APPENDIX L
OPEN SPACE DESIGN STANDARDS FOR THE BAYFRONT REDEVELOPMENT

JERSEY CITY, NJ

Prepared for

Honeywell

115 Tabor Road
Morris Plains, New Jersey 07950

Prepared by

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Wood Environment & Infrastructure Solutions, Inc.
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Hamilton, New Jersey 08619

JUNE 2013
ISSUED FOR CONSTRUCTION
REVISED JANUARY 2021

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JANUARY 2021
REVISION 1

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1.0 INTRODUCTION

1.1 APPLICABILITY

A. Federal Court Orders. These Open Space Design Standards (OSDS) have been adopted pursuant to two federal court orders. These orders are formally titled the *Second Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North ("Study Area 6 North Consent Decree")* ECF No. XXX (DATE) and the *Second Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 South ("Study Area 6 South Consent Decree")* ECF No. XXX (DATE). Both orders have been entered by the United States District Court for the District of New Jersey in consolidated litigation referred to as *Jersey City Municipal Utilities Authority et al. v. Honeywell International Inc.,* Civ. No. 05-5955 (also consolidated with *Interfaith Community Organization v. Honeywell International Inc*., Civ. No. 95-2097). The court orders provide for the remediation of chromium contamination, through the installation of an engineered cap, and for the development of open space parks over the cap. The court orders also require the establishment of Open Space Design Standards that protect the integrity of the Chromium Remedy.

B. Central Park and Promenade. The OSDS apply to the open spaces known as "Central Park" and "Promenade" in the Bayfront Redevelopment Plan and collectively referred to as the Open Spaces Areas. Concept architectural renderings for the Open Spaces (or Open Space Areas) are provided in the Bayfront Redevelopment Plan (dated February 13, 2008). The Bayfront Redevelopment Plan was adopted by the City of Jersey City Planning Board on March 12, 2008. The approximately 100-acre Bayfront Redevelopment Plan envisions a mixed-use, new urbanism development readily accessible to mass transportation and consisting of residential, commercial, retail, professional office, institutional and integrated recreational land use. Recreational open space use totals approximately 25 acres of park space including Central Park (~11 acres) and the Promenade (~8 acre) (see Figure 1). These Open Space Design Standards do not apply to any other open or green space in the Bayfront Redevelopment Plan.

C. Compliance Required. Compliance with the OSDS is required by the federal court orders, and is mandatory for all planning, development, and maintenance of the Open Space Areas regardless of when undertaken.

Under the Study Area 6 North and Study Area 6 South Consent Decrees, the OSDS may be developed in phases. The standards contained herein may be supplemented in the future with additional standards.

Compliance with the OSDS does not replace the obligation to comply with all applicable Jersey City standards, requirements, and ordinances. Compliance with the OSDS is required in addition to compliance with all applicable Jersey City standards, requirements, and ordinances.

D. Protection of Chromium Remedy. The OSDS set forth requirements intended to protect the Chromium Remedy as it was engineered and installed as described in the 100% Design. All Permissible Development Elements must satisfy these standards, the Consent Decrees, and the conservation restrictions for the Open Space Areas (ECF Nos. 249 and 363 in Civ, No. 05-5955). However, the standards are not intended to restrict the selection and variety of Permissible Development Elements. For example, these standards do not require selection of a particular style of lighting fixture. A variety of lighting fixtures may be selected as long as the fixtures satisfy the requirements of these standards, such as those regarding bearing pressure.

E. Organization. Section 1 identifies the pertinent legal and regulatory documents governing the OSDS and provides some background information on relevant aspects of the Chromium Remedy. Section 2 establishes specific criteria for the Permissible Development described in the Consent Decrees. Section 3 provides criteria governing the documentation of development undertaken in the Open Space Areas.

F. References to Consent Decrees. Notwithstanding differences in details of the Study Area 6 North and Study Area 6 South Open Space Area remedies, the requirements related to the OSDS are identical between the two Consent Decrees. The paragraph numbering for specific sections differs between the two documents. For example, "Prohibited Development" is described in Paragraph 60(j) for Study Area 6 North and 74(j) for Study Area 6 South. For the purposes of this document the requirements will be referenced to the numbering used in the Study Area 6 North Consent Decree. Unless specifically noted, that requirement is deemed to apply to the corresponding paragraph in the Study Area 6 South Consent Decree.

Attachment A provides a cross reference of the relevant paragraph numbering from the two Consent Decrees.

1.2 DEFINITIONS

Terms used in the OSDS have the meanings set forth in the Study Area 6 North and Study Area 6 South Consent Decrees, and the definitions set forth therein are incorporated into the OSDS by reference. In addition, the following definitions apply to these OSDS:

1. **100% Design** shall mean the standard to which the Chromium Remedy will be monitored, maintained, repaired or replaced as necessary under the Consent Decree as set forth in the Construction Completion Reports for Study Area 6 North (ECF 1527-1532) and for Study Area 6 South (ECF 1518-1525). Pursuant to the Consent Orders entering the Construction Completion Reports into the record in the federal court (ECF 1543, 1552), the Construction Completion Reports supersede and become the 100% Design. Unless otherwise specifically noted, references herein to Technical Specifications are to those that are set forth in the Construction Completion Reports.
2. **Bayfront Redevelopment Plan** shall mean the development plan adopted by Jersey City on March 12, 2008. The Redevelopment Plan is available at the Jersey City Free Public Library and is also available at https://data.jerseycitynj.gov/pages/home/.
3. **Bedding Material** shall mean the granular soil (sand or crushed stone) placed beneath the utility or structure.
4. **Canopy** shall mean the total area comprised of the drip-line diameter of the trees.
5. **Cap** shall mean the base protective layer, an impervious geomembrane liner; a geocomposite drainage layer, a filter fabric and a distinctive colored warning layer with markings in English and Spanish as described in the 100% Design. The geocomposite drainage layer also serves as the warning layer.
6. **City Engineer** shall mean the Office of the City Engineer for the City of Jersey City.

7. **Consent Decree(s)** shall mean the Second Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North (Study Area 6 North Consent Decree)(ECF No. XXXX) and/or the Second Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 South (Study Area 6 South Consent Decree)(ECF No. XXXX), which were both entered by the United States District Court for the District of New Jersey on [DATE] in the Consolidated Litigation , as defined in the Consent Decrees, in civil docket 95-2097.
8. **Court or Federal Court** shall mean the United States District Court for the District of New Jersey.
9. **Development Plan** shall mean the plan required by the Study Area 6 North Consent Decree Paragraph 60(j)(vi) and the Study Area 6 South Consent Decree Paragraph 74(j)(vi).
10. **Excavation** shall mean any digging activity including plant installation and plant maintenance activities. See also the definition of Intrusive Excavation.
11. **Fill** shall mean the soils or other fill material above the Warning Layer/Liner. The term Fill shall also mean soil and vice versa.
12. **Final Development Grade** shall mean the site surface grades shown in the As-Built drawings created as of the conclusion of the Initial Development Period as set forth in Sections 2.1.3 and 3.1.
13. **Fill Depth** shall mean the Fill or soil depths above the Warning Layer/Liner as set forth in Figures 4 B through D, and G through I, but no greater than the maximum Fill or soil depths set forth in Section 2.1.3.A.
14. **Furnishings** shall mean pedestrian benches, trash receptacles, bollards, kiosks, bus stop sheds, bicycle racks, decorative fencing, signs or other permanent fixtures or amenities.
15. **Geocomposite Drainage Layer Cover Soil** shall mean the nominal 12-inch protective soil cover immediately above the Geocomposite Drainage Layer.
16. **Hardscape Areas** shall mean those areas of the Open Space Areas that are not Roadways or Landscaped Acreage.

17. **Honeywell Groundwater Treatment Plant** shall mean the groundwater treatment plant maintained and operated by Honeywell pursuant to the Deep Overburden and Bedrock Groundwater Remedies Consent Order, which was entered by the United States District Court for the District of New Jersey in *Interfaith Community Organization v. Honeywell International Inc.*, Civ. No. 95-2097 (consolidated with Civ. Nos. 05-5955, 05-5993, and 06-22) ECF No. 898 (September 3, 2008).

18. **Initial Development** shall mean the development undertaken pursuant to paragraph 60(j) (ii) of the Study Area 6 North Consent Decree and paragraph 74(j) (ii) of the Study Area 6 South Consent Decree.

19. **Initial Development Period** shall mean the period defined in paragraph 60(j) (ii) of the Study Area 6 North Consent Decree and paragraph 74(j) (ii) of the Study Area 6 South Consent Decree.

20. **Intrusive Excavation** shall mean any excavation one foot or greater in depth from the ground surface or any excavation within one foot of the Warning Layer/Liner, except for hand-digging unless hand-digging comes within one foot of the Warning Layer/Liner.

21. **Landscape Element** shall mean an individual landscape item, such as a tree or shrub.

22. **Landscaped Acreage** shall mean the total acreage of the Open Space Area devoted to landscaping.

23. **Landscaped Area** shall mean any area included in the Landscaped Acreage.

24. **Liner** shall mean the geomembrane liner component of the Cap. For purposes of the OSDS, the Warning Layer is deemed to have the same elevation as the Liner.

25. **Maintenance Equipment** shall mean vehicles that are permitted in the Landscape and Hardscape Areas based on compliance with the ground pressure requirements set forth in Section 2.1.4.D.

26. **Master Intrusive Excavation Plan** shall mean the plan required by Section 2.1.1.F.

27. **Open Space Area(s)** shall mean the Area of Concern (AOC) 1 Open Space Area as defined in the Study Area 6 North Consent Decree and referred to as "Central Park" in the Bayfront Redevelopment Plan and the Open Space

AOC as defined in the Study Area 6 South Consent Decree and referred to as the "Promenade" in the Bayfront Redevelopment Plan.

28. **Pedestrian Thoroughfare/Way** shall mean the paved walkway that runs from Kellogg Street in the south to the Transit Plaza in the north as shown on page 64 of the Bayfront Redevelopment Plan (Exhibit 7).

29. **Perimeter Hydraulic Barrier** shall mean the walls that form the borders of the Open Space Areas which consist of the Soil/Cement/Bentonite Walls on the south side of the Study Area 6 North Open Space Area and the north side of the Study Area 6 South Open Space Area and the Steel Sheetpile walls on the remaining sides of the Open Space Areas.

30. **Permissible Development** shall mean those items that are permitted under Paragraph 60(k) of the Study Area 6 North Consent Decree and 74(k) of the Study Area 6 South Consent Decree.

31. **Permissible Development Element** shall mean an individual Permissible Development item other than a Landscape Element, such as a single recreational facility or a single streetlight.

32. **Prohibited Development** shall mean that development which is prohibited by Paragraph 60(j) of the Study Area 6 North Consent Decree or Paragraph 74(j) of the Study Area 6 South Consent Decree.

33. **Root Barrier** shall mean a woven polypropylene geotextile similar or equal to Belton Industries 1104.

34. **Root Barrier Horizon C Soils** shall mean the first 6 inches of Horizon C soils directly above the Root Barrier that are compacted as required by Section 2.1.2.D.3. These soils are included as part of the layer of Horizon C Soils set forth in Technical Specification 02315 of the 100% Design and Drawings CN301 and C301 attached as Exhibit 8 but are not identified or labeled in those materials as Root Barrier Horizon C Soils.

35. **Roadway** shall mean the road and its associated curbing. Permanent Roadway shall mean the roads depicted on page 39 of the Bayfront Redevelopment Plan (Exhibit 7).

36. **Warning Layer** shall mean the clearly visible, distinctive colored layer with both English and Spanish warning labels as required by Paragraph 56(a) of the Study Area 6 North Consent Decree or Paragraph 65(a) of the Study Area

6 South Consent Decree. For purposes of the OSDS the Warning Layer is deemed to have the same elevation as the Liner.

1.3 GOVERNING DOCUMENTS

The following documents shall also be consulted and considered in the planning, development, construction, and maintenance of the Open Space Areas:

A. **The Study Area 6 North and Study Area 6 South Consent Decrees.** Both decrees were entered by the United States District Court for the District of New Jersey in Civ. No. 95-2097 in the Consolidated Litigation as defined by the Consent Decrees. The Consent Decrees are entitled: *Second Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North* (ECF No. XXX, DATE) and *Second Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 South* (ECF No. XXX, DATE). The Consent Decrees are available from Honeywell and the Federal Court.

B. **The Chromium Remedy as set forth in the Construction Completion Reports.** Honeywell has prepared and filed with the Court a Study Area 6 South Construction Completion Report (ECF 1518-1525), Study Area 6 North Construction Completion Report (ECF 1527-1532), Study Area 6 South Shallow Groundwater Report supplement to the CCR (ECF 1647-2), and Study Area 6 North TA10-1 Excavation Report supplement to the CCR (ECF 1647-1). The Consent Orders entering the Construction Completion Reports for Study Area 6 North (ECF 1543) and for Study Area 6 South (ECF 1552), as amended by the Consent Order Amending The Consent Orders Entering The Study Areas 6 North And South Construction Completion Reports (ECF 1543 And 1552) And Entering Supplemental Construction Completion Reports (ECF 1654), explain that the Construction Completion Reports supersede and become the 100% Design and set the standard to which the Chromium Remedy will be monitored, maintained, repaired or replaced as necessary under the Consent Decrees. The Construction Completion Reports and supplements thereto for the Chromium Remedy are available from Honeywell, the Federal Court, the City Engineer for Jersey City, and the Jersey City Free Public Library.

C. **The Bayfront Redevelopment Plan** approved March 12, 2008, and specifically Section 4 Mobility and Section 6 Landscape Plan. This plan is

available from Honeywell, the City Engineer and the Jersey City Redevelopment Agency. Numerous provisions of the Consent Decrees and institutional control documents, including these OSDS, specifically reference the Bayfront Redevelopment Plan approved March 12, 2008. While it is anticipated that Jersey City may in the future amend the Bayfront Redevelopment Plan, no such amendment shall modify any term or condition of these OSDS, except as set forth in paragraph 60 of the Study Area 6 North Consent Decree. If a future amendment to the Bayfront Redevelopment Plan is expected to result in a proposal to deviate from a term or condition of the Consent Decrees or these Open Space Design Standards, such matters shall be set forth in the Development Plan and Open Space Design Standards submission by Honeywell pursuant to paragraph 60(j)(vi) and (vii) of the Consent Decree for review, comment, and approval pursuant to the terms of this Consent Decree, including approval by the Court if necessary, pursuant to paragraph 60 of the Study Area 6 North Consent Decree.

D. **The Open Space Design Standards**. Additional Open Space Design Standards may be developed in conjunction with the preparation of the Development Plans for the Initial Development of each Open Space Area. Such additional standards will be incorporated into these standards and re-published as an amendment to the 100% Design. The OSDS as modified are available from Honeywell, the Federal Court and the City Engineer.

E. **The Conservation Restrictions**. Pursuant to the Consent Decrees, a conservation restriction was recorded for each of the Open Space Areas. The conservation restrictions were entered as orders of the Court, ECF Nos. 249 and 363. An amended conservation restriction has been recorded on Study Area 6 North Open Space Area on January 16, 2019 and entered as an Order of the Court on June 26, 2019, ECF No. 1621. In the future, after the remediation of an area known as the Bulkhead Deferred Area, an amended conservation restriction for the Study Area 6 South Open Space Area will be recorded on the property and submitted to the Court for entry as an Order of the Court.

1.4 GENERAL DESCRIPTION OF THE CHROMIUM REMEDIES

The Chromium Remedies for the Open Space Areas consist of the following general components described in this section. For more specific design details, consult the

100% Design for each respective Chromium Remedy. A schematic of the Chromium Remedy is shown in Figure 2.

In general, the Chromium Remedies consist of two components.

- Soil Remedy
    - Resource Conservation and Recovery Act (RCRA) Cap
- Shallow Groundwater Remedy
    - Perimeter Hydraulic Barrier
    - Pump and Treat contingent system, which consists of:
        - Groundwater recovery wells
        - Paired piezometers to measure conformance with the negative gradient requirement stipulated in the Consent Decree
        - Utilities in the form of electrical and instrumentation wiring and discharge piping

A schematic of the cap system detail is shown in Figure 3.

Figure 2: Chromium Remedy Schematic

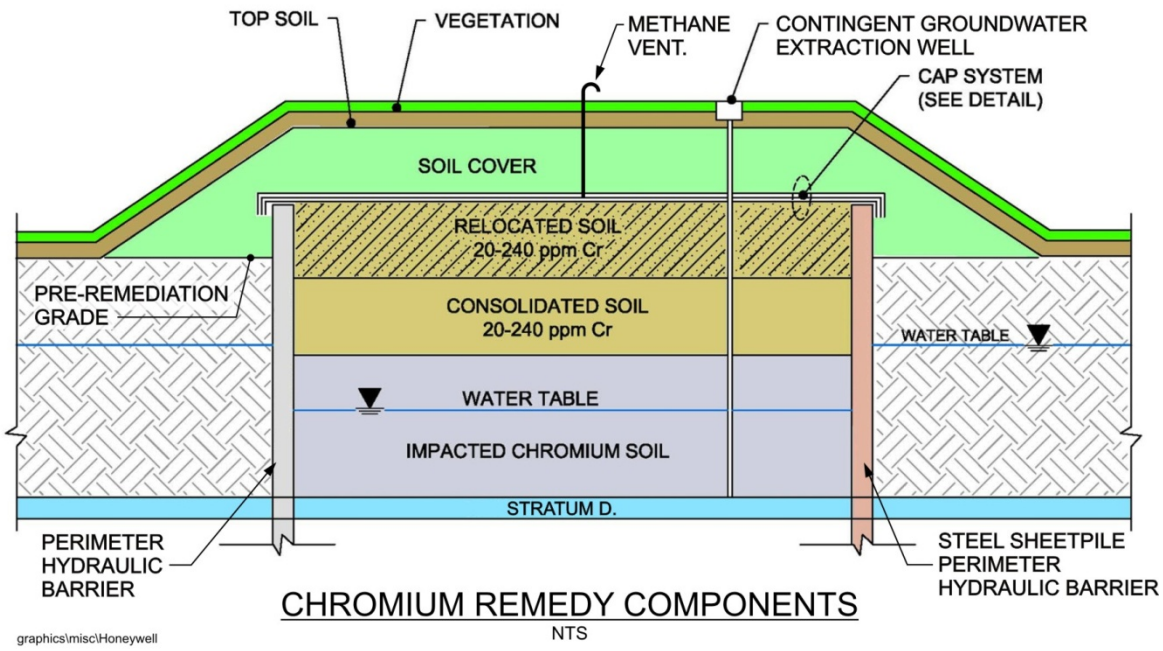
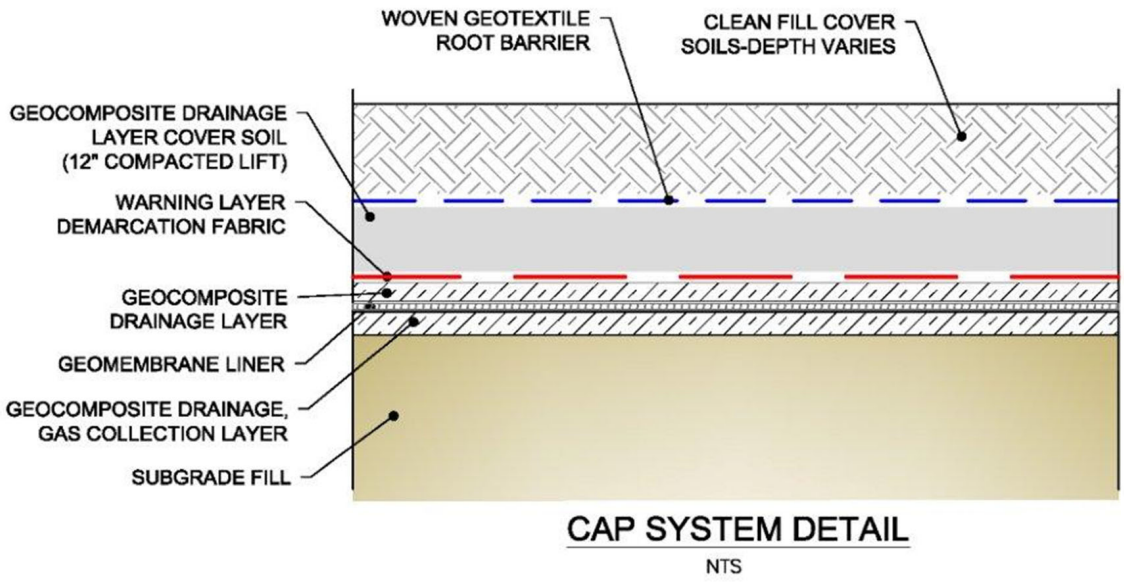


Figure 3: Cap System Detail



1.5 PERMISSIBLE DEVELOPMENT AND OPEN SPACE AREA USES

The Bayfront Redevelopment Plan incorporates two major parks to be developed over the Chromium Remedies in the Open Space Areas. Pursuant to the Study Area 6 North Consent Decree and the Study Area 6 South Consent Decree, the Open Space Areas may include any or all of the following types of development features or facilities, **provided that such features satisfy the conditions set forth in the design criteria contained in Section 2:**

(i) roads and pedestrian thoroughfares-- both crossing and running along the Open Space areas, but no more extensive than provided for in Page 39 of the Bayfront Redevelopment Plan (Exhibit 7). Any proposal to deviate from the page 39 diagram of the Redevelopment Plan for roads and pedestrian thoroughfares shall be set forth in the Development Plan and OSDS submission by Honeywell pursuant to paragraph 60(j)(vi) and (vii) of the Consent Decree for review, comment, and approval, including approval by the Court if necessary.

