Sports Turf Solutions
Athletic Field Testing and Consulting Services

October 22, 2011

Erin Anderson, Field Operations Analyst
City of San Francisco, Recreation and Parks Dept.
501 Stanyon Street
San Francisco, CA 94132

Re: Impact Test Results – Silver Terrace Playground

Dear Erin,

On October 20th I conducted impact attenuation tests on the synthetic turf athletic field at Silver Terrace Playground, in San Francisco, CA. The tests were conducted in accordance with ASTM test method F355-A and test specification F1936-10. Section 8.3 of test specification F1936-10 was adapted for use on a previously tested field lined for soccer, baseball and softball. Detailed test results are attached.

The test results reported herein reflect the performance of the points tested, at the time of testing and at the temperatures reported. As recorded in the attached results, **test points #9 and #10 failed to meet ASTM's requirement of <200 average *g*-max**, when tested in accordance with the above listed method and specification. (It should be noted that these results do not imply that an impact-related injury cannot occur if the surface system complies with ASTM's *g*-max requirement.)

Thank you for the opportunity to be of service. Please call if you have questions or would like additional copies of the report.

Sincerely,

Parker Wood
Sports Turf Solutions

Encl: Impact Test Data
Test Site Diagram

29001 Falcon Ridge Rd.
www.turftest.com Salinas, CA 93908 pwood@turftest.com
Phone: (831) 484-2138 *Assessing and Improving Safety and Playability* Fax: (831) 484-2139

Impact Test Data

Field Location: **Silver Terrace Playground**
Date(s) of Test: **10/20/2011**

Field Description and Condition:

Field Layout:	Soccer
Surface Type:	Infilled synthetic turf
Manufacturer:	Sportexe
Date Installed:	Dec-06
Condition:	Mostly clean; dry
Orientation:	End A is SW

Test Method/Specification: ASTM F1936-10
Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field

Weather Conditions

General:	Overcast; light breeze
Temp. (F):	61 °F (avg.)
Humidity:	79% Relative

Primary Contact:

Name	Erin Anderson
Phone #	(415) 831-6840

Test Performed By:
Parker Wood, Sports Turf Solutions

Summary of Test Results

Location	Vo (m/s)	h (m)	Avg ***g*-max**	SI	HIC	Temperatures				Depths		
						Air (°C)	Air (°F)	Surf (°C)	Surf (°F)	Pile (mm)	Infill (mm)	Turf (mm)
Test Point 1	3.58	0.65	**194**	753.3	648.5	16	61	19	66	28	24	4
Test Point 2	3.57	0.65	**156**	585.4	506.5	16	61	20	68	34	29	5
Test Point 3	3.58	0.65	**192**	780.2	675.6	16	61	20	68	27	22	5
Test Point 4	3.58	0.65	**175**	690.8	597.1	16	61	20	68	35	28	7
Test Point 5	3.58	0.65	**184**	724.2	627.8	16	61	20	68	29	23	6
Test Point 6	3.60	0.66	**158**	599.9	519.0	16	61	20	68	37	30	7
Test Point 7	3.57	0.65	**170**	684.6	594.3	16	61	21	70	35	30	5
Test Point 8	3.57	0.65	**166**	612.8	531.4	16	61	20	68	34	26	8
Test Point 9	3.55	0.64	**279**	1242.3	1056.0	16	61	20	68	21	15	6
Test Point 10	3.58	0.65	**203**	833.2	720.3	15	59	20	68	31	24	7

Range of *g*-max averages:	
Highest average reading	279
Lowest average reading	156
Average of the averages	188

Exceptions / Comments:

Section 8.3 of ASTM Specification F1936-10 was modified for use on a previously tested field lined for soccer. Test points #7 and #8 were selected in accordance with current ASTM guidelines. No site abnormalities were noted, and there were no deviations from standard test procedures. All tests met data integrity requirements. Some fibrillation and shedding were evident. No seam problems were noted.

