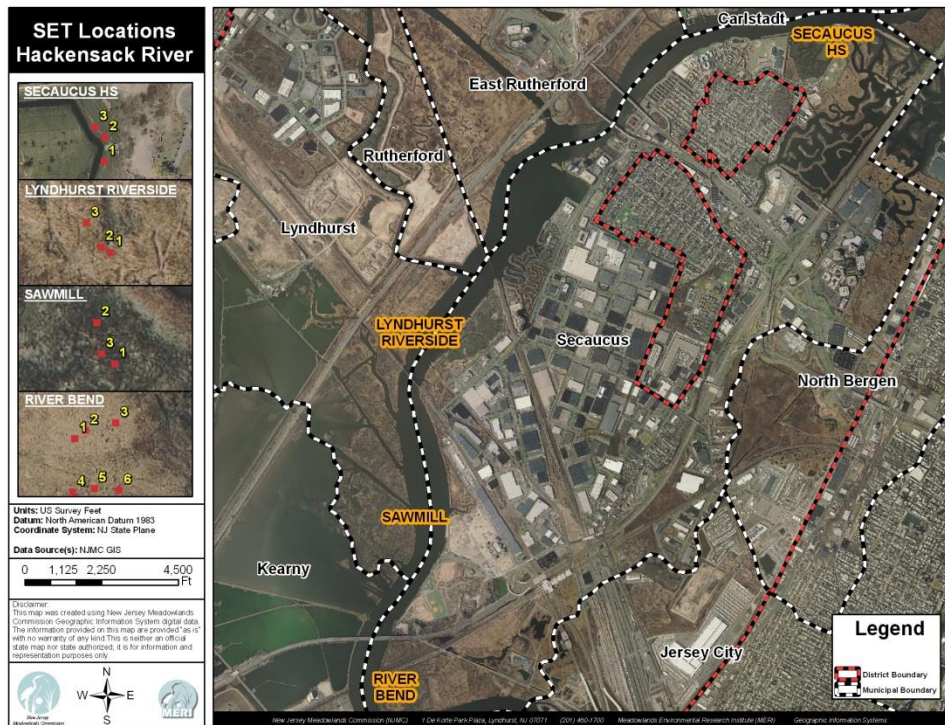


Measuring Elevation Change in Meadowlands Marshes Using Surface Elevation Tables (SETs) and Marker Horizons

Meadowlands Environmental Research Institute (April, 2015)

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 taken annually except 2009. This report is a summary of those measurements taken up to the spring of 2015.

Figure 1: Study Area



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 (Secaucus High School, SHS), a *Spartina alterniflora* low marsh (Saw Mill, SM), a *Spartina patens* dominated high marsh (Riverbend-Patens, RBP), a mixed *Spartina patens* and *Phragmites australis* high marsh (Riverbend Mixed, RBM) and a *Phragmites australis* dominated high marsh (Lyndhurst Riverside, LR). At each site, three replicate plots were installed. At each plot, nine pins are lowered to the marsh surface. Readings are taken in each of four directions resulting in a total of 108 measurements for each of the 5 sites. 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 elevation.

Table 1: Time Elapsed Between Readings

Location	Initial Date	Most Recent Date	Days	Years
RBP and RBM	8/26/2008	4/22/2015	2430	6.66
SM	8/28/2008	4/24/2015	2430	6.66
LR	8/29/2008	4/24/2015	2429	6.65
SHS	8/28/2008	4/15/2015	2421	6.63

Table 1 provides the dates for each reading and the time elapsed in days and years