(ii) surface transit -- provided that these OSDS have been amended pursuant to the Consent Decree requirements to address surface transit as set forth below in this Section and provided that surface transit shall not extend

beyond the limits of the roadways allowed by these OSDS and paragraph 60(k)(i) of the Consent Decree;

(iii) curbing and fences;

(iv) sidewalks, paths, walkways, and nature trails;

(v) utilities and utility corridors, lighting and restrooms;

(vi) irrigation or sprinkler components or systems;

(vii) water features;

(viii) above ground storm water cisterns;

(ix) signs, including signs informing visitors of the history of chromium production, contamination, and remediation;

(x) benches, trash receptacles, and bicycle racks;

(xi) recreational facilities, such as playground equipment, bocce ball courts, tennis courts, basketball courts, and athletic fields, and

(xii) landscaping, including natural grasses, small trees, shrubbery, and potted plants, provided that such landscaping, and the anticipated root structure of each landscaping component do not and will not jeopardize the integrity of the Chromium Remedy.

Pursuant to Consent Decree paragraph 60(k), surface transit may be a permissible development of the Open Space Areas, but such use and development was not considered in the development of these OSDS, and standards for surface transit development are not included in these OSDS. Unless and until amended, these OSDS allow for only the types of development listed in (i), (iii)-(xii) in this section. Surface transit development in the Open Space Areas is not permitted until design standards specific to surface transit, that satisfy the requirements of the paragraph 60(j) of the Consent Decree, are established pursuant to the Consent Decree and these OSDS are amended to incorporate such design standards for surface transit and entered with the Court. Surface transit shall not extend beyond the limits of the proposed roadways allowed by these OSDS and paragraph 60(k) of the Consent Decree.

Other uses of the Open Space Areas are expressly prohibited. All Permissible Development must comply with the Open Space Design Standards set forth in Section 2.

2.0 STANDARDS

The Consent Decrees include specific requirements for protection of the Cap that are expressly incorporated into the Open Space Design Standards as follows:

- Paragraph 60 of the Study Area 6 North Consent Decree sets out the framework for requirements intended to protect the chromium remedy.
- Paragraph 56 of the Study Area 6 North Consent Decree defines the minimum standards for cap components and thickness of cover soils.
- The Consent Decrees recognize that certain types of development are not compatible with the RCRA-type cap. Paragraph 60(j) of the Study Area 6 North Consent Decree addresses Prohibited Development and establishes specific criteria for the Permissible Development and defines acceptable types of development features or facilities.
- Seventy five percent (75%) of the Open Space Area exclusive of the acreage used for roads and the pedestrian thoroughfare shall be comprised of landscaping as defined in Paragraph 60(k) (xi) of the Study Area 6 North Consent Decree.

These Consent Decree requirements, and the corresponding requirements in the Study Area 6 South Consent Decree, are expressly incorporated into the OSDS and must be complied with in the development of the Open Space Areas. This section provides additional requirements which must be met in future development of the Open Space Areas.

2.1 STANDARDS APPLICABLE TO ALL PERMISSIBLE DEVELOPMENT

2.1.1 Excavations and Protection of the Cap from Penetrations

A. Protection of the Cap. Except as provided in this section, the Cap shall not be intentionally penetrated or breached. If breached, all repairs of the Cap shall be conducted in accordance with the 100% Design Technical Specifications Section 02372, Cap Geomembrane Liner, Paragraph 3.07, and sub-paragraphs G – H.

B. Protection of the Perimeter Hydraulic Barrier. No Permitted Development Element shall penetrate, breach, or impair the Perimeter Hydraulic

Barrier, unless measures designed to maintain the integrity of the Perimeter Hydraulic Barrier have been certified by a licensed New Jersey Professional Engineer and incorporated into a Development Plan which has been reviewed and approved by the Special Master or the Federal Court. No penetration or breach shall be certified or approved unless it is demonstrated that the designed measures shall maintain the integrity of the Perimeter Hydraulic Barrier and shall not jeopardize the integrity of the Chromium Remedy.

C. General Prohibition on Excavation Except in Compliance with OSDS. Excavation is prohibited in the Open Space Areas, except to the extent necessary to construct, install, repair, inspect, or otherwise maintain Permissible Development and the Chromium Remedies. Excavation in the Open Space Areas is permitted only if in compliance with these Standards.

D. Criteria for Excavation. To the extent that Excavation is required, the following criteria apply:

1. Machine excavation is prohibited within one foot of the Warning Layer/Liner. Soft digging methods shall be used within one foot of the Warning Layer/Liner. Soft digging methods include hand excavation and use of equipment such as air knives.
2. Use of augers for excavation, including for planting, is prohibited.
3. In any excavation in Roadways, the Roadway and its underlying Fill shall be re-established to pre-excavation conditions.
4. In any excavation in Landscaped Areas, compliance with Section 2.2.9 is also required.
5. In any excavation in Landscaped and Hardscape Areas, reasonable effort shall be made to minimize the mixing of the various soil types and follow the last out/first in principle where the last soils excavated are the first soils returned to the excavation so that the Fill is replaced in the same layering as depicted in the 100% Design and the Final Development Grade. In all instances where applicable, the Root Barrier Horizon C Soils shall be repaired as required by Section 2.1.1.D.9.
6. The Root Barrier Horizon C Soils shall not be intentionally penetrated when installing any Landscape Element. In the event of penetration, the Root

Barrier and Root Barrier Horizon C Soils shall be repaired as required by Section 2.1.1.D.9 before installation of the Landscape Element.

7. The Root Barrier and Warning Layer may be penetrated if necessary to conduct inspections or repairs to the Cap. Upon completion of the inspection or repair, the breach or penetration of the Warning Layer/Liner shall be repaired to meet the requirements of the 100% Design and the breach or penetration of the Root Barrier Horizon C Soils, Root Barrier, and Geocomposite Drainage Layer Cover Soils shall be repaired as required by Section 2.1.1.D.9.
8. In the event of an unplanned breach or penetration of the Root Barrier, Warning Layer or Liner, notice shall be given of such breach to Honeywell and Jersey City within 24 hours. The breach or penetration of the Warning Layer/Liner shall be repaired to meet the requirements of the 100% Design and the breach or penetration of the Root Barrier Horizon C Soils, Root Barrier, and Geocomposite Drainage Layer Cover Soils shall be repaired as required by Section 2.1.1.D.9.
9. All repairs to the Root Barrier Horizon C Soils, the Root Barrier and the Geocomposite Drainage Layer Cover Soils shall comply with the Master Intrusive Excavation Plan requirements developed pursuant to Section 2.1.1.F.2.
10. A licensed New Jersey Professional Engineer shall certify to Honeywell and Jersey City all repairs to the Warning Layer and/or Cap.

E. Criteria for Intrusive Excavation. To the extent that Intrusive Excavation is required, the following criteria apply:

1. The criteria set forth in Section 2.1.1.D.
2. The criteria set forth in the Master Intrusive Excavation Plan to the extent applicable to the particular excavation.
3. Before any Intrusive Excavation, except in cases of emergencies, an entity that intends to excavate in the Open Space Areas shall prepare a Specific Intrusive Excavation Plan to supplement the Master Intrusive Excavation Plan. The Specific Intrusive Excavation Plan shall be approved by a licensed New Jersey Professional Engineer and submitted to Honeywell and

Jersey City. The Specific Intrusive Excavation Plan shall contain a Hazard Analysis check list of items considered critical to the Chromium Remedy including, but not limited to:

a. Type of utility to be repaired or other work to be completed.

b. Contact New Jersey One Call.

c. Review of Record Drawings and the OSDS.

d. Depth to the invert of the utility.

e. Depth to the Warning Layer/Liner at the proposed repair location.

f. Guidance to workers regarding the requirement for soft digging methods such as hand excavation or use of equipment such as air knives within 12 inches of the Warning Layer/Liner.

4. A licensed New Jersey Professional Engineer shall be onsite to observe any Intrusive Excavation within one foot of the Warning Layer/Liner.

5. Notice of each Intrusive Excavation, and a copy of the Specific Intrusive Excavation Plan, shall be provided to Honeywell and/or Jersey City for approval at least 5 business days in advance of any planned excavation and as soon as practicable with respect to any emergency excavation.

6. The Hazard Analysis shall be reviewed with all workers associated with the task prior to excavation.

F. Master Intrusive Excavation Plan. Before any Intrusive Excavation takes place in the Open Space Areas or prior to the submission of the first Development Plan, whichever occurs first, Honeywell shall prepare a Master Intrusive Excavation Plan. The Master Intrusive Excavation Plan shall meet the requirements of this paragraph.

1. The Master Intrusive Excavation Plan shall include the following general requirements:

a. General methods for conducting Intrusive Excavation;

b. Types of precautions that may need to be taken to protect the Warning Layer/Liner;

c. The requirements for the repair of the Root Barrier Horizon C Soils, Root Barrier, Geocomposite Drainage Layer Cover Soils and Warning Layer/Liner;

d. Procedures to be implemented in the event of an unplanned breach or damage to the Root Barrier Horizon C Soils, Root Barrier, Warning Layer/Liner;

e. Procedures to be implemented in the event of an emergency excavation.

2. The Master Intrusive Excavation Plan shall require the following for all repairs and restoration of the Root Barrier Horizon C Soils, Root Barrier, and Geocomposite Drainage Layer Cover Soils:

   a. The Root Barrier shall be repaired in a manner designed to restore its barrier qualities using accepted engineering practices;

   b. The Root Barrier Horizon C Soils and the Geocomposite Drainage Layer Cover Soils shall be re-established to the depth required by the 100% Design and compacted as follows depending on the size of the excavated area:

      i. When the size of the excavated area is 1000 square feet or less, the Root Barrier Horizon C Soils and the Geocomposite Drainage Layer Cover Soils shall be repaired using accepted engineering practices to attempt to achieve a compaction equivalent to 90% maximum dry density as determined in accordance with ASTM D 698 (Standard Proctor); and

      ii. When the size of the excavated area is greater than 1000 square feet, the Root Barrier Horizon C Soils and the Geocomposite Drainage Layer Cover Soils shall be repaired to 90% maximum dry density as determined in accordance with ASTM D 698 (Standard Proctor). A field density test shall be conducted at least once per 2,500 square feet or any part thereof and such repair shall be certified by a licensed New Jersey Professional Engineer;

3. The Master Intrusive Excavation Plan shall include an appendix for each utility in the Open Space Areas. Honeywell shall have each utility prepare an appendix to the Master Intrusive Excavation Plan which shall set forth

the general methods for conducting excavation in the vicinity of the particular utility and the types of precautions that may need to be taken to protect the utility. The appendix shall be approved by a licensed New Jersey Professional Engineer. In conjunction with the preparation of the As-Built Documentation required by Section 3.1, the appendix shall be updated to include utility locations.

4. The Master Intrusive Excavation Plan and its appendices shall be reviewed at least every 5 years and updated as needed.

5. The Master Intrusive Excavation Plan, including all of the appendices required by Section 2.1.1.F.3 above, shall be provided to those utilities and other entities that may need to excavate in the Open Space Areas and shall be made available from the City Engineer and the Honeywell Groundwater Treatment Plant. Anytime the Master Intrusive Excavation Plan and/or its appendices are updated, the updated version shall be provided to those utilities and other entities that may need to excavate in the Open Space Areas and shall be made available from the City Engineer and the Honeywell Groundwater Treatment Plant.

2.1.2 Restrictions on the Use and Placement of Fill

A. Fill Composition. Imported Fill shall be clean natural soil that is free of contamination, meets New Jersey Department of Environmental Protection (NJDEP) Technical Requirements pursuant to 7:26E 5.2(d), and has a hexavalent chromium concentration of 1 milligram per kilogram or less. Treated soils or other recycled materials imported from off-site sources are prohibited.

B. Fill Placement. All Fill shall be placed in conformance with Technical Specifications 2315 and 2374 of the 100% Design.

C. Stockpiling. Small stockpiles of less than 10 feet in height and less than 2 weeks in duration shall be allowed without prior approval or certification. Any stockpiling in excess of 10 feet in height or longer than 2 weeks in duration shall be subject to the approval of Honeywell and Jersey City based upon the certification of a licensed New Jersey Professional Engineer that the size and duration of any proposed stockpiling will not jeopardize the integrity of the Chromium Remedy or potentially affected infrastructure including but not limited to the Jersey City Municipal Utilities Authority 72-inch force main. The certification and approval

must be included with a Development Plan during the Initial Development Period. Subsequent to the Initial Development Period, the certification and approval is required but need not be submitted with a Development Plan.

D. Specific Requirements for Fill Soils in Landscape Areas. Fill soils in the Landscape Areas shall be placed in separate lifts as set forth below:

1. Soil Horizon A – Topsoil shall have a minimum depth of 6 inches. Topsoil shall be placed over the Horizon B and/or C soils to Final Development Grade. Topsoil shall be natural, friable, fertile loam, fine sandy loam or sandy loam with an organic matter content of 3.5% - 6% by weight and a pH range of 5.0 – 6.5.
2. Soil Horizon B – Horizon B soils shall only be used in areas where the total depth of Horizon A and C soils exceeds 24 inches above the Root Barrier. Horizon B soils of specified depths are required for the planting of all Landscape Elements as set forth in Section 2.2.9. Horizon B soils shall be a uniform sandy loam having the following properties: Sandy loam classification having 80% sand, ≤ 10% silt, 10% clay (by weight), a pH range of 5.5 – 7.0, and organic matter (by weight) of 1.5-3.5%.
3. Soil Horizon C – A maximum of 18 inches of Horizon C soils shall be placed immediately above the Root Barrier. The first 6 inches of Horizon C soils above the Root Barrier shall be compacted to a minimum 90% maximum dry density as determined in accordance with ASTM D 698 (Standard Proctor) Horizon C soil shall consist of uniform sandy loam having the following properties: Sandy loam classification with 70-80% sand, ≤ 10% silt, 15-20% clay (by weight), a pH range of 5.0 – 7.5, and organic matter (by weight) of 1% max.
4. Horizon A, B, & C soils shall be handled dry of optimum moisture to reduce the risk of over compaction. Compaction testing will be conducted on these soils prior to placement to determine placement criteria specific to the soil source.
5. Horizon A, B, & C soils shall be placed with low ground pressure equipment as set forth in Technical Specifications 2315 and 2374 of the 100% Design.
6. Soil Horizons B and C shall be blended by scarification (tilling) to a depth of 3 inches prior to the placement of the next layer, if the compaction of the prior

horizon has created a layer at the surface of the horizon that would not be conducive to healthy root growths.

E. Fill in Roadways. The portion of the road subgrade above the Geocomposite Drainage Layer Cover Soils shall meet the requirements in Section 2.2.1.A.2.B. These standards address the material and preparation requirements for the portion of the road subgrade above the Geocomposite Drainage Layer Cover Soils. The requirements for the materials and preparation of the portion of the road subgrade below the Cap, including the Geocomposite Drainage Layer Cover Soils, are in the 100% Design.

F. Fill Soils in Hardscape Areas. Fill in Hardscape Areas shall have a minimum depth of at least 24 inches from the surface to the Warning Layer/Liner, including the Geocomposite Drainage Layer Cover Soils.

2.1.3 Final Development Grading

A. Final Development Grade. The Open Space Areas Final Development Grading shall provide for the minimum soil depths shown in Figures 4 B-D and G-I, but no greater soil depths than two (2) feet above the soil depths shown in Figures 4 B-D and G-I unless a licensed New Jersey Professional Engineer has certified that the soil depths will not jeopardize the integrity of the Chromium Remedy or potentially affected infrastructure. After the Initial Development Period, such certification shall accompany any notice submitted under paragraph 60(j) (x) of the Study Area 6 North Consent Decree or paragraph 74(j) (x) of the Study Area 6 South Consent Decree to the extent that such notice relates to a proposed change in soil depths.

B. Regrading Plan. Any regrading of soils shall be conducted pursuant to a soil regrading plan that:

1. Is designed to maximize the reuse of soils from the prior grade and provides for the segregation and re-establishment of required soil horizons; and
2. Sets out the sequence of work for reaching the Final Development Grade.

C. Positive Surface Drainage. In all cases, the Open Space Areas must be graded to maintain positive surface drainage.

2.1.4 Bearing Pressure, Vehicle Load Limits and Bearing Areas

A. Incremental Bearing Pressure Limits. Except with regard to water features, each Permissible Development Element shall be designed to limit the incremental bearing pressure from its foundation load on the Liner to 1000 pounds per square foot as compared to the surrounding area, unless a greater incremental bearing pressure has been expressly certified as protective of the Cap by a licensed New Jersey Professional Engineer and subsequently approved by the Special Master or the Federal Court. No greater incremental bearing pressure shall be certified or approved unless it is demonstrated that the load imposed by the Permissible Development Element will not jeopardize the integrity of the Chromium Remedy. This limit on incremental bearing pressure on the Liner does not apply to loading due to vehicles. All vehicles, including Maintenance Equipment shall comply with the load limits set forth in Section 2.1.4.C for vehicles and Section 2.1.4.D for Maintenance Equipment.

B. Water Feature Load Limits. Water feature size and weight shall be structurally controlled so as to not cause loads greater than the equivalent soil mass imposed in the Final Development Grade. If higher loads are proposed, a licensed New Jersey Professional Engineer shall certify that the loads will not jeopardize the integrity of the Chromium Remedy, and such certification must be included in a Development Plan reviewed and approved by the Special Master or the Federal Court.

C. Vehicle Load Limits. There is no load limit on automobile and truck traffic on permanent Roadways, provided that permanent Roadways are constructed pursuant to Section 2.2.1.A and through trucks are prohibited pursuant to Jersey City ordinance as set forth in Section 2.2.1.A.8. Automobile and truck traffic is limited to Roadways except that trucks are permitted on temporary roads provided that they comply with the load limits specified in Subsection D.

D. Maintenance Equipment on Landscape Areas, Vehicles on Temporary Roadways. Maintence Equipment is permitted on the Landscape Acreage and the Hardscape Areas in compliance with the following limits. Maintenance Equipment shall comply with the load limits specified in Table 1.

Table 1: Allowable Ground Pressure versus Fill Depth

Maximum Ground Pressure	**Fill Depth Over Warning Layer/Liner**
Maximum Ground Pressure for Maintenance Equipment	
< 5 psi	12 inches
5-10 psi	18 inches
>10-40 psi	24 inches
Additional Maximum Ground Pressure for Temporary Roads	
Fully Loaded Highway Truck (>40-80 psi)	36 inches
Permanent Roadways	
No maximum ground pressure limit	36 inches

The load limits on temporary roads and on Landscape and Hardscape Areas allow for heavier loads where a rigid pavement or temporary load spreading system such as matts is used to spread the load and reduce the bearing pressures to below the limits specified in Table 1, and where a licensed New Jersey Professional Engineer has certified to Honeywell and Jersey City that the rigid pavement or temporary load spreading system will reduce the bearing pressures to below the limits specified in Table 1.

E. Bearing Area – Foundations, Footers and Separation from Cap

1. Each point load from a Permissible Development Element shall have a minimum bearing area of 2 square feet except that traffic light poles and street light poles shall have a minimum bearing area of 3.5 square feet.
2. Each Permissible Development Element requiring a footer shall have a shallow footer.
3. Anchoring systems for Permissible Development Elements such as site furnishings shall be designed for surface mounting on spread footings. Hardscape areas shall accommodate surface mounted anchoring on spread footings.

4. Restroom facilities shall be constructed on insulated matt foundations or spread footings or other equivalent foundations to reduce bearing pressures and counter frost penetration.

5. Use of driven posts for fencing or other purposes is prohibited unless it has been expressly certified by a licensed New Jersey Professional Engineer that the driven posts will not penetrate the Root Barrier Horizon C Soils and will not jeopardize the integrity of the Chromium Remedy and it has been subsequently approved by the Special Master or the Federal Court.

6. The use of stakes for activities such as erosion control fabrics or temporary snow fence will be subject to certification and approval of the City Engineer. Prior to granting approval the City Engineer must certify that the use of stakes will not jeopardize the integrity of the Chromium Remedy. In no case will the length of stake be greater than the depth from the ground surface to the Root Barrier less 6 inches in order to prevent penetration of the Root Barrier Horizon C Soils.

7. There shall be two feet of soil or more between the Warning Layer/Liner and the lowest elevation of the bedding for any footings and/or foundations.

2.2 SPECIFIC STANDARDS FOR PARTICULAR TYPES OF PERMISSIBLE DEVELOPMENT

2.2.1 Roads and Hardscape Areas

A. Permanent Vehicular Roadways. The following requirements apply to all Permanent Roadways:

1. For all Roadways, these standards address the material and preparation requirements for the portion of the road subgrade above the Geocomposite Drainage Layer Cover Soils. The requirements for the materials and preparation of the portion of the road subgrade below the Cap, including the Geocomposite Drainage Layer Cover Soils, are in the 100% Design.

2. The surface of all Roadways shall be a minimum of 3 feet above the Warning Layer/Liner. The three-foot minimum shall be comprised of the following layers:

    a. The Geocomposite Drainage Layer Cover Soils installed pursuant to the 100% Design which has a nominal depth of 12 inches;

b. A layer of Structural Fill for Use Under Roadways which satisfies Technical Specification 2315 of the 100% Design. This layer shall have a minimum depth of 6 inches and shall be placed immediately above the Geocomposite Drainage Layer Cover Soils. This layer shall be compacted to 95% maximum dry density as determined in accordance with ASTM D 698 (Standard Proctor); and

c. A three-layer flexible pavement system which shall include an aggregate base course, a dense graded asphalt course and an asphalt wearing course. The three-layer flexible pavement system shall be placed immediately above the Structural Fill for Use Under Roadways in the order of the courses listed. The three-layer flexible pavement system shall have a total minimum depth of 18 inches. The materials used in the three-layer flexible pavement system shall satisfy the requirements of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction. Each course of the three-layer flexible pavement system shall be prepared and installed to satisfy the requirements of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction and the City of Jersey City Design Standards for Roadways.

