Preliminary Manson School District Athletic Complex Remediation Study

Prepared for
Washington State
Department of Ecology

September 23, 2013
17800-42

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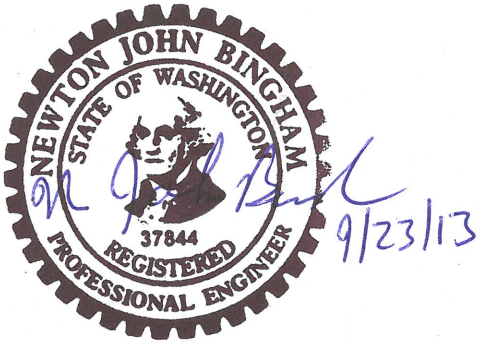

9/23/13

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PRELIMINARY MANSON SCHOOL DISTRICT ATHLETIC COMPLEX REMEDIATION STUDY

1.0 INTRODUCTION

The Washington State Department of Ecology (Ecology) is overseeing development of a remediation strategy for soil containing lead and arsenic at the Manson High School in Manson, Washington (Figure 1). As part of this work, Ecology also plans to work with the Manson School District (District) to update the layout in the existing 2005 Manson School District Athletic Field Complex Master Plan and provide a preliminary cost estimate for the District's proposed athletic field complex.

2.0 PURPOSE, SCOPE, AND USE OF THIS STUDY

2.1 Purpose

The purpose of our work was to:

- Assess subsurface conditions based on our explorations.
- Assist Ecology and the District in refining the athletic complex layout based on a cut and fill remediation strategy that satisfies many of the District's athletic complex needs for reasonable costs.
- Provide preliminary grading and cost information to help guide Ecology and the District in remedial action preliminary planning, funding requests, and timing/phasing of the athletic field complex construction.
- Provide preliminary geotechnical recommendations relevant to earthwork design and construction.

This document is not intended to provide design-level engineering/architectural recommendations or costs since final design work is necessary prior to permitting and construction. Our work was limited to the specific scope items in the next section, based on funding available for this preliminary work. We understand that the District would oversee final design for the athletic complex as a separate phase of work.

2.2 Scope

Our scope of work included:

- Subsurface explorations at the project site;
- Laboratory tests of selected soil samples collected from our explorations;

- Topographic survey of the site;
- Refined athletic field complex conceptual layout;
- Grading plan remediation strategy;
- Preliminary planning-level cost estimate; and
- Preparation of this report.

2.3 Use of this Report

We completed this work in general accordance with our proposal dated May 9, 2013, and subsequent addenda. Our report is for the exclusive use of Ecology and the District for specific application to the subject project and site. We completed this study in accordance with generally accepted geotechnical practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. We make no other warranty, express or implied.

3.0 SITE AND PROJECT DESCRIPTION

The site currently contains Manson Senior-Junior High School buildings on the west part of the site with a gravel track and grass football field east of the school (Figure 2). Grades slope downward east of the football field to a terraced area with soil, boulder, and concrete stockpiles. The east side of this terrace slopes downward to the east property line. Each slope is about 10 to 15 feet high and grades along the east property line are about 30 feet lower than the football field. A gravel parking area is north of the football field. Both the track/field and gravel parking area appear to be on fill soil. A private home is on the lot west of the gravel parking area. The site slopes downward north of the gravel parking area to an orchard (leased from the District) that occupies the north part of the site.

The District is planning to create a new athletic complex at the site. Ecology is planning a remediation strategy to cover soil containing arsenic and lead at the site. Regrading the existing terraced site by cutting high areas and filling in low areas (balancing cut and fill volumes) while covering soil containing arsenic and lead is a feasible and cost-effective approach to achieve both Ecology and District plans. The cut and fill balance remediation strategy is addressed in the remainder of this report.

4.0 SUBSURFACE CONDITIONS

Our understanding of the subsurface conditions at the site is based on materials encountered in our explorations, laboratory testing of soil samples, our field observations, and discussions with District personnel/contractors. Our explorations consisted of four borings drilled to depths below the ground surface ranging from 12.5 to 21 feet and fourteen test pits excavated to depths ranging from 3 to 15 feet (Figure 3 and Appendix A). Details of the conditions observed at the exploration locations are shown on the logs included in Appendix A, along with field exploration procedures, and should be referred to for specific information. Appendix B includes our laboratory soil testing procedures and results.

Our explorations revealed subsurface conditions at discrete locations across the project site; actual conditions in other areas could vary. The conclusions and recommendations contained in this report are based on subsurface conditions interpreted from our explorations and soil properties inferred from field observations and laboratory tests. The nature and extent of variations between the explorations may not become evident until additional explorations are performed or until construction begins. If variations become evident, it will be necessary to re-evaluate the recommendations in this report.

4.1 Soil and Bedrock

The subsurface soil and bedrock conditions interpreted from these explorations are described below in the general order they were encountered from the ground surface downward.

Silty, Gravelly Sand (Fill). We encountered loose, slightly silty to silty, gravelly Sand fill ranging in depth from 2 to 16 feet below the ground surface. This soil unit was present in all of our explorations except for Test Pits TP-1, TP-5, TP-11, and TP-12. When the football field was built, fill was reportedly placed over the existing orchard area with topsoil at the former ground surface. We only observed the topsoil layer in TP-10 and TP-15.

Silty Sand and Sandy Silt (Native Soil). In some explorations, we observed loose to medium dense silty Sand and occasionally stiff Silt above the underlying Till-Like soil. This soil generally was similar to the Fill soil, but contained signs of layering, so appears to be native soil not disturbed by prior grading/earthwork activity at the site.

Till-Like Soil. Till-like soil was encountered in most explorations at varying depths across the site. These soils generally consisted of dense to very dense,

slightly silty to very silty, gravelly Sand with cobbles and boulders and poorly sorted grain sizes.

Refusal from deeper excavation was encountered in this soil type with the rubber-tired backhoe used for TP-5 and TP-11 through TP-13, as noted on the logs and on Figure 3. Refusal was also encountered while drilling Boring B-3, but we were not able to confirm if it was a boulder in till-like soil or bedrock. Note that larger earthwork equipment typically can excavate this soil during mass excavation, but it would be more difficult than less dense non-glacially overridden soil.

Bedrock. A bedrock outcrop was observed near TP-1 and in the orchard east of the track/field. We encountered and observed bedrock while excavating TP-1, TP-6, TP-8, and TP-17. It may have been encountered at depth in Boring B-3, but could not be observed to confirm if it was a cobble/boulder in till-like soil or bedrock. Refusal from deeper drilling/excavation was encountered on bedrock with the drill and backhoe used for the above explorations as noted on the logs and on Figure 3.

Refusal Along West Edge of Complex. Exploration refusal on till-like soil and bedrock occurred along the west edge of the proposed athletic complex with the equipment used for our explorations. Figure 3 and our exploration logs in Appendix A show the elevations of the bottom of our explorations, refusal on till-like soil (R after elevation), and refusal on bedrock (BR after elevation, observed top of bedrock). Underlined bottom of exploration elevations meeting refusal on Figure 3 (TP-5, TP-11, and TP-12) indicate elevations above the fill pad elevation. However, at these three locations refusal was in till-like soil with a rubber-tired backhoe. Larger earthwork equipment used for site earthwork would likely not encounter refusal in this soil. See Preliminary Grading Plan section for addition discussion.

4.2 Groundwater

At the time of drilling, groundwater was not observed in any of our explorations other than seepage on top of the bedrock in TP-8. Very moist to wet soil was noted in some explorations (B-2, TP-7, TP-8, TP-13) near the top of less pervious soil that may represent isolated perched water conditions during wet weather. The amount and location of perched water typically fluctuates seasonally.

Note that water levels were measured at the times and under conditions stated on the exploration logs. Fluctuations in the groundwater conditions may occur due to variations in rainfall, temperature, season, time an excavation/boring is open, and other factors.

5.0 PRELIMINARY ATHLETIC COMPLEX LAYOUT

Ecology, the District, PACE Engineers (civil engineer serving as a subconsultant to Hart Crowser), DOH Associates (architect/planner serving as a subconsultant to Hart Crowser), and Hart Crowser discussed athletic complex layout goals, desires, and constraints during several meetings and calls. In this section we summarize the final conclusions from these discussions in their general order of priority.

Primary Goals. Several revisions to the layout were developed to achieve these primary goals (in order of priority):

- Use a remediation strategy of balancing cut and fill soil volumes to cover soil containing lead and arsenic across the majority of the site.

- Keep site area available for adding building(s) for at least six additional classrooms.

- Include at least the football field, track, track and field event areas, and a regulation soccer field inside the track. These are the minimum required facilities that we understand that the District is funding through a voter-approved levy.
  - The track should have at least six lanes and eight sprint lanes.
  - It is acceptable if the soccer field inside the track is at the smaller end of the regulation size range.

- Avoid using retaining walls to the extent practicable since this would increase costs for the District.

Secondary Goals. The secondary goals for the layout are to provide the greatest number of facilities while reducing costs and achieving the primary goals. The secondary facilities, in order of priority, are:

- Add a second regulation soccer field north of the football field.

- Include a walking/running trail around the complex.

- Include a softball field north of the football field.

Other Layout Considerations. The following items are desired if possible, but not necessary and not in any particular order of priority. The list also includes items that could be used to lower costs.

- Keep the track and field throwing events in close proximity to each other if possible, but the shot put area could be adjacent to the track at a different location from the discus area. The discus area could be on the football field opposite the javelin area if sufficient space is available.

- Create a bus loop through the parking lot at the northwest corner of the site, if possible.

- Remove the softball field to provide space for football field/track, if necessary.

- Remove the regulation size baseball field that was originally considered at the north end of the site (see Phase 3 below), and create a flat area at a lower grade to create a soccer field in this area if needed to balance site cut and fill volumes.

- Grade the area now shown as parking at the northwest corner of the site into a flat area and add parking or tennis courts later.

- Grade the area now shown as discus/shot east of the current District office into parking space, if needed.

- Construct athletic facilities in phases if needed to reduce costs. Three possible layout phases that the District has prioritized are as follows (see preliminary figures in Appendix D).
  - **Phase 1** - Build the track, football field, and soccer field inside the football field, and a second auxiliary soccer field north of the football field that could share some of the football field light poles.
  - **Phase 2** - Build Phase 1, but shift the second soccer field north and add a softball field north of the football field.
  - **Phase 3** - Build Phase 2, but replace the second soccer field with a regulation size baseball field.

- Final athletic complex site layout (e.g., parking requirements) will need to be confirmed during final design after a pre-application meeting and/or project permitting discussions have occurred with Chelan County (County).

Athletic Facility Layout References. The following general references were used to determine the preliminary layout of the athletic facilities included in this report.

- Soccer Field - United States Soccer Federation (USSF)

- Football Field - National Collegiate Athletic Association (NCAA)

- Track and Field - International Amateur Athletic Foundation (IAAF) Facilities Manual 2008

- Baseball Field - National Federation of High Schools (NFHS) Court & Field Diagram 2012 (with modifications) & Cal Ripken Rule Book 2009

- Softball Field - National Federation of High Schools (NFHS) Softball Rule Book 2011

6.0 PRELIMINARY GRADING PLAN

Grading plans were developed based on the goals and constraints indicated in the Preliminary Athletic Complex Layout section. Several iterations were required since the goals and constraints were developed throughout the project. The following list summarizes items incorporated into the final preliminary grading plan, key constraints, and key assumptions.

- The primary and secondary goals for the athletic complex layout (Section 5.0) were incorporated into the final grading plan (Phase 2 layout items).

- Some of the additional layout considerations, like the bus loop, are feasible to incorporate, but will depend on the available funding from the District and Ecology. The regulation baseball field could not be included due to its size, the elevation of rock on the west side of the site, and the need for a retaining wall at the east property line.

- Bedrock elevations limit excavation depth on the northwest edge of the auxiliary soccer field (TP-6 and TP-17). Refusal in till-like soil west of the track (TP-11, TP-12) and softball field (TP-5) may limit excavation depths depending on how much deeper bedrock is at these locations (see Subsurface Conditions section. These areas should be considered further during final design to confirm the depth to bedrock, confirm if rock excavation is practical, adjust grading, and confirm the best way to adjust athletic facilities to accommodate this possible constraint.

- The track pad elevation cannot be raised more or costly retaining walls would be required along the east property line. However, steepened reinforced soil slopes may be a cost-effective alternative.

- Permanent slopes of 2 horizontal to 1 vertical (2H:1V) are recommended (See Section 8) for all fill slopes constructed of compacted structural fill and cut slopes in the granular site soils. We expect that such slopes would be stable and require less long-term maintenance than steeper slopes.

- Structural fill slopes of 1.5H:1V are assumed to be needed east of the track to avoid using retaining walls and due to the possible excavation depth limitations along the east side of the track in till-like soil. At this early stage in the project, we have assumed that these slopes will need to be reinforced with geosynthetics to achieve stable permanent slopes. See Permanent Fill Slopes section for additional information.

- A 6-inch-thick layer of topsoil, free of contamination, was assumed to be imported to provide clean soil cover over reworked site soil that contains areas with elevated lead or arsenic concentrations. This topsoil layer was assumed to be placed over the entire site east of the school building in areas that do not have hard finished surfaces (e.g., pavement, building slab, track). This imported topsoil layer was assumed to reduce the amount of import fill due to the shrink factor discussed in this section.