Table 2: Average Elevation Change (mm) – Spring 2015

Riverbend Patens		Riverbend Mixed		Sawmill	
All Platforms	27.82	All Platforms	34.31	All Platforms	31.53
Std Error	1.81	Std Error	13.02	Std Error	2.57
RB-1	31.22	RB-4	10.19	SM-1	36.58
Std Error	2.21	Std Error	3.40	Std Error	12.74
RB-2	27.19	RB-5	37.89	SM-2	28.19
Std Error	1.56	Std Error	3.91	Std Error	12.23
RB-3	25.06	RB-6	54.86	SM-3	29.81
Std Error	4.47	Std Error	4.27	Std Error	4.93
RB-1 pos 1	32.00	RB-4 pos 1	11.78	SM-1 pos 2	0.11
RB-1 pos 3	35.67	RB-4 pos 3	8.11	SM-1 pos 4	41.00
RB-1 pos 5	32.11	RB-4 pos 5	18.56	SM-1 pos 6	59.11
RB-1 pos 7	25.11	RB-4 pos 7	2.33	SM-1 pos 8	46.11
RB-2 pos 1	26.11	RB-5 pos 2	33.00	SM-2 pos 1	34.00
RB-2 pos 3	30.89	RB-5 pos 4	36.56	SM-2 pos 3	30.56
RB-2 pos 5	23.56	RB-5 pos 6	32.67	SM-2 pos 5	-5.22
RB-2 pos 7	28.22	RB-5 pos 8	49.33	SM-2 pos 7	53.44
RB-3 pos 1	35.67	RB-6 pos 2	50.11	SM-3 pos 1	28.78
RB-3 pos 3	27.11	RB-6 pos 4	47.67	SM-3 pos 3	40.44
RB-3 pos 5	14.11	RB-6 pos 6	66.89	SM-3 pos 5	16.89
RB-3 pos 7	23.33	RB-6 pos 8	54.78	SM-3 pos 7	33.11

Lyndhurst Riverside	
All Platforms	21.15
Std Error	5.18
LR-1	16.06
Std Error	14.78
LR-2	15.89
Std Error	6.93
LR-3	31.50
Std Error	14.62
LR-1 pos 1	-3.00
LR-1 pos 3	-8.11
LR-1 pos 5	56.89
LR-1 pos 7	18.44
LR-2 pos 1	33.78
LR-2 pos 3	11.00
LR-2 pos 5	0.78
LR-2 pos 7	18.00
LR-3 pos 1	-3.89
LR-3 pos 3	51.22
LR-3 pos 5	59.33
LR-3 pos 7	19.33

Secaucus HS	
All Platforms	38.72
Std Error	16.54
SHS-1	61.0
Std Error	2.26
SHS-2	6.42
Std Error	7.07
SHS-3	48.7
Std Error	6.3
SHS-1 pos 2	62.7
SHS-1 pos 4	66.7
SHS-1 pos 6	57.9
SHS-1 pos 8	56.89
SHS-2 pos 1	22.22
SHS-2 pos 3	12.1
SHS-2 pos 5	2.22
SHS-2 pos 7	-10.89
SHS-3 pos 2	51.8
SHS-3 pos 4	30.2
SHS-3 pos 6	54.1
SHS-3 pos 8	58.78

Table 2a: SETs Locations and Measurements – Spring 2015 sampling

Location		Marsh Type	Dominant Vegetation	Rate of Elevation Change from 2008 to 2015(mm/yr.)
RBP	Riverbend Patens	High Marsh	<i>Spartina patens</i>	4.18
RBM	Riverbend Mixed	High Marsh	<i>Phragmites australis</i> / <i>Spartina patens</i>	5.15
SM	Sawmill	High Marsh	<i>Spartina alterniflora</i>	4.74
LR	Lyndhurst Riverside	High Marsh	<i>Phragmites australis</i>	3.18
SHS	Secaucus HS	Low Marsh	<i>Spartina alterniflora</i>	5.84

The above two tables, Tables 2 and 2a, are summaries of the changes in elevation measured at each location.

Table 2 contains the averages of elevation changes obtained at each of the three plots as well as at each of the 4 orientation positions. The averages of measurements from all 108 platforms at each site are also included in Table 2. The average of all platforms is then divided by the time elapsed since the initial date (Table 1) to derive the rate of elevation change in mm/yr (Table 2a). The complete data set for elevation can be found in appendices at the end of the report. As shown in table 2a, values ranged from a subsidence rate of 3.18 mm/yr. at the Lyndhurst Riverside site to a maximum rise in elevation of 5.84 mm/yr. at the Secaucus HS site.