3. Alternative pavement designs may be acceptable provided that (a) the alternative design meets the requirements of Section 1.1.C, (b) obtains all requisite Jersey City approvals, and (c) a licensed New Jersey Professional Engineer certifies that the alternative design will not jeopardize the integrity of the Chromium Remedy and provides equal or better subgrade and utility protection as the three-layer flexible pavement system defined in this subparagraph. Such alternative design and certification shall be included in a Development Plan that is reviewed and approved by the Special Master or Federal Court during the Initial Development Period. After the Initial Development Period, such certification shall accompany any notice submitted under paragraph 60(j)(x) of the Study Area 6 North Consent Decree or paragraph 74(j)(x) of the Study Area 6 South Consent Decree. In the event that an approved alternate pavement system is less than 18 inches in depth, the depth of the Structural Fill for Use Under Roadways must be increased so that the minimum depth between the surface of the Roadway and the Warning Layer/Liner is 3 feet or more.

4. Any improvement, new construction, expansion, and/or modification of the roadway to the east of the Open Space Areas, currently known as Route 440, that would result in any part of that roadway (as opposed to the Frontage Street currently shown on the Bayfront Redevelopment Plan at page 39) coming within the boundaries of one or more of the Open Space Areas shall:

    a. Comply with the requirements of Paragraphs 60 of the Study Area 6 North Consent Decree and Paragraph 74 of the Study Area 6 South Consent Decree;

    b. Meet or exceed the requirements of this Section 2.2.1.A;

    c. Meet the requirements of Section 1.1.C, and obtain all requisite Jersey City approvals;

    d. Have a design certified by a licensed New Jersey Professional Engineer who shall certify that the design will not jeopardize the integrity of the Chromium Remedy and provides equal or better subgrade and utility protection as the three-layer flexible pavement system defined in Section 2.2.1.A.2. Such design and certification shall be included in a Development Plan that is reviewed and approved by the Special Master or Federal Court during the Initial Development Period. After the Initial Development Period, such certification shall accompany any notice submitted under paragraph 60(j) (x) of the Study Area 6 North Consent Decree or paragraph 74(j) (x) of the Study Area 6 South Consent Decree.

5. All Roadways shall be designed to meet the City of Jersey City Design Standards (Figure 6). By way of illustration only, typical cross sections illustrating allowable pavement and landscape concepts for Third Avenue and Stegman Boulevard are shown in Figure 7.

6. Roadways shall be limited to the locations designated for Roadways on the as-built drawings titled, "Structural Fill Under Roadways, North Cap," dated December 15, 2016 and "Structural Fill Under Roadways, South Cap," dated December 15, 2016 provided in the respective CCRs and attached to these OSDS as Exhibit 9. In addition, the potential locations of utilities outside of roadways can be seen by the depression of contour lines on the as-built drawings titled, "North Cap Geomembrane Grading Plan," dated November 16, 2016 and [South Cap] "Geomembrane Grading Plan," dated February 11,

2016 provided in the respective CCRs and attached to these OSDS as Exhibit 9.

7. All curbing shall meet the City of Jersey City Design Standards. Curb types may vary as long as the total depth of curb and footing remains within the pavement box. The curb detail may extend beyond the pavement box provided it meets the required limits of separation from the Warning Layer/Liner. A licensed New Jersey Professional Engineer shall certify that the road and curb design will not jeopardize the integrity of the Chromium Remedy and such certification will be included in a Development Plan reviewed and approved by the Special Master or the Federal Court. No curb and pavement box design shall be certified or approved unless it is demonstrated that it will not jeopardize the integrity of the Chromium Remedy.

8. Through trucks are prohibited on Roadways. Roadways shall be posted to prohibit through trucks. Jersey City shall prohibit through trucks and require the posting of such prohibition in an ordinance prior to the installation of the Roadways. The standard becomes effective upon the effective date of a Jersey City ordinance prohibiting through trucks on Roadways.

9. Every five years from the initial surfacing, a licensed New Jersey Professional Engineer shall inspect all Roadways in the Open Space Areas to evaluate whether the condition of any Roadway or segment thereof has compromised or is likely to compromise the structural integrity of the underlying subgrade or utilities. Within 30 days of the completion of the inspection, the licensed New Jersey Professional Engineer shall submit a certified report to Honeywell and Jersey City that describes the inspection undertaken and the repairs needed, if any, in order to address any condition that has compromised or is likely to compromise the structural integrity of the underlying subgrade or utilities. Within 18 months of the submission of the report, the repairs described in the report shall be completed. In the event that in the report the licensed New Jersey Professional Engineer deems a condition to constitute an emergency requiring immediate repair, such repair shall be made as soon as possible, and, if necessary, interim measures shall be employed to protect the cap, subgrade and utilities. Within 60 days of completion of the repairs, emergency or otherwise, a licensed New Jersey

Professional Engineer shall inspect the repairs and certify that the repairs have been satisfactorily completed.

B. Temporary Construction Roads. The following requirements apply to all temporary construction roads:

1. In the event temporary construction roads are installed, these roads shall be limited to the locations designated for Roadways on the as-built drawings titled, "Structural Fill Under Roadways, North Cap," dated December 15, 2016 and "Structural Fill Under Roadways, South Cap," dated December 15, 2016 provided in the respective CCRs and attached to these OSDS as Exhibit 9. Currently, temporary roads built at the end of the Chromium Remedy are shown on as-built drawings titled, "As-Built Restoration Plan, SA-6 North – Sheet 001," dated January 6, 2017 and "As-Built Restoration Plan, SA-6 South – Sheet 001," dated December 12, 2016 provided in the respective CCRs and attached to these OSDS as Exhibit 9. Temporary roads shall be installed using a load bearing geotextile fabric to isolate the wearing surface from the subgrade. A wearing surface shall be installed that is sufficient to handle the intended temporary traffic loadings. Temporary roads shall be designed consistent with the projected loads and frequency. Temporary roads shall be designed to be protective of the Chromium Remedy. A licensed New Jersey Professional Engineer shall certify that the temporary road design is protective of the Chromium Remedy and such certification shall be included in a Development Plan reviewed and approved by the Special Master or the Federal Court. No temporary road design shall be certified or approved unless it is demonstrated that it will not jeopardize the integrity of the Chromium Remedy.
2. The load limitations specificed in Section 2.1.4.D of the OSDS and Section 02374 Part 3.3 G 7 of the Technical Specifications shall apply to all loads on the temporary roadways.

2.2.2 Hardscape Areas including Pedestrian Thoroughfare

Hardscape Areas shall have a minimum separation of 12 inches between the Warning Layer/Liner and the underside of the hard surfacing. The surface and subgrade materials shall be of sufficient strength to accommodate Maintenance Equipment.

2.2.3 Utilities

All utilities including those supporting the pump and treat system for groundwater remediation, with the exception of any extraction wells or collection trenches, shall be placed above the Cap as required in Paragraph 56(b) of the Study Area 6 North Consent Decree.

2.2.4 Utility Corridors

A. Public Utilities. All public utilities shall be located in a designated utility corridor and shall be installed in accordance with Paragraphs 60(j)(v)(6) and (7) of the Study Area 6 North Consent Decree. The location of the utility corridors is shown on as-built drawings in the CCRs, titled, "Structural Fill Under Roadways, North Cap," dated December 15, 2016 and "Structural Fill Under Roadways, South Cap," dated December 15, 2016 provided in the respective CCRs and attached to these OSDS as Exhibit 9. In addition, the potential locations of utilities outside of roadway/utility corridors can be seen by the depression of contour lines on the as-built drawings titled, "North Cap Geomembrane Grading Plan," dated November 16, 2016 and [South Cap] "Geomembrane Grading Plan," dated February 11, 2016 provided in the respective CCRs and attached to these OSDS as Exhibit 9. During the Initial Development Period, the modification of designated utility corridors or the designation of additional utility corridors, if necessary shall be subject to the review and approval of Honeywell, Jersey City, and the Special Master.

B. Placement within Utility Corridors. Placement of utilities within the utility corridor is flexible as long as the installation does not jeopardize the integrity of the Chromium Remedies and complies with the required separation from the Warning Layer/Liner set forth in the Consent Decrees.

C. Duct Banks. Duct banks shall be concrete encased.

2.2.5 Utility Corridors Beneath Roadways and Hardscape Areas

Except as provided in Section 2.2.6, the following utilities shall be located only within utility corridors beneath Roadways and Hardscape Areas in the Open Space Areas:

- Sanitary Sewers,
- Storm Drains,

- Water Mains,
- Electric Service,
- Telecommunications Service, and
- Gas Mains.

2.2.6 Utility Corridors-Irrigation and Local Electric and Water Service

A. Utilities Outside Corridors. The following utilities may be located outside of the utility corridors depicted by short, localized depression of contour lines on the as-built drawings titled, "North Cap Geomembrane Grading Plan," dated November 16, 2016 and [South Cap] "Geomembrane Grading Plan," dated February 11, 2016 provided in the respective CCRs, provided in the respective CCRs and attached to these OSDS as Exhibit 9 and are located in the interior park space of the Open Space Areas:

1. Water laterals for seasonal water service to amenities;
2. Irrigation mains and laterals; and
3. Local electric service supply for amenities.

B. Designation of Corridors. During the Initial Development Period, the design and location of additional utility corridors, if appropriate, shall be subject to the review and approval of Honeywell, Jersey City, and the Special Master. Upon completion of the design of these utilities the noted drawings shall be amended and recorded accordingly.

C. Minimum Fill Requirements. For any such utilities that may be installed outside a designated utility corridor, there shall be a minimum of two feet of fill between the Warning Layer/Liner and the lowest elevation of the bedding for any such utility.

D. Water Laterals. For seasonal water service to amenities, such as supply lines to drinking fountains. Portions of service lines may be located above the frost line and must be equipped with drain-back valves and hardware for winterization, in accordance with state and local plumbing codes.

E. Irrigation Mains and Laterals. Irrigation systems shall be designed by a licensed New Jersey Landscape Architect.

F. Electric Service. Electric service conductors for local power supply to park amenities such as light fixtures, controllers, (water feature) pumps, timers and other electrical devices shall be contained in buried conduits in accordance with all governing electrical codes. The grounding system for lighting and electrical services shall be installed at least one (1) foot above the Warning Layer/Liner in areas where the Fill Material is two feet. In other instances, the grounding system shall be installed at least two feet above the Warning Layer/Liner. The use of vertical grounding rods that require penetration through the Liner are prohibited.

2.2.7 Restrooms

If installed, restroom structures shall be located in close proximity to recreational use areas. Utilities associated with the restrooms shall meet the requirements of Sections 2.2.3 through 2.2.6. Restroom foundations shall meet the requirements of Section 2.1.4.E.

2.2.8 Water Features and Above Ground Water Cisterns

A waterproof liner system with leak detection shall be installed at all water features and cisterns.

2.2.9 Landscaping

A. Landscaping Acreage Requirement. The Consent Decrees require that 75% of each of the Open Space Areas, exclusive of the acreage used for roads and the pedestrian thoroughfare, be comprised of landscaping. Landscaping includes some or all of the following: natural grasses, trees, shrubbery, flowers, and potted plants, provided that such landscaping and the anticipated root structure of each landscaping component shall not jeopardize the Chromium Remedies. Any portion of an athletic court or playground that is covered in natural grass shall be considered landscaping.

B. Supervision of Design and Installation. Landscaped Acreage shall be designed and installed under the supervision and direction of a licensed New Jersey Landscape Architect, licensed New Jersey Arborist, and a licensed New Jersey Professional Engineer with expertise in RCRA-style engineered caps. The selection

of all plant material shall be performed under the direct supervision of a licensed New Jersey Landscape Architect and a licensed New Jersey Arborist.

C. Landscape Design Preparation. The licensed New Jersey Landscape Architect and licensed New Jersey Arborist shall use:

- Figures 4 C-E, H-J,
- Previously approved Development Plans,
- Utility corridor limits set forth on the as-built drawings titled, "Structural Fill Under Roadways, North Cap," dated December 15, 2016; "Structural Fill Under Roadways, South Cap," dated December 15, 2016; "North Cap Geomembrane Grading Plan," dated November 16, 2016; and [South Cap] "Geomembrane Grading Plan," dated February 11, 2016 provided in the respective CCRs and attached to these OSDS as Exhibit 9, and
- The Bayfront Development Plan Section 6 Landscape Plan

when preparing the design for the Landscaped Acreage.

D. Landscaping Requirements. Landscaping shall meet the following requirements which are consistent with the protection of the integrity of the Chromium Remedy while supporting a viable and attractive landscape:

1. All landscaping shall be of the same type and characteristics of the landscaping classes set forth in Tables 2 through 4. Tables 2 through 4 include those plant species suitable for the Open Space Areas for specific depths of soils. Species included in Tables 2 through 4 are known to exhibit root systems with characteristically high root plate formation typical of species occurring in riparian plant communities as well as adaptability to urban environments.
2. In the event that a landscape design includes a plant species not listed on Tables 2 through 4, such species shall be specifically identified as a new proposed species in a Development Plan subject to the review and approval of the Special Master or Federal Court. Such Development Plan shall not be approved unless it is demonstrated that the new proposed species has the same root growth characteristics as the same corresponding class of species

in Tables 2 through 4, can thrive in the minimum soil depths set forth in the corresponding class applicable table, and is adaptable to urban environments.

3. While Landscape Elements may be located in or in close proximity to utility corridors, no Landscape Element (except natural grasses) shall be located in an area which would prevent access by Maintenance Equipment to any utility, including recovery wells. Landscape Elements within the Open Space Areas shall be located to facilitate access to recovery wells and monitoring wells for operation and maintenance. Trees shall not be located where the Canopy could extend over a pumping well or could inhibit access to pumps for maintenance.

4. Landscape Elements shall be planted in compliance with the soil depths requirements set forth in Tables 2 through 4 and Section 2.1.2.D or as follows for approved landscaping with comparable characteristics:

    a. Table 2 class trees shall only be planted in areas where the Horizon B Soil is 18 inches or greater in depth;

    b. Table 3 class trees shall only be planted in areas where the Horizon B Soil is 12 inches or greater in depth; and

    c. Table 4 Column D class Large Shrubs & Ornamental Trees shall only be planted in areas where the Horizon B Soil is 12 inches or greater in depth.

E. Replacement of Landscaping. Landscaping has been grouped in Tables 2 through 4 into the following classes for the purpose of open space design: (i) turf grass, (ii) herbaceous perennials, (iii) small and medium shrubs, (iv) large shrubs and ornamental trees, (v) major deciduous trees, and (vi) major evergreen trees. Replacement of Landscape Elements with new landscaping of (a) the same class, (b) the same approximate density; and (c) in the same general vicinity within the Open Space shall be considered replacement-in-kind that is not subject to Court or Special Master approval. Replacement of Landscape Elements with (a) a different class of landscaping; (b) a substantially different density of landscaping; or (c) substantially different locations shall be considered a new landscape development which is subject to the Court or Special Master approval. However, in no case shall a different class of landscaping be approved unless it is demonstrated that the new class has the same root growth characteristics as the same corresponding class in

Tables 2 through4, can thrive in the minimum soil depths set forth in the corresponding class applicable table, and is adaptable to urban environments.

F. Landscaping Maintenance. All trees shall be installed and maintained as follows:

1. Direct drip irrigation systems may be provided.
2. No humps of soil or other landscaping material shall be mounded around the trunk.

G. Thorns, Toxic Fruit Prohibited. Shrubs with dangerous thorns and toxic fruit are prohibited.

H. Lawn Areas. All lawn areas shall be established and maintained with an environmentally-friendly, drought tolerant, wear and pest resistant turf grass mixture, with low fertilizer needs, as recommended by the Rutgers' University turf grass breeding program. Seed mixture shall be suitable for New Jersey urban conditions.

I. Drainage. Landscaped Areas shall be designed to provide adequate drainage. Supplemental drainage systems including use of underdrains such as shown in the concept details Figures 5-7 or other functionally equivalent designs may be added by the Landscape Designer and incorporated into the drainage system for the Cap.

J. Raised planters. Raised planters are allowed provided they are consistent with the details in Figure 5. Other types of raised planters may be approved, but design specifications for such raised planters must be set forth in a Development Plan subject to review and approval by the Special Master or Federal Court. However, in no case shall other types of raised planters be approved unless it is demonstrated that they will not jeopardize the integrity of the Chromium Remedy.

K. Criteria for Selection of Landscape Elements. Landscape Elements shall be selected for installation in accordance with the following criteria:

1. **Referenced Standard** – All trees shall be commercially grown in accordance with ANLA publication, "American Standards for Nursery Stock" ANSI Z60.1 2004. (Attached as Exhibit 6).

2. **Source** – All trees and shrubs shall be nursery-grown stock raised in commercial nurseries specializing in the growth and supply of superior quality stock in accordance with ANSI Z60.1 2004 and certified to be free of any and all pathogens by inspection and certification at the time of harvesting. Nurseries shall be in a comparable bioregion to the Open Space Areas. "Plantation grown" trees referenced in ANSI Z60.1 2004 are not permitted.

3. **Lateral Root Growth** – The supply nursery shall have soil characteristics which support a shallow, horizontal high plate formation root systems. All trees and shrubs shall have been root pruned at initial planting (lining out) and transplanted a minimum of three times (trans.3x) in accordance with the ANSI Z60.1 2004 to eliminate downward (striker) roots. Additionally, supply nurseries shall demonstrate that progeny have been generated from mother stock of superior seed provenance with characteristic surface, horizontal, high plate formation root systems. Plant material selected for Open Space Areas shall be provided in numbers such that at time of harvesting (transplanting for shipment to the site), 5% of all individuals selected from the nursery stocks shall be excavated and the root systems exposed to demonstrate the absence of striker roots.

4. **Size** – Except as provided in Section 2.2.9.K.4.f, at the time of installation, Landscape Elements shall meet the size requirements set forth in Tables 2 through 4 or as follows below for approved landscaping with comparable characteristics:

    a. Table 2 class deciduous trees shall have the following size:

        i. a height no less than 10 feet and no greater than 16 feet;

        ii. a caliper no less than 2 inches and no greater than 3.5 inches; and

        iii. a root ball depth no greater than 34 inches.

    b. Table 2 class evergreen trees shall have the following size:

        i. a height no less than 7 feet and no greater than 8 feet;

ii. a spread between 4.5 and 5 feet if the height is 8 feet and between 3.5 and 4 feet if the height is 7 feet; and

iii. a root ball depth no greater than 34 inches.

c. Table 3 class trees shall have the following size at the time of installation:

i. a height no less than 8 feet and no greater than 14 feet;

ii. a caliper no less than 1 inch and no greater than 2.5 inches; and

iii. a root ball depth no greater than 28 inches.

d. Table 4, Column D class trees and shrubs shall have a root ball depth no greater than 28 inches.

e. Table 4, Column C class shrubs shall have a root ball depth no greater than 16 inches.

f. Landscape Elements with larger calipers, spreads and/or heights may be installed provided that the applicable root ball depth is not exceeded.

g. For purposes of these requirements, the root ball depth, the caliper and the spread shall be measured according to ANZI Z60.1 2004.

h. The size of each Landscape Element shall also allow for compliance with the planting requirements set forth in Section 2.2.9.L.

L. Planting Requirements. Verification and certification of the planting requirements set forth in this section shall be made as specified herein by the licensed professionals required under Section 2.2.9.B.

1. The depth of each planting hole shall in no case be deeper than 6 inches above the Root Barrier Horizon C Soils if machine excavation is employed or 2 inches above the Root Barrier Horizon C Soils if soft-digging methods are employed. The maximum allowed depth for each planting hole shall be set forth in a planting plan prepared as part of the landscape design for each Open Space Area and such maximum depths shall be certified on the plan by the licensed New Jersey Professional Engineer.

2. Balled and burlapped or containerized trees and shrubs shall be set during planting such that the top of the root ball (root flare) is approximately 2 inches above the final surface soil line. After balled and burlapped trees and shrubs have been set, burlap shall be removed from the top one third of the root ball and a visual inspection of the root structure shall be made by the licensed New Jersey Arborist or licensed New Jersey Landscape Architect to verify setting height. No backfilling of the planting hole shall be performed until the setting height has been verified by the licensed New Jersey Arborist or licensed New Jersey Landscape Architect. Staking of trees is prohibited.
3. Large containerized shrubs shall be set with containers intact such that the top of the root ball is 2 inches above the final soil line. After verification of the setting height by the licensed New Jersey Arborist or licensed New Jersey Landscape Architect, the container shall be cut and removed leaving the bottom of the container in place. No backfilling of the planting hole shall be performed until the setting height has been verified by the licensed New Jersey Arborist or licensed New Jersey Landscape Architect. Large containerized shrubs are Table 4, column D class shrubs.

