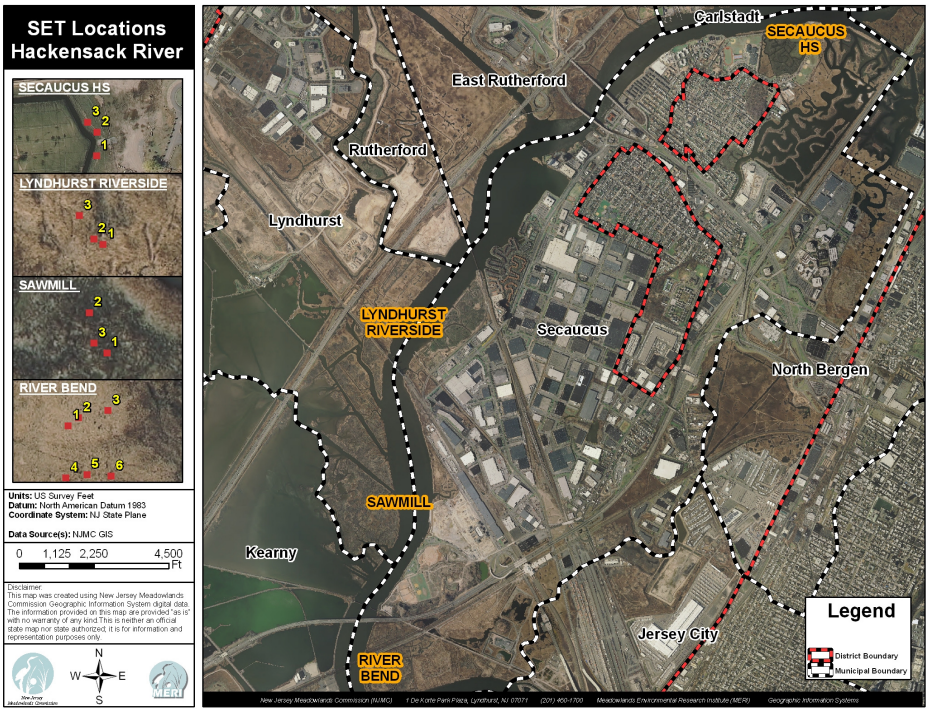
Measuring Elevation Change in Meadowlands Marshes
Using Surface Elevation Tables (SETs) and Marker Horizons

1.0 Introduction

The surface elevation table (SET) provides a constant plane in space from which the distance to a marsh surface can be measured by means of pins lowered to the surface (USGS 2010). During August of 2008, at five locations in the lower Hackensack River Meadowlands, benchmark rods were established, marker horizons of feldspar were emplaced and baseline readings were taken. Periodic monitoring will determine rates of accretion in marsh areas, and track and compare both shallow and deep subsidence. Each site was revisited and readings were taken in the fall of 2010. This report is a summary of those measurements.

Figure 1: Study Area



2.0 Materials and Methods

Locations were chosen to span several miles of tidal wetlands and represent different vegetation and marsh regimes. The five sites selected include a restored *Spartina alterniflora* low marsh (SHS), a *Spartina alterniflora* high marsh (SM), a *Spartina patens* dominated high marsh (RBP), a mixed *Spartina patens* and *Phragmites australis* high marsh (RBM) and a *Phragmites australis* dominated high marsh (LR). At each site, three replicate benchmarks were installed. At each benchmark, nine pins are lowered to the marsh surface. Readings are taken in each of four positions resulting in a total of 108 measurements. At the time of each subsequent reading, results obtained from each pin are compared. The average of the resulting differences becomes one data point that represents the level of the marsh surface.

Table 1: SETs Locations

SETs Locations			
Location		**Marsh Type**	**Dominant Vegetation**
RBP	Riverbend Patens	High Marsh	*Spartina patens*
RBM	Riverbend Mixed	High Marsh	*Phragmites australis / Spartina patens*
SM	Sawmill	High Marsh	*Spartina alterniflora*
LR	Lyndhurst Riverside	High Marsh	*Phragmites australis*
SHS	Secaucus HS	Low Marsh	*Spartina alterniflora*

Feldspar horizons were emplaced inside three corners of each benchmark plot at the time each SET was established. One reading is taken at each horizon resulting in a total of nine values associated with each marsh; the average of all readings produces a summary value.