Table 3: Average Accretion (mm) – Spring 2015 sampling

Riverbend Patens	
All Platforms	3.78
Std Error	0.24
RB-1	3.33
Std Error	1.50
RB-2	3.83
Std Error	0.44
RB-3	4.17
Std Error	0.50
RB-1	
A	3.0
B	2.0
C	5.0
RB-2	
A	4.0
B	4.5
C	3.0
RB-3	
A	4.5
B	3.5
C	4.5

Riverbend Mixed	
All Platforms	4.78
Std Error	0.62
RB-4	4.33
Std Error	0.00
RB-5	6.00
Std Error	0.58
RB-6	4.00
Std Error	0.50
RB-4	
A	4.0
B	4.5
C	4.5
RB-5	
A	7.0
B	5.0
C	6.0
RB-6	
A	3.0
B	4.0
C	5.0

Sawmill	
All Platforms	6.47
Std Error	0.18
SM-1	6.25
Std Error	1.25
SM-2	6.83
Std Error	0.44
SM-3	6.33
Std Error	0.33
SM-1	
A	7.5
B	NA
C	5.0
SM-2	
A	7.5
B	7.0
C	6.0
SM-3	
A	6.0
B	6.0
C	7.0

Lyndhurst Riverside	
All Platforms	2.94
Std Error	0.29
LR-1	3.50
Std Error	0.50
LR-2	2.50
Std Error	0.29
LR-3	2.83
Std Error	0.00
LR-1	
A	3.5
B	4.0
C	3.0
LR-2	
A	2.0
B	2.5
C	3.0
LR-3	
A	3.0
B	3.0
C	2.5

Secaucus HS	
All Platforms	5.22
Std Error	0.89
SHS-1	7.00
Std Error	#DIV/0!
SHS-2	4.50
Std Error	#DIV/0!
SHS-3	4.17
Std Error	0.83
SHS-1	
A	NA*
B	NA*
C	7.0
SHS-2	
A	NA*
B	NA*
C	4.5
SHS-3	
A	2.5
B	5.0
C	5.0

*New Accretion layers were added 4-15-15

Table 3a: Feldspar Horizon Measurements 2008/2015

Site	Positive Accretion (Percent)	Accretion Rate (mm/yr.)
Riverbend Patens	100	5.67
Riverbend Mixed	100	7.18
Sawmill	89	9.70
Lyndhurst Riverside	100	3.40
Secaucus HS	56	7.90

Tables 3 and 3a are summaries of the accretion measured by use of feldspar horizons emplaced at each benchmark location

Feldspar horizons were emplaced inside three corners of each benchmark plot. The sediment between the white feldspar marker and the horizon is measured. One reading is taken at each of the three corners resulting in a total of nine values associated with each marsh; the average of all readings produces a summary value (Table 3a). Not all horizons produced recognizable accretion; it is possible that the feldspar cannot be found and will need to be replaced and a new data set generated. Where negligible material accumulated above the horizon, “0.0 accretion” is designated. All recoverable values are included in the calculation for accretion rate. New horizons were added to the Secaucus HS site on 4-15-15.

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 six and two third years elapsed between the readings summarized in this report. Table 1 provides the dates for each reading and the time elapsed in days and years.

