Geotechnical Recommendations - Access Roadway Repair

Copalis Rock Lane & Copalis Rock Upper Lane

PW10-2659

October 20, 2010

1] In-situ soils comprise predominantly of Silty Clayey Loam and are generally susceptible to distortion and deformation when wet.

2] Based on visible damage to existing roadway it is apparent that the southerly side of the roadway has suffered settlement and lateral deformation under traffic activity.

3] This means that underlaying subgrade soil has suffered some level of mechanical deterioration that has significantly reduce the soils' ability to resist load.

4] Repair will require the removal of the existing asphalt surfacing from a point just upgrade of the start of the cracking and settlement damaged area down to the lower junction where the water line has recently been installed.

5] The repair will also require the overexcavation and removal of the "damaged" soil to sufficient depth to expose a fresh and competent subgrade. We estimate [and recommend] that the overexcavation depth should be a minimum of three feet below the existing pavement surface elevation, and that it encompass, at a minimum, the damaged half of the roadway alignment.

6] Overexcavation and removal to the same depth should also extend out into the adjacent shoulder for a distance of no less than five feet beyond the edge of the existing asphalt. [This should help stabilize the less competent side of the roadway and help avoid the potential for another lateral shear failure, like the one that has recently occurred, from re-occurring].

7] The excavation exposed subgrade should then be redensified. This may be achieved by having a mechanical vibratory steel wheel, or sheepsfoot, compactor making a minimum of three passes over the subgrade. [One pass is considered to be a passage of the compactor in both directions, forwards and backwards, over the same strip of subgrade.] This

redensification process should enhance the competency of the subgrade soils to a depth of about two feet below the subgrade elevation. This redensification process should also be extended out over the northerly and undamaged side of the subgrade too. [Note: if the redensification process begins to pump moisture up to the subgrade surface the vibratory component of the compactor should be shut off and only the compactor's dead weight used.]

8] Once satisfactorily redensified the subgrade should be overlain with one of the following geotextiles, or an equivalent approved by the geotechnical engineer in writing, to act as a separating layer that will help prevent subgrade soil and granular backfill from intermixing, and as a filtration layer that will allow free passage of moisture but will prevent sediment movement. It is CRUCIAL that the geotextile be installed in strict accordance with the manufacturer's specifications.

- ACE Geosynthetics, Inc., ACE GT300/300 PP
- Carthage Mills FS-40HS
- Fiberweb Typar 3401 NW-PP-t
- Maccaferri Inc., MacTex MX180
- Propex Geosynthetics Geotex 601
- SKAPS Industries GE-180
- TenCate Geosynthetics Mirafi 140N
- Thrace-LINQ Inc., 140EX

9] Once the geotextile has been installed the excavated subgrade area should be backfilled with a coarse, angular, two inch minus crushed rock which should be thoroughly compacted-in-place [with the vibratory steel wheel compactor]. The crushed rock should have a minimum 22-inch compacted thickness.