To obtain a yearly rate, this value is divided by the number of days that have elapsed between establishment of the benchmark and the subsequent reading. Approximately one and a half years elapsed between the readings summarized in this report. Table 2 provides the dates for each reading and the time elapsed in days and years.

Table 2: Time Elapsed Between Readings

Location	Initial Date	Subsequent Date	Days	Years
RBP and RBM	8/26/2008	11/23/2010	819	2.24
SM	8/28/2008	11/19/2010	813	2.23
LR	8/29/2008	11/18/2010	811	2.22
SHS-1	8/28/2008	11/16/2010	817	2.24
SHS-2	8/28/2008	11/16/2010	817	2.24
SHS-3	8/21/2008	11/16/2010	810	2.22

3.0 Results

Table 3 is a description of the elevation change compared to the baseline data (2008) and compared to the data from the last sampling session (May, 2010). The purpose of comparing the November 2010 data to the May 2010 data is to get a better indication of what happened at each site within these six months. Please see the previous report for any questions regarding the May 2010 data. The complete data for November 2010 set is found in appendices at the end of the report. Values compared to the baseline data range from a subsidence rate of 6.13 mm/yr at Riverbend to a maximum rise in elevation of 9.63 mm/yr at Lyndhurst Riverside. Values compared from May 2010 range from a subsidence rate of -3.23mm/yr at Secaucus HS to a rise in elevation of 11.13mm/yr at Sawmill.

Table 3: SETs Measurements 2008/2010

Table 3

Site	Rate of Elevation Change from 2008 (mm/yr)	Rate of Elevation Change from May, 2010 (mm/yr)
Riverbend Patens	6.13	3.73
Riverbend Mixed	7.25	1.29
Sawmill	6.60	11.16
Lyndhurst Riverside	9.63	1.09
Secaucus HS	6.77	-3.23

Table 3a: Average Elevation Change (mm)

Riverbend High Marsh	
All Platforms	13.75
Std Error	3.28
RB-1	17.64
Std Error	3.53
RB-2	16.39
Std Error	0.74
RB-3	7.22
Std Error	3.93
RB-1 pos 1	25.33
RB-1 pos 3	18.44
RB-1 pos 5	18.56
RB-1 pos 7	8.22
RB-2 pos 1	16.67
RB-2 pos 3	14.22
RB-2 pos 5	17.11
RB-2 pos 7	17.56
RB-3 pos 1	18.00
RB-3 pos 3	1.00
RB-3 pos 5	8.11
RB-3 pos 7	1.78

Riverbend Mixed Marsh	
All Platforms	16.27
Std Error	1.76
RB-4	12.78
Std Error	2.05
RB-5	18.42
Std Error	5.28
RB-6	17.61
Std Error	5.68
RB-4 pos 1	15.44
RB-4 pos 3	9.33
RB-4 pos 5	9.22
RB-4 pos 7	17.11
RB-5 pos 2	19.00
RB-5 pos 4	9.00
RB-5 pos 6	12.67
RB-5 pos 8	33.00
RB-6 pos 2	7.22
RB-6 pos 4	20.11
RB-6 pos 6	32.56
RB-6 pos 8	10.56

Sawmill	
All Platforms	14.70
Std Error	4.25
SM-1	23.19
Std Error	13.07
SM-2	10.08
Std Error	2.93
SM-3	10.83
Std Error	10.66
SM-1 pos 2	-6.89
SM-1 pos 4	46.56
SM-1 pos 6	9.56
SM-1 pos 8	43.56
SM-2 pos 1	12.33
SM-2 pos 3	13.44
SM-2 pos 5	1.33
SM-2 pos 7	13.22
SM-3 pos 1	23.33
SM-3 pos 3	-11.11
SM-3 pos 5	-2.89
SM-3 pos 7	34.00