Table 2: Bayfront Development – Major Trees

Major Deciduous Trees	Mature Height	Canopy Width	Minimum Overall Fill Depth Above Root Barrier (feet)	Minimum Depth of Horizon B Soils (inches)	Application	Installed Size Range Caliper in Inches Height in Feet	Maximum Root Ball Depth (inches)	Native Species
ACER x freemanii 'Autumn Blaze' Autumn Blaze Red Maple	50'	40'	3.5’	18	Street, Shade Tree	2”-3½"cal. 10’-16' Ht.	34	Y
ACER rubrum 'varieties' Red Maple 'varieties'	50'	40'	3.5’	18	Street, Shade Tree	2”-3½"cal. 10’-16' Ht.	34	Y
ACER saccharum 'varieties' Sugar maple	50'	35'	3.5’	18	Shade Tree	2”-3½"cal. 10’-16' Ht.	34	Y
QUESCUS palustris Pin oak	60'	40'	3.5’	18	Shade, Plaza Tree	2”-3½"cal. 10’-16' Ht.	34	Y
FRAXINUS pennsylvanica 'varieties' Green Ash varieties & cultivars	50'	40'	3.5’	18	Street, Shade Tree	2”-3½"cal. 10’-16' Ht.	34	Y
ZELKOVA serrata 'varieties' Japanese Zelkova	50'	50'	3.5’	18	Street, Shade, Plaza	2”-3½"cal. 10’-16' Ht.	34	N
GINKGO biloba (male only) Ginkgo	50'	35'	3.5’	18	Street, Shade, Plaza	2”-3½"cal. 10’-16' Ht.	34	N
FRAXINUS americana White ash	60'	50'	3.5’	18	Shade Tree	2”-3½"cal. 10’-16' Ht.	34	Y
TILIA americana American Linden	60'	50'	3.5’	18	Park, Plaza Tree	2”-3½"cal. 10’-16' Ht.	34	Y

Major Deciduous Trees	Mature Height	Canopy Width	Minimum Overall Fill Depth Above Root Barrier (feet)	Minimum Depth of Horizon B Soils (inches)	Application	Installed Size Range Caliper in Inches Height in Feet	Maximum Root Ball Depth (inches)	Native Species
BETULA nigra River Birch	40'	30'	3.5’	18	Park	2”-3½"cal. 10’-16' Ht.	34	Y
ILEX opaca American holly	40'	20'	3.5’	18	Park	8' Ht. / 4½-5' Spd.	34	Y
THUJA occidentalis 'nigra' or 'techny' American or 'Techny' Arborvitae	30'	15'	3.5’	18	Park	7' Ht. / 3½-4' Spd.	34	Y
PICEA pungens Colorado Spruce	50'	30'	3.5’	18	Park	8' Ht. / 4½-5' Spd.	34	Y
CHAMECYPARIS thyoides Atlantic White Cedar	35'	15'	3.5’	18	Park	7' Ht. / 3½-4' Spd.	34	Y
CUPRESSOCYPARIS leylandii Leyland Cypress	35'	20'	3.5’	18	Park	7' Ht. / 3½-4' Spd.	34	N

Table 3: Minor Flowering / Ornamental Trees

MM Minor Flowering / Ornamental Trees	Mature Height (feet)	Canopy Width (feet)	Minimum Overall Fill Depth Above Root Barrier (feet)	Minimum Depth of Horizon B Fill Soils (inches)	Application	Installed Size Range Caliper in Inches Height in Feet	Maximum Root Ball Depth (inches)	Native Species
ACER compestre Hedge Maple	30'	25'	3’	12	Park	1”-2½"cal. 8’-14' Ht.	28	N
CERCIDIPHYLUM japonicum Katsura tree	40'	20'	3’	12	Park	1”-2½"cal. 8’-14' Ht.	28	N
CARPINUS betulus European hornbeam	30'	20'	3’	12	Park	1”-2½"cal. 8’-14' Ht.	28	N
MALUS spp. Crabapple	20'	20'	3’	12	Park	1”-2½"cal. 8’-14' Ht.	28	Y
CERCIS canadensis Eastern redbud	25'	25'	3’	12	Park	1”-2½"cal. 8’-14' Ht.	28	Y
CORNUS florida Flowering dogwood	25'	25'	2.5’	12	Park	1”-2½"cal. 8’-14' Ht.	28	Y
AMELANCHIER arborea Serviceberry	25'	20'	2.5’	12	Park	1”-2½"cal. 8’-14' Ht.	28	Y
CRATAEGUS viridis Hawthorn	20'	15'	2.5’	12	Park	1”-2½"cal. 8’-14' Ht.	28	Y

Table 4: Ground Covers, Grasses, Shrubs and Small Trees Suitable for Planting over the Liner at the Bayfront Development Site

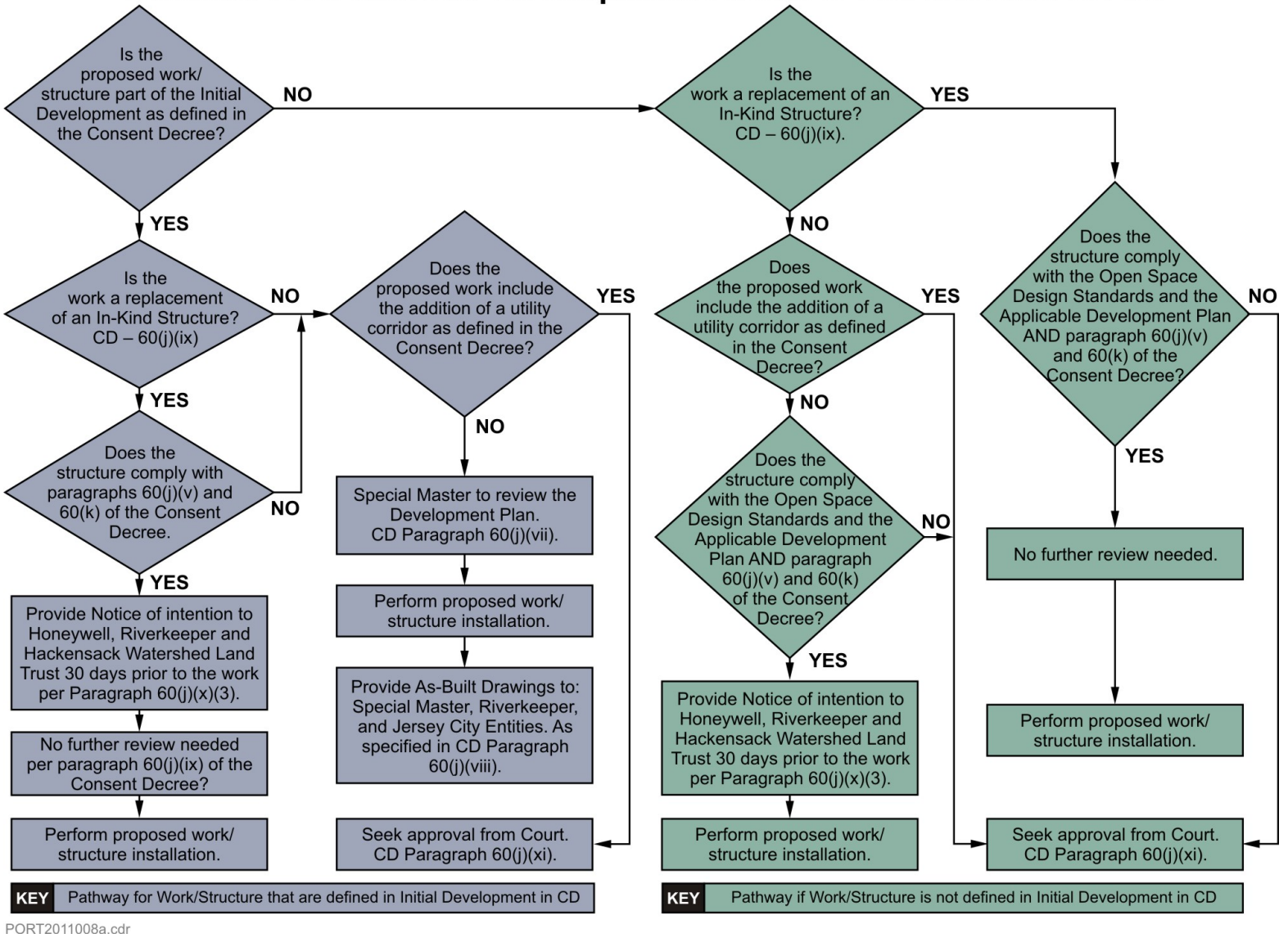
A.	B.	C.	D.
Turfgrass **1.0' Minimum Fill Depth above the Root Barrier**	**Herbaceous Perennials,** **and Ground Covers** **1.5' Minimum Fill Depth above the Root Barrier**	**Small & Med. Shrubs and Native or Ornamental Grasses - 2'- 8' Ht.** **2.0 Minimum Fill Depth above the Root Barrier** **Maximum Root Ball Depth – 16 inches**	**Minor Flowering /Large Shrubs & Ornamental Trees** **3.0' Minimum Fill Depth above the Root Barrier** **Fill thickness by Soil Horizon** **Horizon A - 6 inches minimum** **Horizon B – 12 inches minimum** **Horizon C – 18 inches** **Maximum Root Ball Depth – 28 inches**
Fine Fescue Lawn Mix	Aegopodium (Bishop Weed) Ajuga Arctostaphylos (Bearberry) Chrysogonum Convallaria (Lily of the Valley) Coreopsis (Tickseed) Echinacea (Coneflower) Ferns Heuchera (Coral Bells) Liriope (Lilly Turf)	Aronia arbutifolia Berberris thunbergii (Dwarf) Clethra alnifolia (Summersweet) Cotoneaster horizontalis Euonymous (shrub form) Juniperus (spreaders to 4' ht.) Spiraea (dwarf varieties) Rhododendron (compact) Lonicera (low shrub form) Juniperus (chinensis low spreading) Spiraea (dwarf varieties) Cornus stolenifera Vaccinium angustifolia Miscanthus (Ornamental Grass) Pennisetum (Ornamental Grass) Andropogen (Bluestem)	Acer palmatum Amelanchier canadensis Cornus mas Ilex latifolia (Asiatic Holly) Juniperus chinensis Magnolia (virginiana & stellata) Picea (dwarf varieties) Pinus (dwarf varieties) Prunus - (low varieties) Styrax japonica Thuja (compact varieties) Chamaecyparis (dwarf varieties) Enkianthus campanulatus Forsythia suspense

A.	B.	C.	D.
	Pathenocissus (Virginia Creeper) Phlox (Creeping Phlox) Rudbeckia (Black eyed Susan) Sedum spp. Verbena (creeping) Vinca minor Various Perennials (low) Fine Fescue (grasses) • Design mix for mowing • Design mix for no-mow All species from Table 6A	Sorghastrum (Indian Grass) Tripsacum (Dwarf Gamma Grass) Helictotrichon (Blue Oat Grass) Panicum virgatum (switchgrass) Rosa (low ornamental/shrub forms) All species from Table 6B	Hamamelis virginiana Ilex glabra Ilex meservae Ilex verticillata Juniperus chinensis pfitzeriana Myrica pennsylvanica Rhododendron (hybrid varieties) Spiraea (shrub forms) Syringa (compact varieties) Taxus (cuspidata – low varieties) Viburnum spp. All species from Table 6 A & B

3.0 ADMINISTRATION

The Consent Decrees define the approval process for Permissible Development in the Open Space Areas. In general, Permissible Development requires preparation of a Development Plan and approval of such plan by the Special Master or permits replacement-in-kind of previously approved Permissible Development. The following flow chart provides a general description of the process, but the Consent Decrees should be consulted for the specific requirements.

Decision Flow Chart for Development in AOC SA-6N and AOC SA-6S



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3.1 AS-BUILT DOCUMENTATION

As-Built drawing records shall be required for all Permissible Development to provide a reference for later work conducted pursuant to the OSDS. The requirement for as-built records during Initial Development is stipulated in Paragraph 60(j)(viii) of the Study Area 6 North Consent Decree. If any development or modifications are made following Initial Development, the Developer shall provide the same level of as-built documentation as required during the Initial Development period.

The as-built drawings Permissible Development shall include coordinates for each of the following as specified:

- Utilities: At the beginning and end points of a run and at any structure, turning points or changes of horizontal or vertical alignment.
- Utility Corridors: At all turn points such that the limits of the corridor can be easily identified.
- Final Development Grade
- Landscaped Areas: Types, locations, and limits
- Details on constructed Permissible Development Elements

4.0 LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
NJDEP	New Jersey Department of Environmental Protection
OSDS	Open Space Design Standards
RCRA	Resource Conservation and Recovery Act
SA	Study Area
Study Area 6 North Consent Decree	Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North
Study Area 6 South Consent Decree	Consent Decree Regarding Remediation and Redevelopment of Study Area 6 South

FIGURES

LEGEND:

- OPEN SPACE (BAYFRONT)
- OPEN SPACE (SA-6 NORTH AND SA-6 SOUTH)
- CONSERVATION EASEMENT)
- PROPERTY LINE
- SA7 SCB HYDRAULIC BARRIER
- HYDRAULIC BARRIER SA-6 NORTH
- HYDRAULIC BARRIER SA-6 SOUTH

SA-6 NORTH BARRIER WALL

CENTRAL PARK AOC OPEN SPACE

THE GREEN

SA-7 SCB WALL

PROMENADE AOC OPEN SPACE

SA-6 SOUTH BARRIER WALL

THE PROMENADE AOC OPEN SPACE

0 75 150 300
SCALE IN FEET

Prepared/Date: RJR 06/06/13
Checked/Date: SGS 06/06/13

Honeywell 101 COLUMBIA RD., P.O. BOX 2105 MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY STUDY AREAS 6 NORTH AND SOUTH JERSEY CITY, NEW JERSEY	amec	OPEN SPACE AREAS FIGURE 1

0 20 40 80
SCALE IN FEET

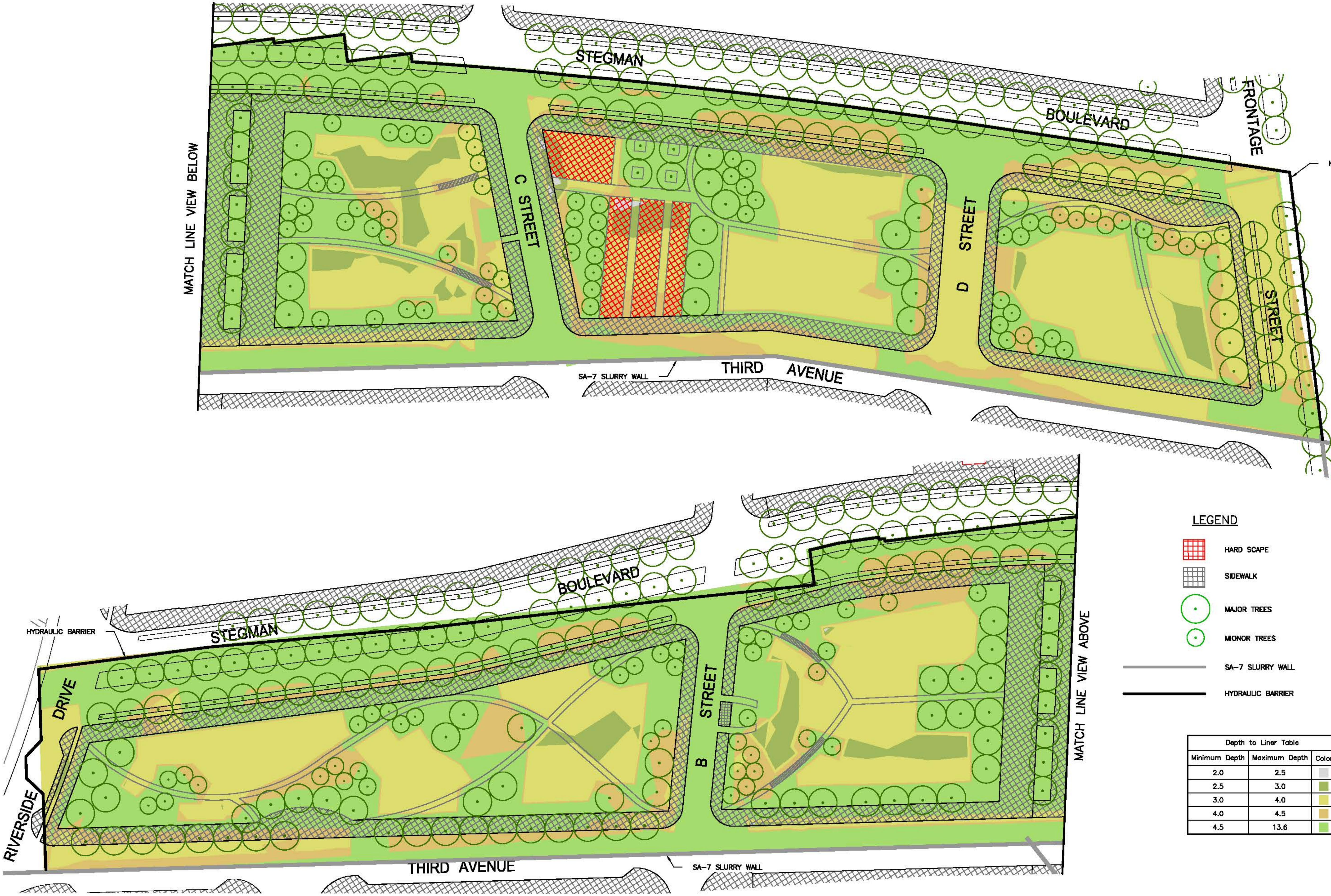
Prepared/Date: RJR 04/08/13
Checked/Date: SGS 04/08/13

Honeywell 101 COLUMBIA RD., BOX 2105 MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY, STUDY AREA 6 NORTH JERSEY CITY, NEW JERSEY HONEYWELL SITE ID - 37472	amec	CENTRAL PARK LANDSCAPING AND HARDSCAPE CONCEPTS FIGURE 4A

Depth to Liner Table		
Minimum Depth	Maximum Depth	Color
2.0	2.5	(grey)
2.5	3.0	(olive green)
3.0	4.0	(yellow)
4.0	4.5	(tan)
4.5	13.6	(light green)

Prepared/Date: RJR 04/08/13
Checked/Date: SGS 04/08/13

Honeywell 101 COLUMBIA RD., BOX 2105 MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY, STUDY AREA 6 NORTH JERSEY CITY, NEW JERSEY HONEYWELL SITE ID - 37472	amec	CENTRAL PARK SOIL DEPTH RANGES ABOVE WARNING LAYER/LINER FIGURE 4B



Depth to Liner Table		
Minimum Depth	Maximum Depth	Color
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2.5	3.0	
3.0	4.0	
4.0	4.5	
4.5	13.6	

Prepared/Date: RJR 04/08/13
Checked/Date: SGS 04/08/13

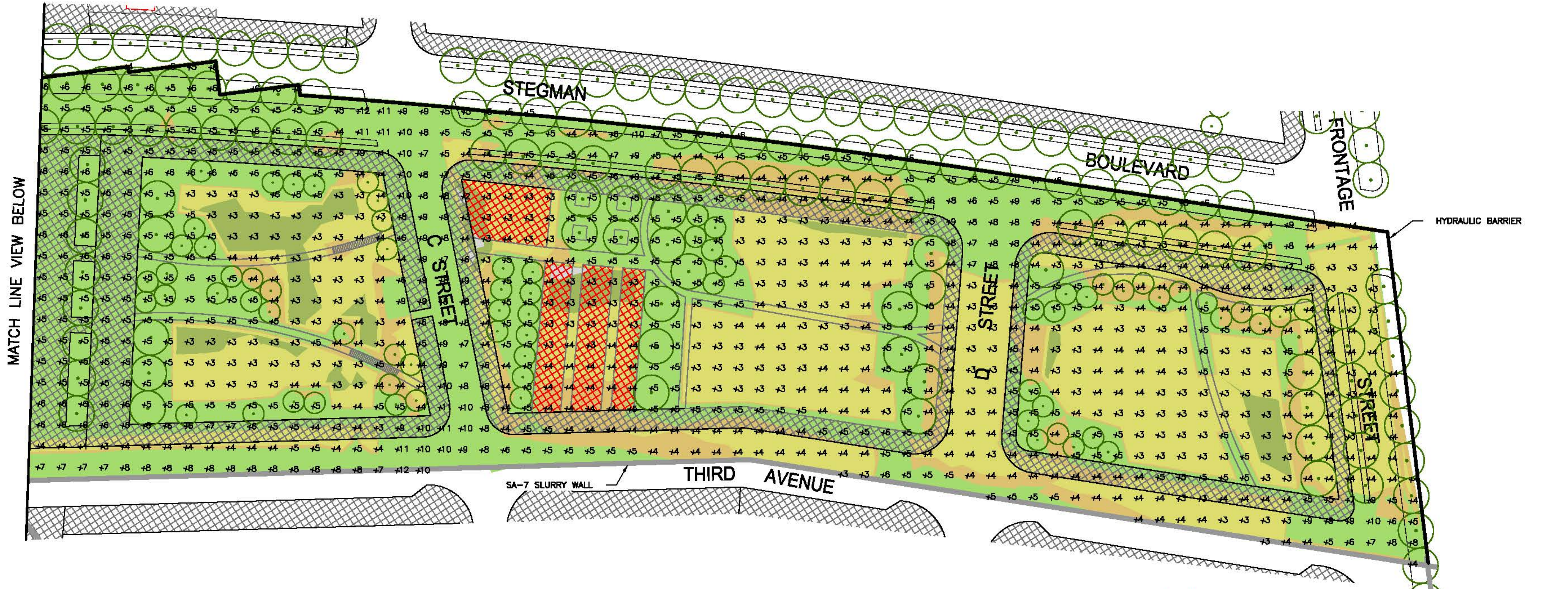
0 20 40 80
SCALE IN FEET

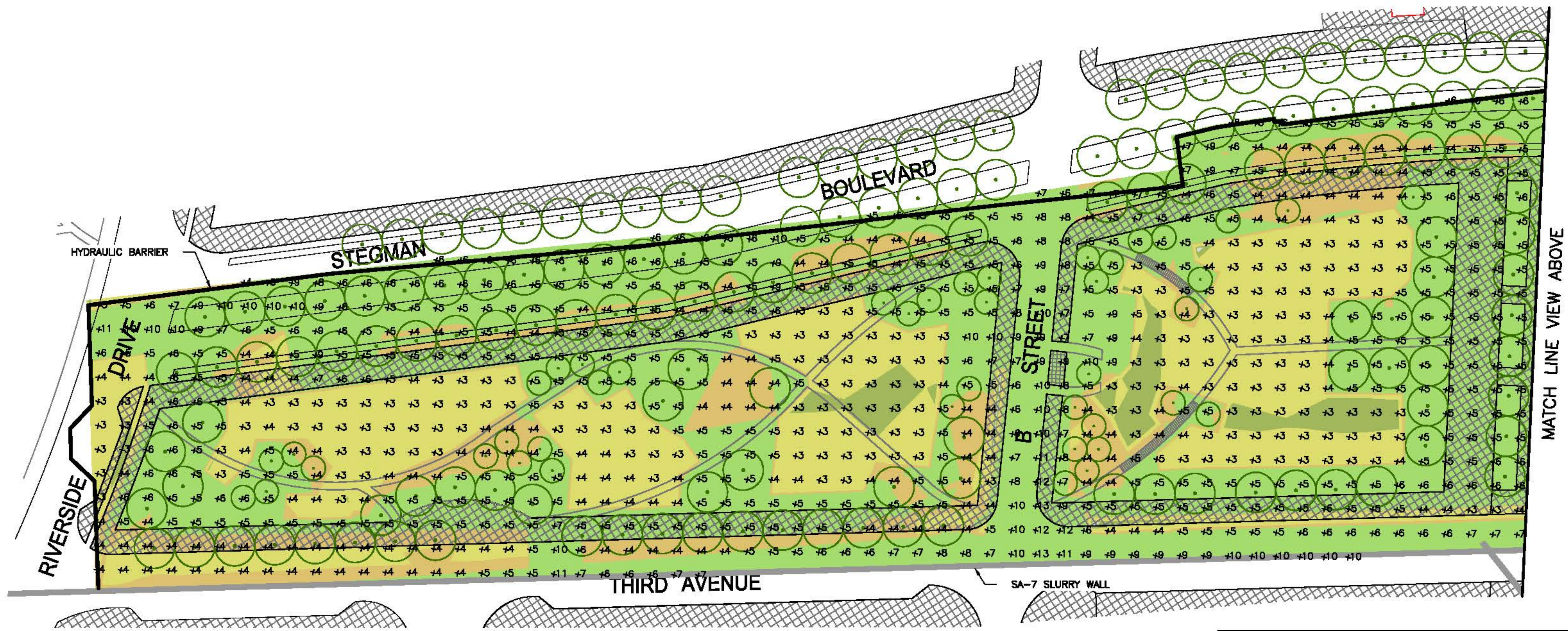
Honeywell
101 COLUMBIA RD., BOX 2105 MORRISTOWN, NJ 07962