Impact Test Data

Field Location: **Silver Terrace Playground**
Date(s) of Test: **10/20/2011**

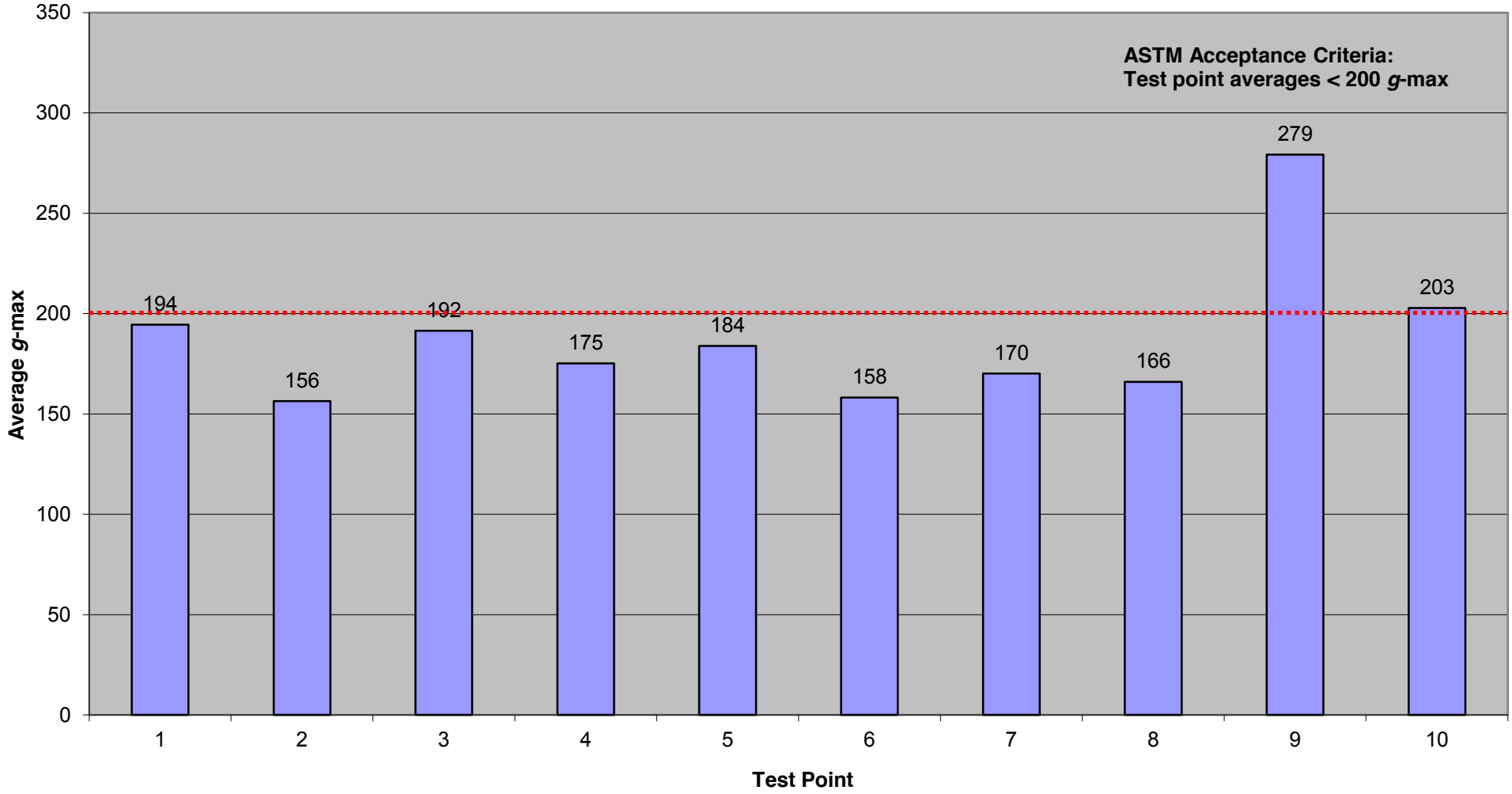
Detailed Test Results

Location	Drop #	Vo (m/s)	h (m)	***g*-max**	SI	HIC	Temperatures				Depths		
							Air (°C)	Air (°F)	Surf (°C)	Surf (°F)	Pile (mm)	Infill (mm)	Turf (mm)
Test Point 1	1	3.50	0.62	181.1	682.6	589.5							
Goal line, End A,	2	3.59	0.66	192.3	741.8	638.7							
Center Field	3	3.57	0.65	196.6	764.8	658.3							
	Avg 2&3	3.58	0.65	**194.5**	753.3	648.5	16	61	19	66	28	24	4
Test Point 2	1	3.53	0.63	141.4	498.2	432.3							
P-box cornr, btwn	2	3.57	0.65	155.4	579.2	501.1							
End A & mid field,	3	3.58	0.65	157.3	591.5	512.0							
Side C	Avg 2&3	3.57	0.65	**156.4**	585.4	506.5	16	61	20	68	34	29	5
Test Point 3	1	3.53	0.64	176.5	686.6	595.7							
Center Field	2	3.58	0.65	189.6	769.1	666.5							
	3	3.58	0.65	193.4	791.4	684.8							
	Avg 2&3	3.58	0.65	**191.5**	780.2	675.6	16	61	20	68	27	22	5
Test Point 4	1	3.57	0.65	160.9	606.2	525.9							
Mid-way from mid	2	3.59	0.66	175.2	692.9	598.6							
field to End B,	3	3.56	0.65	175.1	688.7	595.7							
3' from Side D	Avg 2&3	3.58	0.65	**175.2**	690.8	597.1	16	61	20	68	35	28	7
Test Point 5	1	3.54	0.64	167.8	620.5	538.6							
Corner of End B	2	3.60	0.66	183.2	722.0	625.9							
and Side D	3	3.56	0.65	184.7	726.4	629.6							
	Avg 2&3	3.58	0.65	**184.0**	724.2	627.8	16	61	20	68	29	23	6
Test Point 6	1	3.60	0.66	145.2	524.0	453.7							
Mid-way from mid	2	3.59	0.66	155.4	581.8	503.6							
field to p-box at	3	3.61	0.67	160.9	617.9	534.3							
End B, Center fld.	Avg 2&3	3.60	0.66	**158.2**	599.9	519.0	16	61	20	68	37	30	7
Test Point 7	1	3.56	0.64	160.5	626.6	545.8							
40' from mid-field	2	3.57	0.65	168.9	677.0	587.8							
to End A, 5' out-	3	3.57	0.65	171.5	692.2	600.7							
side Side D	Avg 2&3	3.57	0.65	**170.2**	684.6	594.3	16	61	21	70	35	30	5
Test Point 8	1	3.58	0.65	151.7	533.4	463.1							
Corner of End B	2	3.57	0.65	166.1	615.0	532.8							
and Side C	3	3.57	0.65	165.8	610.5	530.0							
	Avg 2&3	3.57	0.65	**166.0**	612.8	531.4	16	61	20	68	34	26	8
Test Point 9	1	3.58	0.65	242.6	992.0	854.2							
Penalty kick line,	2	3.53	0.64	286.1	1271.4	1071.1							
End A, center of	3	3.58	0.65	272.3	1213.1	1041.0							
field	Avg 2&3	3.55	0.64	**279.2**	1242.3	1056.0	16	61	20	68	21	15	6
Test Point 10	1	3.57	0.65	184.5	720.1	623.1							
3' from goal line to	2	3.60	0.66	201.3	826.6	714.7							
mid-field, End B,	3	3.57	0.65	204.2	839.8	726.0							
center of field	Avg 2&3	3.58	0.65	**202.8**	833.2	720.3	15	59	20	68	31	24	7

Note: The equipment used to determine *g*-max values was last calibrated 9/06/11. The calibration certificate is on file at Sports Turf Solutions. Copies are available upon request.

