



Sports Turf Solutions

Athletic Field Testing and Consulting Services

September 27, 2017

Dave Pedroli, Director of Maintenance and Operations
San Rafael City Schools
38 Union Street
San Rafael, CA 94901

Re: Impact Test Results – Terra Linda High School

Dear Dave,

On September 26th, I conducted impact attenuation tests on the synthetic turf athletic field at Terra Linda High School in San Rafael, CA. The tests were conducted in accordance with ASTM test method F355-A and test specification F1936-10. Section 8.2 of test specification F1936-10 was adapted for use on a previously tested field lined for football and soccer. Detailed test results are enclosed.

The test results reported herein reflect the condition of the points tested at the time of testing and at the temperatures reported. As recorded in the enclosed results, **all test points, with the exception of test point #4, 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 a 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,

A handwritten signature in black ink, appearing to read 'Parker Wood', written in a cursive, flowing style.

Parker Wood
Sports Turf Solutions

Encl: Synthetic Turf Test Report



Impact Test Data



Field Location: Terra Linda High School
Date(s) of Test: 9/26/2017

Field Description and Condition:

Field Layout: Football and soccer
 Surface Type: Infilled synthetic turf
 Manufacturer: FieldTurf USA
 Date Installed: 10/29/2006
 Condition: Clean and dry
 Orientation: End A is WNW



Weather Conditions

General: Clear; light breeze
 Temp. (F): 86 °F (avg.)
 Humidity: 19% Relative

Primary Contact:

Name Dave Pedrolì
 Phone # (415) 485-2445

Test Method/Specification: ASTM F1936-10

*Standard Specification for Impact Attenuation of
 Turf Playing Systems as Measured in the Field*

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)	Turf (°C)	Turf (°F)	Pile (mm)	Infill (mm)	Turf (mm)
Test Point 1	3.48	0.62	271	n.a	1101.0	30.4	87	31.1	88	35	24	11
Test Point 2	3.48	0.62	257	n.a	967.0	30.2	86	29.2	85	32	17	15
Test Point 3	3.47	0.61	224	n.a	843.0	29.6	85	29.5	85	36	23	13
Test Point 4	3.48	0.62	183	n.a	630.0	30.0	86	33.3	92	55	25	30
Test Point 5	3.47	0.61	216	n.a	829.0	31.0	88	29.2	85	34	23	11
Test Point 6	3.47	0.61	252	n.a	1013.5	31.0	88	32.5	91	40	21	19
Test Point 7	3.46	0.61	208	n.a	751.0	30.4	87	31.2	88	44	28	16
Test Point 8	3.49	0.62	212	n.a	776.5	28.9	84	29.2	85	35	25	10
Test Point 9	3.48	0.62	257	n.a	943.0	30.0	86	31.7	89	19	12	7
Test Point 10	3.47	0.61	226	n.a	805.5	30.8	87	30.8	87	36	21	15

Range of g-max averages:	
Highest average reading	271
Lowest average reading	183
Average of the averages	230

Exceptions / Comments:

Section 8.2 of ASTM standard specification F1936-10 was adapted for use on a previously tested field lined for football and soccer. No site abnormalities were noted, and there were no deviations from standard test procedures. All tests met data integrity requirements. There were painted lines on the field for men's and women's lacrosse. A number of new turf patches were observed. Significant fibrillation, shedding and pile layover were noted. Some sections of white and yellow turf showed additional wear. Stitch lines were visible in areas with high wear.