OPEN SPACE DESIGN STANDARDS
CHROMIUM REMEDY, STUDY AREA 6 NORTH
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

amec

CENTRAL PARK
LANDSCAPING AND SOIL DEPTH RANGES
ABOVE WARNING LAYER/LINER
FIGURE 4C





LEGEND

- HARD SCAPE
- SIDEWALK
- MAJOR TREES
- MIONOR TREES
- SA-7 SLURRY WALL
- HYDRAULIC BARRIER

Depth to Liner Table		
Minimum Depth	Maximum Depth	Color
2.0	2.5	
2.5	3.0	
3.0	4.0	
4.0	4.5	
4.5	13.6	

Prepared/Date: RJR 04/08/13
Checked/Date: SGS 04/08/13

0 20 40 80
SCALE IN FEET

Honeywell
101 COLUMBIA RD, BOX 2105 MORRISTOWN, NJ 07962

OPEN SPACE DESIGN STANDARDS
CHROMIUM REMEDY, STUDY AREA 6 NORTH
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

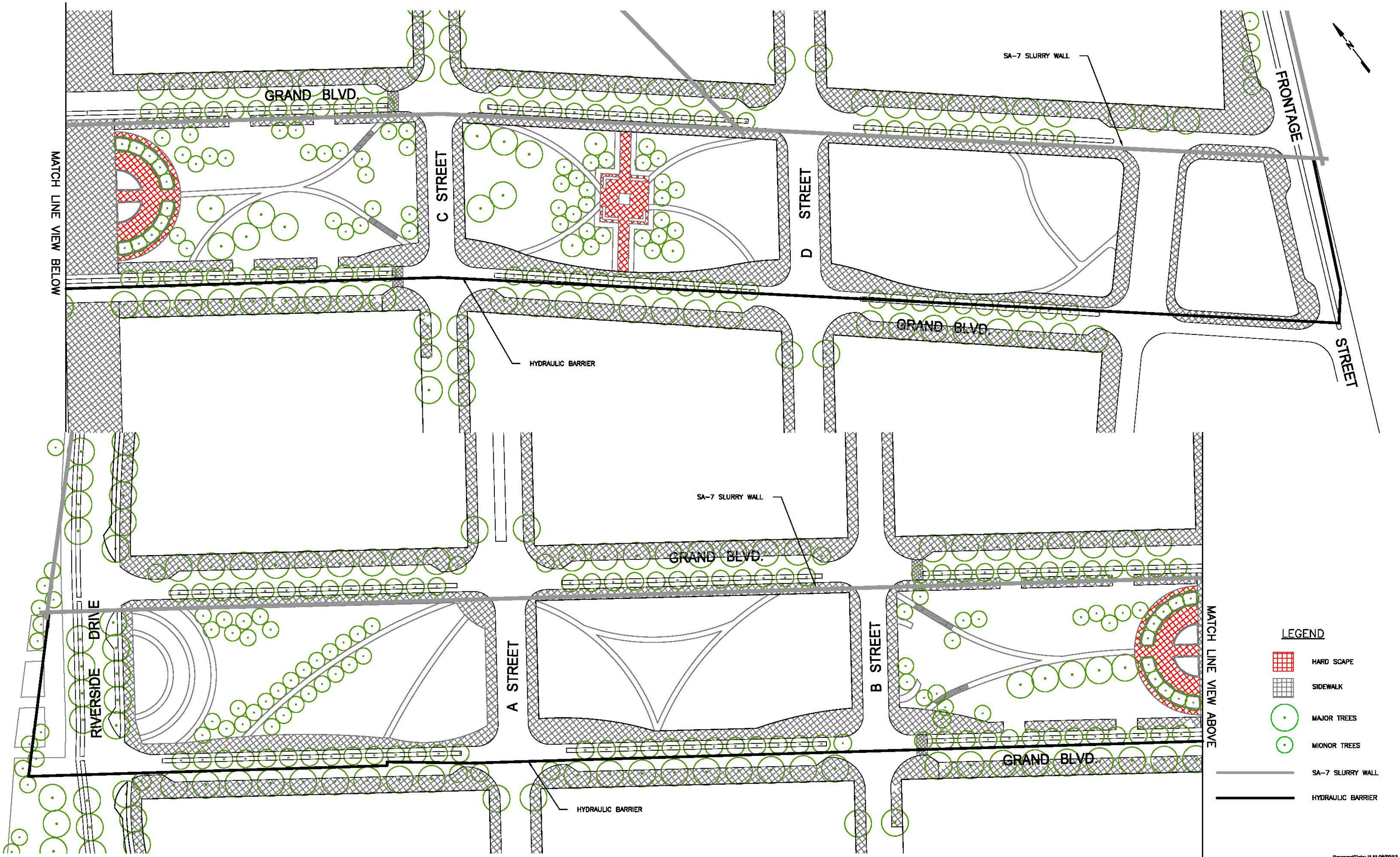
amec

CENTRAL PARK
LANDSCAPING AND SOIL SPOT DEPTHS
TO WARNING LAYER/LINER
FIGURE 4D

STEGMAN
BOULEVARD
FRONTAGE
NEW JERSEY STATE HIGHWAY ROUTE 440
HYDRAULIC BARRIER
C STREET
D STREET
STREET
MATCH LINE VIEW BELOW
THIRD AVENUE
SA-7 SLURRY WALL
HACKENSACK RIVER
HYDRAULIC BARRIER
STEGMAN
BOULEVARD
RIVERSIDE DRIVE
B STREET
MATCH LINE VIEW ABOVE
THIRD AVENUE
SA-7 SLURRY WALL
LEGEND
MAJOR TREES
MIONOR TREES
SA-7 SLURRY WALL
HYDRAULIC BARRIER
0 20 40 80
SCALE IN FEET

Prepared/Date: RJR 04/08/13
Checked/Date: SGS 04/08/13

Honeywell 101 COLUMBIA RD. BOX 2105 MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY, STUDY AREA 6 NORTH JERSEY CITY, NEW JERSEY HONEYWELL SITE ID - 37472	amec	CENTRAL PARK SOIL SPOT DEPTH TO ROOT BARRIER Figure 4E



Prepared/Date: RJR 06/09/13
Checked/Date: SGS 06/09/13

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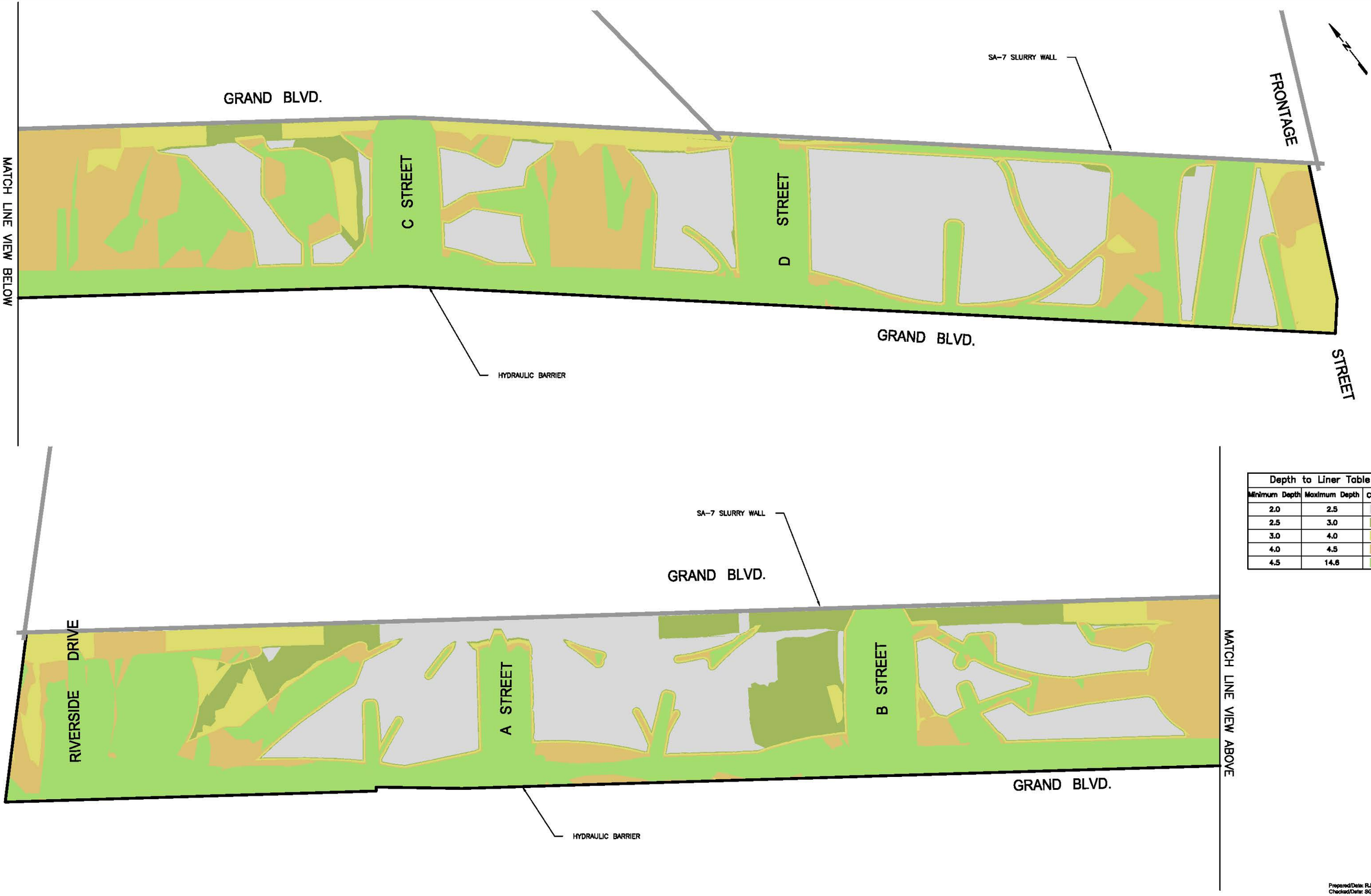
OPEN SPACE DESIGN STANDARDS
CHROMIUM REMEDY
STUDY AREA 6 SOUTH
JERSEY CITY, NEW JERSEY

amec

PROMENADE
LANDSCAPING AND HARDSCAPE CONCEPTS

Figure 4F



Depth to Liner Table		
Minimum Depth	Maximum Depth	Color
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2.5	3.0	
3.0	4.0	
4.0	4.5	
4.5	14.6	

Prepared/Date: RJR 04/08/13
Checked/Date: SGS 04/08/13

0 20 40 80
SCALE IN FEET

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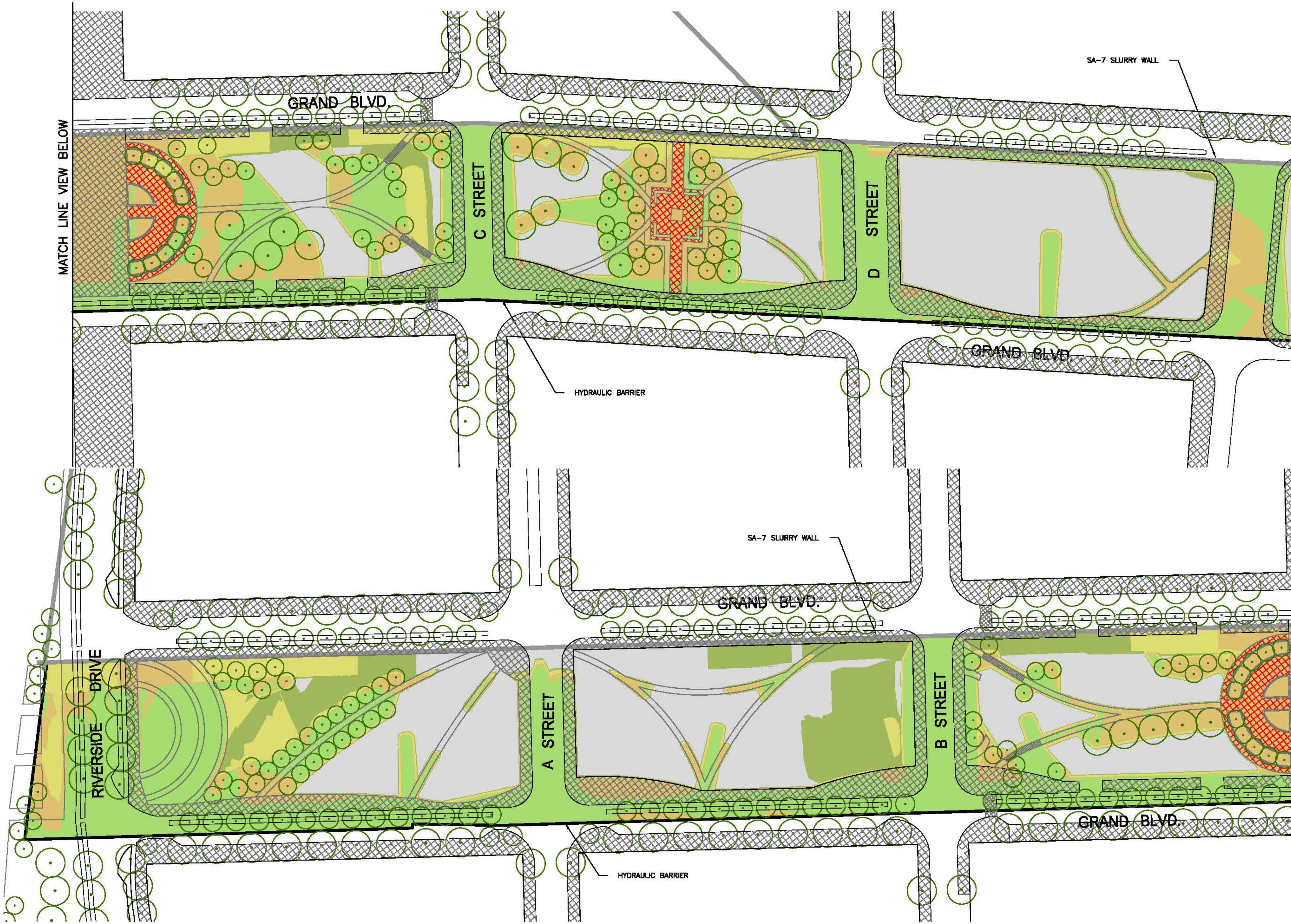
OPEN SPACE DESIGN STANDARDS
CHROMIUM REMEDY
STUDY AREA 6 SOUTH
JERSEY CITY, NEW JERSEY

amec

PROMENADE
SOIL DEPTH RANGES ABOVE
WARNING LAYER/LINER
Figure 4G



Depth to Liner Table		
Minimum Depth	Maximum Depth	Color
2.0	2.5	
2.5	3.0	
3.0	4.0	
4.0	4.5	
4.5	14.6	

LEGEND

- HARD SCAPE
- SIDEWALK
- MAJOR TREES
- MIONOR TREES
- SA-7 SLURRY WALL
- HYDRAULIC BARRIER

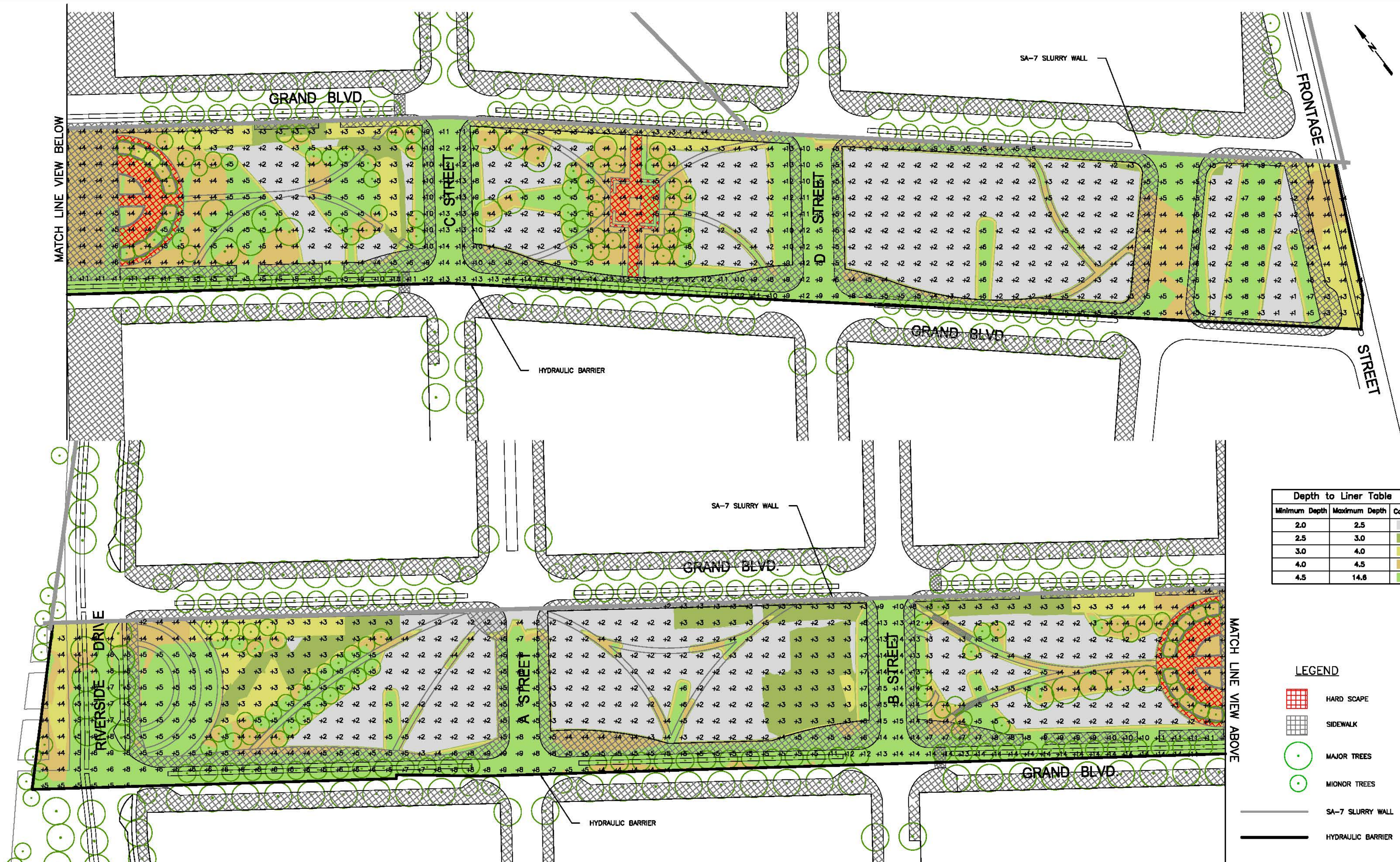
Prepared/Date: RJR 06/09/13
Checked/Date: SGS 06/09/13

Honeywell
101 COLUMBIA RD. BOX 2105 MORRISTOWN, NJ 07962

OPEN SPACE DESIGN STANDARDS
CHROMIUM REMEDY
STUDY AREA 6 SOUTH
JERSEY CITY, NEW JERSEY

amec

PROMENADE
LANDSCAPING AND SOIL DEPTH RANGES
ABOVE WARNING LAYER/LINER
Figure 4H



Depth to Liner Table		
Minimum Depth	Maximum Depth	Color
2.0	2.5	
2.5	3.0	
3.0	4.0	
4.0	4.5	
4.5	14.6	