- A significant portion of the site soils were loose to medium dense and would generally shrink in volume when compacted as fill during earthwork. Thus, a 10 percent shrink factor was assumed for earthwork calculations, after the grading plan was completed to balance cut and fill.

- The volume of excavated, or cut, soil was estimated to be 83,500 cubic yards (CY). The volume of fill was estimated to be 83,300 CY (200 CY of excess cut soil). With a 10 percent shrink factor applied, 8,200 CY of import fill would be required. Subtracting out the imported 6-inch-thick topsoil cover layer results in only 3,400 CY of import fill. This is a relatively small volume and can likely be eliminated during final design or construction adjustments.

- Final athletic complex site grading and surface water drainage will need to be a completed during final design prior to project permit submission to the County. This is beyond the current scope of work.

7.0 PRELIMINARY COST ESTIMATE FOR CONCEPT-LEVEL LAYOUT

This work included reviewing prior District master plan costs (by Landmark Landscape Architects) and a concise cross-check of those costs to update items incorporated during our work. It was beyond this scope of work to provide a

comprehensive update of all the costs. Preliminary estimated costs for the concept-level athletic complex layout and preliminary grading plan are included in Table 1. The preliminary costs are intended to aid Ecology and the District in preliminary planning efforts. The estimate is not intended to provide design-level engineering, architectural, or construction costs since final design work is needed to develop such costs.

The following items summarize assumptions and clarifications used to estimate these preliminary costs.

- Prior master plan costs by Landmark include overhead and profit.

- Table 1 includes a base option of the track and football/soccer field along with alternative cost items since we expect that the District and Ecology will have to discuss which items each would fund. In addition, Ecology might elect to fund certain parts of alternatives that satisfy their remedial strategy during the first construction phase, even though the District might decide to construct other parts of the same alternative athletic complex improvement during a later construction phase.

- We understand that Ecology would help fund items that are related to the remedial strategy of covering soil containing lead and arsenic with soil free of contamination. Ecology has indicated that this would generally include earthwork and at-grade/below-grade items that would be part of the cover (e.g., including grass, turf, pavement/sidewalks subgrades, and utilities). We understand that the funding from Ecology would not include above-grade athletic facilities items such as track surfacing, concession building, fencing, lights, etc. Ecology and the District will need to determine and negotiate the eligible remedial action costs and matching fund requirements for the project.

- Estimated costs assume that design and construction work would be done without volunteer work/materials and does not include potential cost saving measures such as reuse of light poles, lighting, etc., as these are difficult to estimate.

8.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS AND ENVIRONMENTAL CONSIDERATIONS

This section of the report presents our key preliminary recommendations regarding the geotechnical aspects of design and construction for the project, as well as environmental considerations. Additional geotechnical design

recommendations are necessary, but beyond the scope of this work. We have developed our recommendations based on our current understanding of the project and the subsurface conditions encountered by our explorations. If the nature or location of the facilities are different than we have assumed, Hart Crowser should be notified so we can change or confirm our recommendations.

8.1 Preliminary Geotechnical Recommendations

8.1.1 Permanent Cut and Fill Slopes

General Considerations. Preliminary permanent cut and fill slope recommendations depend on:

- The presence, quantity, and location of water;
- The type, density, and strength of the soil;
- The time that the soil is exposed to weather;
- The slope height;
- Surcharge loading (i.e., existing or future structures, construction equipment, or stockpiled soils) adjacent to the slope;
- The proximity of the slope to existing facilities, utilities, and roadways; and
- Other factors.

Due to the variety of factors affecting slope stability and their ability to change with time and location, it is difficult to calculate the stability of slopes at this concept-level stage of the project. Thus, it will be important that permanent slopes be evaluated during final design when final slope configurations and locations are available to determine if slope stability analysis is needed. It is also critical to understand construction methods and confirm that subsurface conditions at the time of construction match design assumptions. Therefore, we strongly recommend that Hart Crowser be involved during final design and construction.

8.1.1.1 Permanent Cut Slopes

The current grading plan (Figure 3) indicates proposed permanent cut slopes at several locations on the site. Based on the variable site conditions, where permanent cut slopes are necessary, we recommend that permanent cut slopes be constructed at 2H:1V. Steeper permanent slopes may be possible in some areas, but maintenance of minor sloughs should be anticipated as regular maintenance.

8.1.1.2 Permanent Fill Slopes

The east side of the site includes permanent fill slopes to attain site grades. We recommend the following for these slopes:

- Construct fill slopes with compacted structural fill.
- Construct all permanent fill slopes no steeper than 2H:1V.
- Special measures may be required for the 1.5H:1V permanent fill slopes east of the track, where they are required to avoid using retaining walls. Although 1.5H:1V permanent fill slopes can be constructed to be stable, we recommend that they be evaluated further during final design to confirm they are stable using site soils and to evaluate long-term maintenance. Final design alternatives for these slopes include, but are not limited to: reinforcing a steepened slope with geotextile layers and surficial vegetation, confirmation of the east property line that could allow a flatter slope, and/or property acquisition. These slope alternatives were beyond the scope of this work.
- For fill slopes with an overall height greater than 10 feet, or with structures near the crest, overbuild the outside edge of slopes at least 5 feet beyond final slope lines and cut back to ensure adequate compaction of fill out to the final slope line.

8.1.2 Fill Selection, Placement, and Compaction

The suitability of excavated on-site soil for reuse as compacted fill is critical for the feasibility of the cut and fill balance remedial strategy. The gradation and moisture content of the soil at the time of earthwork are key soil parameters to this strategy. It will be critical to the success of this remedial strategy that earthwork be planned during extended dry weather.

Backfill placed under structures, in fill slopes, or below paved areas should be considered structural fill. The following sections include our recommendations for structural fill selection, placement, and compaction.

8.1.2.1 Reuse of Site Soil as Structural Fill

The suitability of excavated site soil for compacted structural fill will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion passing the No. 200 sieve) increases, the soil becomes increasingly sensitive to small changes in moisture content and adequate

compaction becomes more difficult to achieve. Soil containing more than about 5 percent fines cannot be consistently compacted to a dense non-yielding condition when the water content is greater than about 2 percent above or below optimum. Explorations generally indicate soils are damp to moist and, therefore, should be reasonably close to their optimal moisture content for compaction. Reusable soil must also be free of organic and other unsuitable material.

Our explorations generally indicate that most soils to be excavated would consist of silty to very silty Sand. These soils typically contain more than about 30 percent fine-grained material, which will be moisture-sensitive and extremely difficult to place and compact if too wet, and are generally not recommended for use as structural fill during extended wet weather periods. We anticipate that it will only be possible to achieve compaction if soil is placed during extended periods of dry weather at the proper moisture content. However, very careful earthwork practices may allow reuse of some of the existing silty to very silty Sand if it can be compacted near its optimum moisture content.

It is critical that excavated site soil be protected from wet weather and that it be near its optimum moisture content at the time of placement.

The reuse of on-site soil at this site will be very difficult during periods of extended wet weather. Moisture conditioning of the soil, either wetting or drying over a large area, may be necessary to achieve appropriate compaction. Specific earthwork plans should be developed during final design.

8.1.2.2 Selection of Import Fill

Structural fill is recommended in areas where the native soil cannot be sufficiently compacted. We recommend using a non-silty, well graded sand or sand and gravel with less than 5 percent fines for import structural fill placed during wet weather periods. Compaction of material containing more than about 5 percent fines may be difficult if the material is wet or becomes wet during rainy weather. During dry weather, import soil can contain 20 to 30 percent by weight fines provided it is compacted at a moisture content within 2 percent of the optimum moisture content.

8.1.2.3 Placement and Compaction of Structural Fill

We make the following recommendations for placement and compaction of structural fill:

- During final design, determine the compaction characteristics of proposed fill material to be used as structural fill. Compaction characteristics of on-site soils from representative samples (at depths and locations of cut soil) should include determination of maximum dry density, optimum and natural moisture contents, and the grain size distribution of these soils.

- Structural fill can consist of either imported soils or recompacted on-site soils, if the moisture content is suitable and weather conditions allow.

- Compact structural fill to a minimum of 95 percent of the maximum dry density as determined by the modified Proctor (ASTM D 1557) test method, except within 3 feet horizontally of subgrade walls where the compaction requirement should be 90 percent.

- Under athletic field areas more than 2 feet below the ground surface, fill can be compacted to at least 92 percent. This does not apply to areas within 20 feet of permanent fill slope surfaces.

- Maintain moisture content within 2 percent of the optimum moisture content (ASTM D 1557).

- Place structural fill only on dense, non-yielding subgrade soils prepared in accordance with final design geotechnical recommendations.

- Place and compact all structural fill in even lifts with a loose thickness no greater than 10 inches. If small, hand-operated compaction equipment is used to compact structural fill, fill lifts should not exceed 6 to 8 inches in loose thickness.

- The compacted density of all lifts should be verified by field testing.

- Stockpiles of fill containing cobbles, boulders, and concrete are east of the existing football field. The cobbles, boulders, and large concrete pieces will be difficult to incorporate into the fill and achieve compaction of the fill in lifts. It is feasible to spread this large material out and compact soil around the large pieces, but this would be labor intensive and most earthwork contractors would probably not consider this economical. It may be possible to segregate the larger rocks from the other material and reuse them on site as part of landscaping features or rockeries.

8.2 Preliminary Environmental Considerations

We initially discussed with Ecology the feasibility of segregating soil with elevated lead and arsenic concentrations from other soil (based on XRF test results Ecology performed on samples from our explorations). The XRF results (Appendix C) indicate some trends of elevated concentrations closer to the ground surface, but this trend is not consistent in all explorations. Some of the XRF data from boring samples show elevated concentrations at depth. This is likely due to the borings intersecting the former ground surface before original fill placement.

Overall, the current XRF results and variability of fill across the site suggest it would be difficult to segregate soil with elevated lead and arsenic concentrations from other soil as part of earthwork during construction. We discussed this with Ecology and collectively decided segregation of impacted soil was not practical during earthwork operations.

It may be prudent to perform XRF screening tests with lab confirmation sampling after rough grading is complete to determine if lead and arsenic concentrations are low enough in a large area to avoid placement of clean import cover soil.

We assume that the District's final design plans and specifications would include appropriate measures to inform contractors of the elevated lead and arsenic soil concentrations and requirements that contractors provide appropriate means to protect their workers and those near the site during earthwork construction.

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Table 1 - Preliminary Planning Level Estimated Costs

Items	Estimated Quantity	Unit	Unit Cost	Total Cost (with Markup A[1])	Comments
Base Option - Track and Field					
Site earthwork, cut/haul/fill/compact	75,150	CY	$9.00	$845,438	PACE
Import fill material, haul/place/compact	3,440	CY	$20.00	$86,000	PACE & HC
Track East Slope (1.5H:1V) Reinforcement/Planting	13,000	SF	$15.00	$243,750	HC: < $5/SF planting only without grid (http://www.wsdot.wa.gov/Design/Roadside/SoilBioengineering.htm#Typical Costs). ~$30/SF for MSE walls with keysone type facing.
Import Topsoil (graded non-hardscape areas)	4,710	CY	$22.00	$129,525	PACE & HC - 6" topsoil cap layer per Ecology. Import fill volume reduced by this amount assuming cap is part of import fill volume.
Import Topsoil (non-graded, non-hardscape areas)	540	CY	$22.00	$14,850	PACE & HC - 6" topsoil cap layer per Ecology. Assumes NE corner needs capped although no grading required there.
General Site Drainage (Including Stormwater Facilities)	1	EA	$100,000	$125,000	PACE - Could entail a fair amount of piping, inlets, CB's etc. Includes detention pond.
General Site Utilities (Sewer, Electrical)	1	EA	$75,000	$93,750	PACE - Several unknowns: grades of existing sewer, lift station needed.
Touch up Final Grading	50,000	SY	$1.71	$106,875	DOH
Turf and Irrigation	1	EA	$72,000	$81,360	Landmark (Existing District Master Plan Costs)
Track Subsurface	39,000	SF	$3.50	$170,625	DOH
Track Surfacing	39,000	SF	$2.90	$141,375	DOH, Latex surface
Track Striping	1	EA	$6,000	$6,780	Landmark
Field Events	1	EA	$15,000	$16,950	Landmark
Special Field Drainage Collection Inside Track	1	EA	$25,000	$28,250	Landmark, DOH assumes Special Field Drainage Collection Inside Track
Lighting	1	EA	$225,000	$254,250	Landmark
Goal Posts (Football & Soccer)	1	LS	$8,000	$9,040	Landmark
Goals (2nd Soccer)	1	LS	$6,000	$7,500	DOH
Accessories	1	EA	$30,000	$33,900	Landmark
Scoreboard	1	EA	$20,000	$22,600	Landmark
Electrical/Sound	1	EA	$50,000	$56,500	Landmark
Subtotal				*$2,474,318*	Includes overhead/profit (8-12%) + general conditions (mob, bonds, insurance, survey; 5%) + tax (8%)
Architectural and Engineering Design & Permitting Costs	-	%	10%	$247,432	
Construction Contingency	-	%	7%	$173,202	
Total With All Markups[2]				*$2,894,951*	