Impact Test Data



Field Location: Terra Linda High School
Date(s) of Test: 9/26/2017

Detailed Test Results

Location	Drop #	Vo (m/s)	h (m)	g-max	SI	HIC	Temperatures				Depths		
							Air (°C)	Air (°F)	Turf (°C)	Turf (°F)	Pile (mm)	Infill (mm)	Turf (mm)
Test Point 1 Football goal line, End A, center of the field	1	3.48	0.62	241		917							
	2	3.48	0.62	271		1101							
	3	3.48	0.62	271		1101							
	Avg 2&3	3.48	0.62	271	n.a	1101	30.4	87	31.1	88	35	24	11
Test Point 2 10 Yd line, End A, 20 ft from Side C	1	3.48	0.62	235		829							
	2	3.48	0.62	257		966							
	3	3.47	0.61	257		968							
	Avg 2&3	3.48	0.62	257	n.a	967	30.2	86	29.2	85	32	17	15
Test Point 3 25 Yd line, End A, 40 ft from Side C	1	3.47	0.61	200		701							
	2	3.47	0.61	222		835							
	3	3.47	0.61	225		851							
	Avg 2&3	3.47	0.61	224	n.a	843	29.6	85	29.5	85	36	23	13
Test Point 4 Center of the Field	1	3.47	0.61	168		541							
	2	3.47	0.61	182		625							
	3	3.48	0.62	183		635							
	Avg 2&3	3.48	0.62	183	n.a	630	30.0	86	33.3	92	55	25	30
Test Point 5 25 Yd line, End B, 20 ft from Side D	1	3.47	0.61	189		662							
	2	3.47	0.61	213		815							
	3	3.47	0.61	218		843							
	Avg 2&3	3.47	0.61	216	n.a	829	31.0	88	29.2	85	34	23	11
Test Point 6 12 Yd line, End B, center of field	1	3.47	0.61	221		822							
	2	3.47	0.61	247		985							
	3	3.47	0.61	256		1042							
	Avg 2&3	3.47	0.61	252	n.a	1014	31.0	88	32.5	91	40	21	19
Test Point 7 35 Yd line, End B, 10' outside foot- ball Side C	1	3.47	0.61	184		624							
	2	3.46	0.61	206		742							
	3	3.46	0.61	209		760							
	Avg 2&3	3.46	0.61	208	n.a	751	30.4	87	31.2	88	44	28	16
Test Point 8 Corner of soccer field at End A and soccer Side D	1	3.48	0.62	194		671							
	2	3.49	0.62	212		777							
	3	3.48	0.62	212		776							
	Avg 2&3	3.49	0.62	212	n.a	777	28.9	84	29.2	85	35	25	10
Test Point 9 Soccer goal line, End A, center of field	1	3.48	0.62	239		834							
	2	3.48	0.62	265		978							
	3	3.48	0.62	248		908							
	Avg 2&3	3.48	0.62	257	n.a	943	30.0	86	31.7	89	19	12	7
Test Point 10 3' fm soccer goal line to 50 Yd line, End B, ctr of field	1	3.47	0.61	197		651							
	2	3.47	0.61	224		794							
	3	3.47	0.61	228		817							
	Avg 2&3	3.47	0.61	226	n.a	806	30.8	87	30.8	87	36	21	15

