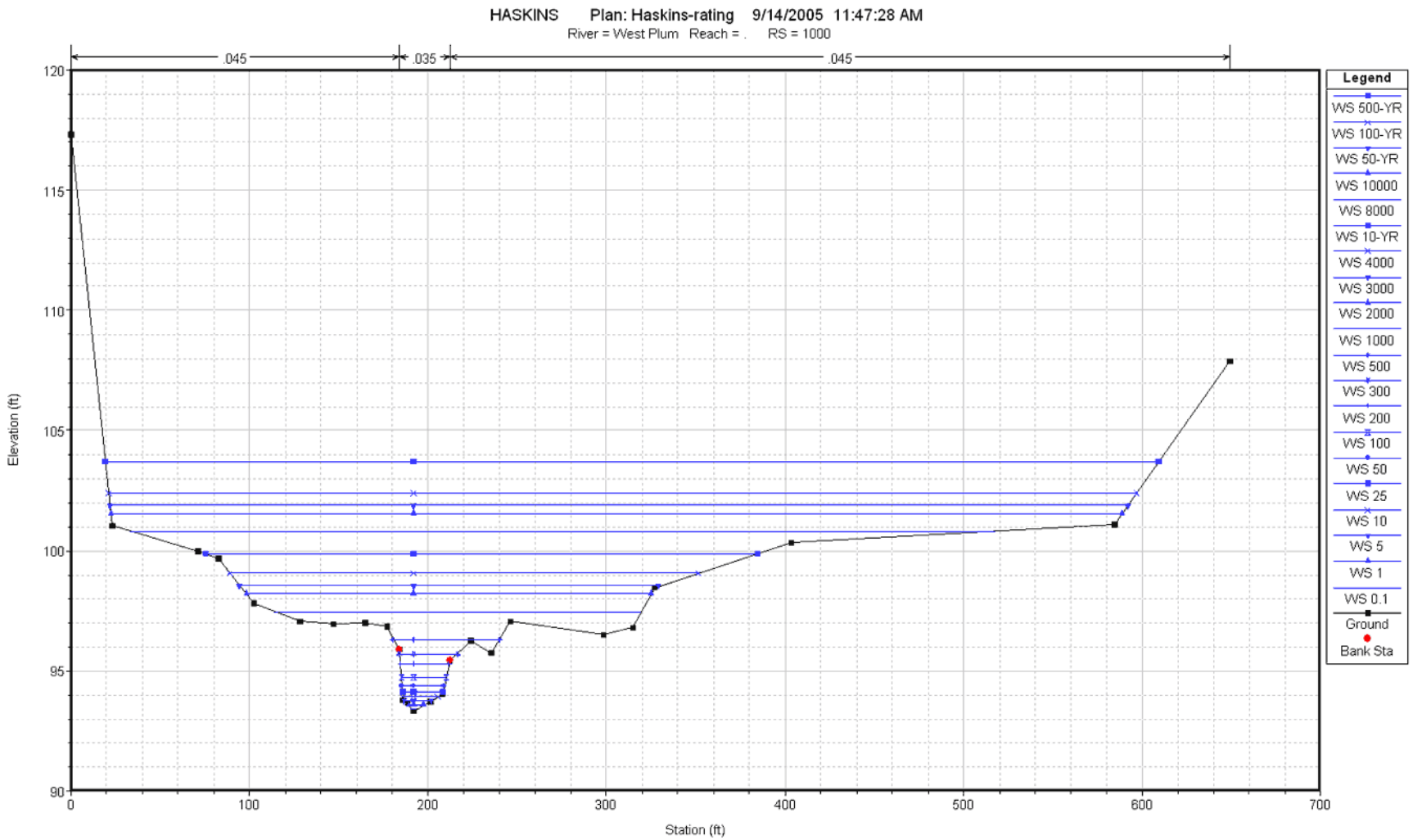

Figure 3 – HEC-RAS Cross Section with all Profiles

River	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
West Plum	500-YR	26900	93.34	103.69	103.56	105.57	0.009001	17.96	2824.28	589.87	1.01
West Plum	100-YR	16200	93.34	102.41	102.41	103.86	0.008298	15.69	2074.90	575.82	0.95
West Plum	50-YR	12100	93.34	101.88	101.88	103.09	0.007366	14.17	1773.47	570.07	0.89
West Plum	10000	10000	93.34	101.54	101.54	102.67	0.007004	13.42	1582.41	566.40	0.86
West Plum	8000	8000	93.34	100.81	100.26	102.20	0.009007	14.24	1182.86	484.82	0.96
West Plum	10-YR	5850	93.34	99.87		101.14	0.008983	12.89	830.88	309.51	0.93
West Plum	4000	4000	93.34	99.08		100.24	0.009118	11.80	604.92	262.52	0.92
West Plum	3000	3000	93.34	98.55		99.65	0.009248	11.06	473.90	234.62	0.91
West Plum	2000	2000	93.34	98.21	98.21	98.95	0.006556	8.84	394.66	226.24	0.75
West Plum	1000	1000	93.34	97.48	97.48	98.06	0.005352	7.06	236.27	205.62	0.66
West Plum	500	500	93.34	96.32	96.17	97.06	0.008997	7.03	79.68	59.32	0.80
West Plum	300	300	93.34	95.72		96.24	0.008996	5.83	51.86	32.20	0.77
West Plum	200	200	93.34	95.30		95.70	0.009009	5.04	39.67	27.54	0.74
West Plum	100	100	93.34	94.75		95.00	0.008925	3.96	25.26	25.25	0.70
West Plum	50	50	93.34	94.38		94.53	0.009139	3.11	16.08	23.68	0.66
West Plum	25	25	93.34	94.14		94.23	0.009036	2.39	10.44	22.66	0.62
West Plum	10	10	93.34	93.92		93.96	0.008939	1.76	5.68	19.52	0.57
West Plum	5	5	93.34	93.79		93.83	0.009020	1.44	3.47	16.21	0.55
West Plum	1	1	93.34	93.59	93.52	93.60	0.008889	0.99	1.01	8.17	0.50
West Plum	0.1	0.1	93.34	93.44		93.45	0.008891	0.56	0.18	3.45	0.43