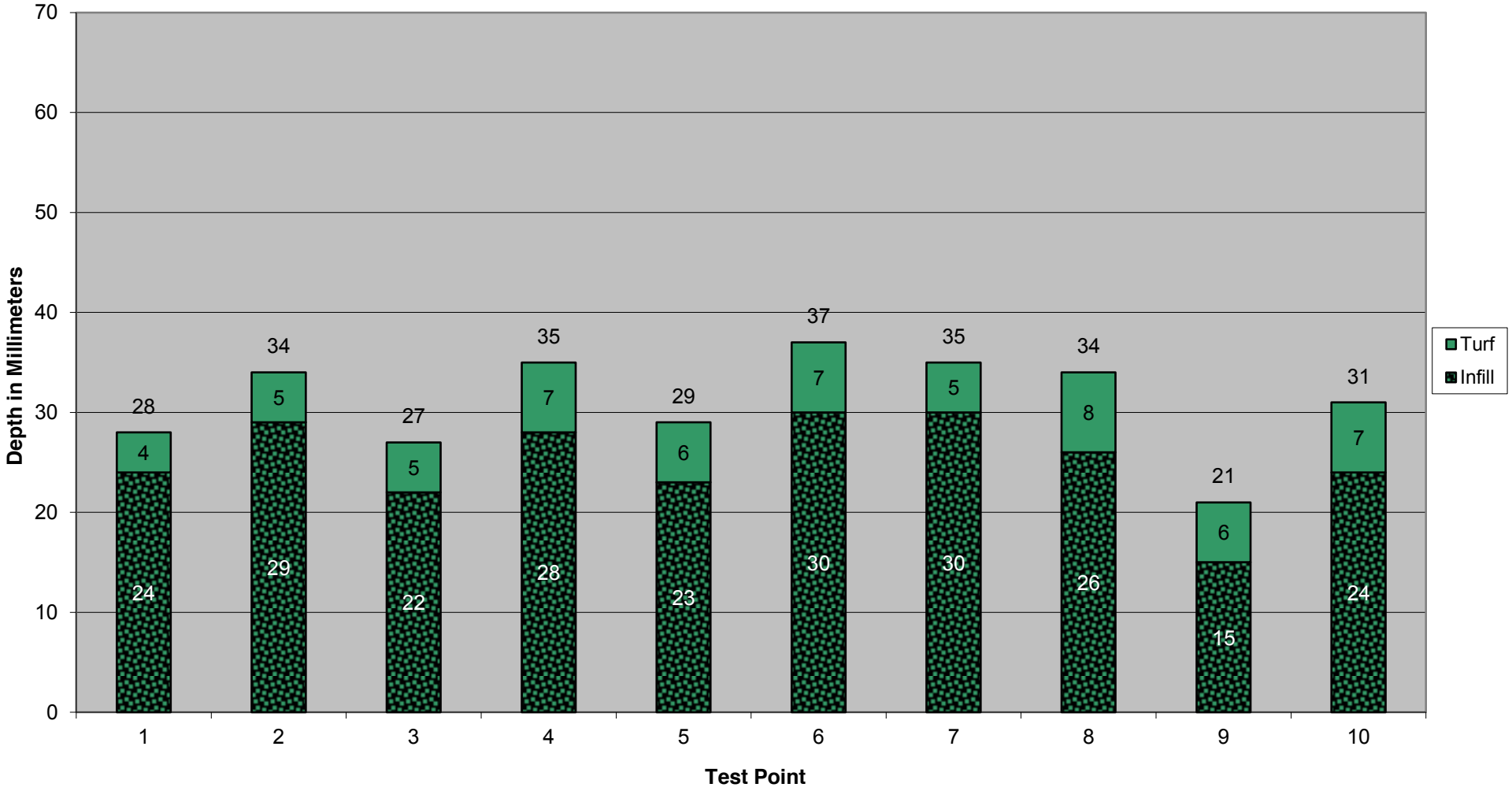
Silver Terrace Playground - Soccer Field

Average *g*-max Levels



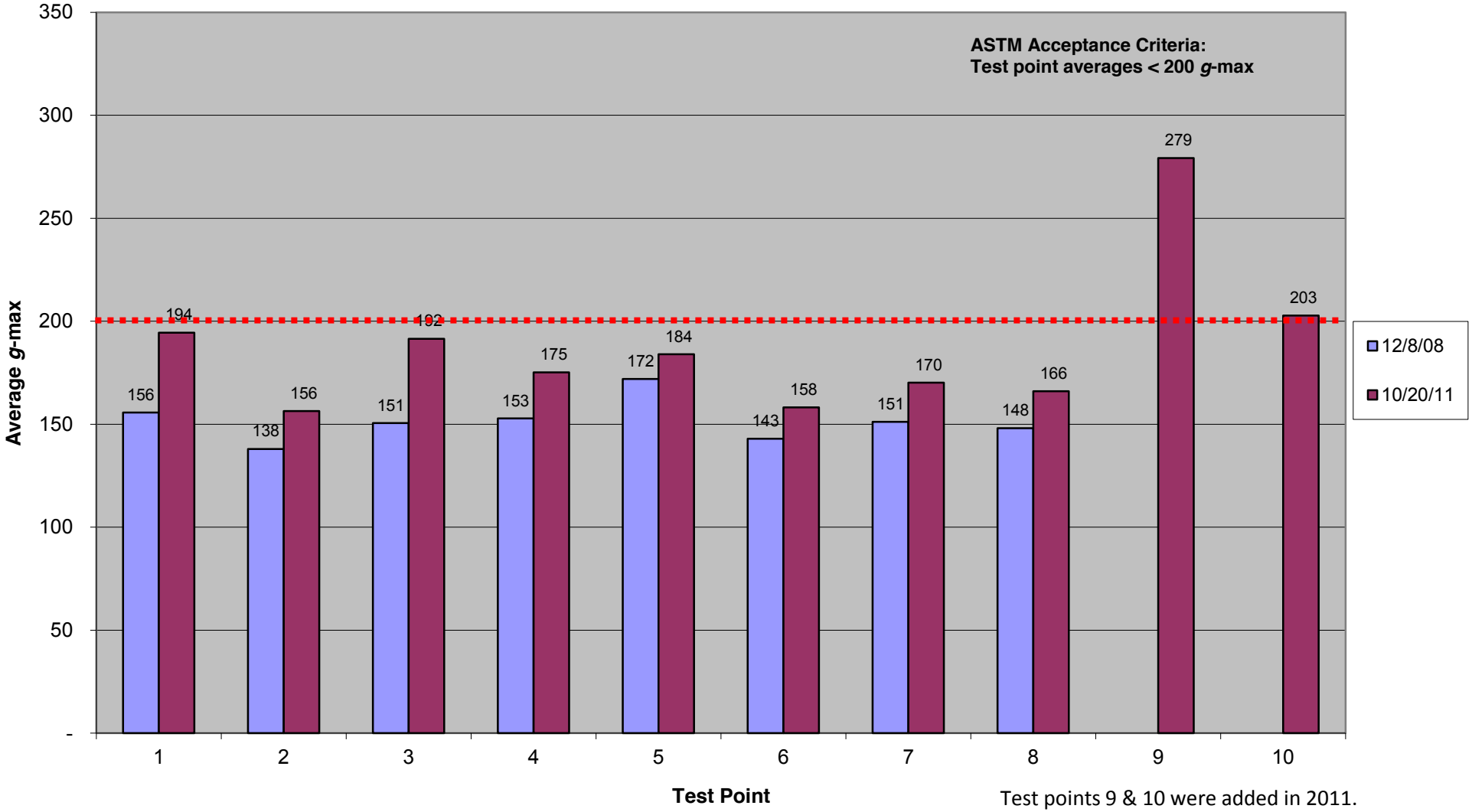
Silver Terrace Playground - Soccer Field