Table 4: Elevation Rate and Accretion Rate values – Fall 2008 to Spring 2015

Riverbend Patens						
Days	0	632	980	1555	2065	2430
Sample Date	8/26/2008	5/20/2010	5/3/2011	11/28/2012	4/22/2014	4/22/2015
Elevation Rate mm/yr	0.00	2.48	6.02	5.92	3.68	4.18
Accretion Rate mm/yr	0.00	0.00	5.69	6.39	5.03	5.67

Riverbend Mixed						
Days	0	632	980	1555	2065	2430
Sample Date	8/26/2008	5/20/2010	5/3/2011	11/28/2012	4/22/2014	4/22/2015
Elevation Rate mm/yr	0.00	5.96	7.58	6.99	3.63	5.15
Accretion Rate mm/yr	0.00	0.00	7.80	6.31	5.05	7.18

Sawmill						
Days	0	631	980	1566	2065	2430
Sample Date	8/28/2008	5/21/2010	5/5/2011	12/11/2012	4/24/2014	4/24/2015
Elevation Rate mm/yr	0.00	-4.66	5.51	7.94	5.70	4.74
Accretion Rate mm/yr	0.00	0.00	13.80	11.10	9.90	9.70

Lyndhurst Reserve						
Days	0	630	979	1557	2064	2429
Sample Date	8/29/2008	5/21/2010	5/5/2011	12/3/2012	4/24/2014	4/24/2015
Elevation Rate mm/yr	0	8.79	6.38	7.53	3.65	3.18
Accretion Rate mm/yr	0	2.74	3.94	4.20	3.40	4.40

Secaucus HS						
Days	0	609	984	1553	2066	2421
Sample Date	8/28/2008	4/29/2010	5/9/2011	11/28/2012	4/25/2014	4/15/2015
Elevation Rate mm/yr	0.00	9.97	5.03	6.52	6.16	5.84
Accretion Rate mm/yr	0.00	10.00	4.40	6.70	8.90	7.90

Table 4 shows the yearly elevation and accretion rate for every sampling event.

Table 5: Marsh Processes (USGS 2010)

2010)SURFACE PROCESSES:
1) Sediment deposition
2) Sediment erosion
SUBSURFACE PROCESSES:
3) Root Growth
4) Decomposition
5) Pore water Flux
6) Compaction

Table 5 explains both surface and subsurface interactions (USGS, 2010).

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.

The two sites at Riverbend had increases in both elevation and accretion rates while the 3 other sites had small drops in the elevation rates.

The accretion rate remains consistent, but the elevation rate at Lyndhurst Reserve is decreasing each year according to table 4. Five years ago the rate was 8.79 mm/yr and now it's at 3.18 mm/yr, which is about a 1 mm/yr decrease.

On 4-15-15, new horizons were added at the Secaucus HS site so there can be better accretion rate results. Half of the horizons were eroded away or are just not visible anymore.

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).

Conclusions

The installation of the surface elevation tables and feldspar horizons provides an accurate method for determining changes in the marshes of the Hackensack River estuary. As more time passes, the accretion and elevation rates will become stable and there will not be large fluctuations in the measurements unless there is a large weather event or human impact on the sites.