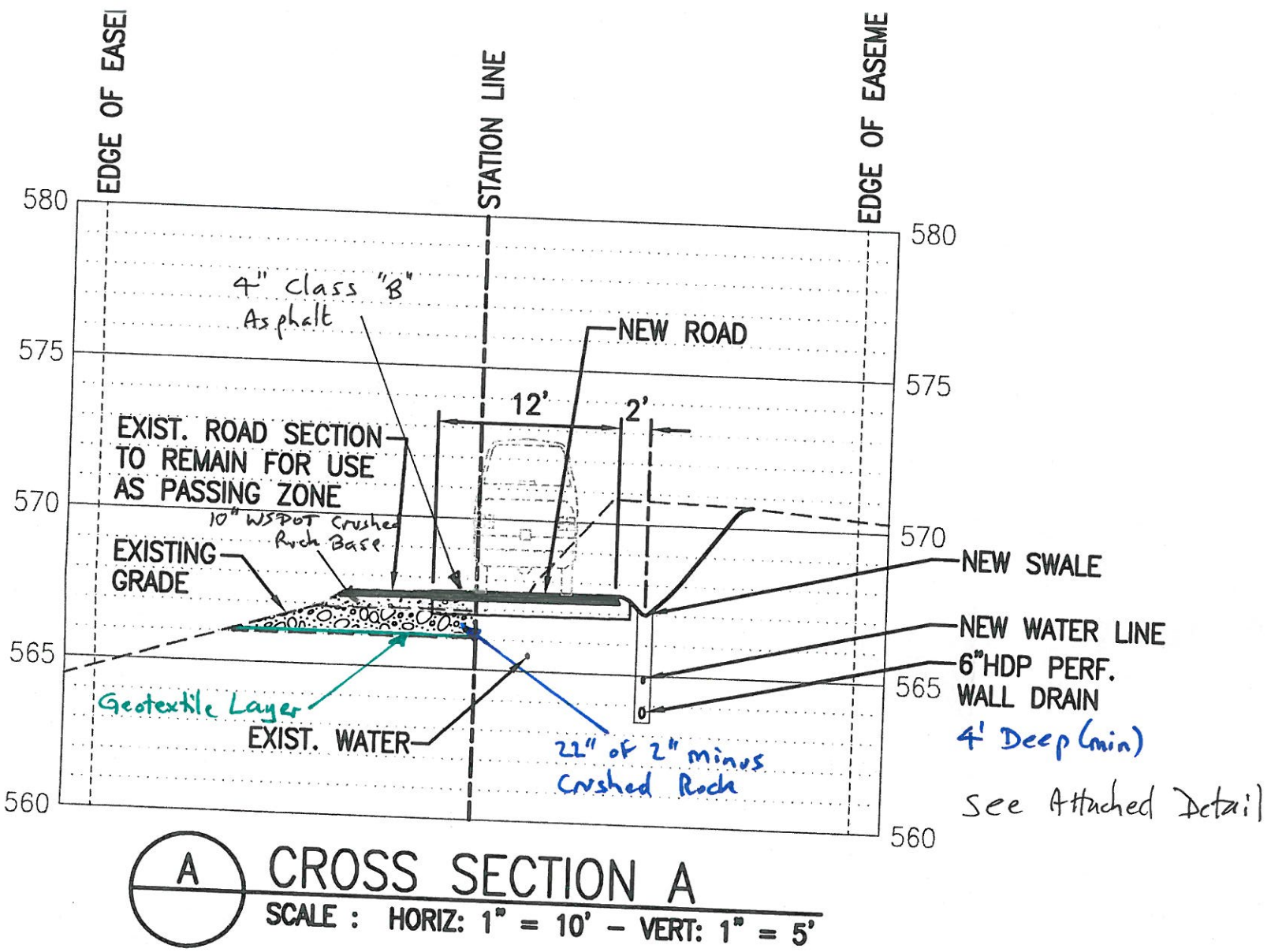
10] Then a minimum of ten (10) inches [compacted thickness] of crushed rock base material should be placed and compacted over the crushed rock. This material should meet the requirements of Section 9-03.9(3) Crushed Surfacing - Base Course of the 2006 edition of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction. The gradation of this material is as follows:

Sieve Size	Base Course
1-1/4"	100
1"	80 - 100
5/8"	50 - 80
U.S. No. 4	25 - 45
U.S. No. 40	3 - 18
U.S. No. 200	7.5 max.
% Fracture	75 min.
Sand Equivalent	40 min.

11] When the base course material has been satisfactorily compacted-in-place and provides a firm, competent and unyielding surface the final Class B asphalt surfacing layer should be placed. The Class B asphalt layer should have a minimum four inch compacted thickness.