Lyndhurst Riverside	
All Platforms	21.41
Std Error	9.43
LR-1	13.53
Std Error	7.72
LR-2	10.50
Std Error	5.43
LR-3	40.19
Std Error	13.12
LR-1 pos 1	7.00
LR-1 pos 3	-3.67
LR-1 pos 5	32.33
LR-1 pos 7	18.44
LR-2 pos 1	20.44
LR-2 pos 3	2.67
LR-2 pos 5	-0.33
LR-2 pos 7	19.22
LR-3 pos 1	10.56
LR-3 pos 3	58.56
LR-3 pos 5	65.67
LR-3 pos 7	26.00

Secaucus HS	
All Platforms	15.03
Std Error	12.52
SHS-1	37.0
Std Error	2.43
SHS-2	-6.39
Std Error	10.45
SHS-3	14.5
Std Error	5.1
SHS-1 pos 1	33.3
SHS-1 pos 3	32.3
SHS-1 pos 5	40.2
SHS-1 pos 7	42.00
SHS-2 pos 2	-31.56
SHS-2 pos 4	-13.1
SHS-2 pos 6	17.44
SHS-2 pos 8	1.67
SHS-3 pos 2	14.3
SHS-3 pos 4	11.2
SHS-3 pos 6	28.3
SHS-3 pos 8	4.11

Tables 4 and 4a are summaries of the accretion measured by use of feldspar horizons emplaced at each benchmark location. Not all horizons produced recognizable accretion; where negligible material accumulated above the horizon, "0.0 accretion" is designated. All recoverable values are included in the calculation for accretion rate.

During this monitoring period, the marshes at Riverbend, Lyndhurst Riverside, and Secaucus showed a positive accretion rate of 5.0 mm/yr and the marsh at Sawmill had a slightly higher rate of 8 mm/yr.

Table 4: Feldspar Horizon Measurements 2009/2010

Site	Positive Accretion (Percent)	Accretion Rate (mm/yr)
Riverbend Patens	100	5.0
Riverbend Mixed	100	5.0
Sawmill	55.6	8.0
Lyndhurst Riverside	100	5.0
Secaucus HS	44.4	5.0

Table 4a: Average Accretion (mm)

Riverbend Patens	
All Platforms	1.20
Std Error	0.15
RB-1	1.00
Std Error	0.00
RB-2	1.10
Std Error	0.10
RB-3	1.50
Std Error	0.50
RB-1	
A	1.0
B	1.0
C	1.0
RB-2	
A	1.3
B	1.0
C	1.0
RB-3	
A	2.0
B	1.0
C	1.0

Riverbend Mixed	
All Platforms	1.22
Std Error	0.26
RB-4	1.25
Std Error	0.25
RB-5	1.67
Std Error	0.33
RB-6	0.75
Std Error	0.25
RB-4	
A	1.0
B	1.5
C	1.0
RB-5	
A	2.0
B	2.0
C	1.0
RB-6	
A	0.5
B	1.0
C	1.0

Sawmill	
All Platforms	1.89
Std Error	0.39
SM-1	1.50
Std Error	1.50
SM-2	2.67
Std Error	0.44
SM-3	1.50
Std Error	1.50
SM-1	
A	0.0
B	3.0
C	0.0
SM-2	
A	2.5
B	3.5
C	2.0
SM-3	
A	0.0
B	3.0
C	0.0

Table 4a (Cont.): Average Accretion (mm)

Lyndhurst Riverside	
All Platforms	1.03
Std Error	0.12
LR-1	1.25
Std Error	0.25
LR-2	0.83
Std Error	0.17
LR-3	1.00
Std Error	0.00
LR-1	
A	1.0
B	1.5
C	1.0
LR-2	
A	0.5
B	1.0
C	1.0
LR-3	
A	1.0
B	1.0
C	1.0

Secaucus HS	
All Platforms	1.17
Std Error	0.73
SHS-1	0.00
Std Error	0.00
SHS-2	1.00
Std Error	1.00
SHS-3	2.50
Std Error	0.00
SHS-1	
A	0.0
B	0.0
C	0.0
SHS-2	
A	0.0
B	0.0
C	3.0
SHS-3	
A	2.5
B	2.5
C	5.0

4.0 Discussion

Elevation change measured by the SET is influenced by both surface and subsurface processes occurring within the soil profile (USGS 2010). The marker horizons reveal surface processes only. One can surmise the relative contribution of these processes by looking at the difference between the rates obtained by each.