Table 1 - Preliminary Planning Level Estimated Costs

Items	Estimated Quantity	Unit	Unit Cost	Total Cost (with Markup A[1])	Comments
Alternate 1 - All Purpose Field (2nd Soccer Field & Softball Field)					
Secondary Field Turf and Irrigation	117,000	SF	1.55	$226,688	DOH
Fencing around football field (S. half of site)	2,010	LF	27	$70,338	Includes $2,000 for gates, DOH
Subtotal				*$297,025*	Includes overhead/profit (8-12%) + general conditions (mob, bonds, insurance, survey; 5%) + tax (8%)
Architectural and Engineering Design & Permitting Costs	-	%	10%	$29,703	
Construction Contingency	-	%	7%	$20,792	
Total With All Markups[2]				*$347,519*	
Alternate 2 - Track & Field Parking					
Parking Lot	28,612	SF	4.64	$165,950	DOH, crushed rock and asphalt
Curb	1,414	LF	8	$14,140	DOH
Stripping	1	EA	3,000	$3,750	DOH
Walks	9,842	SF	6.12	$75,291	DOH
Bleachers (less than shown)	42	CY	490	$25,725	DOH
Bleacher Seats (less than shown)	60	Seat	70	$5,250	DOH
Subtotal				*$290,106*	Includes overhead/profit (8-12%) + general conditions (mob, bonds, insurance, survey; 5%) + tax (8%)
Architectural and Engineering Design & Permitting Costs	-	%	10%	$29,011	
Construction Contingency	-	%	7%	$20,307	
Total With All Markups[2]				*$339,424*	
Alternate 3 - North Field Parking					
Parking Lot	34,739	SF	4.64	$201,486	DOH, crushed rock and asphalt
Curb	1,803	LF	8.00	$18,030	DOH
Stripping	1	EA	3,000	$3,750	DOH
Subtotal				*$223,266*	Includes overhead/profit (8-12%) + general conditions (mob, bonds, insurance, survey; 5%) + tax (8%)
Architectural and Engineering Design & Permitting Costs	-	%	10%	$22,327	
Construction Contingency	-	%	7%	$15,629	
Total With All Markups[2]				*$261,221*	

Table 1 - Preliminary Planning Level Estimated Costs

Items	Estimated Quantity	Unit	Unit Cost	Total Cost (with Markup A[1])	Comments
Alternate 4 - Concession Stand					
Upper Floor	1,121	SF	264	$369,930	DOH
Basement	1,121	SF	50	$70,063	DOH
Subtotal				*$439,993*	Includes overhead/profit (8-12%) + general conditions (mob, bonds, insurance, survey; 5%) + tax (8%)
Architectural and Engineering Design & Permitting Costs	-	%	10%	$43,999	2008 Means (5% Architectural & 5% Engineering design)
Construction Contingency	-	%	7%	$30,799	
Total With All Markups[2]				*$514,791*	
Total of Base & Alternates 1 to 4 with All Markups				**$4,357,907**	

Notes:
1. Markup A includes overhead/profit (8-12%) + general conditions (mob, bonds, insurance, survey; 5%) + tax (8%)
2. Markup B includes A/E design & permitting (10%) + construction contingency (7%)

Cost Data References:

Track and Field Costs	Landmark Landscape ArchitectsManson Athletic Facility Improvements October 12, 2012
Parking and Improvement Costs	RS Means Building Cost Data 2013

DRAFT

0 2,000 4,000

Scale in Feet

N

Source: DeLorme Topo USA®.

Manson School District Remediation
Manson, Washington

Vicinity Map

17800-42 9/13

HARTCROWSER

Figure 1

JAB 09/4/13 F:\Data\Jobs\17800-42 SEATTLE temp\1590042-001 (Vicinity Map).dwg

MATCHLINE - SEE FIGURE 2b

PARCEL
282135608336

PARCEL
282136608750

PARCEL
282135608327

#1000 TOTEM POLE RD

TOTEM POLE ROAD

HILL STREET

TP-1 TP-2 TP-3 TP-4 TP-5 TP-10 TP-11 TP-12 TP-13 TP-15

B-1 B-2 B-3 B-4

SDMH, TOP=1311.82
I.E. 8"PERF. IN 12"CMP(W)=1307.97
I.E. 8"PERF. IN 12"CMP(NE)=1307.97

CP# 6
654A-20.6 CGS VRN
N=326169.05
E=1807189.79
ELEV.=1312.18

CP# 1
654A-20.1 MIC VRN
N=326089.45
E=1806998.27
ELEV.=1318.02

CP# 2
654A-20.2 MIC VRN
N=325611.02
E=1807185.15
ELEV.=1301.91

CP# 7
654A-20.7 H/T VRN
N=325846.20
E=1807384.17
ELEV.=1309.40

CP# 11
654A-30.11 H/T VRN
N=325640.39
E=1807775.41
ELEV.=1298.31

CP# 12
654A-30.12 H/T VRN
N=325805.53
E=1807713.04
ELEV.=1293.48

CP# 4
654A-20.4 R/C VRN
N=325717.60
E=1808087.49
ELEV.=1275.88

SDMH, 24"DIA. CONC.
ON 48"DIA. STRUCTURE
TOP=1308.88
I.E. 6"PVC(SW)=1305.68
I.E. 6"STEEL(SW)=1304.58
OUTLET NOT VISIBLE

CB, TOP=1308.81
I.E. 6"PVC(NE)=1307.41

18"DIA. YARD DRAIN
TOP=1308.96
I.E. 6"STEEL(NE)=1304.46

CB, TOP=1309.90
I.E. 6"PVC(SW)=1306.90
I.E. 6"PVC(SE)=1306.90

CB, TOP=1309.51
I.E. 6"PVC(SE)=1306.21
I.E. 6"PVC(SW)=1305.91
I.E. 6"PVC(NE)=1305.51

CB, TOP=1309.21
I.E. 6"PVC(SE)=1305.61
I.E. 6"PVC(SW)=1305.61
I.E. 6"PVC(NE)=1304.31

CB, TOP=1309.31
I.E. 4"PVC(S)=1307.56
I.E. 6"PVC(NW)=1307.31

CB, TOP=1299.22
I.E. 12"PVC(S)=1297.02

I.E. 6"PVC=1303.33

I.E. 6"PVC=1301.58

BUILDING
GARAGE
SHEDS
SHOTPUT AREA
FLAGPOLE
CONC. PAD FOR DISCUS THROW
GOAL POST
SCOREKEEPER BLDG.
SCOREBOARD
POLE FOR FIELD LIGHTS (TYP.)
5' WOOD FENCE
6'CLF
5'CLF
GRAVEL
ASPHALT
GATE
CONC.
R/R TIE WALL
WALL
DIRT MOUND
DIRT PILE
SPOILS PILE OF RIP-RAP SIZED BOULDERS
GRASS
GRAVEL TRACK
IRRIGATION LINE
RET. POND
DOUBLE YELLOW LINE
5' CHAIN-LINK FENCE
CONC. WALK
CURB & GUTTER
"SCHOOL ZONE SPEED LIMIT 20"
"SPEED LIMIT 25"
"MANSON SCHOOL DISTRICT"
PEDESTRIAN SIGN
P.I.V.
F.H.
DOUBLE YELLOW LINE
10"-12"LOCUST
2x12"LOCUST
3x12"LOCUST
18"LOCUST
16"PINE
12"FIR
20'

N

WATER VALVE
HYDRANT
WATER METER
MANHOLES (SS/SD)
POWER/UTILITY POLE
GUY ANCHOR
POWER TRANSFORMER
POWER/TELEPHONE VAULT
POWER METER
TELEPHONE/TV RISER
GAS VALVE
GAS METER
STREET LIGHT
LUMINAIRE
SPOT ELEVATION
SIGN
MAILBOX
ROCKERY
CONIFEROUS TREE
DECIDUOUS TREE
FOUND CASED MONUMENT
SET MAGNETIC NAIL W/ WASHER

CENTER LINES
PROPERTY LINES
RIGHT-OF-WAY LINES
LOT LINES
DITCH LINE
FLOW LINE
WATER LINE
SANITARY SEWER LINE
STORM DRAIN LINE
GAS LINE
UNDERGROUND POWER LINES
UNDERGROUND TELEPHONE LINES
UNDERGROUND CABLE TV LINES
UNDERGROUND FIBER OPTIC LINES
OVERHEAD POWER LINES
OVERHEAD UTILITY LINES
CHAIN LINK FENCE
WIRE FENCE
WOOD FENCE

NOTES:

HORIZONTAL DATUM: (NAD 83)
COORDINATES AND BEARINGS FOR THIS SURVEY DERIVED FROM RTK GPS OBSERVATIONS CONSTRAINED TO THE WASHINGTON STATE VIRTUAL REFERENCE NETWORK FOR THE WASHINGTON COORDINATE SYSTEM NORTH ZONE.

VERTICAL DATUM: (NAVD 88)
ELEVATIONS FOR THIS SURVEY DERIVED FROM RTK GPS OBSERVATIONS CONSTRAINED TO THE WASHINGTON STATE VIRTUAL REFERENCE NETWORK FOR THE WASHINGTON COORDINATE SYSTEM NORTH ZONE.

ALL DISTANCES SHOWN ARE GROUND DISTANCES UNLESS OTHERWISE NOTED.

THE LOCATION AND DESCRIPTION OF ALL SURVEY MARKERS SHOWN HEREON ARE BASED ON FIELD OBSERVATIONS TAKEN IN JUNE 2013, UNLESS OTHERWISE INDICATED.

WORK PERFORMED IN CONJUNCTION WITH THIS SURVEY UTILIZED THE FOLLOWING EQUIPMENT AND PROCEDURES: (A) 1" TRIMBLE S6 SERIES ELECTRONIC TOTAL STATION, MAINTAINED TO THE MANUFACTURER'S SPECIFICATIONS PER W.A.C. 332-130-100. (B) TRIMBLE 5700GPS RECEIVER IN RTK MODE. FIELD SURVEY ACCURACY MEETS OR EXCEEDS THE REQUIREMENTS SET FORTH IN W.A.C. 332-130-090.

THIS SURVEY WAS PERFORMED WITHOUT THE BENEFIT OF A TITLE REPORT AND DOES NOT PURPORT TO SHOW ALL EASEMENTS.

THIS TOPOGRAPHIC SURVEY DRAWING ACCURATELY PRESENTS SURFACE FEATURES LOCATED DURING THE COURSE OF THIS SURVEY. UNDERGROUND UTILITIES SHOWN HEREON ARE BASED SOLELY UPON INFORMATION PROVIDED BY OTHERS AND PACE ENGINEERS, INC. DOES NOT ACCEPT RESPONSIBILITY OR ASSUME LIABILITY FOR THEIR ACCURACY OR COMPLETENESS. CONTRACTOR/ENGINEERS SHALL VERIFY EXACT SIZE AND LOCATION PRIOR TO CONSTRUCTION.
CALL FOR LOCATE: UTILITY LOCATION SERVICE: 1-800-424-5555.

DRAFT

Exploration Location and Number:
TP-4 Test Pit
B-1 Soil Boring

0 80 160
Scale in Feet

Source: Base map prepared from Topographic Survey by PACE Engineers, dated 6/28/13.

Manson School District Remediation
Manson, Washington

Topographic Survey and Explorations

17800-42 9/13

HARTCROWSER

Figure
2a

JAB 09/10/13 F:\DataJobs\17800-42 SEATTLE temp\15900042-002 (Topo Survey).dwg

NOTES:

HORIZONTAL DATUM: (NAD 83)
COORDINATES AND BEARINGS FOR THIS SURVEY DERIVED FROM RTK GPS OBSERVATIONS CONSTRAINED TO THE WASHINGTON STATE VIRTUAL REFERENCE NETWORK FOR THE WASHINGTON COORDINATE SYSTEM NORTH ZONE.

VERTICAL DATUM: (NAVD 88)
ELEVATIONS FOR THIS SURVEY DERIVED FROM RTK GPS OBSERVATIONS CONSTRAINED TO THE WASHINGTON STATE VIRTUAL REFERENCE NETWORK FOR THE WASHINGTON COORDINATE SYSTEM NORTH ZONE.

ALL DISTANCES SHOWN ARE GROUND DISTANCES UNLESS OTHERWISE NOTED.

THE LOCATION AND DESCRIPTION OF ALL SURVEY MARKERS SHOWN HEREON ARE BASED ON FIELD OBSERVATIONS TAKEN IN JUNE 2013, UNLESS OTHERWISE INDICATED.

WORK PERFORMED IN CONJUNCTION WITH THIS SURVEY UTILIZED THE FOLLOWING EQUIPMENT AND PROCEDURES: (A) 1" TRIMBLE S6 SERIES ELECTRONIC TOTAL STATION, MAINTAINED TO THE MANUFACTURER'S SPECIFICATIONS PER W.A.C. 332-130-100. (B) TRIMBLE 5700GPS RECEIVER IN RTK MODE. FIELD SURVEY ACCURACY MEETS OR EXCEEDS THE REQUIREMENTS SET FORTH IN W.A.C. 332-130-090.

THIS SURVEY WAS PERFORMED WITHOUT THE BENEFIT OF A TITLE REPORT AND DOES NOT PURPORT TO SHOW ALL EASEMENTS.

THIS TOPOGRAPHIC SURVEY DRAWING ACCURATELY PRESENTS SURFACE FEATURES LOCATED DURING THE COURSE OF THIS SURVEY. UNDERGROUND UTILITIES SHOWN HEREON ARE BASED SOLELY UPON INFORMATION PROVIDED BY OTHERS AND PACE ENGINEERS, INC. DOES NOT ACCEPT RESPONSIBILITY OR ASSUME LIABILITY FOR THEIR ACCURACY OR COMPLETENESS. CONTRACTOR/ENGINEERS SHALL VERIFY EXACT SIZE AND LOCATION PRIOR TO CONSTRUCTION.
CALL FOR LOCATE: UTILITY LOCATION SERVICE: 1-800-424-5555.