12] In addition to the above, we also recommend incorporating the new water line trench into a cut-off interceptor drain trench. The trench should have a minimum invert depth of one foot below the maximum depth of roadway overexcavation, or approximately four feet in this case. The bottom of the trench should be covered with three to four inches of one inch minus washed rock and a perforated, smooth-walled, plastic drain pipe should be set on this material with the perforations facing downwards. The pipe should then be surrounded by, and covered with the washed rock which should be extended back to within about six inches of the ground surface. [If desired, to help prevent sediment loss into the washed rock over time as a result of subsurface seepage inflow, the trench may also be lined with a layer of geotextile selected from the above list.]

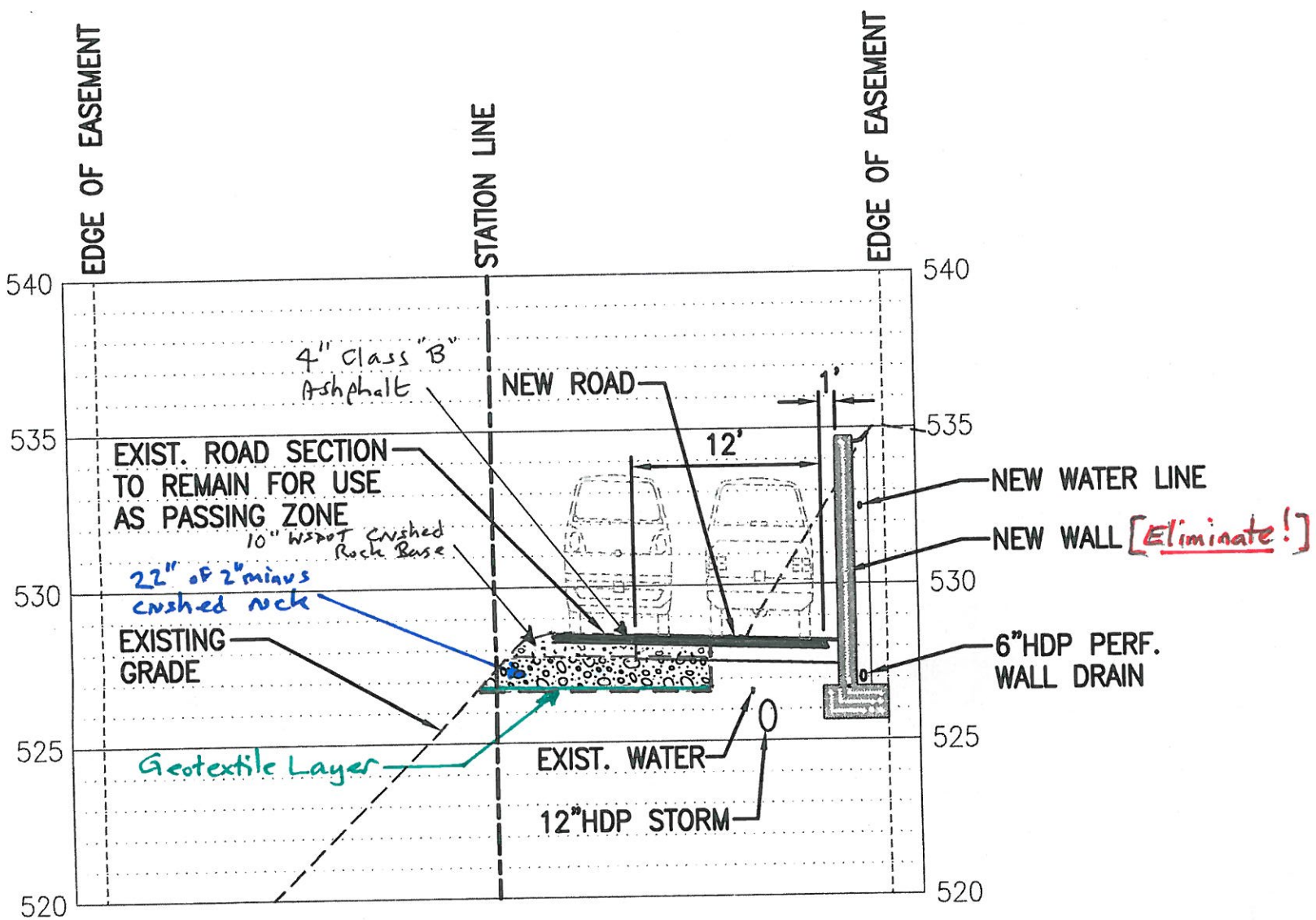
13] The drain pipe should be installed with sufficient gradient to initiate gravity flow to the bottom of the roadway [towards the beach] where it should be connected to a tightline that will transport the collected water to the beach for discharge under control.