LEGEND

- HARD SCAPE
- SIDEWALK
- MAJOR TREES
- MIONOR TREES
- SA-7 SLURRY WALL
- HYDRAULIC BARRIER

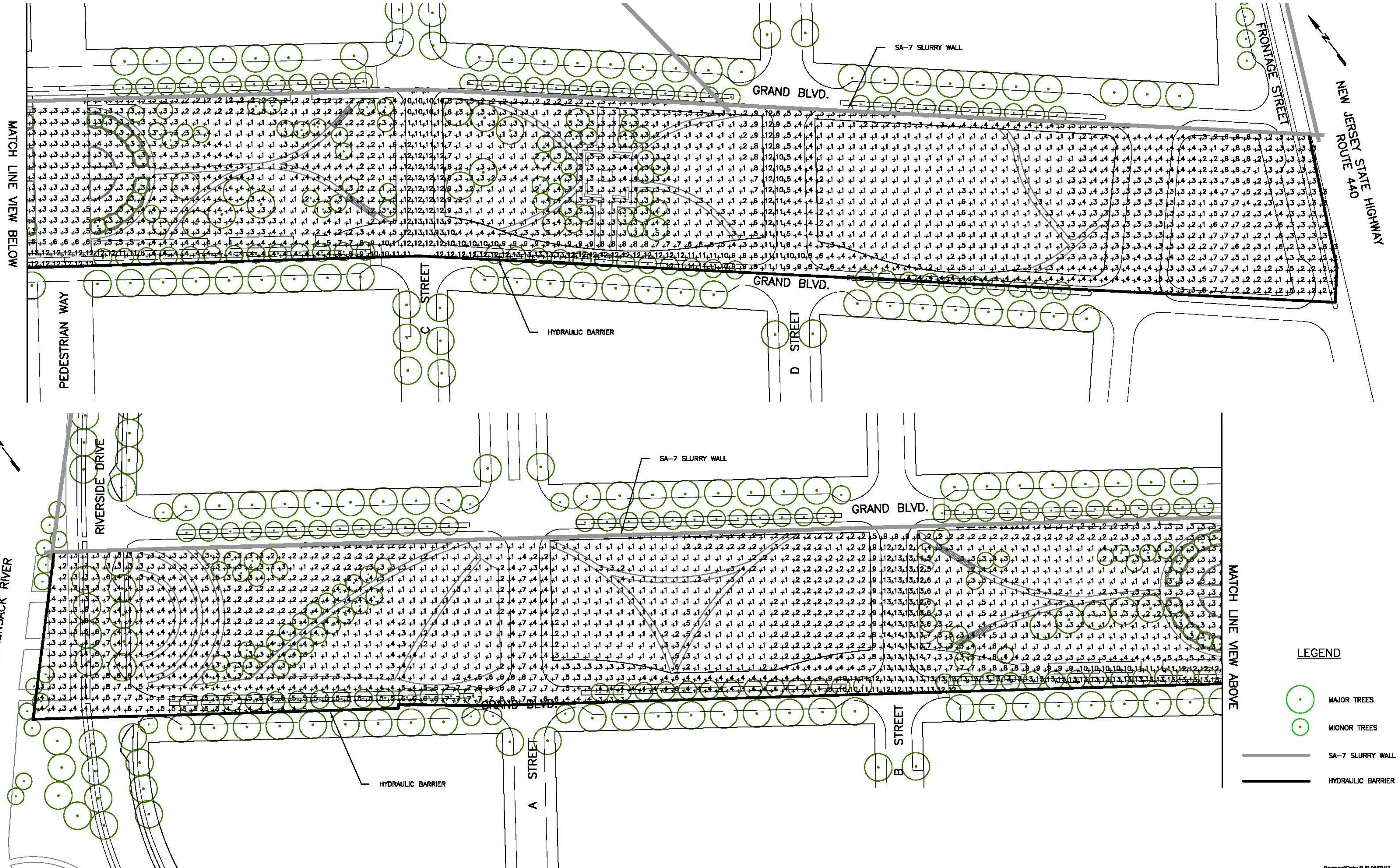
Prepared/Date: RJR 06/09/13
Checked/Date: SGS 06/09/13

Honeywell
101 COLUMBIA RD. BOX 2105
MORRISTOWN, NJ 07962

OPEN SPACE DESIGN STANDARDS
CHROMIUM REMEDY
STUDY AREA 6 SOUTH
JERSEY CITY, NEW JERSEY

amec

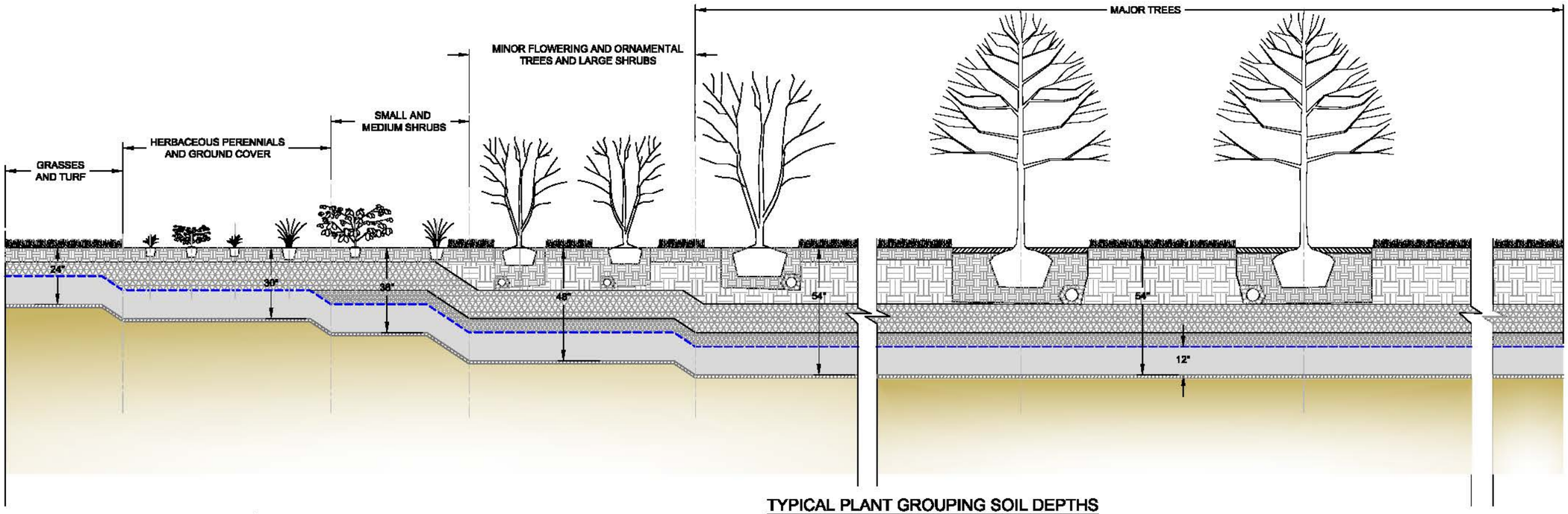
PROMENADE
LANDSCAPING AND SOIL SPOT
DEPTHS TO WARNING LAYER/LINER
Figure 4I



Prepared/Date: RJR 06/09/13
Checked/Date: SGS 06/09/13

0 20 40 80
SCALE IN FEET

Honeywell 101 COLUMBIA RD. BOX 2105 MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY STUDY AREA 6 SOUTH JERSEY CITY, NEW JERSEY	amec	PROMENADE SOIL SPOT DEPTH TO ROOT BARRIER Figure 4J

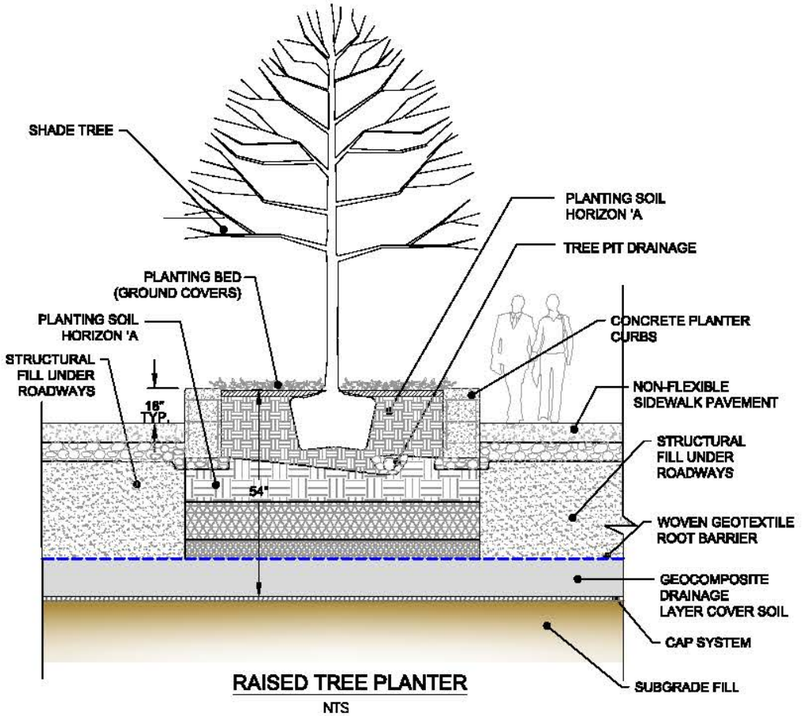


TYPICAL PLANT GROUPING SOIL DEPTHS

NTS

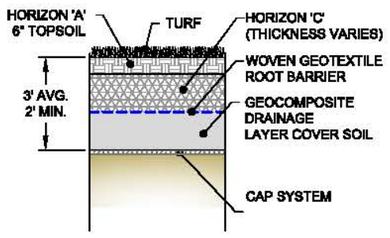
NOTES:

1. SOIL DEPTHS ILLUSTRATE THE NOMINAL DEPTH FOR EACH PLANT GROUPING TABULATED IN TABLE 2 OF THE OSDS. PLANTS FROM SHALLOW GROUPINGS MAY BE PLACED IN AREAS WHERE DEPTHS EXCEED THAT SHOWN.
2. GEOCOMPOSITE DRAINAGE LAYER COVER SOIL WILL BE PLACED IN A SINGLE LIFT AS SPECIFIED. THE LAYER WILL HAVE A MINIMUM COMPACTED THICKNESS OF 12 INCHES.
3. THE ROOT BARRIER WILL BE PLACED OVER THE GEOCOMPOSITE DRAINAGE LAYER COVER SOIL.
4. HORIZON C SOIL WILL BE PLACED OVER THE ROOT BARRIER. THE FIRST 6 INCHES OF HORIZON C SOIL WILL BE COMPACTED TO 90% STANDARD PROCTOR IN THE TREE PLANTING AREAS.
5. THE ROOT BARRIER WILL EXTEND UNDER ALL NON-ROADWAY AREAS WITHIN THE OPEN SPACE. HONEYWELL RESERVES THE RIGHT TO NOT INSTALL THE ROOT BARRIER UNDER ROADWAYS.



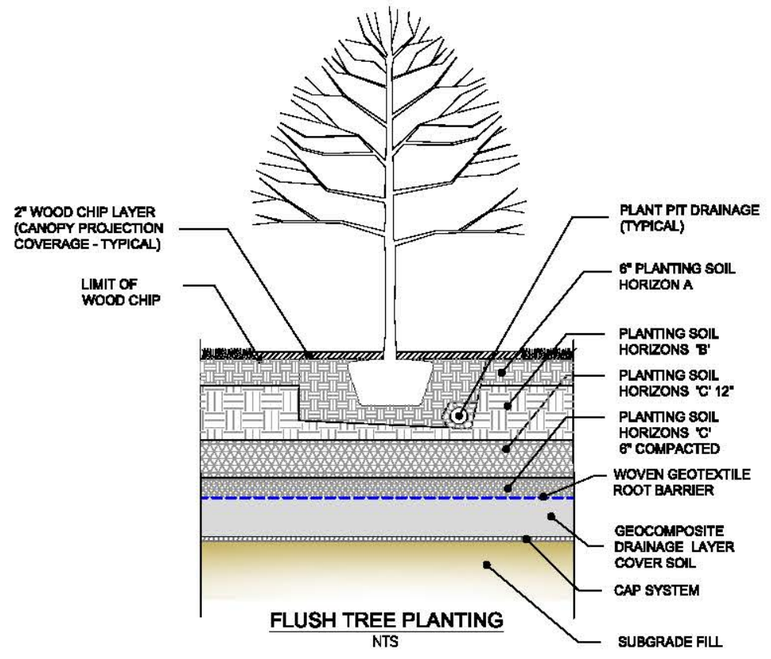
RAISED TREE PLANTER

NTS



SOIL DEPTH LAWNS

NTS



FLUSH TREE PLANTING

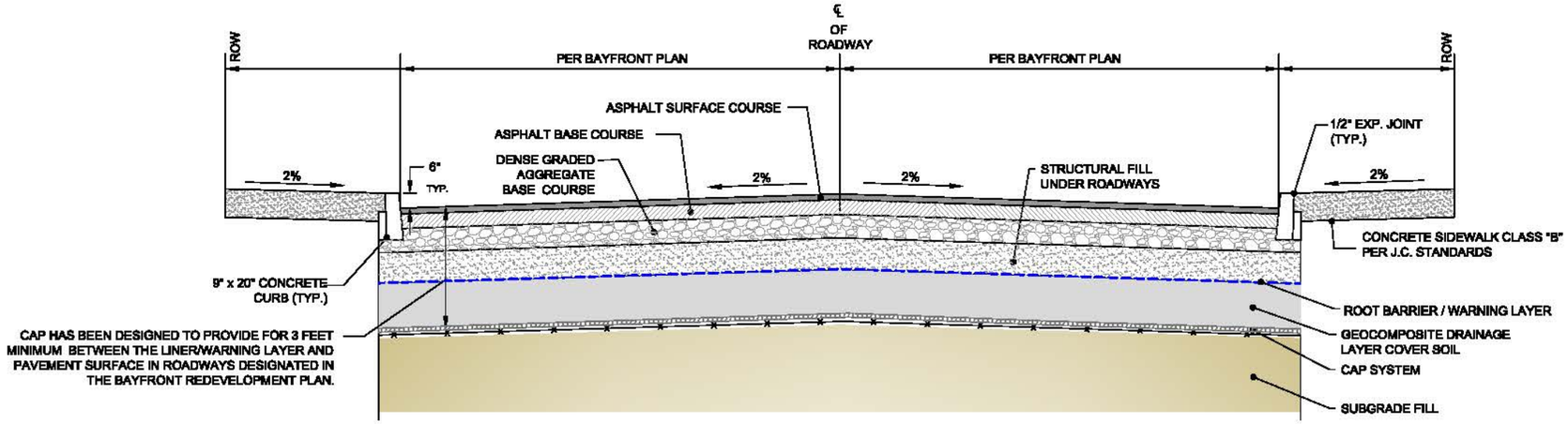
NTS

NOTES:

A. RAISED PLANTER DETAIL IS INCLUDED TO ILLUSTRATE ARCHITECTURAL CONCEPTS BAYFRONT REDEVELOPMENT MASTER PLAN REPORT AS PER EXHIBIT NO.123, PAGE 164.
B. DRAINAGE SYSTEM DETAILS WILL BE DEVELOPED AS PART OF THE FINAL LANDSCAPE DESIGN BASED ON PLANTING LAYOUT AND SPECIES SELECTION.

Prepared/Date: RJR 05/20/13
Checked/Date: BGB 05/20/13

Honeywell 101 COLUMBIA RD, MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY, STUDY AREA 6 NORTH JERSEY CITY, NEW JERSEY HONEYWELL SITE ID - 37472	amec	TYPICAL PLANTING GROUPING SOIL DEPTHS FIGURE 5

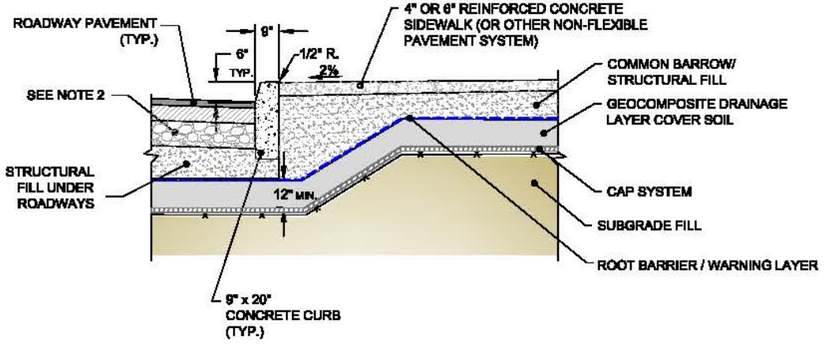


TYPICAL ROADWAY SECTION

NTS

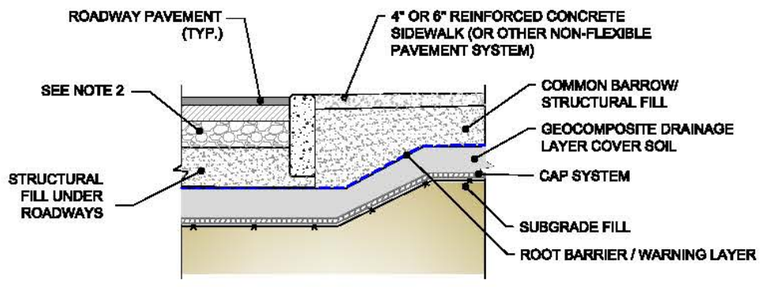
NOTE:

1. THESE SECTIONS ILLUSTRATE DESIGN CONCEPTS THAT ARE PROTECTIVE OF THE CAP SYSTEM. THE ROAD DESIGNER WILL INCORPORATE THE FOLLOWING COMPONENTS OF THE REMEDIAL DESIGN INTO THE ROAD DESIGN.
   - 12" COMPACTED SINGLE LIFT OF GEOCOMPOSITE DRAINAGE LAYER COVER SOIL .
   - STRUCTURAL FILL UNDER ROADWAYS. DEPTH WILL VARY SUBJECT TO THE PAVEMENT DESIGN.
2. DEPTH OF PAVEMENT BOX AS SHOWN IS BASED ON JERSEY CITY DEPARTMENT OF ENGINEERING STANDARDS. PAVEMENT DESIGNS WILL BE PREPARED IN ACCORDANCE WITH APPENDIX L: OPEN SPACE DESIGN STANDARDS, SECTION 2.2.1.A ROADS AND HARDSCAPE AREAS.
3. THE ROOT BARRIER WILL EXTEND UNDER ALL NON-ROADWAYS AREAS WITHIN THE OPEN SPACE. HONEYWELL RESERVES THE RIGHT TO NOT INSTALL THE ROOT BARRIER UNDER ROADWAYS.



TYPICAL SIDEWALK & CURB SECTION

NTS

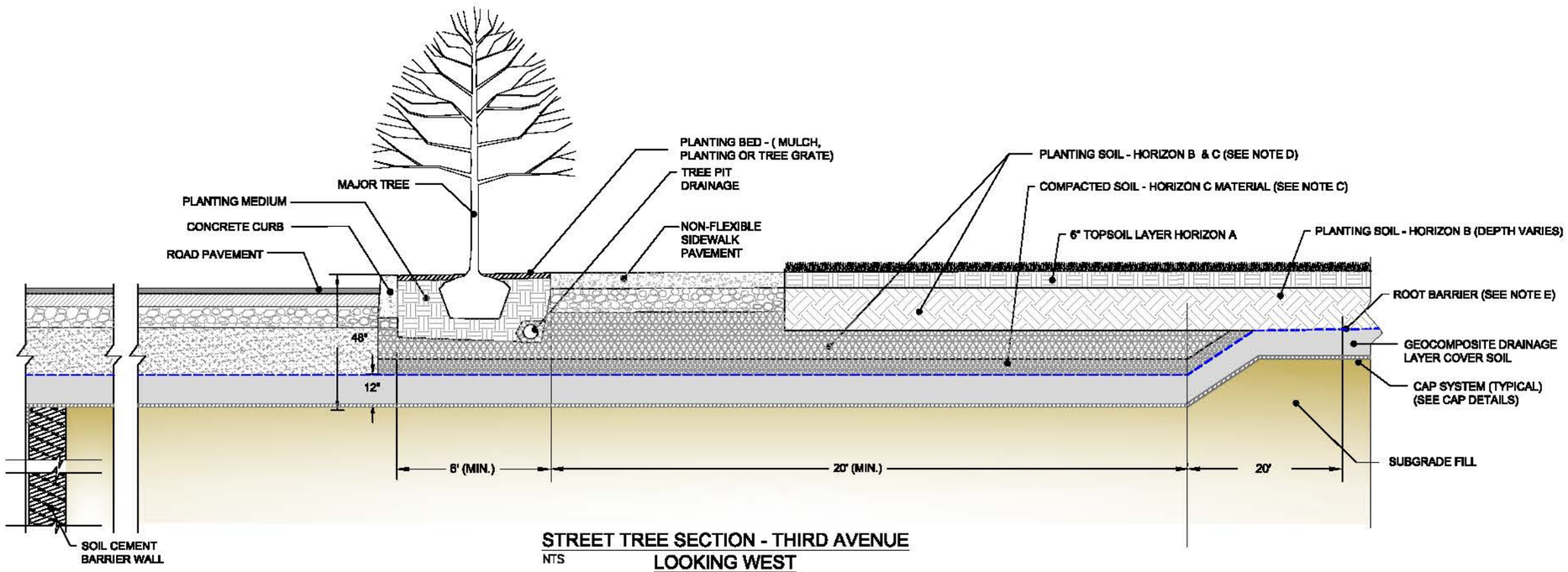


TYPICAL RECESSED CURB SECTION

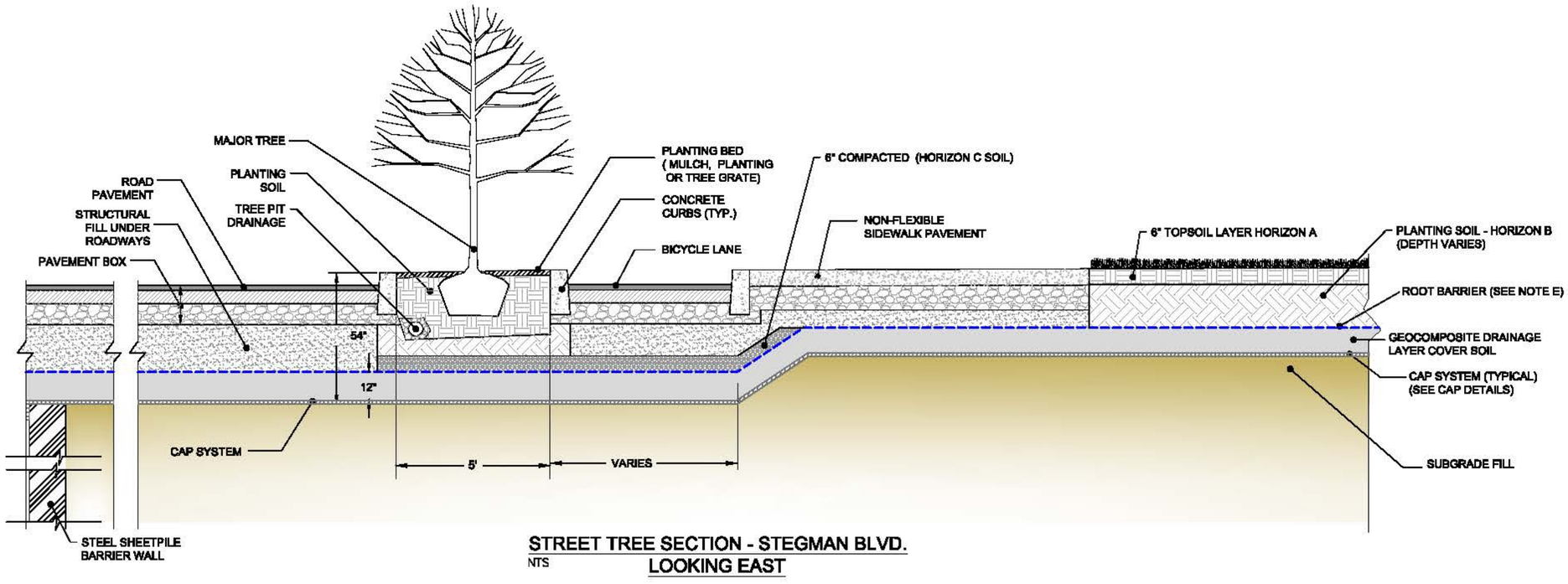
NTS

Prepared/Date: RJR 05/20/13
Checked/Date: SCS 05/20/13

Honeywell 101 COLUMBIA RD, BOX 2105 MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY, STUDY AREA 6 NORTH JERSEY CITY, NEW JERSEY HONEYWELL SITE ID - 37472	amec	ROAD SECTION CONCEPTS HONEYWELL BAYFRONT REDEVELOPMENT FIGURE 6