MATCHLINE - SEE FIGURE 2a

Exploration Location and Number:

TP-4 Test Pit

B-1 Soil Boring

0 80 160

Scale in Feet

Source: Base map prepared from Topographic Survey by PACE Engineers, dated 6/28/13.

DRAFT

Manson School District Remediation
Manson, Washington

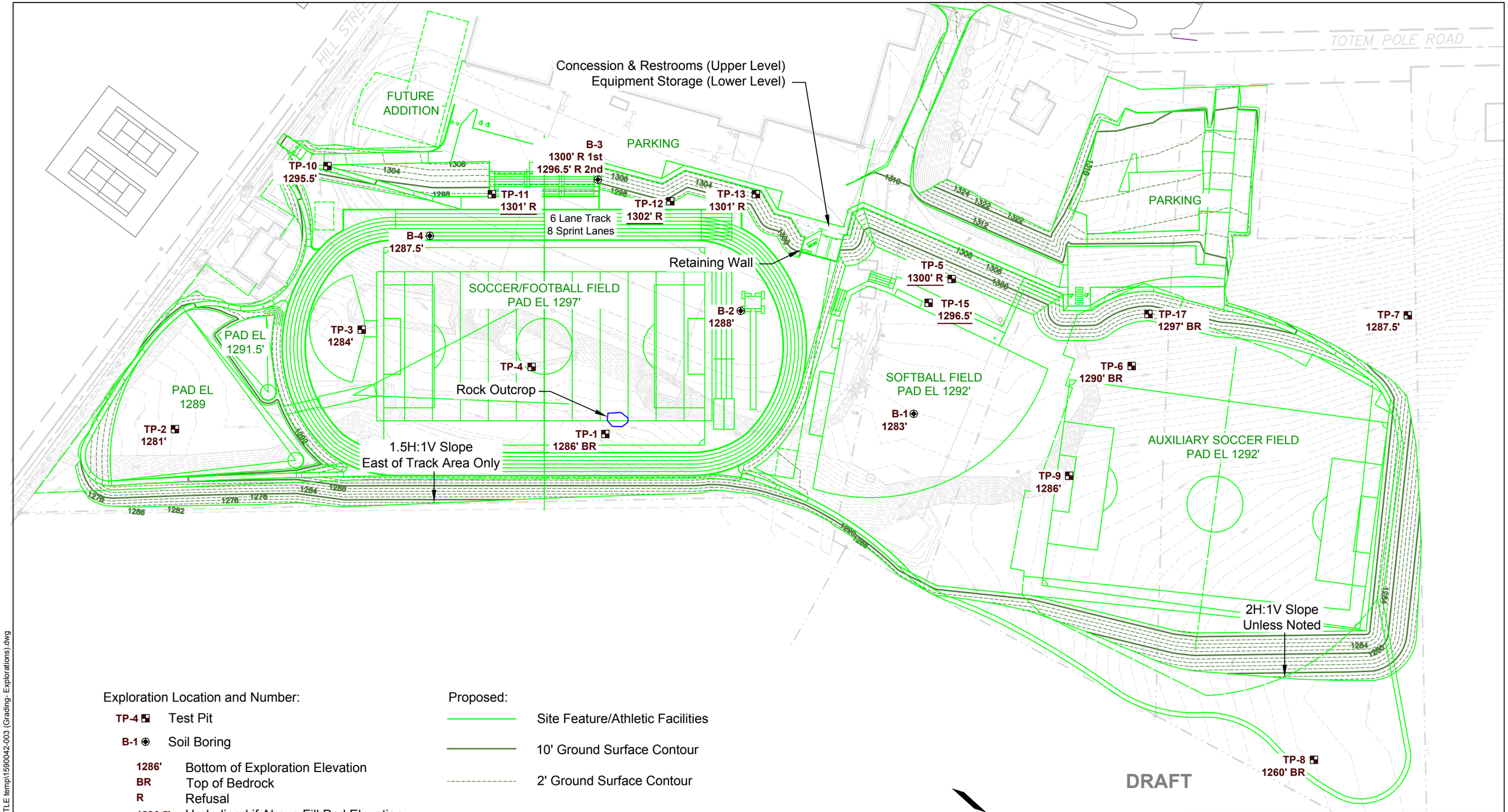
Topographic Survey and Explorations

17800-42 9/13

HARTCROWSER

Figure **2b**

JAB 09/10/13 F:\Data\Jobs\17800-42 SEATTLE temp\1590042-002 (Topo Survey).dwg



Exploration Location and Number:

- TP-4 — Test Pit
- B-1 — Soil Boring
- 1286' — Bottom of Exploration Elevation
- BR — Top of Bedrock
- R — Refusal
- 1286.5' — Underlined if Above Fill Pad Elevation

Proposed:

- Site Feature/Athletic Facilities
- 10' Ground Surface Contour
- 2' Ground Surface Contour

N

0 80 160

Scale in Feet

Source: Base map prepared from Topographic Survey by PACE Engineers, dated 6/28/13. Preliminary Grading Plan by PACE Engineers, dated 8/28/13, and Phase 2 High School Site Plan (athletic facilities layout) by The DOH Associates, dated 8/19/13.

Manson School District Remediation
Manson, Washington

Preliminary Athletic Complex Layout and Grading Plan

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Figure 3

JAB 09/10/13 F:\Data\Jobs\17800-42 SEATTLE temp\1590042-003 (Grading- Explorations).dwg

APPENDIX A
FIELD EXPLORATION METHODS AND ANALYSIS

APPENDIX A
FIELD EXPLORATION METHODS AND ANALYSIS

This appendix documents the processes Hart Crowser used in determining the nature (and quality) of the soil and groundwater underlying the project site. The discussion includes information on the following subjects:

- Explorations and Their Location;
- Hollow-Stem Auger Borings;
- Standard Penetration Test (SPT) Procedures;
- Excavation of Test Pits; and
- Soil Sampling Procedures.

Explorations and Their Location

Subsurface explorations for this project include four borings (B-1 through B-4) and 14 test pits (TP-1, TP-2, TP-3, TP-5 through TP-13, TP-15, and TP-17). The exploration logs in this appendix show our interpretation of the drilling/excavation, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on Figure A-1 - Key to Exploration Logs. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Figure 3 shows the location of explorations, located by hand taping or pacing from existing physical features. The ground surface elevations at these locations were interpreted from elevations shown on the Topographic Survey for Manson School District site map by PACE Engineers, Inc., dated June 2013. The method used determines the accuracy of the location and elevation of the explorations.

Hollow-Stem Auger Borings

With depths ranging from 12.5 to 20.9 feet below the ground surface, four hollow-stem auger borings, designated B-1 through B-4, were drilled on June 20, 2013. The borings used a 4-inch-inside-diameter, hollow-stem auger and were advanced with a track-mounted drill rig subcontracted by Hart Crowser. The drilling was continuously observed by an engineering geologist from Hart Crowser. Detailed field logs were prepared of each boring. Using the Standard Penetration Test (SPT), we obtained samples at 2-1/2- to 5-foot-depth intervals.

The borings logs are presented on Figures A-2 through A-5 at the end of this appendix.

Standard Penetration Test (SPT) Procedures

This test is an approximate measure of soil density and consistency. To be useful, the results must be used with engineering judgment in conjunction with other tests. The SPT (as described in ASTM D 1586) was used to obtain disturbed samples. This test employs a standard 2-inch outside diameter split-spoon sampler. Using a 140-pound autohammer, free-falling 30 inches, the sampler is driven into the soil for 18 inches. The number of blows required to drive the sampler the last 12 inches only is the Standard Penetration Resistance. This resistance, or blow count, measures the relative density of granular soils and the consistency of cohesive soils. The blow counts are plotted on the boring logs at their respective sample depths.

Soil samples are recovered from the split-barrel sampler, field classified, and placed into water-tight jars. They are then taken to Hart Crowser's laboratory for further testing.

In the Event of Hard Driving

Occasionally very dense materials preclude driving the total 18-inch sample. When this happens, the penetration resistance is entered on logs as follows:

Penetration less than 6 inches. The log indicates the total number of blows over the number of inches of penetration.

Penetration greater than 6 inches. The blow count noted on the log is the sum of the total number of blows completed after the first 6 inches of penetration. This sum is expressed over the number of inches driven that exceed the first 6 inches. The number of blows needed to drive the first 6 inches are not reported. For example, a blow count series of 12 blows for 6 inches, 30 blows for 6 inches, and 50 (the maximum number of blows counted within a 6-inch increment for SPT) for 3 inches would be recorded as 80/9.

Excavation of Test Pits

Fourteen test pits, designated TP-1, TP-2, TP-4 through TP-13, TP-15, and TP-17, were excavated across the site from June 19, 2013 to July 22, 2013, with a backhoe subcontracted by our firm. The sides of these excavated pits offer direct observation of the subgrade soils. The test pits were located by and excavated under the direction of an engineering geologist from Hart Crowser. The geologist observed the soil exposed in the test pits and reported the findings on a field log. Our geologist took representative samples of soil types for testing at Hart Crowser's laboratory. Groundwater levels or seepage were noted during

excavation. The density/consistency of the soils (as presented parenthetically on the test pit logs to indicate their having been estimated) is based on visual observation only as disturbed soils cannot be measured for in-place density in the laboratory.

The test pit logs are presented on Figures A-6 through A-12.

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 to 4	Very soft	0 to 2	<0.125
Loose	4 to 10	Soft	2 to 4	0.125 to 0.25
Medium dense	10 to 30	Medium stiff	4 to 8	0.25 to 0.5
Dense	30 to 50	Stiff	8 to 15	0.5 to 1.0
Very dense	>50	Very stiff	15 to 30	1.0 to 2.0
		Hard	>30	>2.0

Sampling Test Symbols

- 1.5" I.D. Split Spoon
- Grab (Jar)
- 3.0" I.D. Split Spoon
- Shelby Tube (Pushed)
- Bag
- Cuttings
- Core Run

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, likely below optimum
Moist	Likely near optimum moisture content
Wet	Much perceptible moisture, likely above optimum

Minor Constituents	Estimated Percentage
Trace	<5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

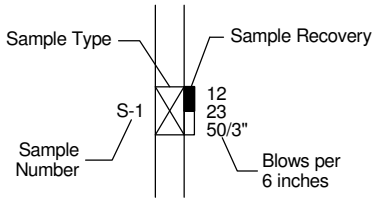
Laboratory Test Symbols

GS	Grain Size Classification
CN	Consolidation
UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits
	Water Content in Percent Liquid Limit Natural Plastic Limit
PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	In Situ Density in PCF
OT	Tests by Others

Groundwater Indicators

- Groundwater Level on Date or (ATD) At Time of Drilling
- Groundwater Seepage (Test Pits)

Sample Key



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17800-42 6/13

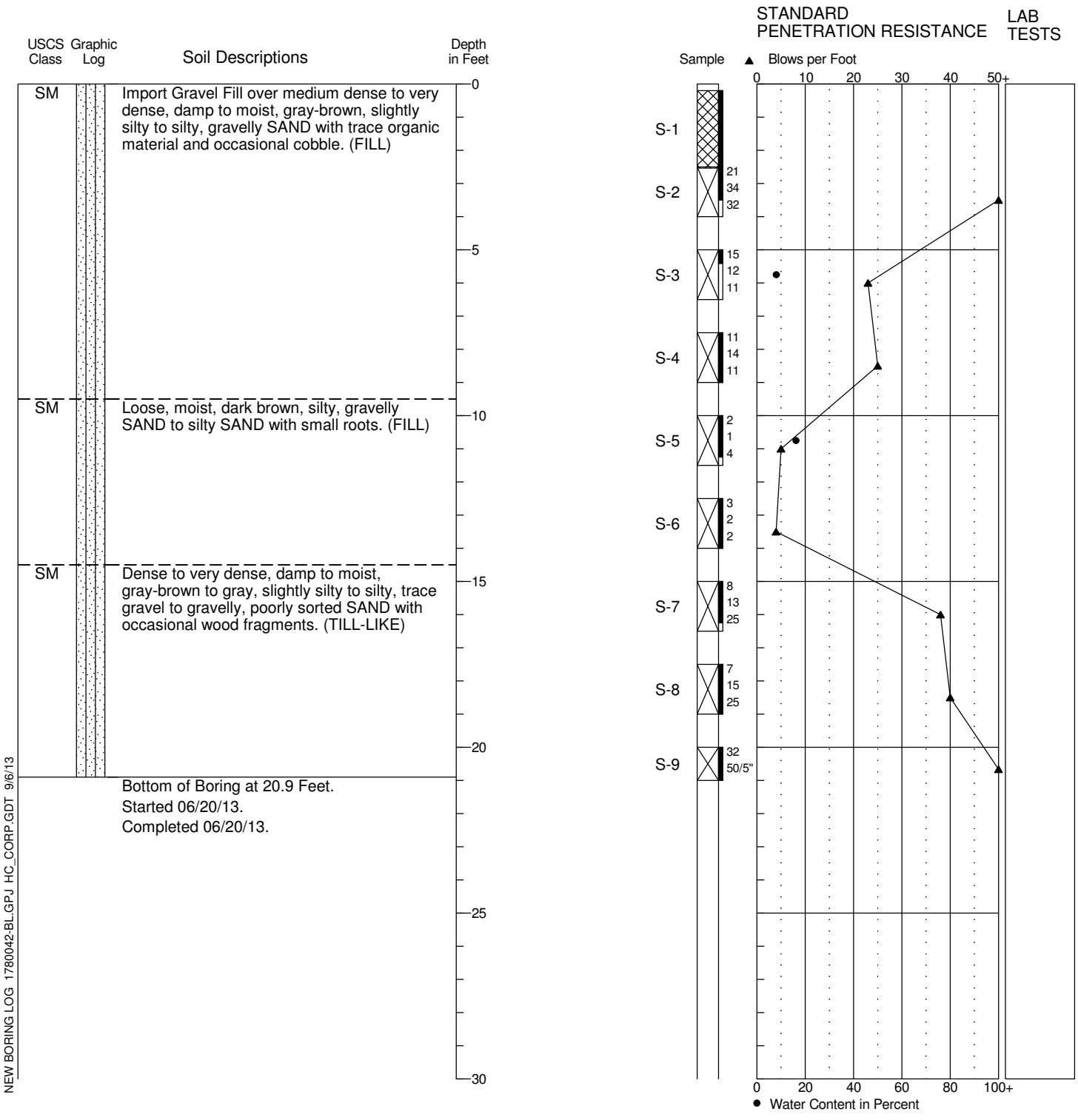
Figure A-1

KEY SHEET 1780042-BL.GPJ HC_CORP.GDT 8/30/13

Boring Log B-1

Location:
Approximate Ground Surface Elevation: 1304 Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Diedrich D-50/HSA
Hammer Type: SPT w/140 lb. Automatic Hammer
Hole Diameter: inches
Logged By: B. McDonald Reviewed By: C. Valdez