A CROSS SECTION A

SCALE : HORIZ: 1" = 10' – VERT: 1" = 5'

R LINE AND 6"HDP

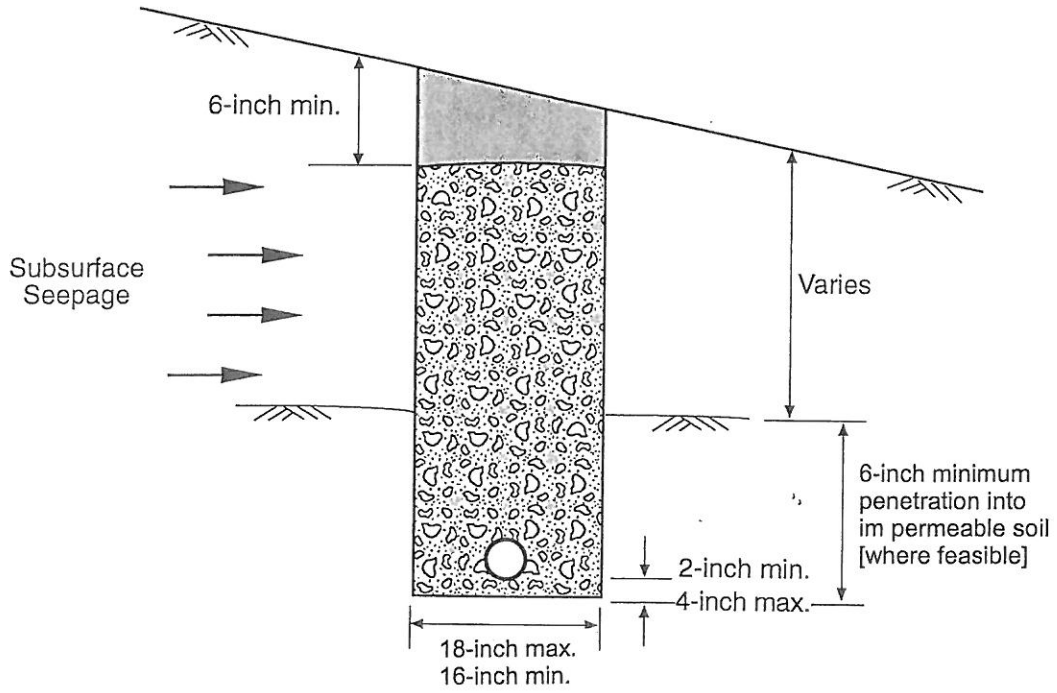


B CROSS SECTION B

SCALE : HORIZ: 1" = 10' – VERT: 1" = 5'

12"HDP STORM DRAIN LINE (TIGHTLINE)

Schematic Only - Not to Scale



LEGEND

Surface Seal of Impermeable Soil

Gravel Backfill for Drains: 2006 edition of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction; Section 9-03.12(4).

Sieve Size	Percentage Passing
1 inch	100
3/4 inch	80 - 100
3/8 inch	0 - 40
#4 mesh	0 - 4
#200 mesh	0 - 2

6-inch minimum diameter, perforated or slotted, smooth-walled, rigid PVC or other rigid pipe material laid with perforations facing downwards, tight jointed, and with sufficient gradient to initiate gravity flow. Connect by means of an unperforated tight line to a positive, permanent, discharge system such as a storm drain catch basin. Do NOT use flexible, corrugated, pipe.

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TYPICAL SECTION - INTERCEPTOR DRAIN

Plate