STREET TREE SECTION - THIRD AVENUE
NTS
LOOKING WEST



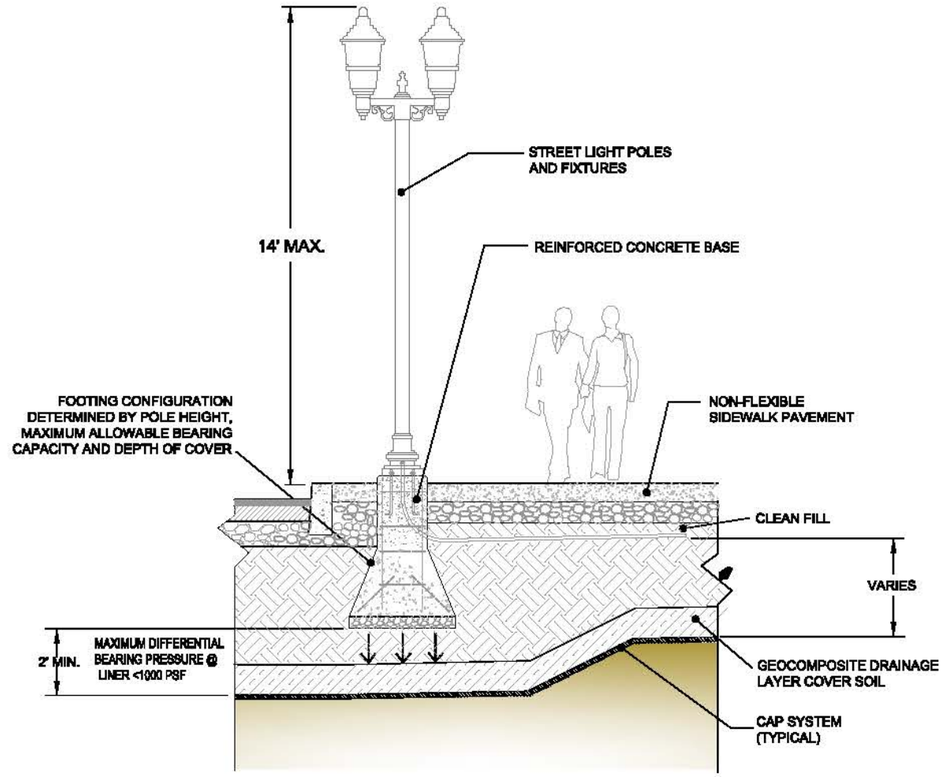
STREET TREE SECTION - STEGMAN BLVD.
NTS
LOOKING EAST

NOTES:

A. SIDEWALK WIDTH AND DEPTH ARE INCLUDED TO ILLUSTRATE POTENTIAL DEVELOPMENT CONCEPTS. FINAL DESIGN DETAILS WILL BE DEVELOPED TO MEET JERSEY CITY DESIGN REQUIREMENTS STIPULATED IN THE CONSENT DECREE AND OSDS.
B. ACTUAL DEPTH TO LINER MAY BE DEEPER THAN SHOWN WHERE UTILITIES OCCUR.
C. HORIZON C MATERIAL SHALL BE PLACED TO A MAXIMUM OF 18" THICKNESS ABOVE THE LINER, WITH BOTTOM 6" WILL BE COMPACTED TO 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR TEST. HORIZON B MATERIAL SHALL BE PLACED OVER HORIZON C AND EXTEND TO HORIZON A. IF THE DEPTH TO LINER IS LESS THAN 36 INCHES HORIZON C MATERIAL WILL EXTEND TO HORIZON A.
D. IN LAWN OR PAVEMENT AREAS HORIZON C MATERIAL SHALL EXTEND TO HORIZON A.
E. THE ROOT BARRIER WILL EXTEND UNDER ALL NON-ROADWAYS AREAS WITHIN THE OPEN SPACE. HONEYWELL RESERVES THE RIGHT TO NOT INSTALL THE ROOT BARRIER UNDER ROADWAYS.

Prepared/Date: RJR 05/20/13
Checked/Date: SGS 05/20/13

Honeywell 101 COLUMBIA RD, BOX 2105 MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY, STUDY AREA 6 NORTH JERSEY CITY, NEW JERSEY HONEYWELL SITE ID - 37472	amec	STREET TREE PLANTING CONCEPTS HONEYWELL BAYFRONT REDEVELOPMENT FIGURE 7



STREET LIGHT INSTALLATION CONCEPT

NTS

PSF - LBS PER SQUARE FOOT

Prepared/Date: RJR 03/15/13
Checked/Date: BGS 03/15/13

Honeywell 101 COLUMBIA RD, MORRISTOWN, NJ 07962	OPEN SPACE DESIGN STANDARDS CHROMIUM REMEDY, STUDY AREA 6 NORTH JERSEY CITY, NEW JERSEY HONEYWELL SITE ID - 37472	amec	STREET LIGHT CONCEPTS HONEYWELL BAYFRONT REDEVELOPMENT Project 3480-10-0005 FIGURE 8

ATTACHMENT A

OSDS COMPARISON OF APPLICABLE CONSENT DECREE PARAGRAPHS					
ARTICLE	**SECTION**	**Description**	**PARAGRAPH**		**COMMENTS**
			Study Area 6 South	Study Area 6 North	
	A	Chromium Remediation	65	56	
ARTICLE III		Cap 40 mil	65(a)	56(a)	Identical
		Utilities above cap	65(b)	56(b)	56(b) outfall etc. adds provisions related to JCMUA
		Average Soil Depths	65(c)	56(c)	Identical
		Soil Consolidation	65(d)	56(d)	65(d) allows for soils up to 1000 PPM to be consolidated under cap. 56(c) allows soils up to 240 PPM
		Shallow Groundwater Remedy	69	58	
		Incorporation of Study Area 7 SCB wall	a	a	Identical
		Hydraulic Barrier wall depth	b	b	Identical
		Groundwater Extraction system	c	c	Identical
		Shallow groundwater capture	d	d	Study Area 6 North includes a caveat related to the deep groundwater remedy
		Plan for control of water levels	e	e	Identical
		Demolition of structures below the meadow mat	f	f	Identical
		NJDEP groundwater classification exception submittal	g	g	Identical
	B	Long Term Monitoring, Maintenance and Protection of Engineering and Institutional Controls		60	
		Prohibited Development	74(j)	60(j)	
		Establishment of OSDS by Honeywell	i	i	Identical
		Initial Development	ii	ii	Identical
		Special Master review of Initial Development	iii	iii	Identical

OSDS COMPARISON OF APPLICABLE CONSENT DECREE PARAGRAPHS					
ARTICLE	**SECTION**	**Description**	**PARAGRAPH**		**COMMENTS**
			Study Area 6 South	Study Area 6 North	
		Honeywell responsibility for compliance with the requirements of the CD	iv	iv	Identical
		Requirements for Development	v	v	Identical
		NJDEP submission of OSDS not reqd.	(vi)	vi	Identical
		During Initial period Development Plans require Special Master approval	vii	vii	Identical
		As-Built documentation distribution	viii	viii	Identical
		Initial Development "in kind" and modification approvals	ix	ix	Identical
		Benchmarks for Development after Initial Period	x (1-3)	x (1-3)	Identical
		Approval for expansion of Utility corridors after Initial Period	xi	xi	Identical
		Reporting of alteration and additions after the Initial Period	xii	xii	Identical
		Demolition of Development to maintain or repair the Chromium Remedy	xiii	xiii	Identical
		Permissible Development	74(k)	60(k)	Identical
		Roads and Pedestrian thoroughfare	i	i	Identical
		Surface Transit	ii	ii	Identical
		Curbing and Fences	ii	iii	Identical
		Sidewalks, paths, walkways and trails	iii	iv	Identical
		Utilities and Utility corridors	iv	v	Identical
		Irrigation and sprinkler components	v	vi	Identical
		Water features	vi	vii	Identical
		Above ground stormwater cisterns	vii	viii	Identical
		Signs	viii	ix	Identical

OSDS COMPARISON OF APPLICABLE CONSENT DECREE PARAGRAPHS					
ARTICLE	**SECTION**	**Description**	**PARAGRAPH**		**COMMENTS**
			Study Area 6 South	Study Area 6 North	
		Benches, trash receptacle and bicycle racks	ix	x	Identical
		Recreational facilities	x	xi	Identical
		Landscaping	xi	xii	Identical
		Honeywell's Ongoing Responsibility	75	61	Identical
		Long Term Monitoring Plan	76	62	Identical
		Long Term Monitoring Plan Objectives	77	63	Identical
		Quarterly Visual		64(a)(i)	Identical
		Quarterly Erosion		ii	Identical
		Quarterly differential settlement		iii	Identical
		Topographic survey frequency		iv	Identical
		Quarterly Remedy disturbance		v	Identical
		Quarterly Burrowing animals		vi	Identical
		Quarterly vegetation cover		vii	Identical
		Quarterly groundwater levels		viii	Identical
		Other monitoring to be defined		ix	Identical
		Procedures for Changes to Long term monitoring		(b)	Identical
		Contingency Plan		(c)	Identical
		Routine Maintenance		(d)	Identical
		Record keeping		(e)	Identical
		Monitoring Reporting	79	65	Identical
		Notice to Stakeholders	80	66	Identical
		Annual Letter	81	67	Identical
		Future Notice to Stakeholders	82	68	Identical
		Stakeholder Enforcement	83	69	Identical

Notes:

CD = Consent Decree

JCMUA = Jersey City Municipal Utilities Authority

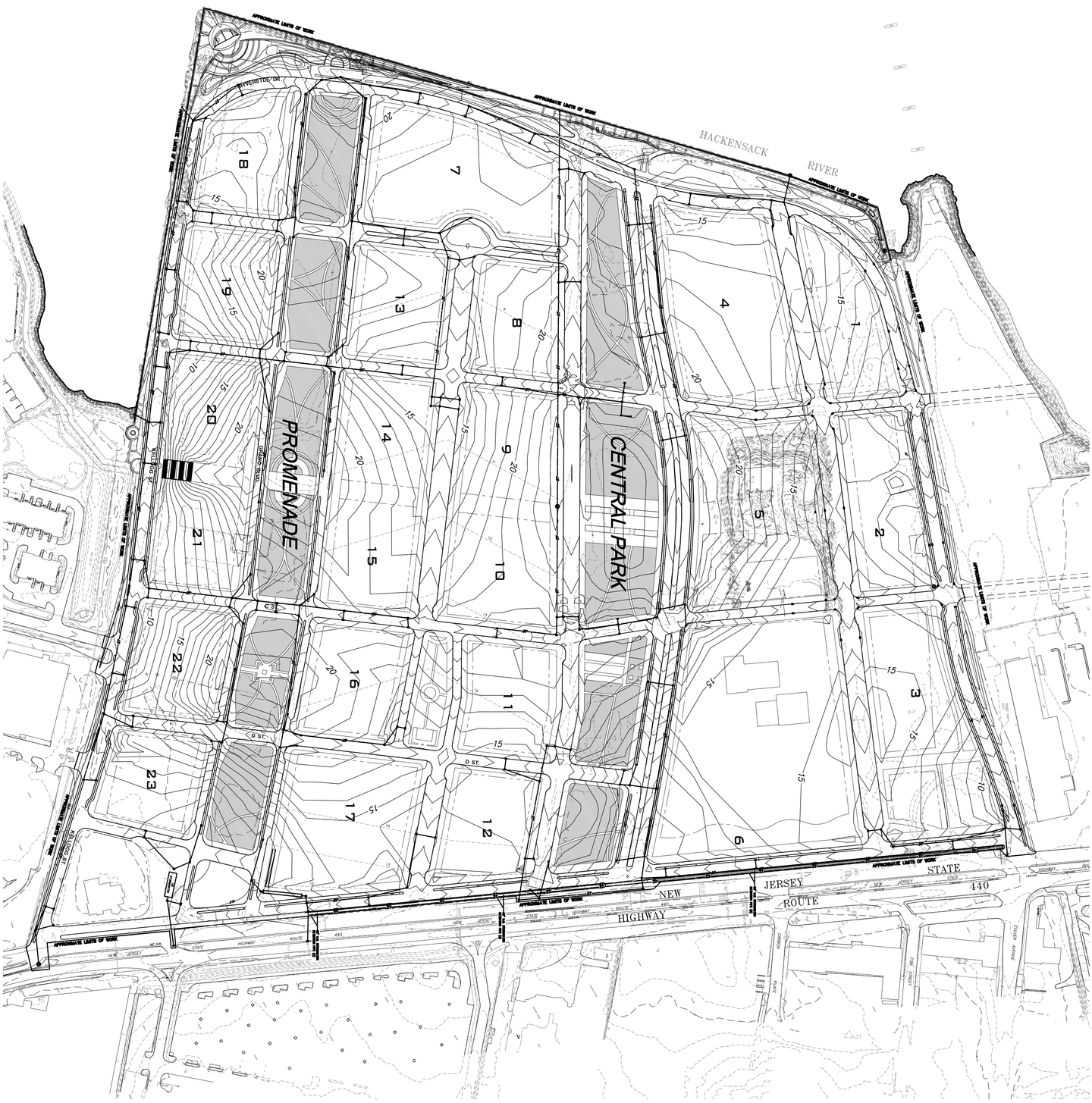
NJDEP = New Jersey Department of Environmental Protection

PPM = Parts Per Million

SCB = Soil Cement Bentonite

EXHIBIT 1

BAYFRONT REDEVELOPMENT PROPOSED FINAL GRADING



Scale in feet: 0, 150, 300

CHA
6 Campus Drive
Parsipanny, NJ 07054-4406
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MACTEC
200 American Metro BLVD,
Hamilton, New Jersey 08619
(609) 936-0700

Honeywell
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MORRISTOWN, NJ 07962

OVERALL GRADING PLAN

BAYFRONT REDEVELOPMENT PLAN
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

CONCEPT DESIGN

NO.	DATE	REVISION	BY	APVD
1	3-12-13	REVISE GRAND BLVD/FRONTAGE RD LAYOUT	JRH	APS
		PER ROUTE 440 DESIGN MODIFICATION		

DSGN	DR	CHK	APVD
APS	JRH	APS	APS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
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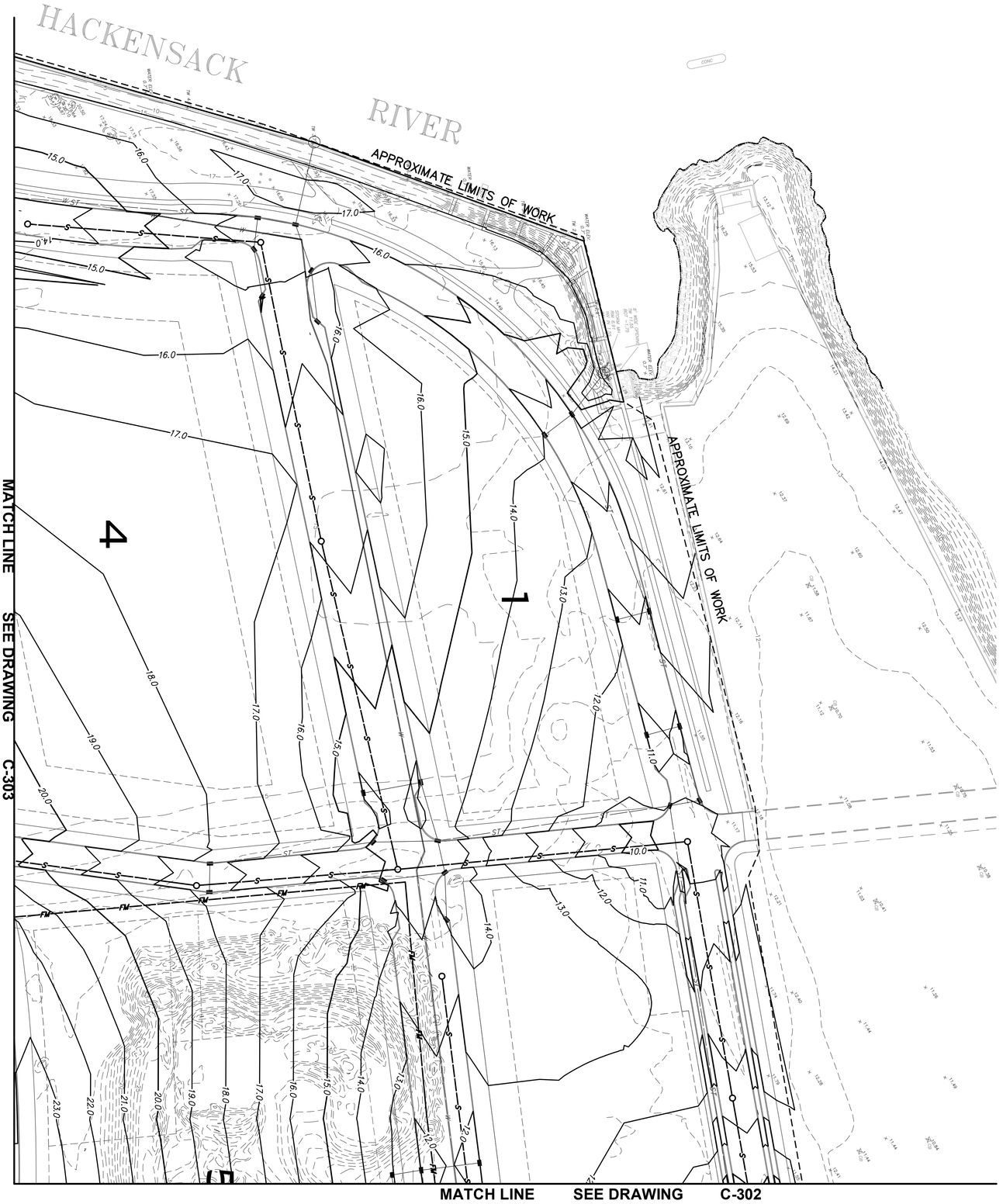
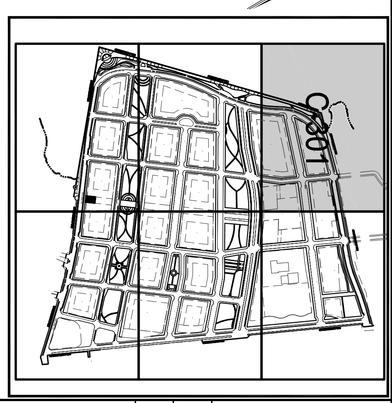
DATE 03/12/2010
PROJ 3480-05-0155
DWG C-300
SHEET 24 OF 64





SHEET KEY

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Scale in feet

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GRADING PLAN

BAYFRONT REDEVELOPMENT PLAN
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

CONCEPT DESIGN

NO.	DATE	REVISION	BY	APVD
1				

DSGN	DR	CHK	APVD
NDT	MAB	NJS	APS

DATE	03/12/2010
PROJ	3480-05-0155
DWG	C-301
SHEET	25 OF 64

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

MATCH LINE SEE DRAWING C-301

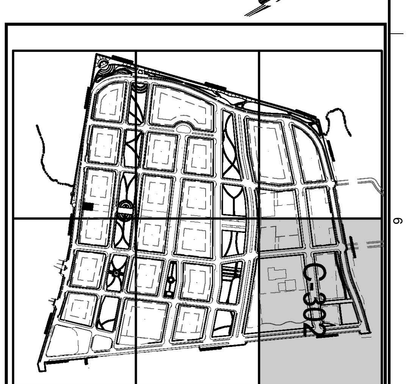
MATCH LINE SEE DRAWING C-304

APPROXIMATE LIMITS OF WORK

APPROXIMATE LIMITS OF WORK

60" U.C. STORMWATER DETENTION PIPE (2)

SHEET KEY



Scale in Feet
0
50
100

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BAYFRONT REDEVELOPMENT PLAN
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

GRADING PLAN

CONCEPT DESIGN

NO.	DATE	REVISION	BY	APVD
1				

DSGN	DR	CHK	APVD
NDT	MAB	NJS	APS

VERIFY SCALE
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0 1"

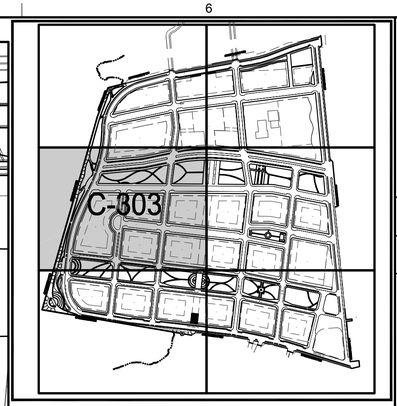
DATE 03/12/2010
PROJ 3480-05-0155
DWG C-302
SHEET 26 OF 64

MATCH LINE SEE DRAWING C-301

APPROXIMATE LIMITS OF WORK

MATCH LINE SEE DRAWING C-304

MATCH LINE SEE DRAWING C-305



SHEET KEY

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Scale in feet

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BAYFRONT REDEVELOPMENT PLAN
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

CONCEPT DESIGN

GRADING PLAN

NO.	DATE	REVISION	BY	APVD
		DR MAB CHK NJS	APVD	APS
1		DSGN NDT		

VERIFY SCALE
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0 1"

DATE	03/12/2010
PROJ	3480-05-0155
DWG	C-303
SHEET	27 OF 64

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MATCH LINE SEE DRAWING C-302

MATCH LINE SEE DRAWING C-303

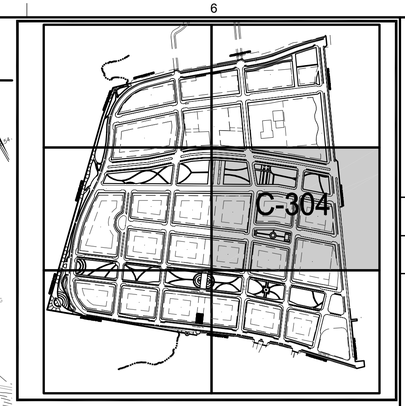
MATCH LINE SEE DRAWING C-306

APPROXIMATE LIMITS OF WORK

60" U.G. STORMWATER DETENTION PIPE (2)

D ST.