NEW BORING LOG 1780042-BL.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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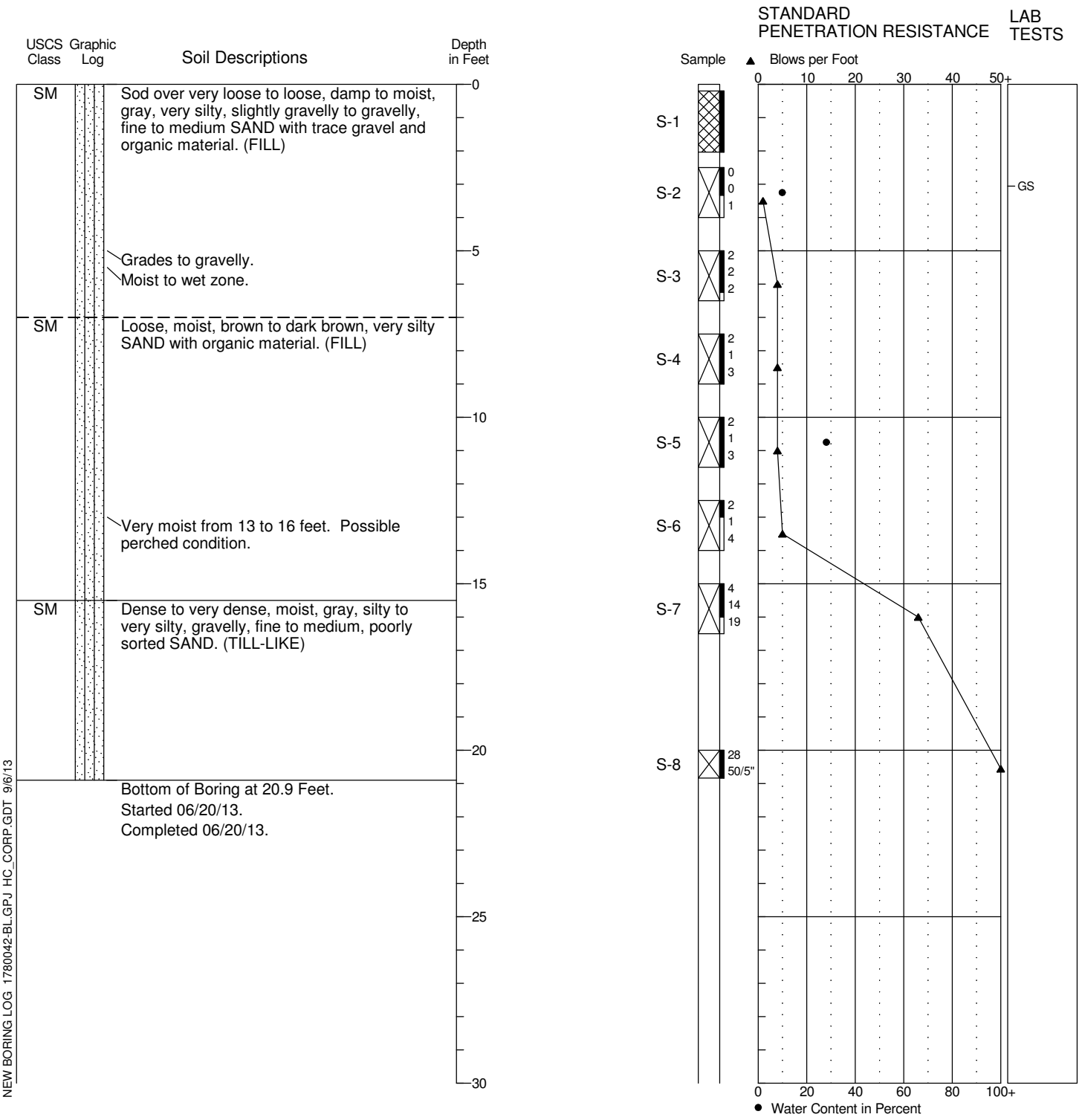
17800-42 ***6/13***

Figure A-2

Boring Log B-2

Location:
Approximate Ground Surface Elevation: 1309 Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Diedrich D-50/HSA
Hammer Type: SPT w/140 lb. Automatic Hammer
Hole Diameter: inches
Logged By: B. McDonald Reviewed By: C. Valdez



NEW BORING LOG 1780042-BL.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

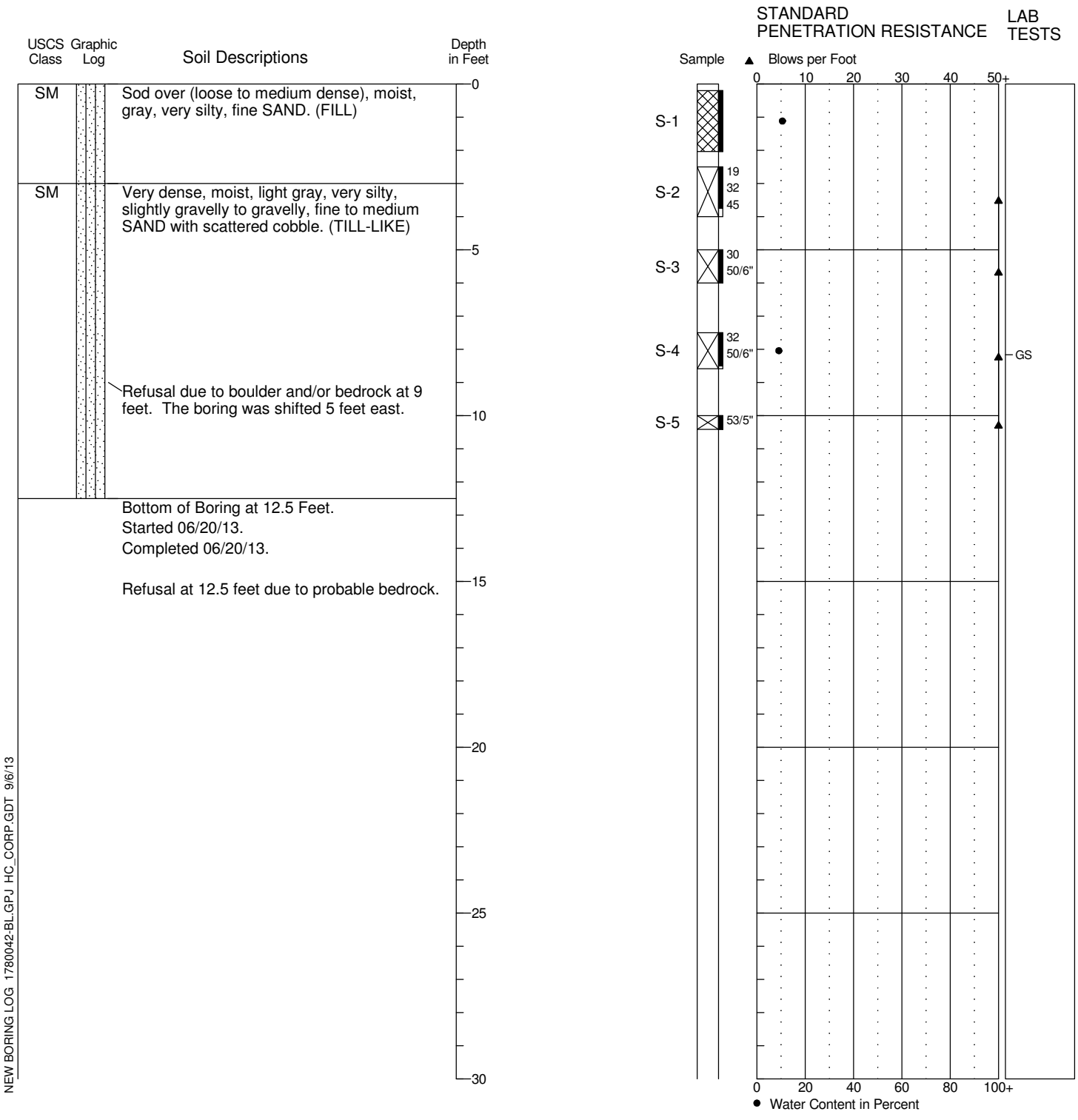
17800-42 ***6/13***

Figure A-3

Boring Log B-3

Location:
Approximate Ground Surface Elevation: 1309 Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Diedrich D-50/HSA
Hammer Type: SPT w/140 lb. Automatic Hammer
Hole Diameter: inches
Logged By: B. McDonald Reviewed By: C. Valdez



NEW BORING LOG 1780042-BL.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

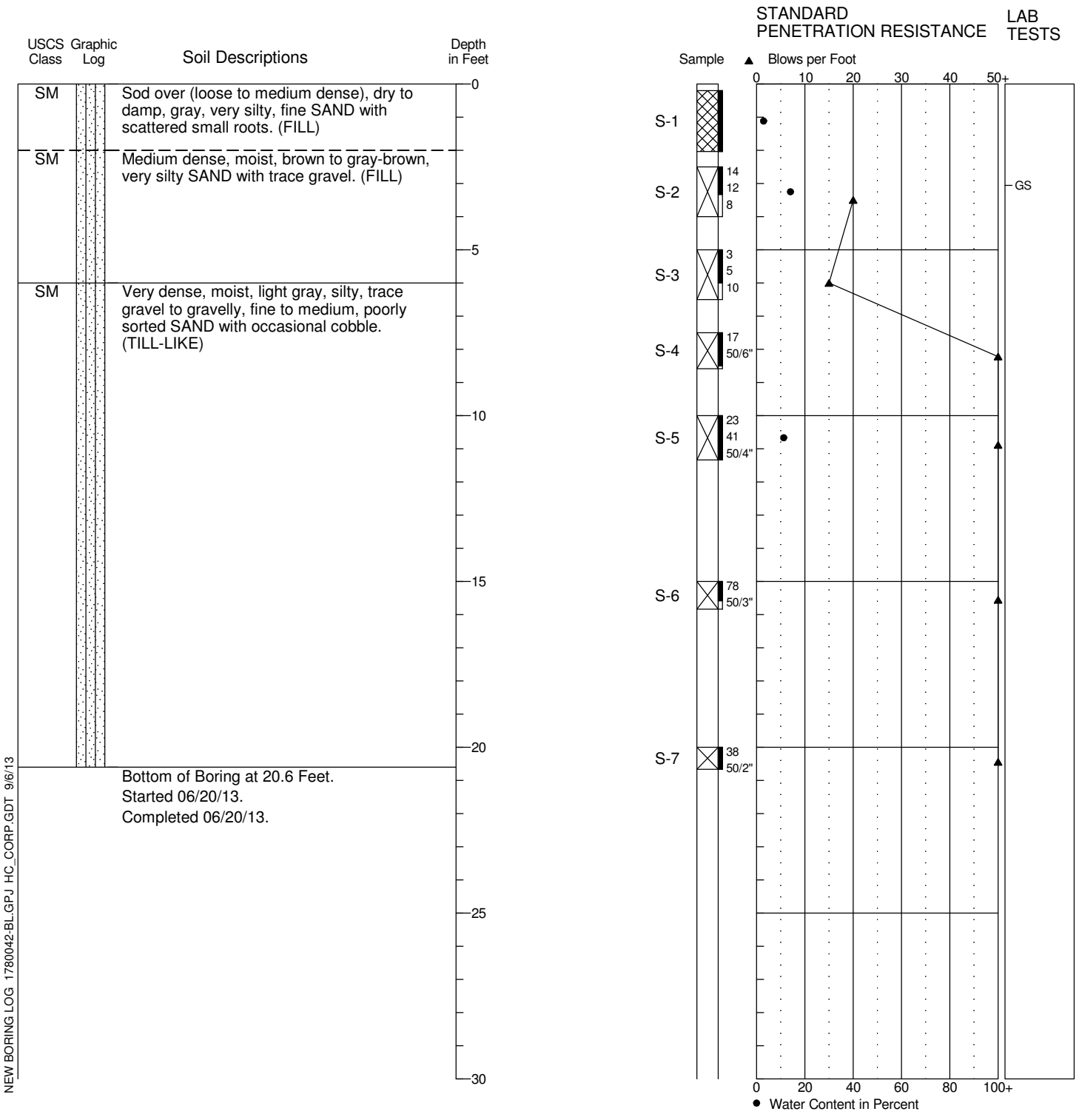
17800-42 ***6/13***

Figure A-4

Boring Log B-4

Location:
Approximate Ground Surface Elevation: 1308 Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Diedrich D-50/HSA
Hammer Type: SPT w/140 lb. Automatic Hammer
Hole Diameter: inches
Logged By: B. McDonald Reviewed By: C. Valdez