Test Point Profiles



Silver Terrace Playground - Soccer Field

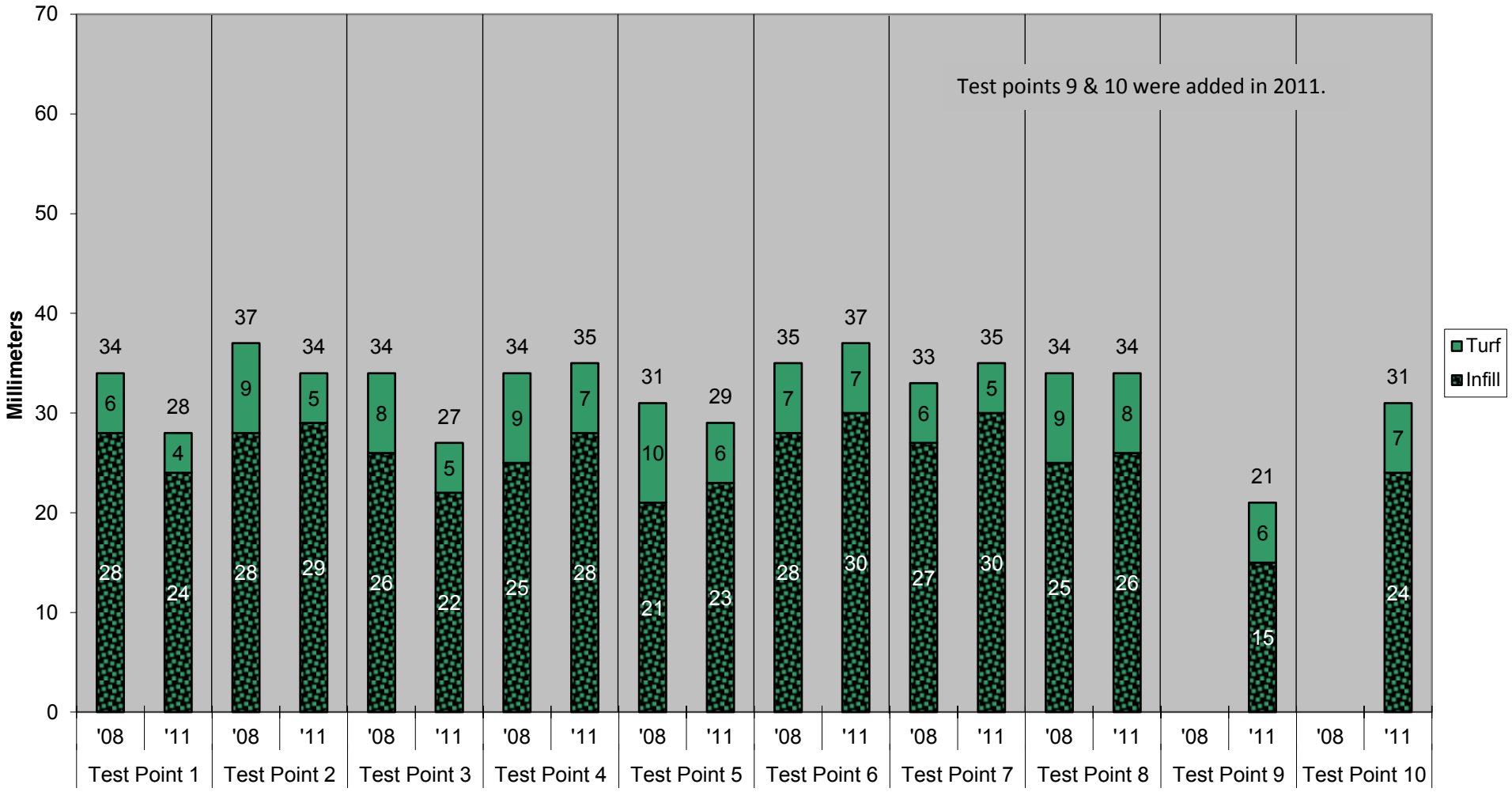
Comparison of Past and Present *g*-max Values



Test points 9 & 10 were added in 2011.

Silver Terrace Playground - Soccer Field

Comparison of Past and Present Surface Profile Data



Impact Test Data

Field Location: **Silver Terrace Playground**
Date(s) of Test: **10/20/2011**

Field Description and Condition:

Field Layout:	Baseball and softball
Surface Type:	Infilled synthetic turf
Manufacturer:	Sportexe
Date Installed:	December, 2006
Condition:	Mostly clean; dry
Orientation:	n/a

Test Method/Specification: ASTM F1936-10
Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field

Weather Conditions

General:	Overcast; light breeze
Temp. (F):	61 °F (avg.)
Humidity:	79% Relative

Primary Contact:

Name	Erin Anderson
Phone #	(415) 831-6840

Test Performed By:
Parker Wood, Sports Turf Solutions

Summary of Test Results

Location	Vo (m/s)	h (m)	Avg G_{max}	SI	HIC	Temperatures				Depths		
						Air (°C)	Air (°F)	Surf (°C)	Surf (°F)	Pile (mm)	Infill (mm)	Turf (mm)
Test Point S1	3.57	0.65	**151**	559.6	484.1	16	61	21	70	39	32	7
Test Point S2	3.58	0.65	**165**	626.1	541.1	16	61	21	70	33	24	9
Test Point S3	3.58	0.65	**163**	609.4	525.9	17	63	21	70	34	26	8
Test Point S4	3.60	0.66	**152**	556.9	481.7	16	61	21	70	36	30	6
Test Point S5	3.57	0.65	**139**	493.6	427.5	16	61	21	70	39	32	7
Test Point S6	3.56	0.65	**150**	556.4	481.4	16	61	21	70	39	31	8
Test Point S7	3.55	0.64	**155**	583.9	505.2	16	61	21	70	37	29	8
Test Point S8	3.59	0.66	**149**	547.1	473.0	17	63	21	70	39	32	7

Range of G_{max} averages:	
Highest average reading	165
Lowest average reading	139
Average of the averages	153

Exceptions / Comments:

ASTM standard specification F1936-10 was adapted for use on a combination baseball/softball field that was immediately adjacent to, and partially incorporated in, a soccer field. No site abnormalities were noted, and there were no deviations from standard test procedures. All tests met data integrity requirements. Some fibrillation and shedding were noted, especially in the high-wear areas of the infields. No seam problems were noted. Dirt from the pitcher's mound on the baseball field is contaminating adjacent infill.