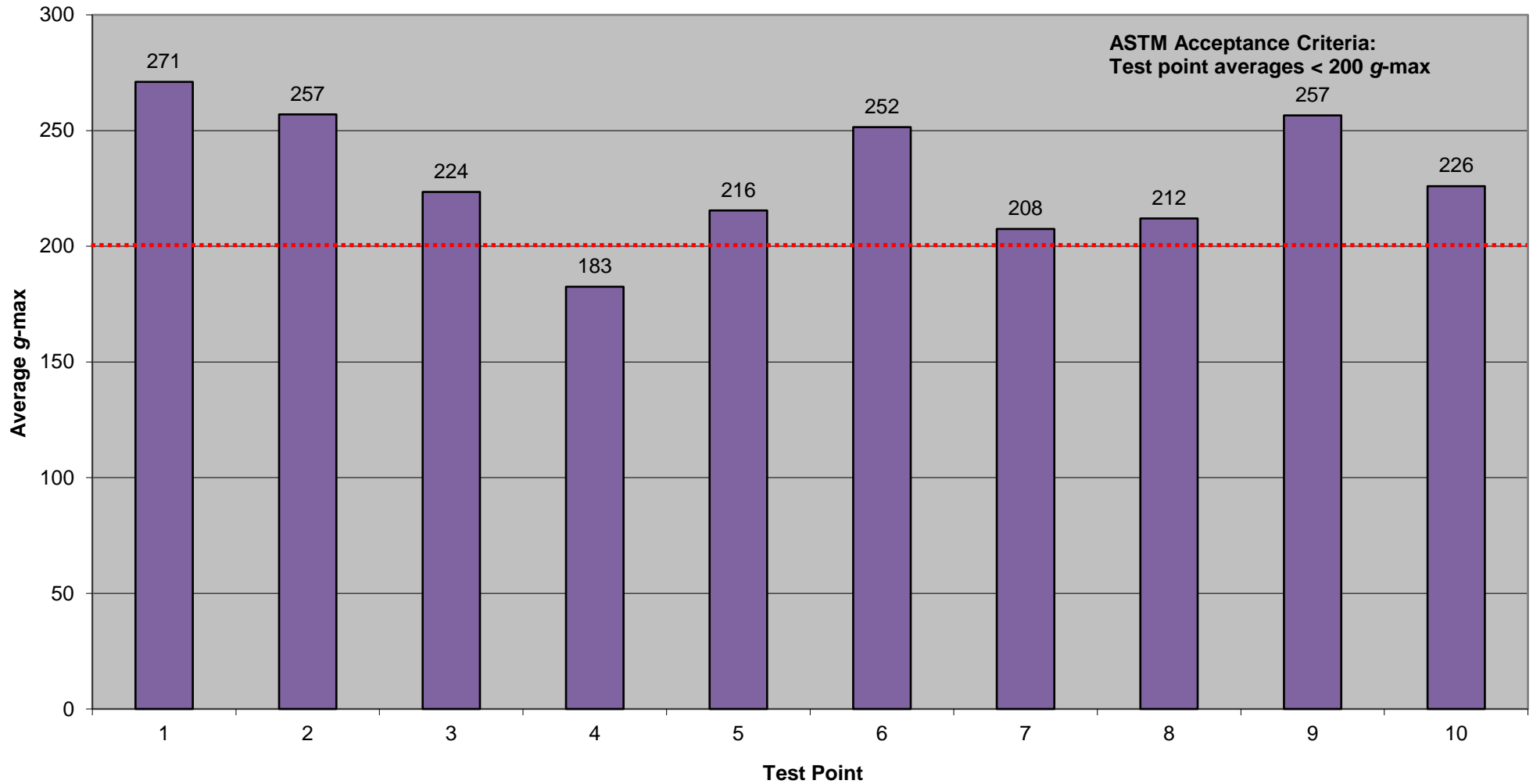
Note: The accelerometer used to determine g-max values was last calibrated on 1/13/17. The calibration certificate is on file at Sports Turf Solutions. Copies are available upon request.