NEW BORING LOG 1780042-BL.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

17800-42 ***6/13***

Figure A-5

Test Pit Log TP- 1

Location:
Approximate Ground Surface Elevation: 1289 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
GM		Sod over (medium dense), moist, red-brown, silty, sandy GRAVEL with scattered small roots. (Bedrock and bedrock fragments)	0	S-1			
		Competent bedrock.		S-2			
		Bottom of Test Pit at 3.0 Feet. Started 06/19/13. Completed 06/19/13.	5				
		Refusal at 3.0 feet due to bedrock.	10				
			15				

Test Pit Log TP- 2

Location:
Approximate Ground Surface Elevation: 1287 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Sod over (medium stiff), moist, light gray, fine sandy SILT with trace gravel. (FILL)	0	S-1			
SM		(Medium dense), damp to moist, brown, very silty SAND with scattered gravel and cobble and construction debris. (FILL)		S-2	9		
MH		(Stiff), moist, gray, clayey SILT. (NATIVE SOIL)	5	S-3	33		
		Bottom of Test Pit at 6.0 Feet. Started 06/19/13. Completed 06/19/13.	10				
			15				

NEW TEST PIT LOG 1780042-TP.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

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17800-42 6/13

Figure A-6

Test Pit Log TP- 3

Location:
Approximate Ground Surface Elevation: 1294 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (medium dense), dry to damp, light brown-gray, silty SAND with occasional fine sandy SILT. (FILL)	0	S-1			
SM		(Loose to medium dense), moist, brown, silty to very silty, gravelly SAND with scattered small roots and occasional clayey SILT pockets. (NATIVE SOIL)	5	S-2	11		
				S-3	21		
SM		(Medium dense), moist, brown SAND and silty SAND. (NATIVE SOIL)	10	S-4			
		Bottom of Test Pit at 10.0 Feet. Started 06/19/13. Completed 06/19/13.	15				

Test Pit Log TP- 5

Location:
Approximate Ground Surface Elevation: 1307 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Import Gravel over (medium dense), damp to moist, brown, silty, gravelly SAND, weathered. (NATIVE)	0	S-1	17		
SM		(Dense), damp to moist, gray-brown, very silty, gravelly SAND with scattered boulder and cobble. (TILL-LIKE)	5	S-2	6		
		Becomes gray.		S-3	8		
		Bottom of Test Pit at 7.0 Feet. Started 06/19/13. Completed 06/19/13. Refusal at 7.0 feet due to boulders.	10 15				

NEW TEST PIT LOG 1780042-TP.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

HARTCROWSER

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Figure A-7

Test Pit Log TP- 6

Location:
Approximate Ground Surface Elevation: 1297 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (loose), moist, light gray to gray, silty SAND.	0	S-1			
SM		(Loose to medium dense), damp to moist, brown, silty SAND.		S-2			
SM		(Medium dense), damp to moist, gray, slightly gravelly, very silty SAND.		S-3	6		GS
SM		(Very dense), moist, gray-brown, silty, gravelly SAND with occasional cobble. (TILL-LIKE) Roots observed.	5	S-4	12		
		Bottom of Test Pit at 7.0 Feet. Started 06/19/13. Completed 06/19/13. Refusal at 7.0 feet due to bedrock.	10				
			15				

Test Pit Log TP- 7

Location:
Approximate Ground Surface Elevation: 1296 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (loose), damp, gray-brown, silty SAND with scattered small roots. Gravel observed.	0	S-1	22		
SM		(Very dense), moist, gray-brown, very silty, gravelly, poorly sorted SAND with occasional small roots and cobble.	5	S-2			
				S-3	23		
SM		(Very dense), moist to wet, red-brown, very silty, fine SAND.		S-4			
		Bottom of Test Pit at 9.5 Feet. Started 06/19/13. Completed 06/19/13.	10				
			15				

NEW TEST PIT LOG 1780042-TP.GPJ HC_CORP.GDT 9/6/13

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Figure A-8

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

Test Pit Log TP- 8

Location:
Approximate Ground Surface Elevation: 1267 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (loose to medium dense), damp to moist, brown, silty, fine to medium SAND with small roots. (FILL)	0	S-1	14		
SM		(Medium dense), moist to wet, gray-brown, silty, gravelly, fine to medium SAND.	5	S-2 S-3	17		
		Slight moderate seepage on top of bedrock.	ATD	S-4			
		Bottom of Test Pit at 7.0 Feet. Started 06/19/13. Completed 06/19/13.					
		Refusal at 7.0 feet due to bedrock.	10				
			15				

Test Pit Log TP- 9

Location:
Approximate Ground Surface Elevation: 1292 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (loose to medium dense), moist, brown to gray-brown, silty to very silty, trace gravel to gravelly SAND with scattered small roots. (FILL)	0	S-1	12		
		Grades to gravelly.	5	S-2			
SM		Toe of slope. Test pit excavated into fill slope above flatter existing grade and below existing flatter grade.	10	S-3	23		
		(Medium dense), moist, dark brown to gray-brown, silty SAND with scattered small roots.					
SM		(Very dense), moist, gray-brown, silty, gravelly SAND.	15	S-4			
		Bottom of Test Pit at 15.0 Feet. Started 06/19/13. Completed 06/19/13.					

NEW TEST PIT LOG 1780042-TP.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

HARTCROWSER

17800-42 6/13

Figure A-9

Test Pit Log TP-10

Location:
Approximate Ground Surface Elevation: 1307 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (loose), damp to moist, light gray, silty SAND with trace gravel and small roots and occasional cobble. (FILL)	0	S-1			
SM		(Loose to medium dense), moist, brown to dark brown, silty SAND with trace gravel and small roots. (TOPSOIL)	5	S-2			
SM/ML		(Medium stiff), damp to moist, gray-brown, fine sandy SILT and very silty, fine SAND.		S-3			
		Increased moisture content.	10				
SP-SM		(Dense), moist, gray, slightly silty, gravelly, fine to medium SAND with trace roots and scattered cobble. (TILL-LIKE)		S-4			
		Bottom of Test Pit at 11.5 Feet.					
		Started 07/22/13.					
		Completed 07/22/13.	15				

Test Pit Log TP-11

Location:
Approximate Ground Surface Elevation: 1308.5 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (loose), moist, brown to dark brown, silty SAND with trace gravel. (TOPSOIL)	0	S-1			
SM		(Dense to very dense), moist, gray, silty, very gravelly, fine to medium SAND with cobbles. (TILL-LIKE)		S-2			
SM		(Very dense), moist, gray, silty, gravelly, fine to medium SAND. (TILL-LIKE)	5	S-3			
				S-4			
		Bottom of Test Pit at 7.5 Feet.					
		Started 07/22/13.					
		Completed 07/22/13.	10				
		Refusal at 7.5 feet.					
			15				

NEW TEST PIT LOG 1780042-TP.GPJ HC_CORP.GDT 9/6/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

HARTCROWSER

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Figure A-10

Test Pit Log TP-12

Location:
Approximate Ground Surface Elevation: 1309.5 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (dense), moist, gray, silty, gravelly, fine to medium SAND. (TILL-LIKE)	0	S-1			
		Becomes (very dense).	5	S-2			
				S-3			
		Bottom of Test Pit at 7.5 Feet.					
		Started 07/22/13.					
		Completed 07/22/13.	10				
		Refusal at 7.5 feet.					
			15				

Test Pit Log TP-13

Location:
Approximate Ground Surface Elevation: 1310 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Import Gravel over (medium dense to dense), moist, gray, silty, gravelly, fine to medium SAND. (FILL)	0	S-1			
			5				
		4-inch PVC abandoned drain line and increased moisture observed.					
SM		(Very dense), moist, gray, silty, gravelly, fine to medium SAND with scattered cobble. (TILL-LIKE)		S-2			
		Bottom of Test Pit at 9.5 Feet.	10				
		Started 07/22/13.					
		Completed 07/22/13.					
		Refulas at 9.5 feet.	15				

NEW TEST PIT LOG 1780042-TP.GPJ HC_CORP.GDT 9/6/13

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Figure A-11

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

Test Pit Log TP-15

Location:
Approximate Ground Surface Elevation: 1309 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Import Gravel over (medium dense), moist, gray-brown, silty, gravelly SAND. (FILL)	0	S-1			
SM		(Medium dense), moist, brown, silty SAND with trace gravel and organic material. (TOPSOIL)		S-2			
			5				
ML		(Dense), moist, gray-brown, silty SAND to sandy SILT. (Fragmented Clasts)		S-3			
SM		(Very dense), damp to moist, silty, gravelly, fine to medium SAND with occasional cobble. (TILL-LIKE)		S-4			
		Increased moisture content.		S-5			
			10				
		Cobbles and boulders observed.		S-6			
		Bottom of Test Pit at 12.5 Feet.					
		Started 07/22/13.					
		Completed 07/22/13.					
			15				

Test Pit Log TP-17

Location:
Approximate Ground Surface Elevation: 1305 Feet
Logged By: B. McDonald Reviewed By: C. Valdez

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM		Sod over (medium dense), moist, gray-brown, silty SAND with occasional cobble and trace organic material. (FILL)	0	S-1			
SM		(Dense to very dense), moist, gray, silty, gravelly, fine to medium SAND. (TILL-LIKE)		S-2			
			5				
		Bottom of Test Pit at 8.0 Feet.					
		Started 07/22/13.					
		Completed 07/22/13.					
			10				
		Bedrock at 8 feet.					
			15				

NEW TEST PIT LOG 1780042-TP.GPJ HC_CORP.GDT 9/6/13

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1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

APPENDIX B
LABORATORY TESTING PROGRAM

APPENDIX B
LABORATORY TESTING PROGRAM

A laboratory testing program was performed for this study to evaluate the basic index and geotechnical engineering properties of the site soils. The tests performed and the procedures followed are outlined below.

Soil Classification

Field Observation and Laboratory Analysis. Soil samples from the explorations were visually classified in the field and then taken to our laboratory where the classifications were verified in a laboratory environment. Field and laboratory observations include density/consistency, moisture condition, and grain size and plasticity estimates.

The classifications of selected samples were checked by laboratory tests such as Atterberg limits determinations and grain size analyses. Classifications were made in general accordance with the Unified Soil Classification (USC) System, ASTM D 2487, as presented on Figure B-1.

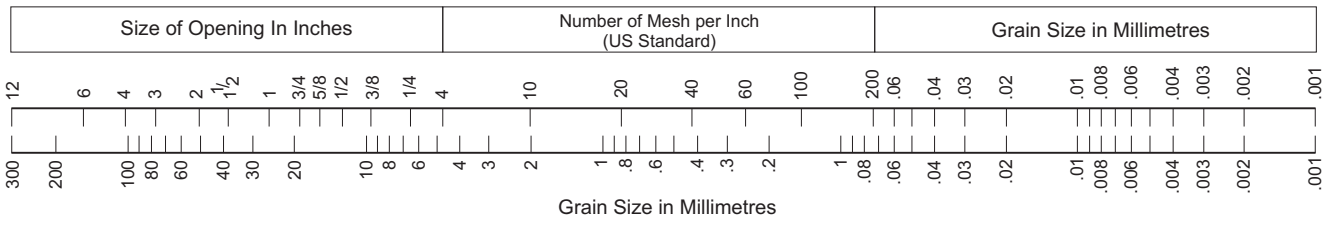
Water Content Determinations

Water contents were determined for most samples recovered in the explorations in general accordance with ASTM D 2216, as soon as possible following their arrival in our laboratory. Water contents were not determined for very small samples nor samples where large gravel contents would result in values considered unrepresentative. The results of these tests are plotted at the respective sample depth on the exploration logs. In addition, water contents are routinely determined for samples subjected to other testing. These are also presented on the exploration logs.

Grain Size Analysis (GS)

Grain size distribution was analyzed on representative samples in general accordance with ASTM D 422. Wet sieve analysis was used to determine the size distribution greater than the U.S. No. 200 mesh sieve. The size distribution for particles smaller than the No. 200 mesh sieve was determined by the hydrometer method for a selected number of samples. The results of the tests are presented as curves on Figures B-2 through B-3 plotting percent finer by weight versus grain size.