Table 2 – HEC-RAS Profile Output Table

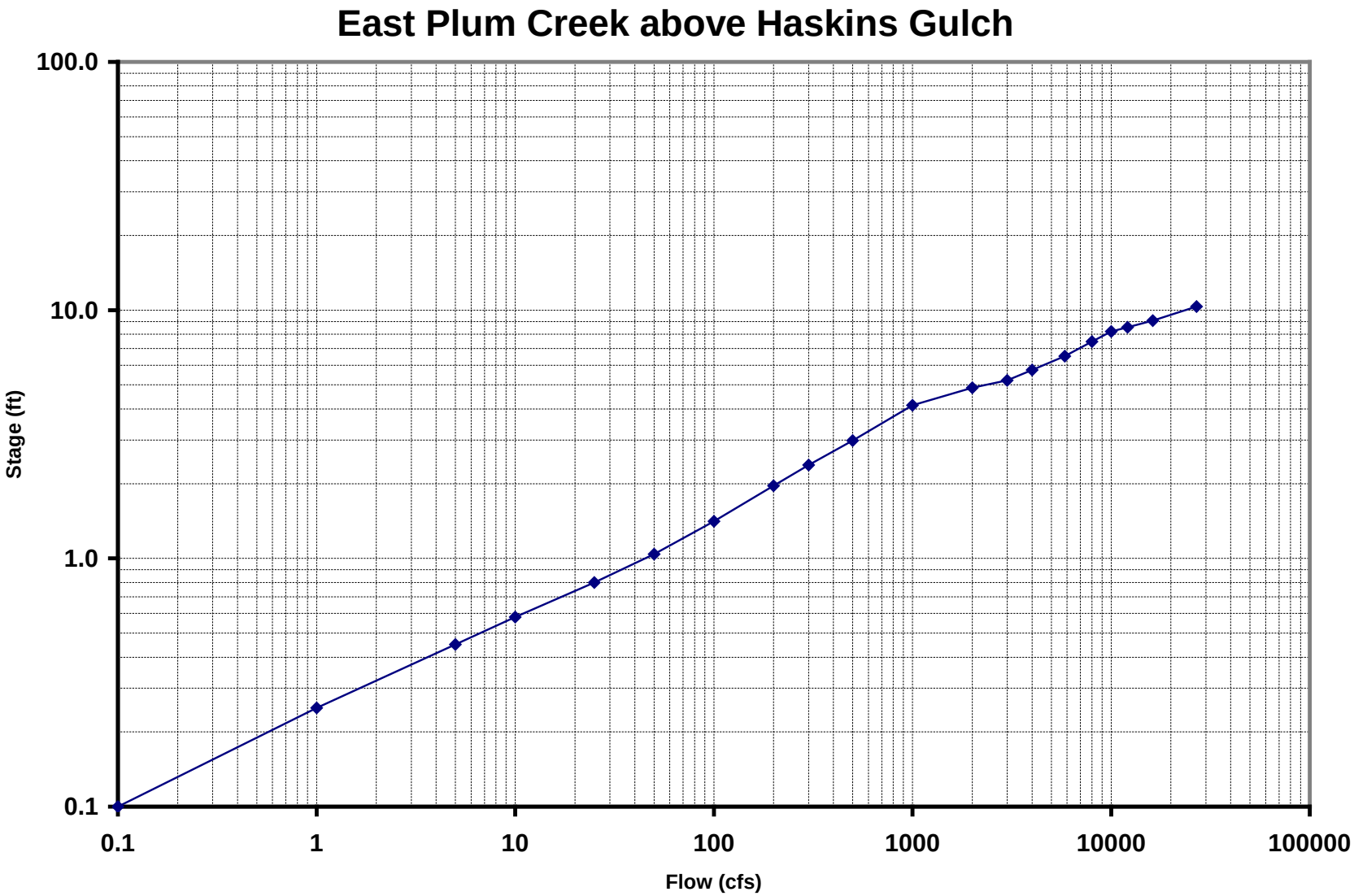

Figure 4 – HEC-RAS Log-Log Plot of Rating Table

Site photographs

Figure 5 – Panoramic View of Site, Looking Upstream, Southeast (left), to Northwest (right)

Figure 6 – Looking Downstream

Figure 7 – Looking Upstream and Across Floodplain

Figure 8 – Looking Across Floodplain at Gage Cross-section

Figure 9 – Treatment Plant Outlet (Immediately Downstream of Gage)

Study Data

According to the Douglas County Flood Insurance Study (FIS), the Haskins Gulch gage has a drainage area of approximately 110 square miles. The following table includes estimates of the frequency-discharge data interpolated between two reporting stations in the FIS Summary of Discharges table:

Frequency	Peak Discharge (cfs)
10-year	5,850
50-year	12,100
100-year	16,200
500-year	26,900

Table 3 – Frequency/Discharge Table

Historic records

There is limited information available for this gage. The USGS station that is co-located with the UDFCD station has been in operation since 1999. Since the USGS gage installation date, a peak stage of 7.75 feet above the invert was recorded on June 19, 2002.

Appendix

Haskins

POINT_ID	EASTING	NORTHING	EASTING_M	NORTHING_M	ELEV	DESC
1000	9999.98	9999.98	-3048.03	3047.94	117.96	INST
1001	10025.38	9999.98	-3055.77	3047.94	117.33	BS
1002	10023.04	10022.90	-3055.06	3054.92	101.04	TOEOFSLP