Impact Test Data

Field Location: **Silver Terrace Playground**
Date(s) of Test: **10/20/2011**

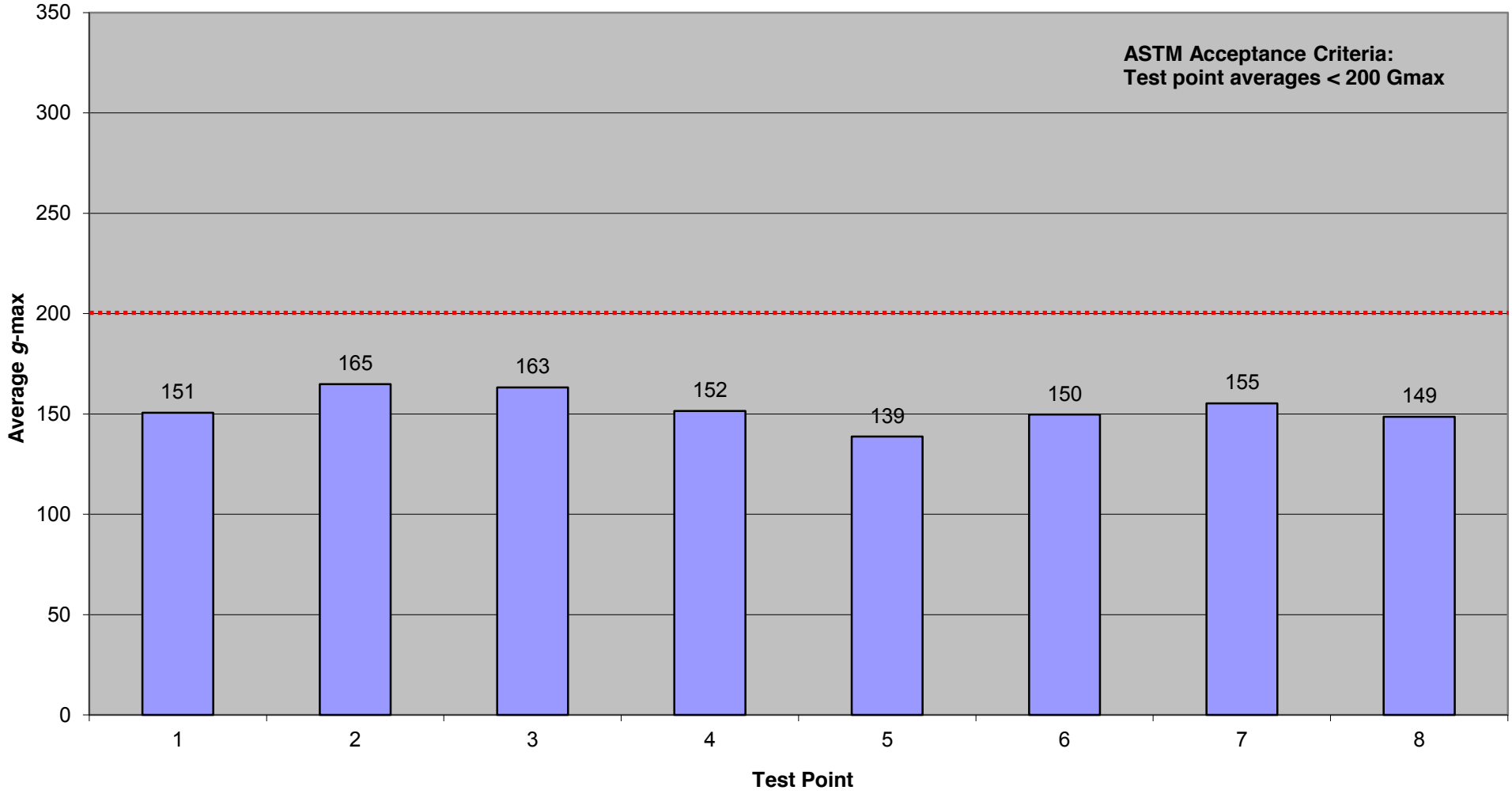
Detailed Test Results

Location	Drop #	Vo (m/s)	h (m)	G_{max}	SI	HIC	Temperatures				Depths		
							Air (°C)	Air (°F)	Surf (°C)	Surf (°F)	Pile (mm)	Infill (mm)	Turf (mm)
Test Point S1	1	3.58	0.66	133.9	469.9	408.2							
40' from HP to 1B,	2	3.61	0.66	151.1	565.1	489.1							
10' into infield (in-	3	3.54	0.64	150.1	554.0	479.2							
field turf) Field 1	Avg 2&3	3.57	0.65	**150.6**	559.6	484.1	16	61	21	70	39	32	7
Test Point S2	1	3.60	0.66	149.5	542.5	469.7							
3' from 2B to 1B	2	3.58	0.65	165.4	634.5	548.5							
(base path turf)	3	3.59	0.66	164.3	617.6	533.8							
Field 1	Avg 2&3	3.58	0.65	**164.9**	626.1	541.1	16	61	21	70	33	24	9
Test Point S3	1	3.56	0.65	147.4	521.8	450.8							
4' from 3B to 2B	2	3.56	0.65	159.6	586.4	506.2							
(base path turf)	3	3.59	0.66	166.8	632.4	545.6							
Field 1	Avg 2&3	3.58	0.65	**163.2**	609.4	525.9	17	63	21	70	34	26	8
Test Point S4	1	3.60	0.66	141.5	503.7	437.1							
60' from HP to 3B,	2	3.59	0.66	150.0	548.8	474.8							
5' outside foul line	3	3.61	0.66	153.0	565.0	488.5							
(infield turf) Field 1	Avg 2&3	3.60	0.66	**151.5**	556.9	481.7	16	61	21	70	36	30	6
Test Point S5	1	3.58	0.65	128.1	433.1	373.4							
200' down RF line,	2	3.58	0.65	137.8	490.2	424.6							
50' into RF (out-	3	3.56	0.64	139.6	497.0	430.3							
field turf) Field 1	Avg 2&3	3.57	0.65	**138.7**	493.6	427.5	16	61	21	70	39	32	7
Test Point S6	1	3.57	0.65	135.1	472.3	409.0							
4' from 3B to 2B	2	3.57	0.65	147.9	546.9	473.2							
(base path turf)	3	3.55	0.64	151.5	566.0	489.6							
Field 2	Avg 2&3	3.56	0.65	**149.7**	556.4	481.4	16	61	21	70	39	31	8
Test Point S7	1	3.58	0.65	140.7	499.3	432.6							
3' from 2B to 1B	2	3.56	0.65	153.6	575.2	497.9							
(base path turf)	3	3.54	0.64	157.0	592.5	512.5							
Field 2	Avg 2&3	3.55	0.64	**155.3**	583.9	505.2	16	61	21	70	37	29	8
Test Point S8	1	3.59	0.66	135.1	471.1	407.6							
140' down RF line,	2	3.61	0.67	147.6	541.6	468.3							
30' into RF (out-	3	3.56	0.65	149.6	552.6	477.7							
field turf) Field 2	Avg 2&3	3.59	0.66	**148.6**	547.1	473.0	17	63	21	70	39	32	7

Note: The equipment used to determine g-max values was last calibrated 9/06/11. The calibration certificate is on file at Sports Turf Solutions. Copies are available upon request.

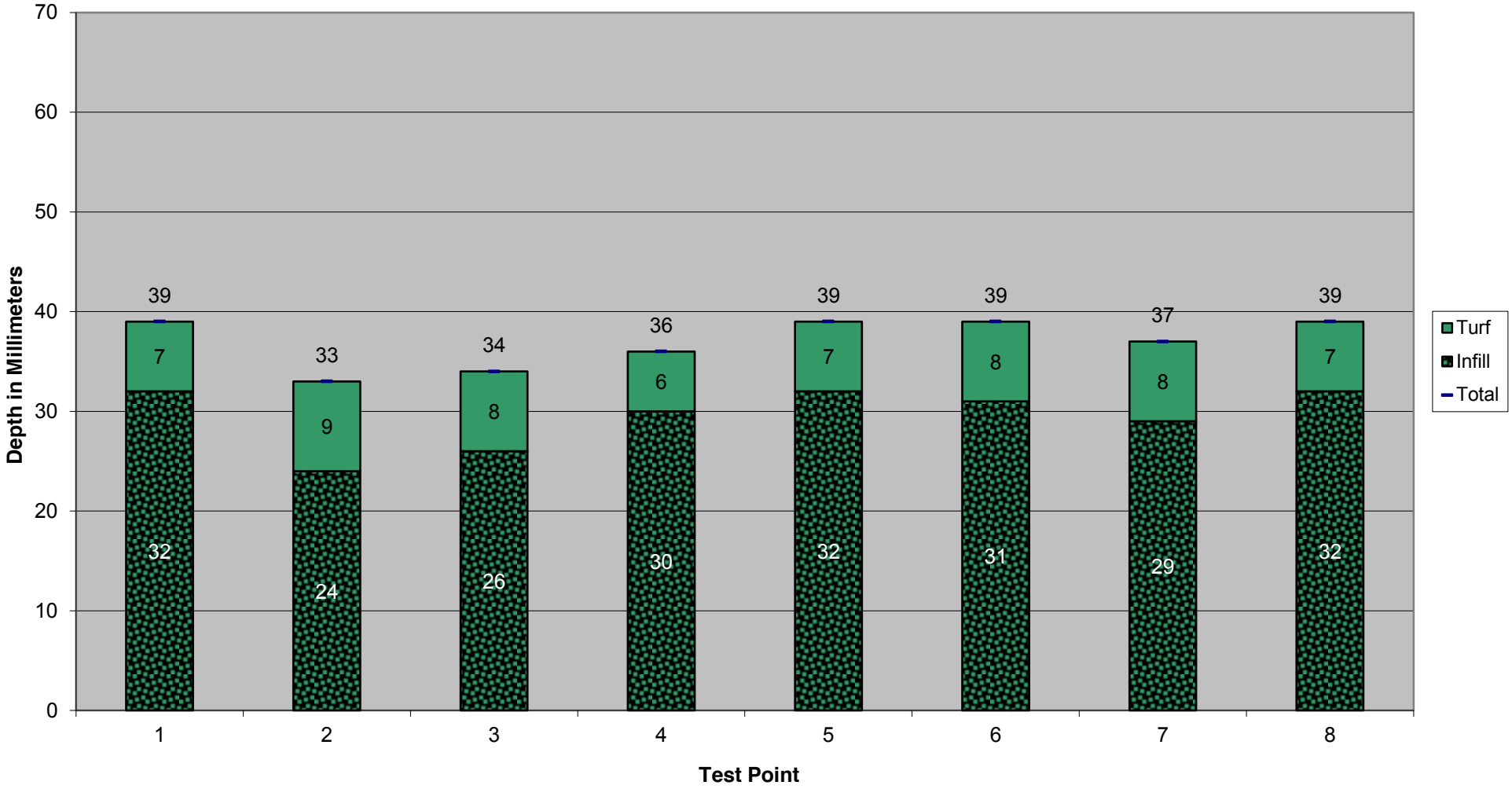
Silver Terrace Playground - Supplemental Test Points