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

RB-1					RB-2					RB-3				
Position	Pin	8/26/2008	4/22/2015	Difference	Position	Pin	8/26/2008	4/22/2015	Difference	Position	Pin	8/26/2008	4/22/2015	Difference
1	1	197	249	52	1	1	145	170	25	1	1	192	195	3
	2	227	249	22		2	150	177	27		2	179	185	6
	3	213	255	42		3	157	175	18		3	180	219	39
	4	230	250	20		4	159	179	20		4	188	205	17
	5	228	252	24		5	160	190	30		5	174	205	31
	6	222	252	30		6	160	189	29		6	177	195	18
	7	208	245	37		7	163	186	23		7	164	225	61
	8	226	265	39		8	161	192	31		8	158	227	69
	9	232	254	22		9	150	182	32		9	161	238	77
3	1	201	242	41	3	1	158	182	24	3	1	167	223	56
	2	203	251	48		2	155	196	41		2	196	207	11
	3	211	251	40		3	157	186	29		3	175	207	32
	4	218	264	46		4	143	186	43		4	182	206	24
	5	202	240	38		5	160	195	35		5	180	219	39
	6	220	235	15		6	162	194	32		6	192	211	19
	7	221	259	38		7	160	190	30		7	173	196	23
	8	223	260	37		8	165	195	30		8	191	212	21
	9	214	232	18		9	166	180	14		9	191	210	19
5	1	215	262	47	5	1	162	196	34	5	1	187	222	35
	2	208	251	43		2	165	179	14		2	195	215	20
	3	214	242	28		3	157	190	33		3	195	192	-3
	4	208	245	37		4	158	176	18		4	204	198	-6
	5	216	229	13		5	155	185	30		5	193	200	7
	6	221	256	35		6	161	184	23		6	199	204	5
	7	219	258	39		7	143	178	35		7	200	193	-7
	8	216	252	36		8	161	173	12		8	185	217	32
	9	227	238	11		9	165	178	13		9	152	196	44
7	1	216	245	29	7	1	160	175	15	7	1	130	198	68
	2	213	245	32		2	154	187	33		2	178	202	24
	3	215	230	15		3	156	186	30		3	179	199	20
	4	216	236	20		4	155	185	30		4	195	202	7
	5	221	245	24		5	156	182	26		5	176	224	48
	6	216	244	28		6	155	184	29		6	193	192	-1
	7	212	220	8		7	154	180	26		7	195	202	7
	8	217	247	30		8	153	190	37		8	192	225	33
	9	212	252	40		9	151	179	28		9	191	195	4

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

RB-4					RB-5					RB-6				
Position	Pin	8/26/2008	4/22/2015	Difference	Position	Pin	8/26/2008	4/22/2015	Difference	Position	Pin	8/26/2008	4/22/2015	Difference
1	1	196	199	3	2	1	148	179	31	1	1	180	224	44
	2	196	195	-1		2	136	143	7		2	189	239	50
	3	100	206	106		3	146	191	45		3	186	237	51
	4	196	195	-1		4	164	184	20		4	177	219	42
	5	186	215	29		5	161	192	31		5	185	224	39
	6	206	195	-11		6	106	184	78		6	181	222	41
	7	212	192	-20		7	136	160	24		7	189	249	60
	8	190	200	10		8	155	169	14		8	178	233	55
	9	180	171	-9		9	149	196	47		9	149	218	69
3	1	190	217	27	4	1	153	184	31	3	1	173	208	35
	2	192	200	8		2	137	163	26		2	182	235	53
	3	196	210	14		3	134	185	51		3	168	227	59
	4	194	194	0		4	140	190	50		4	177	223	46
	5	183	208	25		5	141	198	57		5	176	215	39
	6	193	209	16		6	160	184	24		6	185	229	44
	7	198	186	-12		7	159	194	35		7	181	231	50
	8	190	185	-5		8	144	169	25		8	192	242	50
	9	190	190	0		9	149	179	30		9	187	240	53
5	1	198	223	25	6	1	141	171	30	5	1	178	219	41
	2	172	215	43		2	164	157	-7		2	176	226	50
	3	195	217	22		3	149	202	53		3	149	219	70
	4	189	214	25		4	163	210	47		4	154	223	69
	5	198	214	16		5	162	189	27		5	151	236	85
	6	204	204	0		6	160	222	62		6	161	244	83
	7	209	212	3		7	162	204	42		7	168	250	82
	8	208	222	14		8	176	206	30		8	178	236	58
	9	177	196	19		9	170	180	10		9	148	212	64
7	1	193	192	-1	8	1	138	178	40	7	1	134	225	91
	2	203	216	13		2	142	181	39		2	161	225	64
	3	201	210	9		3	145	170	25		3	163	233	70
	4	197	190	-7		4	68	173	105		4	178	235	57
	5	201	205	4		5	126	175	49		5	175	220	45
	6	202	212	10		6	141	174	33		6	191	244	53
	7	199	204	5		7	139	171	32		7	192	225	33
	8	190	186	-4		8	120	171	51		8	193	222	29
	9	203	195	-8		9	124	194	70		9	188	239	51

Appendix 3: Sawmill Surface Elevation Table Readings (mm)