Table 5: Marsh Processes (USGS 2010)

SURFACE PROCESSES:
1) Sediment deposition
2) Sediment erosion
SUBSURFACE PROCESSES:
3) Root Growth
4) Decomposition
5) Porewater Flux
6) Compaction

Like the results in the spring of 2010, the rate of elevation change at Riverbend remained the same. The *Spartina patens* had a lower change in elevation than the mixed *Spartina patens* and *Phragmites australis*.

Both of the sites with *Phragmites australis* (Riverbend mixed and Lyndhurst Riverside) show the highest change in elevation. This is possibly due to the large decomposition of *Phragmites australis* on the marsh surface and the growth of the large root beds under the marsh surface.

Unlike the results in the spring of 2010, the marsh at Sawmill had a large increase in accretion in the fall of 2010. This is most likely due to the build-up in decomposing organic matter and foliage from the spring and summer months.

All of the sites show positive accretion rates most likely due to the summer foliage, however, Sawmill showed the highest accretion at 8mm/yr due to the large amount of decaying matter from the *Spartina alterniflora.*

The only site that had a loss in elevation from the spring to the fall of 2010 was the Secaucus High School marsh. A possible reason for this change is because prior to sampling the site, a large aquatic vehicle drove directly through sites 2 and 3 causing the compaction of soil in that area.

While it is tempting to try to draw conclusions from this data set, one must acknowledge that marsh sediment processes take place slowly over long periods of time. To quote Jim Lynch, USGS SETs methodology expert, "…It will take a long time to get enough data to see what's going on."(2010, personal communication)

The following is a picture of the Secaucus High School Marsh site. The red lines outline the damage that was made when the vehicle drove through.

5.0 Conclusions

The installation of the surface elevation tables and feldspar horizons provided an accurate method for determining changes in the marshes of the Hackensack River. The data derived during the period covered in this report suggest surface and subsurface processes are at work; and the two methods indicate the relative contribution of each. The data also shows that there are seasonal effects on the surfaces of the marsh which cause changes in the readings. A longer timescale is necessary to confirm these initial observations.

References

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USGS 2010. SET Concepts and Theory, url: http://www.pwrc.usgs.gov/set/theory.html#mh Patuxent Wildlife Research Center.

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Appendix 1: Riverbend Patens Surface Elevation Table Readings (mm)