Average *g*-max Levels



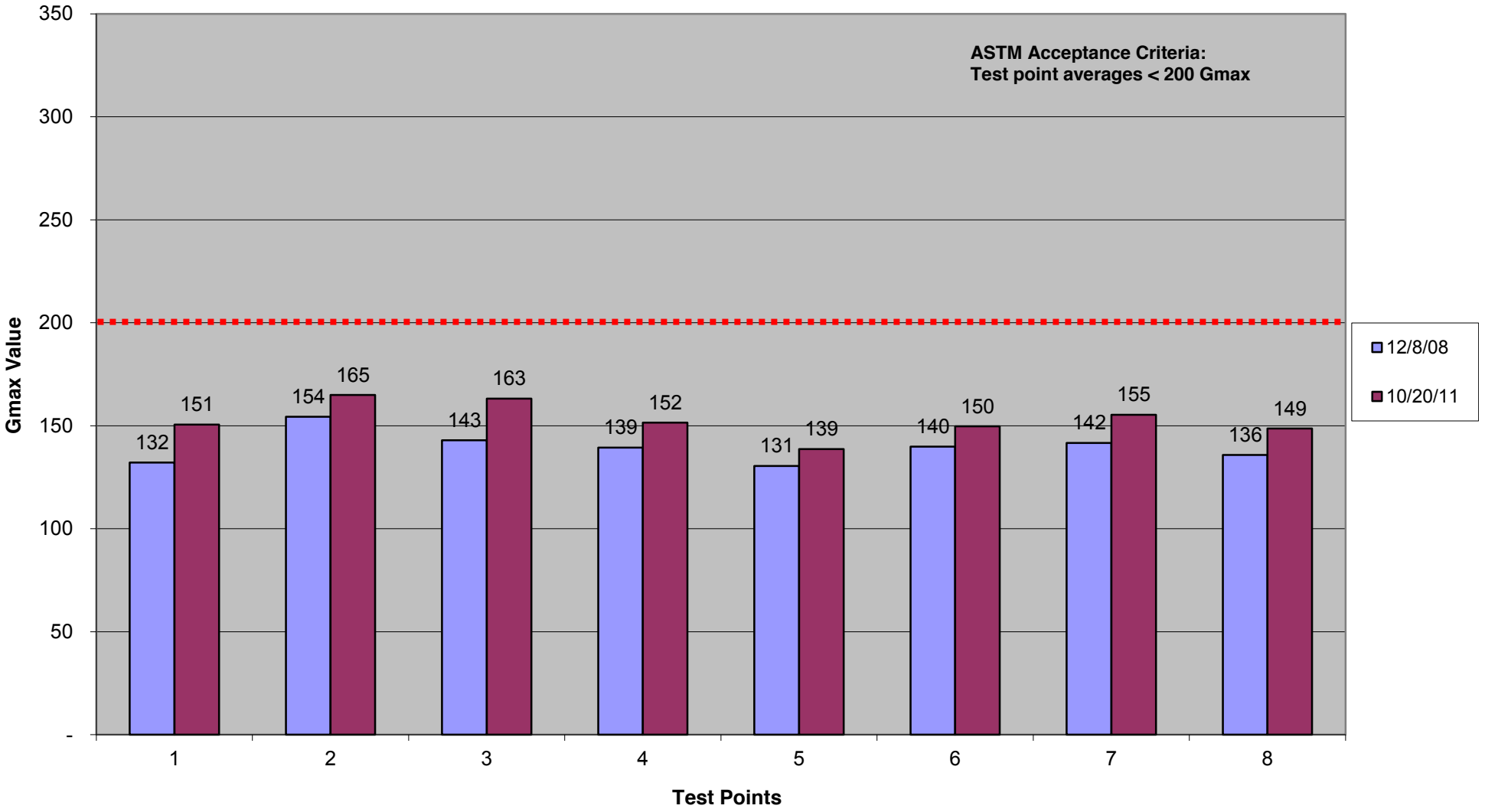
Silver Terrace Playground - Supplemental Test Points

Test Point Profiles



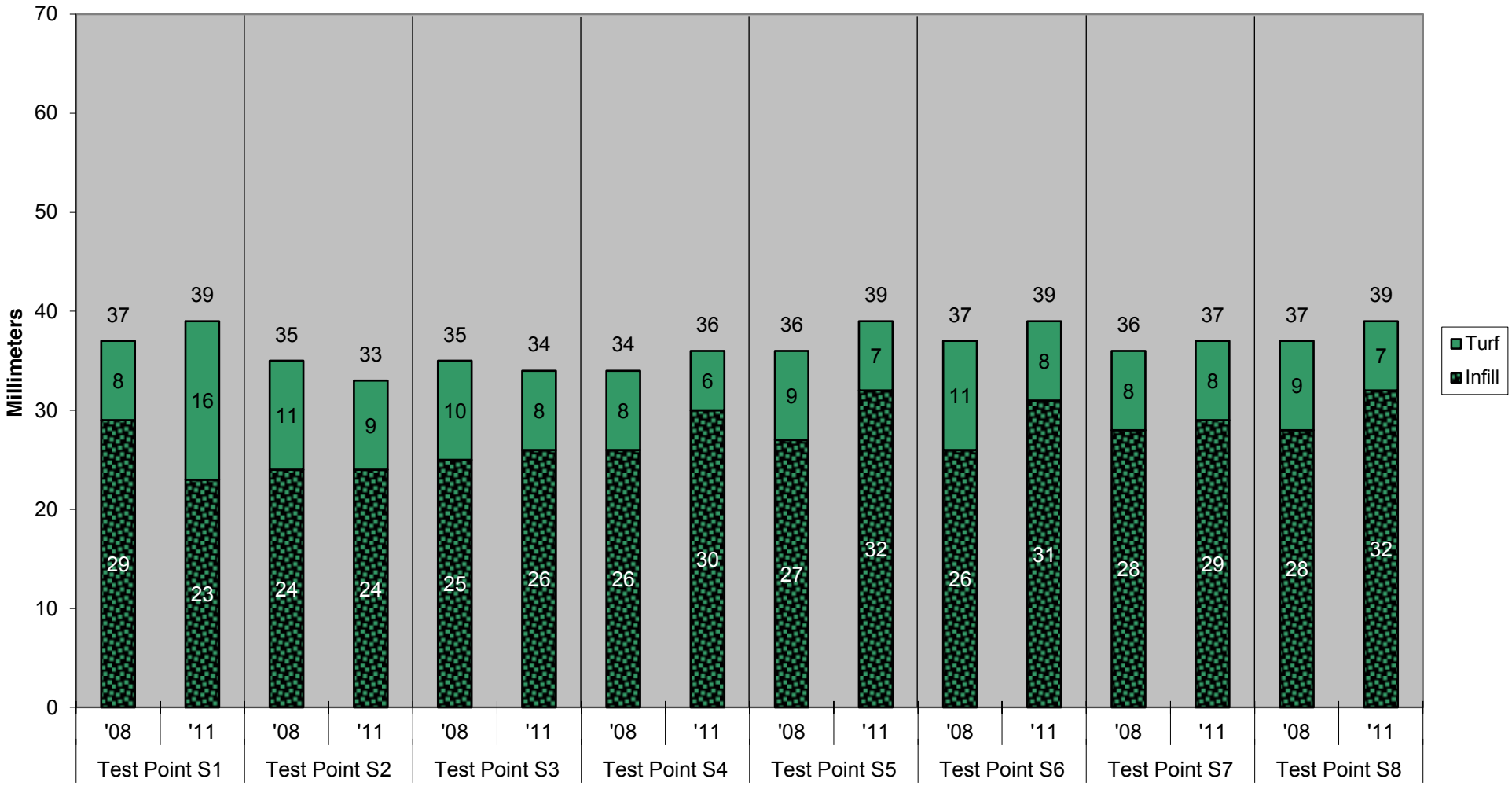
Silver Terrace Playground - Supplemental Test Points