Unified Soil Classification (USC) System
Soil Grain Size



COBBLES	GRAVEL	SAND	SILT and CLAY
Coarse-Grained Soils			Fine-Grained Soils

Coarse-Grained Soils

G W	G P	G M	G C	S W	S P	S M	S C
Clean GRAVEL <5% fines		GRAVEL with >12% fines		Clean SAND <5% fines		SAND with >12% fines	
GRAVEL >50% coarse fraction larger than No. 4				SAND >50% coarse fraction smaller than No. 4			
Coarse-Grained Soils >50% larger than No. 200 sieve							

*

G W and S W $\left(\frac{D_{60}}{D_{10}}\right)$ >4 for G W, >6 for S W & $1 \leq \left(\frac{(D_{30})^2}{D_{10} \times D_{60}}\right) \leq 3$

G P and S P Clean GRAVEL or SAND not meeting requirements for G W and S W

G M and S M Atterberg limits below A line with PI <4

G C and S C Atterberg limits above A Line with PI >7

* Coarse-grained soils with percentage of fines between 5 and 12 are considered borderline cases requiring use of dual symbols.

D_{10}, D_{30}, and D_{60} are the particles diameter of which 10, 30, and 60 percent, respectively, of the soil weight are finer.

Fine-Grained Soils

M L	C L	O L	M H	C H	O H	Pt
SILT	CLAY	Organic	SILT	CLAY	Organic	Highly Organic Soils
Soils with Liquid Limit <50%			Soils with Liquid Limit >50%			
Fine-Grained Soils >50% smaller than No. 200 sieve						

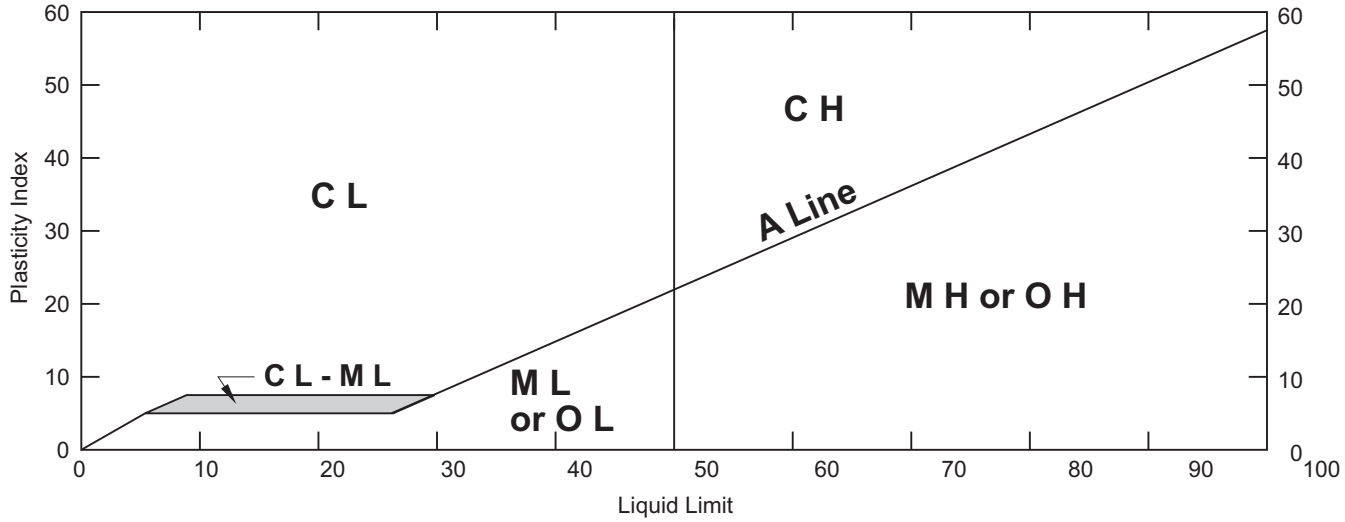


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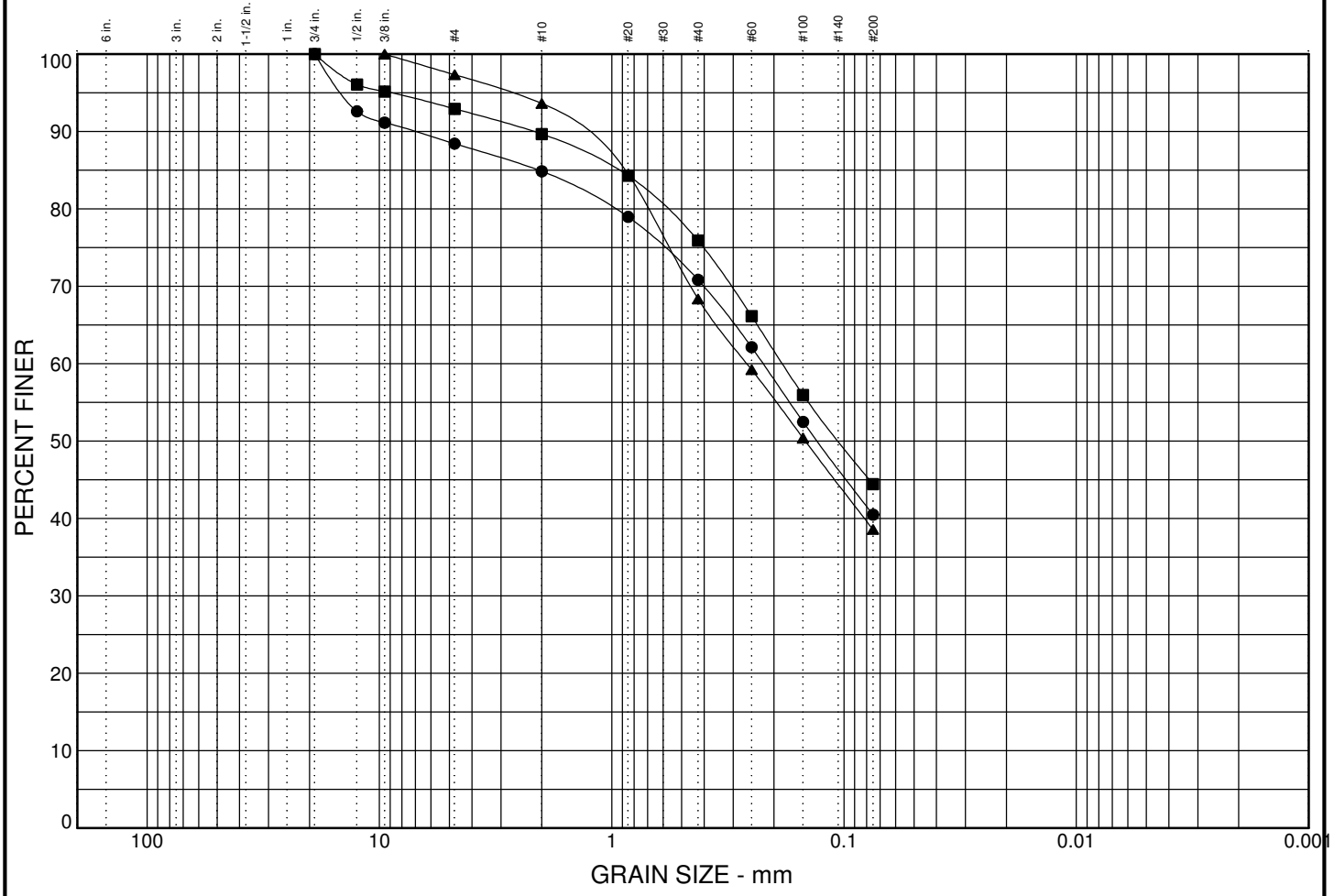
Figure B-1

SRF Grain Size (B-1).cdr 3/06

Particle Size Distribution Test Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	11.6	47.9	40.5	
■	0.0	7.1	48.5	44.4	
▲	0.0	2.7	58.8	38.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			2.069	0.223	0.13					
■			0.95	0.184	0.105					
▲			0.89	0.261	0.147					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● slightly gravelly, very silty SAND	SM	9.9%
■ slightly gravelly, very silty SAND	SM	9.1%
▲ very silty SAND, trace gravel	SM	14.0%

Remarks:

● Description and Classification based on sieve analysis only.

■ Description and Classification based on sieve analysis only.

▲ Description and Classification based on sieve analysis only.

Project: Manson High School

Client:

●	Source: B-2	Sample No.: S-2	Depth: 2.5 to 4.0
■	Source: B-3	Sample No.: S-4	Depth: 7.5 to 9.0
▲	Source: B-4	Sample No.: S-2	Depth: 2.5 to 4.0

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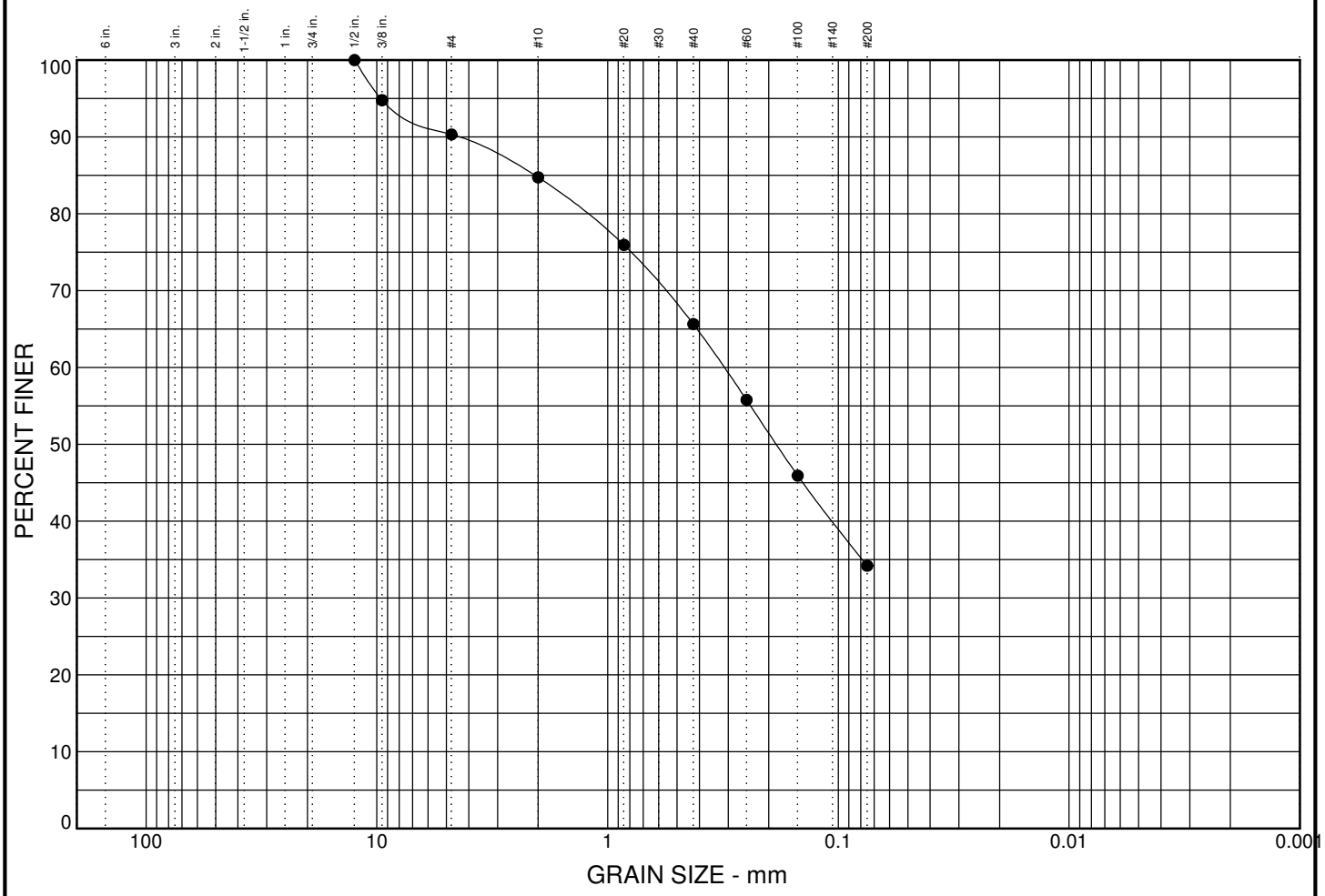
Figure B-2

GRAIN SIZE 1780042-BL.GPJ HC_CORP.GDT 8/30/13

Particle Size Distribution Test Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	9.7	56.1	34.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			2.081	0.314	0.185					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● slightly gravelly, very silty SAND	SM	6.3%

Remarks:

● Description and Classification based on sieve analysis only.

Project: Manson High School

Client:

● Source: TP-6 Sample No.: S-3 Depth: 3.0 to 4.0

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Figure B-3

GRAIN SIZE 1780042-TP.GPJ HC_CORP.GDT 8/30/13

APPENDIX C
ECOLOGY XRF DATA FROM CURRENT STUDY

APPENDIX C
ECOLOGY XRF DATA FROM CURRENT STUDY

This appendix includes Ecology's XRF test results on samples from our explorations collected June 19 and 20, 2013. The data are provided for informational purposes and are presented without technical interpretation by Hart Crowser. Hart Crowser is not responsible for the accuracy nor completeness of this information and has presented it as received.

Ecology XRF sampling from the site in 2005 is not included in this report.