1003	10010.89	10065.57	-3051.35	3067.93	99.94	BASETRAN
1004	10012.08	10069.60	-3051.72	3069.16	100.00	BASETRAN
1005	10004.52	10067.07	-3049.41	3068.39	100.06	BASETRAN
1006	10015.63	10080.57	-3052.80	3072.50	99.66	GR
1007	10019.31	10100.24	-3053.92	3078.50	97.82	GR
1008	10016.55	10125.77	-3053.08	3086.28	97.04	GR
1009	10012.74	10144.51	-3051.92	3091.99	96.95	GR
1011	10013.46	10162.13	-3052.14	3097.36	96.99	GR
1012	10015.64	10173.71	-3052.80	3100.89	96.84	GR
1013	10013.44	10180.75	-3052.13	3103.03	95.90	TOPBNK
1014	10014.45	10183.08	-3052.44	3103.75	93.80	EDGWT
1015	10010.19	10189.06	-3051.14	3105.57	93.34	THALWAG
1016	10009.64	10185.73	-3050.97	3104.55	93.67	EDGWT
1017	10015.58	10198.47	-3052.79	3108.44	93.75	EDGWT
1018	10015.85	10205.11	-3052.87	3110.46	94.02	GR
1019	10016.27	10209.53	-3052.99	3111.81	95.46	TOPBNK
1020	10018.55	10220.70	-3053.69	3115.21	96.25	GR
1021	10019.90	10231.93	-3054.10	3118.63	95.73	GR
1022	10022.22	10242.65	-3054.81	3121.90	97.07	GR
1023	10028.46	10294.70	-3056.71	3137.77	96.50	GR
1024	10029.42	10310.69	-3057.00	3142.64	96.81	GR
1025	10030.40	10322.71	-3057.30	3146.30	98.49	GR
1026	10039.34	10399.11	-3060.03	3169.59	100.32	GRBARBFENC
1027	10076.32	10576.25	-3071.30	3223.58	101.10	GR
1028	10083.49	10640.44	-3073.49	3243.15	107.89	GR
1029	10107.38	10212.09	-3080.77	3112.59	94.51	THALWAG
1030	10157.88	10225.05	-3096.16	3116.54	94.67	THALWAG

Table 4 – Survey Data