Comparison of Past and Present *g*-max Values



Silver Terrace Playground - Supplemental Test Points

Comparison of Past and Present Surface Profile Data



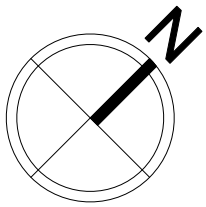
Test Point Reference Guide

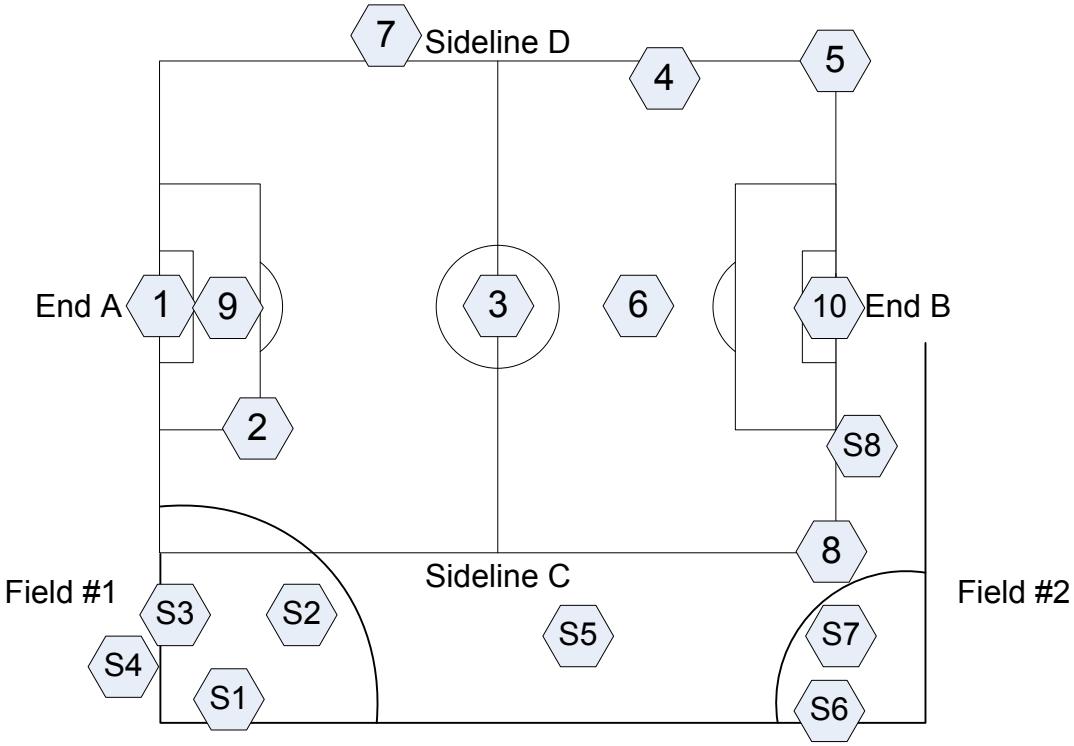
Job Number: 11-088

Client: City of San Francisco

Field: Silver Terrace Playground

Date Tested: 10/20/2011





Test Points:

Point 1 – Goal line, end A, center of field
Point 2 – Corner of penalty box between end A and mid-field line, closest to side line C
Point 3 – Mid-field line, center of field
Point 4 – Half way between mid-field line and end B, 3 ft into the field from side line D
Point 5 – Corner of the field at end B and side line D
Point 6 – Half way between mid-field line and penalty box at end B, center of field
Point 7 – 40' from mid-field line to end A, 5' outside side line D
Point 8 – Corner of the field at end B and side line C
Point 9 – Penalty kick line, end A, center of field
Point 10 – 3' from goal line to mid-field line, end B, center of field
Point S1 – Field 1 - 40' from home plate toward 1st base, 10' into infield (infield turf)
Point S2 – Field 1 - 3' from 2nd base toward 1st base (base path)
Point S3 – Field 1 - 4' from 3rd base toward 2nd base (base path)
Point S4 – Field 1 - 60' from home plate toward 3rd base, 5' outside foul line (infield turf)
Point S5 – Field 1 – 200' down right field line, 50' into right field (outfield turf)
Point S6 – Field 2 - 4' from 3rd base toward 2nd base (base path)
Point S7 – Field 2 - 3' from 2nd base toward 1st base (base path)
Point S8 – Field 2 - 140' down right field line, 30' into right field (outfield turf)

Note: Not to scale.

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