		SM-1			SM-2			SM-3						
Position	Pin	8/28/2008	4/24/2015	Difference	Position	Pin	8/28/2008	4/24/2015	Difference	Position	Pin	8/28/2008	4/24/2015	Difference
2	1	171	189	18	1	1	205	239	34	1	1	119	179	60
	2	178	194	16		2	176	222	46		2	114	179	65
	3	170	190	20		3	196	180	-16		3	145	145	0
	4	172	164	-8		4	175	210	35		4	162	165	3
	5	144	157	13		5	206	254	48		5	152	166	14
	6	234	168	-66		6	219	264	45		6	152	155	3
	7	169	171	2		7	205	264	59		7	117	154	37
	8	182	190	8		8	207	251	44		8	144	177	33
	9	202	200	-2		9	238	249	11		9	135	179	44
4	1	70	167	97	3	1	218	196	-22	3	1	149	175	26
	2	127	167	40		2	203	259	56		2	135	157	22
	3	127	162	35		3	200	231	31		3	85	153	68
	4	155	130	-25		4	213	248	35		4	111	155	44
	5	160	130	-30		5	240	266	26		5	91	137	46
	6	156	215	59		6	226	234	8		6	140	193	53
	7	161	236	75		7	203	224	21		7	150	223	73
	8	166	229	63		8	222	285	63		8	153	181	28
	9	167	222	55		9	203	260	57		9	140	144	4
6	1	164	204	40	5	1	230	237	7	5	1	156	156	0
	2	35	186	151		2	215	204	-11		2	150	175	25
	3	149	180	31		3	215	207	-8		3	145	182	37
	4	146	167	21		4	218	191	-27		4	156	183	27
	5	109	170	61		5	225	264	39		5	143	185	42
	6	134	190	56		6	225	262	37		6	157	176	19
	7	151	193	42		7	215	179	-36		7	175	179	4
	8	121	191	70		8	216	205	-11		8	176	156	-20
	9	130	190	60		9	228	191	-37		9	160	178	18
8	1	155	227	72	7	1	232	296	64	7	1	115	192	77
	2	172	227	55		2	226	236	10		2	92	169	77
	3	153	195	42		3	205	227	22		3	100	181	81
	4	122	205	83		4	167	245	78		4	132	120	-12
	5	57	77	20		5	210	249	39		5	107	135	28
	6	129	186	57		6	185	230	45		6	116	159	43
	7	50	185	135		7	200	274	74		7	164	157	-7
	8	146	134	-12		8	206	256	50		8	144	150	6
	9	187	150	-37		9	147	246	99		9	155	160	5