Impact Test Data



Terra Linda High School Average g-max Levels

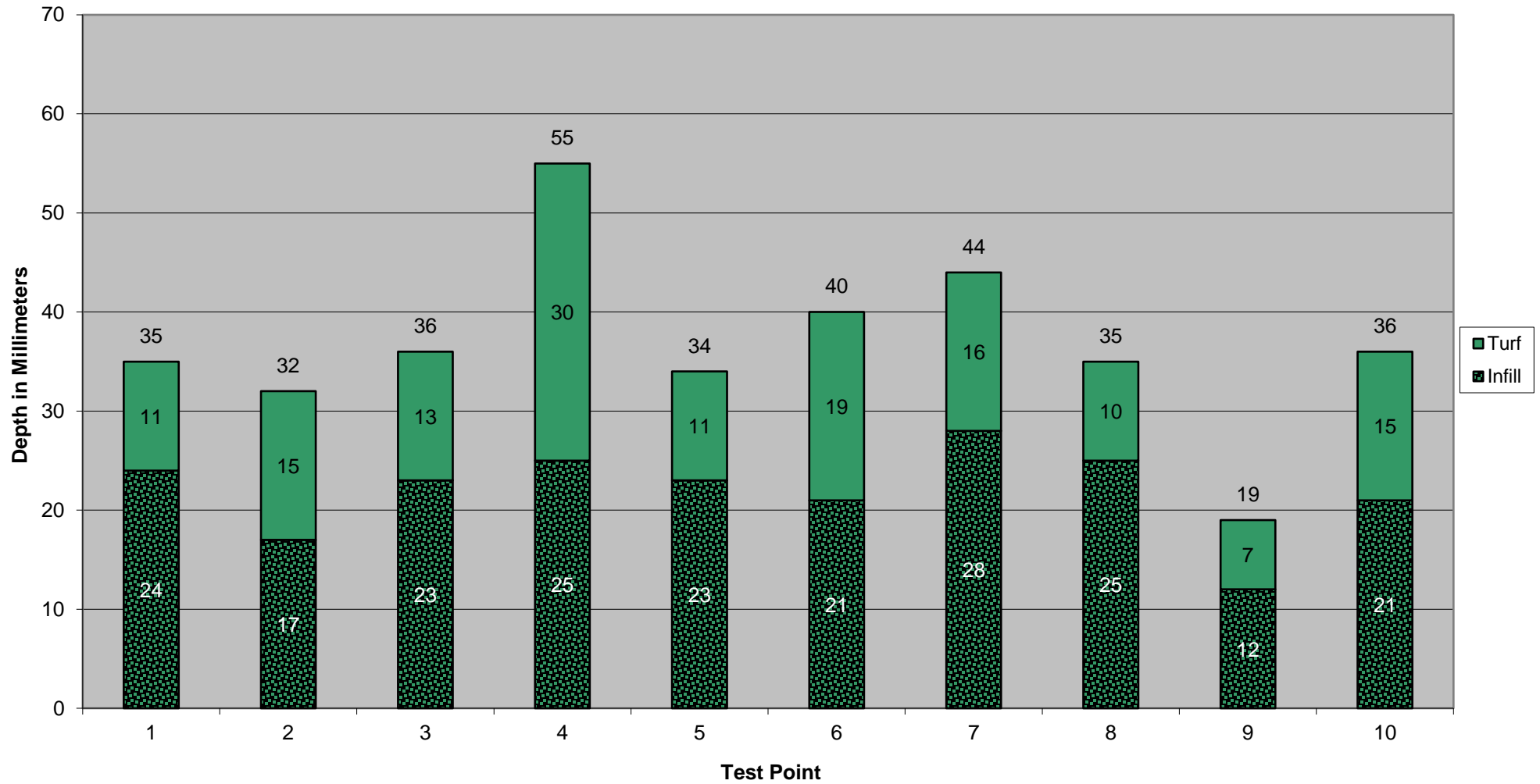




Impact Test Data



Terra Linda High School Test Point Profiles