RB-1					RB-2					RB-3				
Position	Pin	8/26/2008	11/23/2010	Difference	Position	Pin	8/26/2008	11/23/2010	Difference	Position	Pin	8/26/2008	11/23/2010	Difference
1	1	197	247	50	1	1	145	157	12	1	1	192	192	0
	2	227	241	14		2	150	164	14		2	179	204	25
	3	213	243	30		3	157	159	2		3	180	201	21
	4	230	248	18		4	159	176	17		4	188	180	-8
	5	228	243	15		5	160	174	14		5	174	187	13
	6	222	257	35		6	160	176	16		6	177	190	13
	7	208	256	48		7	163	180	17		7	164	191	27
	8	226	246	20		8	161	180	19		8	158	200	42
	9	232	230	-2		9	150	189	39		9	161	190	29
3	1	201	234	33	3	1	158	156	-2	3	1	167	175	8
	2	203	231	28		2	155	168	13		2	196	186	-10
	3	211	230	19		3	157	178	21		3	175	200	25
	4	218	236	18		4	143	176	33		4	182	189	7
	5	202	238	36		5	160	170	10		5	180	176	-4
	6	220	235	15		6	162	175	13		6	192	182	-10
	7	221	236	15		7	160	177	17		7	173	184	11
	8	223	217	-6		8	165	180	15		8	191	176	-15
	9	214	222	8		9	166	174	8		9	191	188	-3
5	1	215	236	21	5	1	162	179	17	5	1	187	199	12
	2	208	230	22		2	165	177	12		2	195	212	17
	3	214	242	28		3	157	168	11		3	195	193	-2
	4	208	240	32		4	158	176	18		4	204	203	-1
	5	216	234	18		5	155	182	27		5	193	205	12
	6	221	242	21		6	161	178	17		6	199	200	1
	7	219	236	17		7	143	168	25		7	200	195	-5
	8	216	216	0		8	161	178	17		8	185	198	13
	9	227	235	8		9	165	175	10		9	152	178	26
7	1	216	226	10	7	1	160	172	12	7	1	130	146	16
	2	213	235	22		2	154	172	18		2	178	186	8
	3	215	207	-8		3	156	176	20		3	179	168	-11
	4	216	212	-4		4	155	169	14		4	195	198	3
	5	221	235	14		5	156	169	13		5	176	198	22
	6	216	225	9		6	155	169	14		6	193	188	-5
	7	212	240	28		7	154	169	15		7	195	184	-11
	8	217	206	-11		8	153	176	23		8	192	194	2
	9	212	226	14		9	151	180	29		9	191	183	-8

Appendix 2: Riverbend Mixed Surface Elevation Table Readings (mm)

RB-4					RB-5					RB-6				
Position	Pin	8/26/2008	11/23/2010	Difference	Position	Pin	8/26/2008	11/23/2010	Difference	Position	Pin	8/26/2008	11/23/2010	Difference
1	1	196	204	8	2	1	148	166	18	2	1	180	182	2
	2	196	184	-12		2	136	157	21		2	189	186	-3
	3	100	210	110		3	146	153	7		3	186	182	-4
	4	196	195	-1		4	164	150	-14		4	177	168	-9
	5	186	204	18		5	161	162	1		5	185	189	4
	6	206	208	2		6	106	180	74		6	181	194	13
	7	212	206	-6		7	136	187	51		7	189	180	-9
	8	190	207	17		8	155	170	15		8	178	204	26
	9	180	183	3		9	149	147	-2		9	149	194	45
3	1	190	206	16	4	1	153	136	-17	4	1	173	208	35
	2	192	202	10		2	137	146	9		2	182	205	23
	3	196	194	-2		3	134	148	14		3	168	190	22
	4	194	204	10		4	140	152	12		4	177	204	27
	5	183	207	24		5	141	170	29		5	176	186	10
	6	193	184	-9		6	160	152	-8		6	185	182	-3
	7	198	205	7		7	159	182	23		7	181	208	27
	8	190	198	8		8	144	165	21		8	192	207	15
	9	190	210	20		9	149	147	-2		9	187	212	25
5	1	198	228	30	6	1	141	166	25	6	1	178	184	6
	2	172	198	26		2	164	178	14		2	176	194	18
	3	195	215	20		3	149	162	13		3	149	204	55
	4	189	203	14		4	163	165	2		4	154	202	48
	5	198	210	12		5	162	193	31		5	151	198	47
	6	204	207	3		6	160	170	10		6	161	204	43
	7	209	206	-3		7	162	175	13		7	168	194	26
	8	208	200	-8		8	176	164	-12		8	178	196	18
	9	177	166	-11		9	170	188	18		9	148	180	32
7	1	193	205	12	8	1	138	150	12	8	1	134	152	18
	2	203	212	9		2	142	153	11		2	161	164	3
	3	201	228	27		3	145	159	14		3	163	170	7
	4	197	228	31		4	68	158	90		4	178	188	10
	5	201	210	9		5	126	168	42		5	175	194	19
	6	202	202	0		6	141	153	12		6	191	202	11
	7	199	218	19		7	139	151	12		7	192	200	8
	8	190	216	26		8	120	183	63		8	193	188	-5
	9	203	224	21		9	124	165	41		9	188	212	24