Table C-1 - Ecology XRF data from June 19 and 20, 2013 Explorations

Sample ID	As	Pb	Date Analyzed
TP-1 S-1	**44**	13	20-Jun-13
TP-2 S-1	<LOD	<LOD	20-Jun-13
TP-2 S-2	**65**	238	20-Jun-13
TP-2 S-3	<LOD	14	1-Jul-13
TP-3 S-1	<LOD	38	20-Jun-13
TP-3 S-2	<LOD	30	20-Jun-13
TP-3 S-3	16	37	20-Jun-13
TP-3 S-4	14	36	20-Jun-13
TP-5 S-1	10	11	20-Jun-13
TP-5 S-2	<LOD	12	20-Jun-13
TP-5 S-3	<LOD	<LOD	1-Jul-13
TP-6 S-1	**65**	194	20-Jun-13
TP-6 S-2	**27**	<LOD	20-Jun-13
TP-6 S-3	<LOD	<LOD	20-Jun-13
TP-6 S-4	<LOD	<LOD	20-Jun-13
TP-7 S-1	**56**	28	20-Jun-13
TP-7 S-2	<LOD	<LOD	20-Jun-13
TP-7 S-3	<LOD	<LOD	20-Jun-13
TP-7 S-4	<LOD	<LOD	20-Jun-13
TP-8 S-1	16	21	20-Jun-13
TP-8 S-2	<LOD	<LOD	20-Jun-13
TP-8 S-3	<LOD	14	1-Jul-13
TP-8 S-4	<LOD	11	1-Jul-13
TP-9 S-1	**29**	94	20-Jun-13
TP-9 S-2	<LOD	17	20-Jun-13
TP-9 S-3	**34**	46	20-Jun-13
TP-9 S-4	<LOD	12	20-Jun-13
B-1 S-1	<LOD	27	20-Jun-13
B-1 S-2	<LOD	16	20-Jun-13
B-1 S-3	<LOD	<LOD	20-Jun-13
B-1 S-4	19	94	20-Jun-13
B-1 S-5	**21**	95	20-Jun-13
B-1 S-6	18	<LOD	20-Jun-13
B-1 S-7	<LOD	<LOD	20-Jun-13
B-1 S-8	<LOD	<LOD	1-Jul-13
B-1 S-9	<LOD	<LOD	1-Jul-13
B-2 S-1	<LOD	18	1-Jul-13
B-2 S-2	<LOD	12	1-Jul-13
B-2 S-3	<LOD	25	1-Jul-13
B-2 S-4	**33**	167	1-Jul-13
B-2 S-5	**32**	176	1-Jul-13
B-2 S-6	<LOD	72	1-Jul-13
B-2 S-7	<LOD	<LOD	1-Jul-13
B-2 S-8	<LOD	13	1-Jul-13
B-3 S-1	<LOD	23	1-Jul-13
B-3 S-2	<LOD	<LOD	20-Jun-13
B-3 S-3	<LOD	<LOD	20-Jun-13
B-3 S-4	<LOD	<LOD	20-Jun-13
B-3 S-5	<LOD	17	20-Jun-13
B-4 S-1	**123**	**790**	20-Jun-13
B-4 S-2	**77**	158	20-Jun-13
B-4 S-3	17	15	1-Jul-13
B-4 S-4	<LOD	44	20-Jun-13
B-4 S-5	<LOD	<LOD	20-Jun-13
B-4 S-6	<LOD	<LOD	20-Jun-13
B-4 S-7	<LOD	<LOD	1-Jul-13

Notes: Sample TP-1 S-2 was not analyzed because material consisted of large rock fragments and no soil.
TP-4 was not excavated, TP-9 was excavated as an alternative.
Some samples were re-analyzed on July 1, 2013 after drying due to high water content.
Values in **red/bold** font are above MTCA Method A of 20 mg/kg for arsenic (As) and above 250 mg/kg for lead (Pb).
<LOD - Below level of detection.

APPENDIX D
ATHLETIC COMPLEX PHASING PLANS

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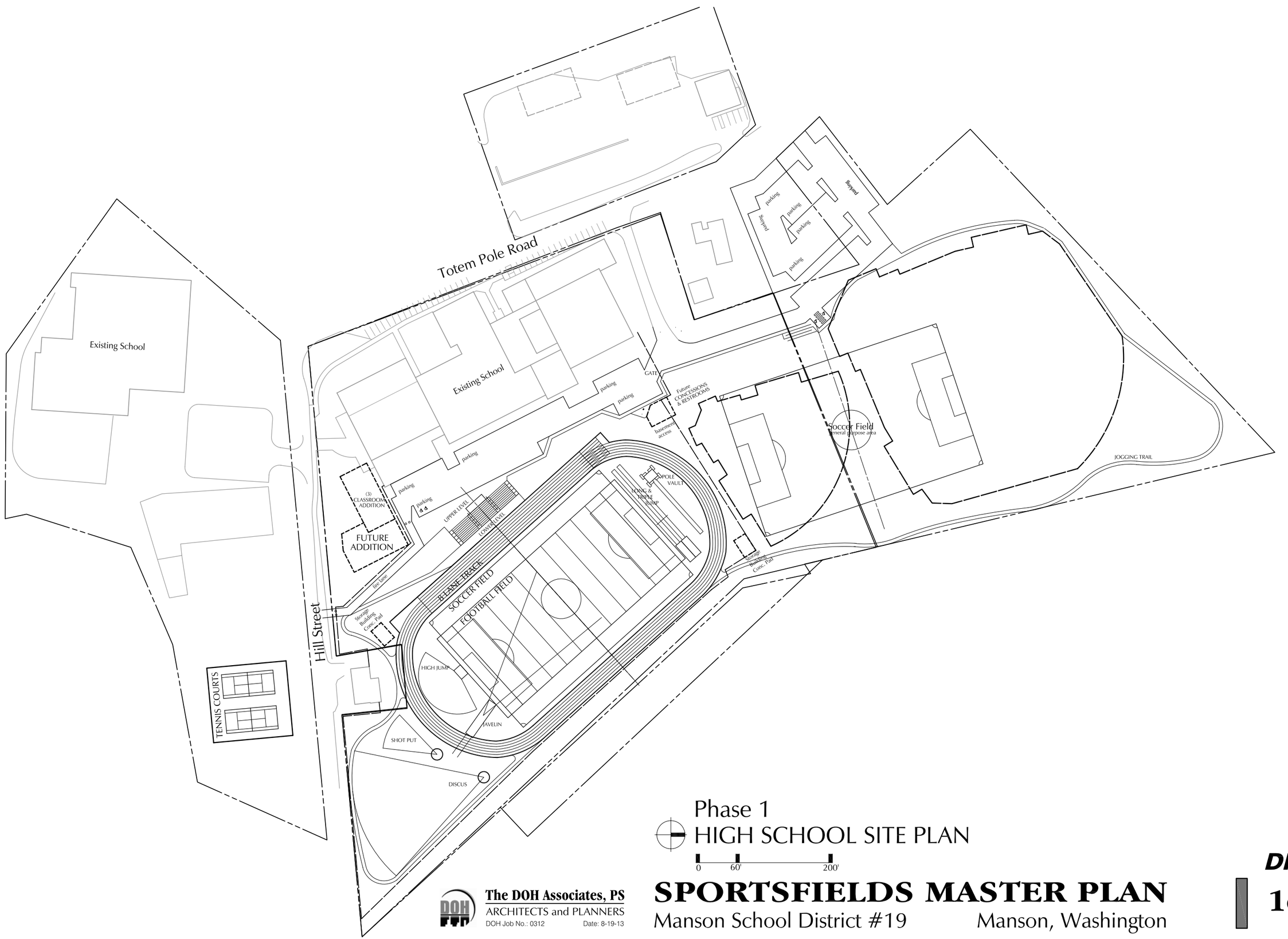
ATHLETIC COMPLEX PHASING PLANS

This appendix includes The DOH Associates athletic complex layouts for different phases. This information is based on their discussion with the District and phasing priorities the District communicated to them in August 2013. Phase 1 represents the expected lowest-cost layout, Phase 2 represents an intermediate cost layout, and Phase 3 represents the expected highest-cost layout. The data are provided for informational purposes and are presented without technical interpretation by Hart Crowser. Hart Crowser is not responsible for the accuracy or completeness of this information and has presented it as received.



Phase 1

HIGH SCHOOL SITE PLAN

0 60' 200'

The DOH Associates, PS
ARCHITECTS and PLANNERS
DOH Job No.: 0312 Date: 8-19-13

SPORTSFIELDS MASTER PLAN

Manson School District #19 Manson, Washington

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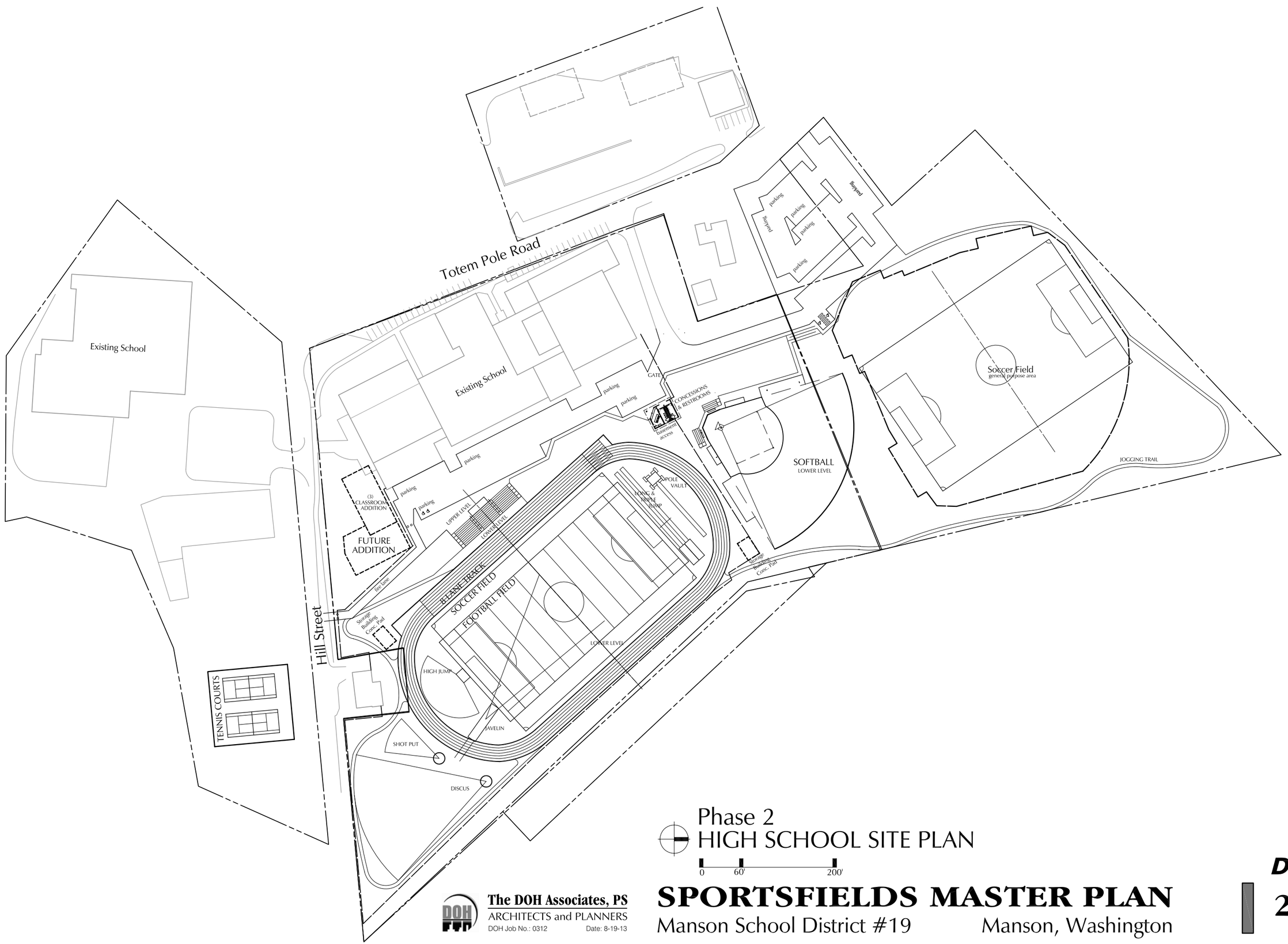

Phase 2
HIGH SCHOOL SITE PLAN

0 60' 200'

The DOH Associates, PS
ARCHITECTS and PLANNERS
DOH Job No.: 0312 Date: 8-19-13

SPORTSFIELDS MASTER PLAN

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Totem Pole Road

Existing School

Existing School

TENNIS COURTS

Runyard

parking

optional parking

UPPER LEVEL

LOWER LEVEL

BASEBALL
future layout

300'

385'

JOGGING TRAIL

300'

SOFTBALL
LOWER LEVEL

BATTING CAGES

Storage Buildings Conc. Pad

parking

parking

parking

parking

GATE

CONCESSIONS & RESTROOMS

Basement access

(3) CLASSROOM ADDITION

FUTURE ADDITION

UPPER LEVEL

LOWER LEVEL

POLE VAULT

LONG & TRIPLE JUMP

BEANE TRACK

SOCCER FIELD

FOOTBALL FIELD

LOWER LEVEL

HIGH JUMP

JAVELIN

SHOT PUT

DISCUS

Hill Street

FUTURE PRE-SCHOOL

Phase 3
HIGH SCHOOL SITE PLAN

0 60' 200'

The DOH Associates, PS
ARCHITECTS and PLANNERS
DOH Job No.: 0312 Date: 8-19-13

SPORTSFIELDS MASTER PLAN

Manson School District #19 Manson, Washington

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