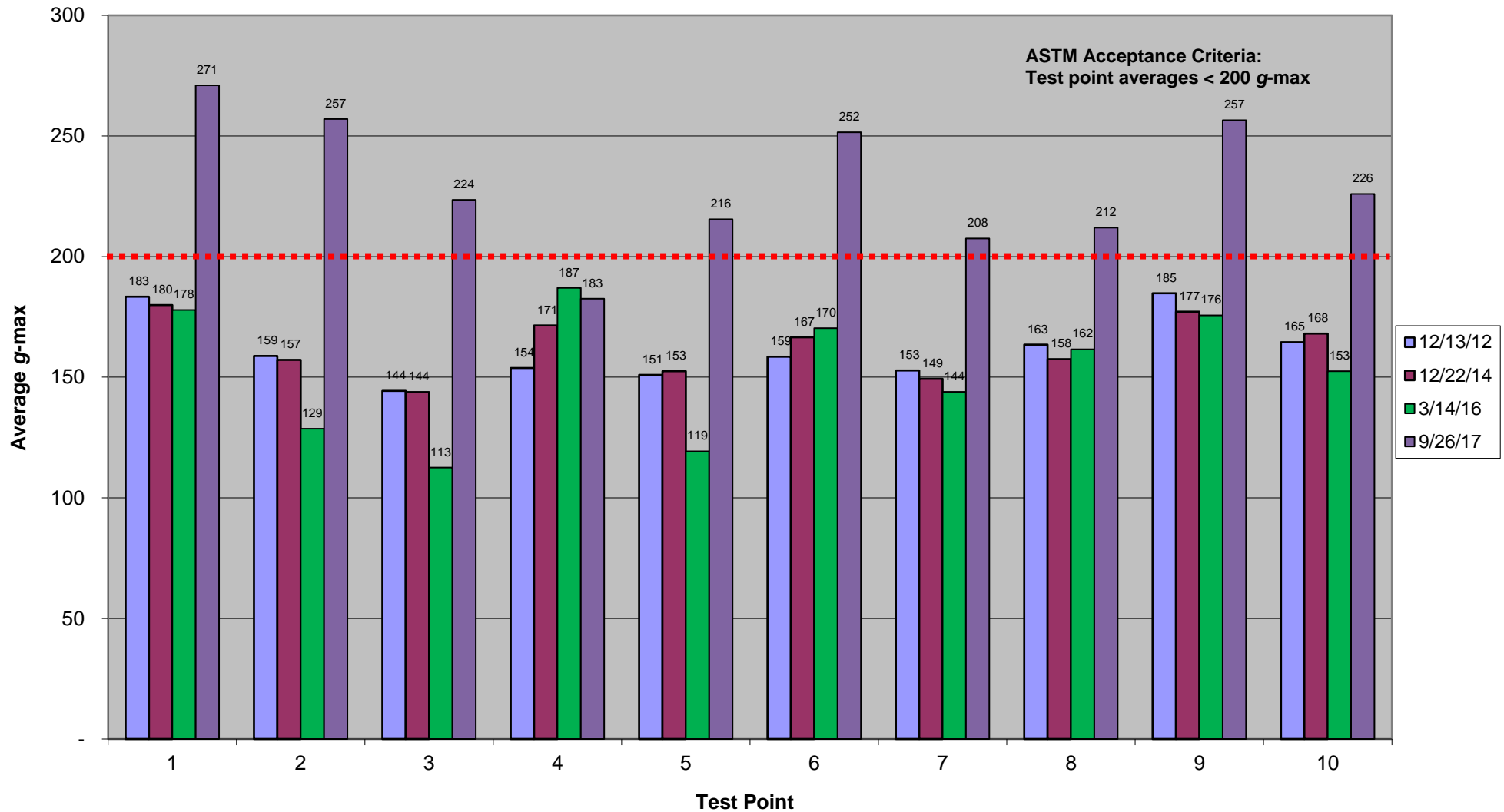




Impact Test Data



Terra Linda High School Comparison of Past and Present g-max Values

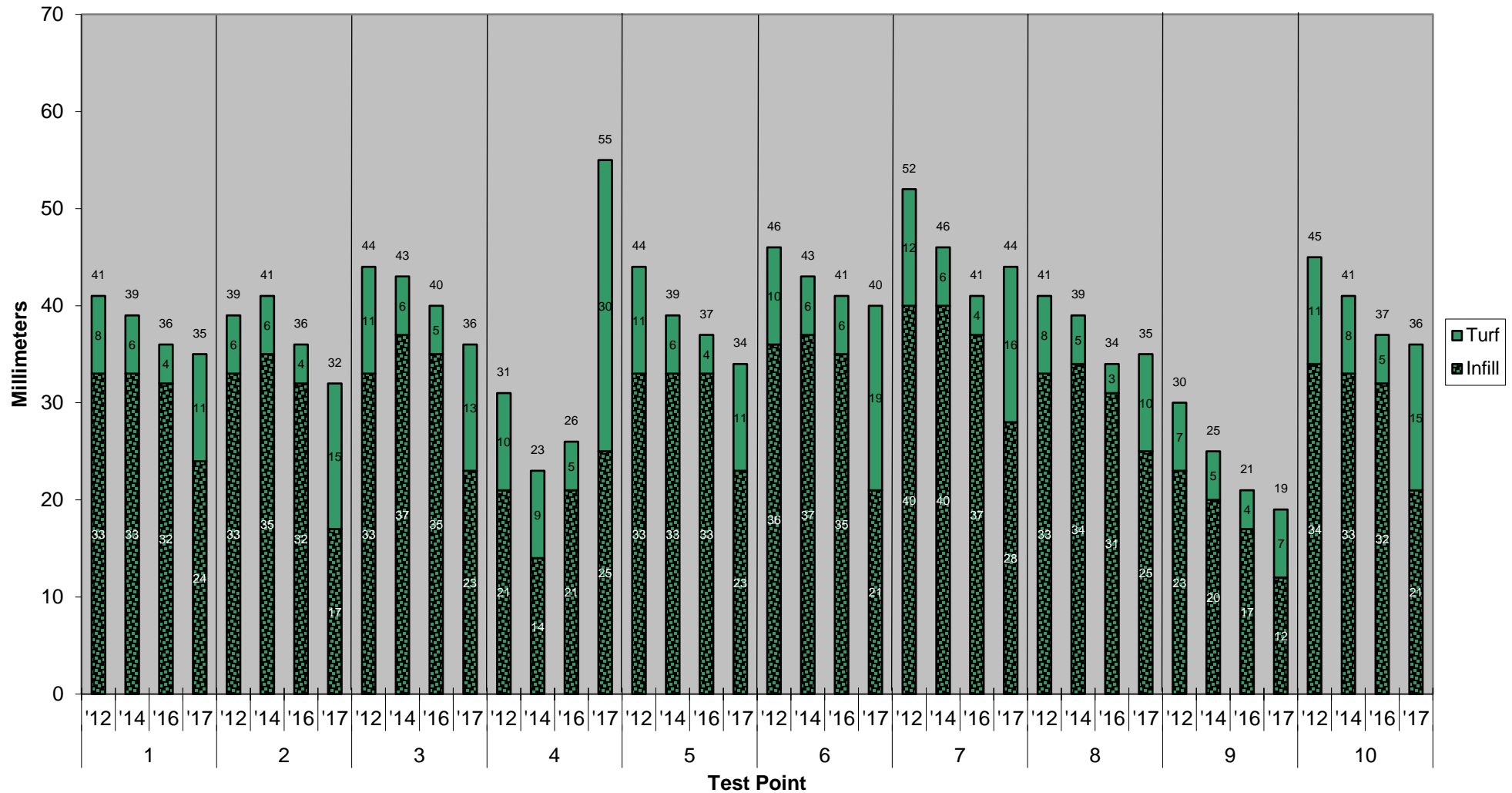




Impact Test Data