Appendix 3: Sawmill Surface Elevation Table Readings (mm)

		SM-1				SM-2					SM-3				
Position	Pin	8/28/2008	11/19/2010	Difference	Position	Pin	8/28/2008	11/19/2010	Difference	Position	Pin	8/28/2008	11/19/2010	Difference
2	1	171	189	18	1	1	119	140	21	1	1	205	196	-9
	2	178	178	0		2	114	152	38		2	176	237	61
	3	170	182	12		3	145	133	-12		3	196	173	-23
	4	172	192	20		4	162	160	-2		4	175	241	66
	5	144	166	22		5	152	162	10		5	206	239	33
	6	234	149	-85		6	152	165	13		6	219	249	30
	7	169	140	-29		7	117	155	38		7	205	239	34
	8	182	174	-8		8	144	134	-10		8	207	202	-5
	9	202	190	-12		9	135	150	15		9	238	261	23
4	1	70	183	113	3	1	149	134	-15	3	1	218	204	-14
	2	127	171	44		2	135	151	16		2	203	174	-29
	3	127	192	65		3	85	117	32		3	200	191	-9
	4	155	195	40		4	111	119	8		4	213	184	-29
	5	160	170	10		5	91	151	60		5	240	211	-29
	6	156	179	23		6	140	157	17		6	226	226	0
	7	161	184	23		7	150	147	-3		7	203	217	14
	8	166	220	54		8	153	142	-11		8	222	196	-26
	9	167	214	47		9	140	157	17		9	203	225	22
6	1	164	140	-24	5	1	156	140	-16	5	1	230	214	-16
	2	35	117	82		2	150	171	21		2	215	220	5
	3	149	146	-3		3	145	174	29		3	215	203	-12
	4	146	121	-25		4	156	159	3		4	218	202	-16
	5	109	162	53		5	143	152	9		5	225	202	-23
	6	134	115	-19		6	157	146	-11		6	225	220	-5
	7	151	107	-44		7	175	173	-2		7	215	230	15
	8	121	117	-4		8	176	172	-4		8	216	240	24
	9	130	200	70		9	160	143	-17		9	228	230	2
8	1	155	191	36	7	1	115	148	33	7	1	232	244	12
	2	172	209	37		2	92	98	6		2	226	236	10
	3	153	196	43		3	100	130	30		3	205	237	32
	4	122	165	43		4	132	139	7		4	167	245	78
	5	57	152	95		5	107	150	43		5	210	252	42
	6	129	129	0		6	116	134	18		6	185	213	28
	7	50	166	116		7	164	155	-9		7	200	243	43
	8	146	195	49		8	144	133	-11		8	206	209	3
	9	187	160	-27		9	155	157	2		9	147	205	58

Appendix 4: Lyndhurst Riverside Surface Elevation Table Readings (mm)