Appendix 4: Lyndhurst Riverside Surface Elevation Table Readings

LR-1					LR-2					LR-3				
Position	Pin	8/29/2008	4/24/2015	Difference	Position	Pin	8/29/2008	4/24/2015	Difference	Position	Pin	8/29/2008	4/24/2015	Difference
1	1	218	238	20	1	1	116	135	19	1	1	226	214	-12
	2	241	250	9		2	90	151	61		2	219	219	0
	3	244	251	7		3	55	135	80		3	219	220	1
	4	248	247	-1		4	64	126	62		4	215	206	-9
	5	231	217	-14		5	103	142	39		5	183	205	22
	6	223	219	-4		6	114	170	56		6	234	197	-37
	7	239	232	-7		7	113	155	42		7	208	214	6
	8	228	205	-23		8	188	145	-43		8	225	219	-6
	9	217	203	-14		9	168	156	-12		9	215	215	0
3	1	234	226	-8	3	1	175	171	-4	3	1	162	199	37
	2	210	248	38		2	179	160	-19		2	193	200	7
	3	237	210	-27		3	102	162	60		3	184	205	21
	4	233	247	14		4	137	145	8		4	118	209	91
	5	242	226	-16		5	150	155	5		5	153	200	47
	6	236	232	-4		6	82	161	79		6	137	200	63
	7	258	226	-32		7	125	159	34		7	138	210	72
	8	230	198	-32		8	185	155	-30		8	145	182	37
	9	225	219	-6		9	207	173	-34		9	95	181	86
5	1	122	230	108	5	1	190	180	-10	5	1	195	205	10
	2	182	230	48		2	150	165	15		2	174	201	27
	3	210	241	31		3	166	135	-31		3	134	189	55
	4	151	278	127		4	135	147	12		4	145	202	57
	5	210	265	55		5	137	150	13		5	72	185	113
	6	224	245	21		6	148	130	-18		6	120	184	64
	7	208	240	32		7	145	142	-3		7	97	188	91
	8	206	246	40		8	122	142	20		8	131	182	51
	9	197	247	50		9	130	139	9		9	114	180	66
7	1	212	245	33	7	1	135	135	0	7	1	165	200	35
	2	219	216	-3		2	123	150	27		2	175	215	40
	3	213	232	19		3	135	136	1		3	222	215	-7
	4	211	255	44		4	116	145	29		4	216	214	-2
	5	200	221	21		5	100	115	15		5	205	209	4
	6	205	215	10		6	98	124	26		6	220	215	-5
	7	207	222	15		7	110	141	31		7	169	214	45
	8	227	214	-13		8	115	127	12		8	199	223	24
	9	190	230	40		9	115	136	21		9	196	236	40

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

Position	SHS-1				SHS-2				SHS-3					
	Pin	8/28/2008	4/15/2015	Difference	Position	Pin	8/28/2008	4/15/2015	Difference	Position	Pin	8/21/2008	4/15/2015	Difference
2	1	154	228	74	1	1	122	150	28	1	1	177	227	50
	2	158	248	90		2	90	157	67		2	165	215	50
	3	172	247	75		3	174	149	-25		3	160	210	50
	4	160	252	92		4	164	153	-11		4	168	220	52
	5	183	232	49		5	127	146	19		5	160	225	65
	6	172	209	37		6	155	165	10		6	170	209	39
	7	178	208	30		7	147	157	10		7	165	207	42
	8	170	221	51		8	90	173	83		8	170	204	34
	9	150	216	66		9	136	155	19		9	130	214	84
4	1	142	214	72	3	1	141	162	21	3	1	182	214	32
	2	127	222	95		2	144	176	32		2	175	205	30
	3	134	219	85		3	156	151	-5		3	174	205	31
	4	165	231	66		4	132	148	16		4	165	219	54
	5	176	227	51		5	130	140	10		5	175	198	23
	6	156	219	63		6	135	142	7		6	174	199	25
	7	148	219	71		7	116	132	16		7	175	202	27
	8	167	216	49		8	118	127	9		8	177	220	43
	9	163	211	48		9	120	123	3		9	175	182	7
6	1	170	223	53	5	1	146	164	18	5	1	180	242	62
	2	173	225	52		2	145	150	5		2	149	208	59
	3	171	240	69		3	152	155	3		3	155	192	37
	4	178	222	44		4	150	151	1		4	174	202	28
	5	181	230	49		5	156	150	-6		5	160	222	62
	6	165	259	94		6	155	136	-19		6	135	220	85
	7	182	250	68		7	140	135	-5		7	135	204	69
	8	185	227	42		8	120	134	14		8	148	198	50
	9	180	230	50		9	114	123	9		9	170	205	35
8	1	187	242	55	7	1	129	166	37	7	1	191	235	44
	2	183	257	74		2	187	170	-17		2	175	241	66
	3	184	261	77		3	232	176	-56		3	175	236	61
	4	178	226	48		4	180	171	-9		4	188	235	47
	5	185	234	49		5	174	184	10		5	183	240	57
	6	199	230	31		6	158	153	-5		6	190	244	54
	7	182	252	70		7	190	157	-33		7	185	234	49
	8	186	247	61		8	186	164	-22		8	200	268	68
	9	197	244	47		9	175	172	-3		9	175	258	83