Terra Linda High School Comparison of Past and Present Surface Profile Data





Test Point Reference Guide

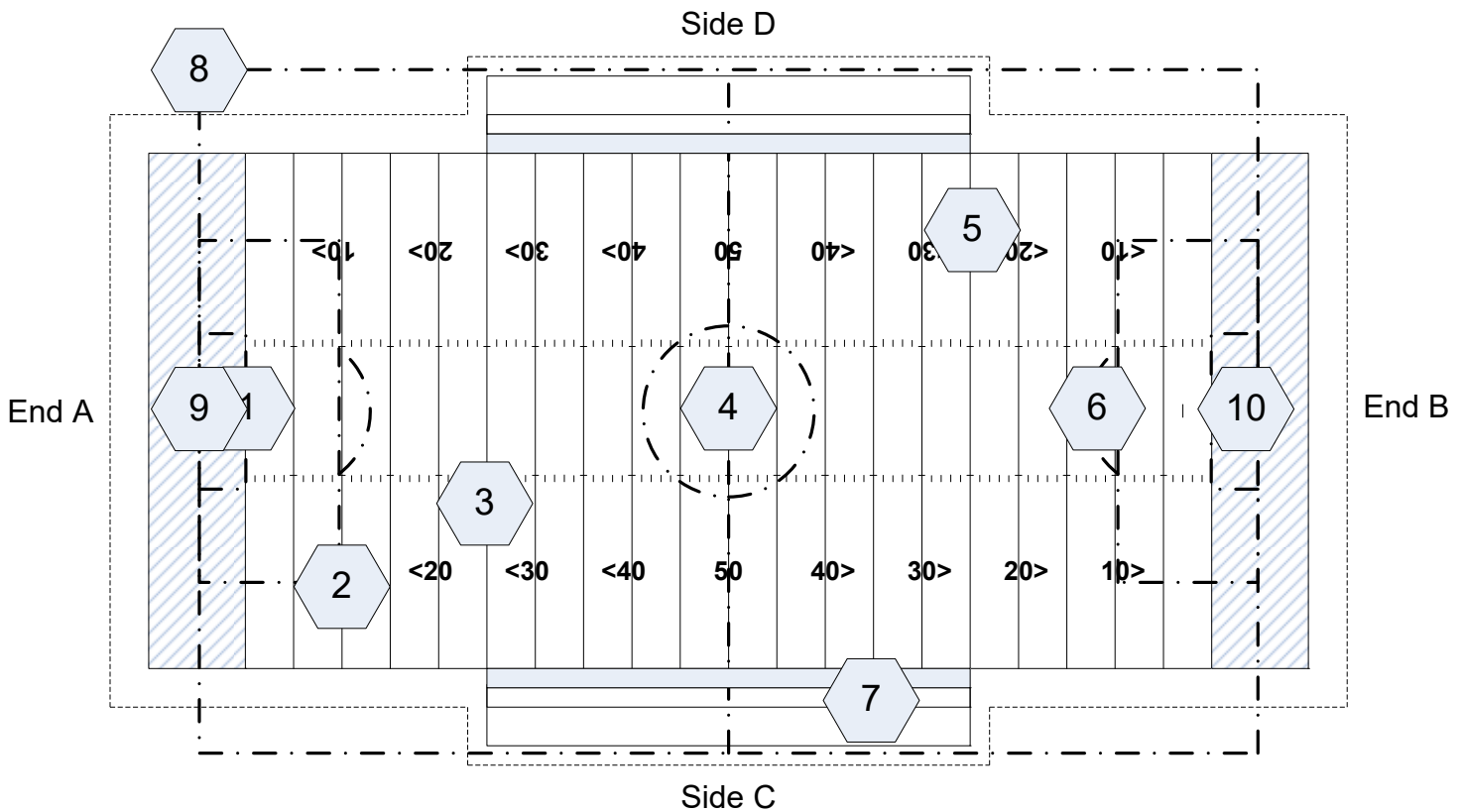
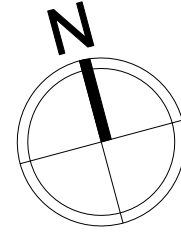