LR-1					LR-2					LR-3				
Position	Pin	8/29/2008	11/18/2010	Difference	Position	Pin	8/29/2008	11/18/2010	Difference	Position	Pin	8/29/2008	11/18/2010	Difference
1	1	218	235	17	1	1	116	125	9	1	1	226	217	-9
	2	241	235	-6		2	90	120	30		2	219	244	25
	3	244	240	-4		3	55	139	84		3	219	235	16
	4	248	249	1		4	64	119	55		4	215	219	4
	5	231	230	-1		5	103	126	23		5	183	225	42
	6	223	257	34		6	114	126	12		6	234	231	-3
	7	239	243	4		7	113	147	34		7	208	211	3
	8	228	235	7		8	188	135	-53		8	225	233	8
	9	217	228	11		9	168	158	-10		9	215	224	9
3	1	234	248	14	3	1	175	152	-23	3	1	162	212	50
	2	210	222	12		2	179	160	-19		2	193	214	21
	3	237	238	1		3	102	150	48		3	184	219	35
	4	233	234	1		4	137	146	9		4	118	205	87
	5	242	230	-12		5	150	128	-22		5	153	212	59
	6	236	209	-27		6	82	140	58		6	137	203	66
	7	258	249	-9		7	125	125	0		7	138	179	41
	8	230	231	1		8	185	181	-4		8	145	206	61
	9	225	211	-14		9	207	184	-23		9	95	202	107
5	1	122	229	107	5	1	190	165	-25	5	1	195	187	-8
	2	182	222	40		2	150	162	12		2	174	190	16
	3	210	216	6		3	166	143	-23		3	134	193	59
	4	151	230	79		4	135	151	16		4	145	189	44
	5	210	215	5		5	137	150	13		5	72	207	135
	6	224	214	-10		6	148	141	-7		6	120	209	89
	7	208	224	16		7	145	121	-24		7	97	201	104
	8	206	220	14		8	122	144	22		8	131	195	64
	9	197	231	34		9	130	143	13		9	114	202	88
7	1	212	232	20	7	1	135	142	7	7	1	165	217	52
	2	219	221	2		2	123	139	16		2	175	239	64
	3	213	230	17		3	135	134	-1		3	222	223	1
	4	211	235	24		4	116	155	39		4	216	224	8
	5	200	226	26		5	100	136	36		5	205	231	26
	6	205	227	22		6	98	128	30		6	220	223	3
	7	207	221	14		7	110	128	18		7	169	205	36
	8	227	233	6		8	115	127	12		8	199	216	17
	9	190	225	35		9	115	131	16		9	196	223	27

Appendix 5: Secaucus HS Surface Elevation Table Readings (mm)

	SHS-1					SHS-2					SHS-3				
Position	Pin	8/28/2008	11/16/2010	Difference	Position	Pin	8/28/2008	11/16/2010	Difference	Position	Pin	8/21/2008	11/16/2010	Difference
1	1	154	206	52	2	1	122	127	5	2	1	177	190	13
	2	158	203	45		2	90	114	24		2	165	194	29
	3	172	190	18		3	174	105	-69		3	160	176	16
	4	160	208	48		4	164	108	-56		4	168	184	16
	5	183	206	23		5	127	107	-20		5	160	180	20
	6	172	198	26		6	155	86	-69		6	170	185	15
	7	178	201	23		7	147	80	-67		7	165	170	5
	8	170	185	15		8	90	93	3		8	170	158	-12
	9	150	200	50		9	136	101	-35		9	130	157	27
3	1	142	200	58	4	1	141	139	-2	4	1	182	190	8
	2	127	197	70		2	144	135	-9		2	175	185	10
	3	134	197	63		3	156	137	-19		3	174	185	11
	4	165	177	12		4	132	132	0		4	165	180	15
	5	176	180	4		5	130	119	-11		5	175	181	6
	6	156	170	14		6	135	102	-33		6	174	181	7
	7	148	180	32		7	116	104	-12		7	175	174	-1
	8	167	186	19		8	118	111	-7		8	177	185	8
	9	163	182	19		9	120	95	-25		9	175	212	37
5	1	170	223	53	6	1	146	151	5	6	1	180	183	3
	2	173	214	41		2	145	163	18		2	149	175	26
	3	171	210	39		3	152	163	11		3	155	187	32
	4	178	214	36		4	150	163	13		4	174	183	9
	5	181	209	28		5	156	162	6		5	160	186	26
	6	165	214	49		6	155	158	3		6	135	185	50
	7	182	225	43		7	140	160	20		7	135	190	55
	8	185	216	31		8	120	155	35		8	148	196	48
	9	180	222	42		9	114	160	46		9	170	176	6
7	1	187	225	38	8	1	129	160	31	8	1	191	184	-7
	2	183	224	41		2	187	170	-17		2	175	196	21
	3	184	229	45		3	232	235	3		3	175	191	16
	4	178	228	50		4	180	181	1		4	188	174	-14
	5	185	223	38		5	174	185	11		5	183	180	-3
	6	199	226	27		6	158	185	27		6	190	187	-3
	7	182	231	49		7	190	172	-18		7	185	205	20
	8	186	241	55		8	186	170	-16		8	200	194	-6
	9	197	232	35		9	175	168	-7		9	175	188	13