Job Number: 17-055

Client: San Rafael City Schools

Field: Terra Linda High School

Date Tested: 9/26/2017



Test Points:

- Point 1 – Football goal line, end A, center of field
- Point 2 – 10 yard line, end A, $\frac{1}{4}$ of the distance from football sideline C to center of field
- Point 3 – 25 yard line, end A, $\frac{1}{2}$ of the distance from football sideline C to center of field
- Point 4 – 50 yard line, center of field
- Point 5 – 25 yard line, end B, $\frac{1}{4}$ of the distance from football sideline D to center of field
- Point 6 – 12 yard line, end B, center of field
- Point 7 – 35 yard line, end B, 10' outside football sideline C
- Point 8 – Corner of soccer field, end A, soccer sideline D
- Point 9 – Soccer goal line, end A, center of field
- Point 10 - 3' from soccer goal line to 50 yard line, end B, center of field

Note: Not to scale. Soccer field dimensions may vary from illustration.



Impact Test Terminology

The following terms and symbols appear in the attached test data:

Symbol	Definition
V _o	Velocity of the test missile immediately prior to impact, as measured in meters per second.
h	Theoretical height from which the test missile is dropped, as measured in meters. (“h” is a calculated value, derived from V _o , that enables comparison of test data based on drop height.)
g	The ratio of the magnitude of missile acceleration during impact to the acceleration of gravity, expressed in equivalent units
g-max	The maximum value of g encountered during impact.
SI	Severity Index – a measure of the injury potential of an impact. Best used to estimate the risk of a <i>focal</i> brain injury. (*)
HIC	Head Injury Criteria – a measure of the injury potential of an impact, similar to SI. Best for estimating the risk of a <i>diffuse</i> brain injury. (*)
Air Temp	The ambient air temperature, measured in the shade. Values are reported both in degrees Celsius and degrees Fahrenheit.
Surface Temp	The temperature of the playing surface, measured with a probe inserted ½ inch below the top of the infill material. Values are reported both in degrees Celsius and degrees Fahrenheit.
Pile Depth	The depth of the pile at the test point, measured from the top of the playing surface to the upper surface of the pile backing. Reported values are the average of at least three measurements and are stated in millimeters. (Note: Due to pile layover, curling, and other characteristics of installed turf systems, pile depth will generally be less than the length of pile fibers as measured at the time of manufacture.)
Infill Depth	The depth of the infill material at the test point, measured from the upper surface of the infill material to the upper surface of the pile backing. Reported values are the average of at least three measurements and are stated in millimeters.
Turf Depth	The difference between the pile depth and the infill depth. This is the amount of pile projecting above the infill layer. Values are reported in millimeters. (May also be referred to as “free pile.”)

(*) SI and HIC values are reported for the purpose of making year-to-year comparisons of a field’s condition. Do not use SI or HIC values determined by Standard Specification F1936 or Standard Test Method F-355A, to decide the safety or acceptability of a field.