10 11 12 15 16 17



SHEET KEY

0 50 100
Scale in feet

NO.	DATE	REVISION	BY	APVD
1		DR MAB CHK NJS APVD APS NDT DSGN		

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BAYFRONT REDEVELOPMENT PLAN
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

CONCEPT DESIGN

GRADING PLAN

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Hamilton, New Jersey 08619
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VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	03/12/2010
PROJ	3480-05-0155
DWG	C-304
SHEET	28 OF 64

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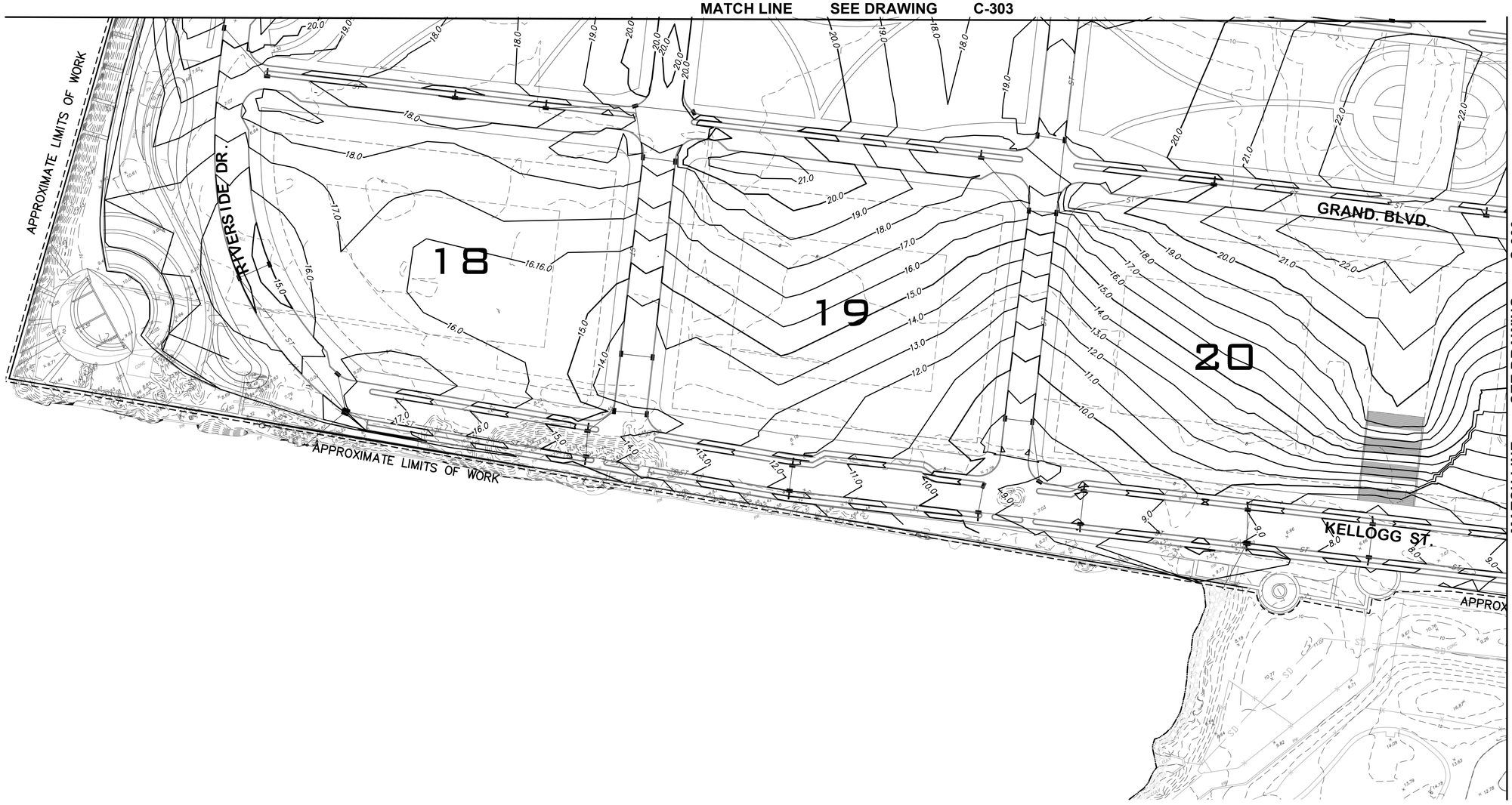

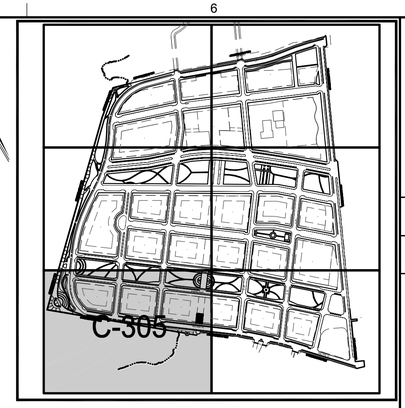

SHEET KEY

0 50 100
Scale in feet

NO.	DATE	REVISION	BY	APVD
1		DR CHK	NJS	APVD
		NDT MAB	DSGN	APS

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BAYFRONT REDEVELOPMENT PLAN
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37472

CONCEPT DESIGN

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VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	03/12/2010
PROJ	3480-05-0155
DWG	C-305
SHEET	29 OF 64

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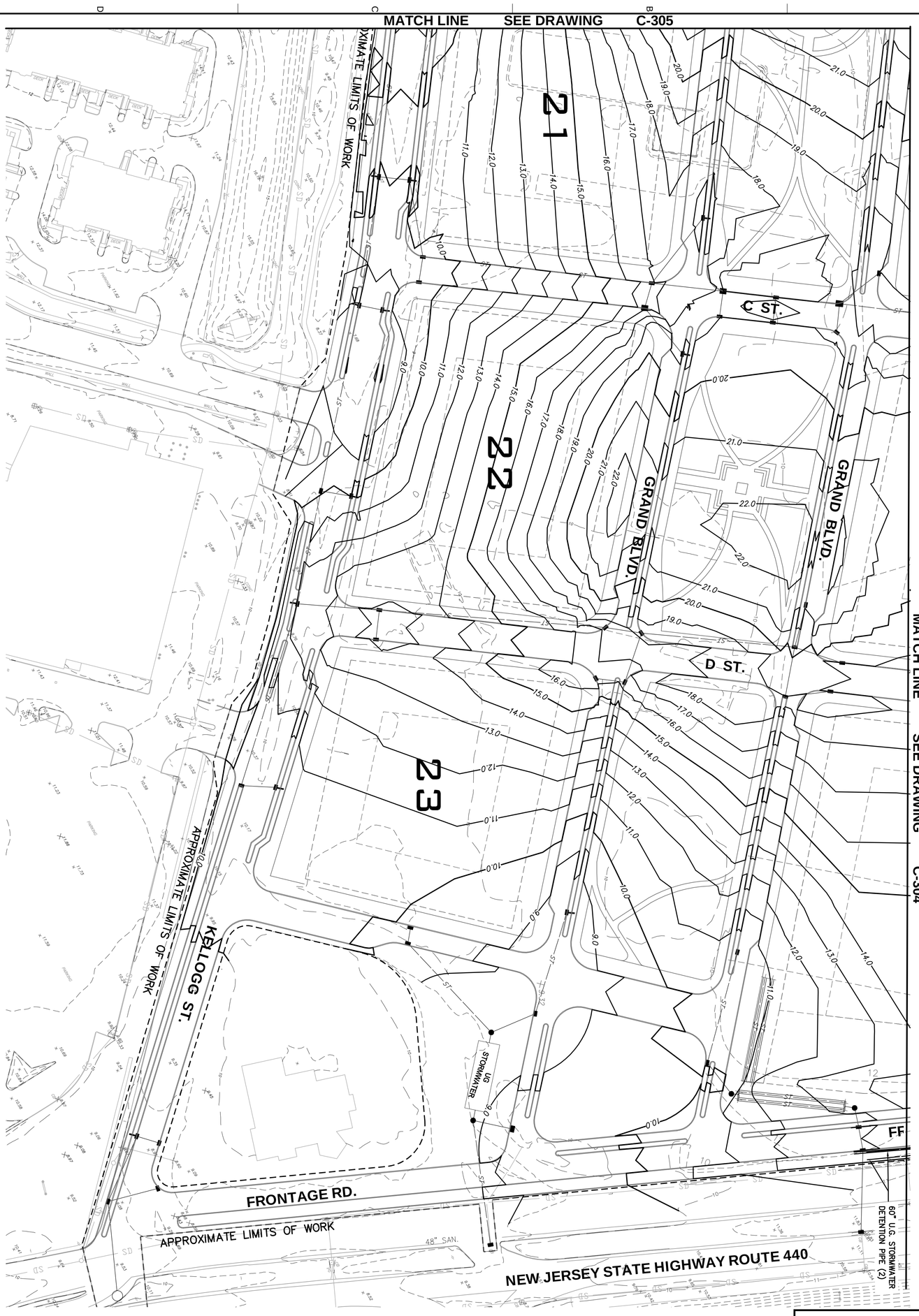

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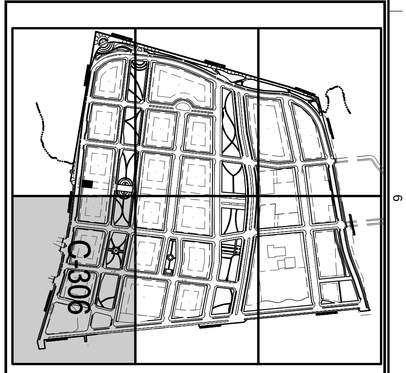

Scale in feet: 0, 50, 100

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BAYFRONT REDEVELOPMENT PLAN
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CONCEPT DESIGN

GRADING PLAN

NO.	DATE	REVISION	BY	APVD
1	3-12-13	REVISE GRAND BLVD/FRONTAGE RD LAYOUT PER ROUTE 440 DESIGN MODIFICATION	JRH	APS

DSGN	DR	CHK	APVD
APS	JRH	APS	APS

VERIFY SCALE
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0 1"

DATE 03/12/2010
PROJ 3480-05-0155
DWG C-306
SHEET 30 OF 64

EXHIBIT 2

TECHNICAL SPECIFICATIONS – SECTION 02315, 02372, 02374

SECTION 02315

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish all labor, equipment, and materials necessary for excavation, filling/backfilling, compaction, testing, and grading. The Work shall be as shown on the Drawings and as specified herein. Work includes, but is not limited to, the following:
   1. Borrow source testing of imported fill materials;
   2. Installation of decontamination facilities;
   3. Excavation of soils/materials;
   4. Placement and compaction of non-chromium impacted excavated soils/materials to remain on-site;
   5. Placement and compaction of chromium impacted excavated soils/materials to remain on-site;
   6. Placement and compaction of imported fill materials;
   7. Field quality control testing of fill materials;
   8. Restoration of all disturbed areas; and
   9. Other miscellaneous earthwork activities, as necessary.

B. Control of surface water run-on and run-off during construction shall be in accordance with Section 02370, ñErosion and Sedimentation Controlò.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01010: Summary of Work (RFP Section III).
B. Section 01100: Remediation Construction Requirements (RFP Section III).
C. Section 01330: Submittal Procedures.
D. Section 01560: Dust Control.
E. Section 01600: Soil Handling and Management.
F. Section 02140: Dewatering.
G. Section 02150: Temporary Excavation Support.
H. Section 02170: Hydraulic Barrier.
I. Section 02230: Clearing and Grubbing.
J. Section 02370: Erosion and Sedimentation Control.

1.03 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The current version/edition of the publication is referenced, unless otherwise noted. The publications are referred to in the text by basic designation only.

B. ASTM International, Inc. (ASTM):
   1. ASTM C 88 Standard Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
   2. ASTM C 136 Sieve Analysis of Fine and Coarse Aggregates;
   3. ASTM D 422 Standard Test Method for Particle-Size Analysis of Soils;

4. ASTM D 535 Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
5. ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
6. ASTM D 854 Test Method for Specific Gravity of Soils;
7. ASTM D 1140 Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve;
8 . ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
9. ASTM D 2216 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soils and Rock by Mass;
10. ASTM D 2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System);
11. ASTM D 3740 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction;
12. ASTM D 4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils;
13. ASTM D 5101 Standard Test Method for Measuring the Soil-Geotextile System Clogging Potential by the Gradient Ratio;
14. ASTM D 5519 Standard Test Method for Particle Size Analysis of Natural and Man-Made Riprap Materials;
15. ASTM D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. New Jersey Soil Erosion and Sediment Control Standards, July 1999.
D. N.J.A.C. 7:26E Technical Requirements for Site Remediation ("Tech Rule")
E. USEPA 7199 Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography, 1996
F. Alternative and Clean Fill Guidance for SRP Sites, 2011

1.04 DEFINITIONS

A. Satisfactory Soils:
1. Satisfactory soils shall meet the requirements specified in Part 2 of this Section and shall be used in areas as shown on the Drawings and as approved by the Engineer. In addition, satisfactory soils shall satisfy the following conditions:
a. Satisfactory soils shall be free of material greater than 6 inches any direction, unless otherwise specified or approved by the Engineer. Furthermore, the maximum particle size shall not exceed ½ of the lift thickness, unless otherwise specified.
b. Satisfactory soils shall be certified clean from the off-site borrow source of origin, based on analytical testing data, as approved by the Engineer.
c. Satisfactory soils shall be free of all unsatisfactory soils/materials listed below.

B. Unsatisfactory Soils/Materials:
1. Unsatisfactory soils/materials include but are not limited to highly plastic/fat silt and clay, organic soils, and/or peat (classified as MH, CH, OL, OH, or PT via ASTM D 2487), stumps/brush, trash, refuse, debris, frozen soils, soils containing materials greater than the allowable size (see above),

saturated soils, fine-grained soils above their liquid limit at the time of compaction, and soils that are either too wet or too dry to compact.

C. Cohesionless and Cohesive Soils:
   1. Cohesionless soils include gravels, sand-gravel mixtures, sands, and gravelly-sands, classified as GW, GP, SW, or SP by the Unified Soil Classification System (ASTM D 2487).
   2. Cohesive soils include clayey gravels, sand-clay mixtures, clayey sands, clays, and silts, classified as GC, SC, CL, CH, ML, or MH by the Unified Soil Classification System (ASTM D 2487).
   3. Soils classified as GM and SM will be identified as cohesionless only when the "fines" are determined to be non-plastic.
   4. Testing required for the classification of soil shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and/or ASTM D 1140.

D. Structural and Non-structural Fills
   1. Structural fills include soils to be placed under or in the vicinity of proposed structures or under pavement.
   2. Non-structural fills include soils not placed under the vicinity of proposed structures or pavement.

E. Percent Compaction:
   1. Degree of compaction (percent compaction) required is expressed as a percentage of the maximum dry density, at the optimum moisture content.
   2. Maximum dry density and optimum moisture content for structural fills shall be obtained by the test procedures presented in ASTM D 698, unless otherwise specified.
   3. Maximum dry density and optimum moisture content for non-structural fills shall be obtained by the test procedures presented in ASTM D 698, unless otherwise specified.

1.05 QUALITY ASSURANCE

A. Codes and Standards:
   1. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

1.06 SUBMITTALS

A. Submit to the Engineer for approval (unless otherwise specified) the following in accordance with Section 01330, "Submittal Procedures":
   1. Surveyor:
      a. The name, qualifications, and proposed survey means/methods of an independent third-party Land Surveyor to complete site topographic surveys as required for measurement and payment shall be submitted within 7 days following notice to proceed.
      b. The Land Surveyor shall be registered in the State of New Jersey.

2. Borrow Source(s):
    a. The Contractor shall provide the proposed source(s) of borrow materials prior to initiation of work. Any available/previous geotechnical laboratory testing data shall be provided.
3. Contractor's Quality Control Testing Laboratory (QCTL):
    a. The name and qualifications of an independent third-party geotechnical testing laboratory to be used for borrow source testing and field quality control testing shall be submitted within 7 days following notice to proceed.
    b. The Contractor's QCTL shall meet the requirements of ASTM D 3740, at a minimum.
4. Test Reports:
    a. The Contractor's QCTL shall submit 2 copies of the following test reports directly to the Engineer, with at least 1 copy to the Contractor:
        (1) All test reports for borrow source materials; and
        (2) Field quality control test reports (for review).

1.07 SITE CONDITIONS

A. Subsurface Information:
    1. Site Subsurface soils identified within the limits of excavation contain hexavalent chromium in excess of NJDEP's most stringent Non-Residential Soil Cleanup Criteria of 20 mg/kg, based on available analytical testing data.

B. Existing Utilities and Underground Structures:
    1. Known existing utilities and underground structures are shown on the Drawings. The location of existing utilities and underground structures should be considered approximate.
        a. The approximate footprints of former/historic structures are shown on the Drawings. The presence and/or condition of below-grade foundations, slabs, walls, etc. is not known.
    2. Prior to the commencement of site activities, the Contractor shall locate and identify all existing utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection.
    3. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the Utility Owner and Engineer immediately for directions. Cooperate with the Owner, Honeywell, and utility companies in keeping respective services and facilities in operation. The Contractor shall repair damaged utilities to satisfaction of the Utility Owner and Honeywell.
    4. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

C. Use of Explosives:
    1. Use of explosives is prohibited.

D. Protection of Persons and Property:
    1. Barricade and mark open excavations occurring as part of this Work in accordance with applicable standards.
    2. Protect wooded areas, facilities, structures, utilities, pavements, sidewalks, fences, and other facilities designated to remain from damage caused by

settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations and heavy truck/equipment traffic.

a. Unless otherwise noted, existing monitoring wells and piezometers are to remain. The Contractor shall take necessary precautions to protect existing wells and piezometers during all phases of the work.

b. Unless otherwise noted, existing storm water inlets and sanitary sewer manholes are to remain. The Contractor shall take necessary precautions to protect existing storm water inlets and sanitary sewer manholes during the work.

c. Any damage to facilities, structures, utilities, etc. designated to remain shall be repaired and/or replaced by the Contractor at no additional expense to Honeywell.

PART 2 - PRODUCTS

2.01 IMPORTED FILL

A. Location/Use:

1. Imported Fill shall consist of Common Borrow, Structural Fill, Geocomposite Drainage Layer Cover Soil, Cushion Fill and Planting Soils.

B. Imported Fill shall be certified clean from the origin, based on analytical testing data, as approved by the Engineer.

1. NJDEP Technical Requirements 7:26E 1.8, Imported Fill shall meet requirements of “Clean Fill”.
2. NJDEP Alternative and Clean Fill Guidance for Soil Remediation Project Sites December 29, 2011 Version 2.
3. USEPA 7199, Imported Fill shall have a hexavalent chromium concentration of 1 milligram per kilogram or less.
4. Treated soils or other recycled materials imported from off-site sources are prohibited.

2.02 NON-CHROMIUM IMPACTED SOILS/MATERIALS

A. Location/Use:

1. Non-Chromium Impacted Soils/Materials removed and stockpiled to access the chromium impacted soils shall be used initially as backfill to achieve the subgrade elevations indicated on the Drawings. Upon completion of excavation activities, the stockpiled soils from that excavation are to be returned to the excavation first.

2.03 CHROMIUM IMPACTED SOILS/MATERIALS

A. Location/Use:

1. Chromium Impacted Soils/Materials that are removed from beyond the limits of the cap in accordance with the Drawings, or as directed by the Engineer, are to be used as backfill to achieve the subgrade elevations within the footprint of the cap(s) in compliance with the limits defined in the Consent Decree and specified in Part 1.01 C of Specification 01600.

2.04 COMMON BORROW

A. Location/Use:
   1. Common Borrow shall be used to supplement the non-chromium impacted soils in order to reinstate the subgrade in areas of excavation, in fill areas as necessary to achieve subgrade, and as indicated on the Drawings.
   2. The Contractor is to use all available on-site suitable fill materials prior to importing Common Borrow.

B. Common Borrow shall consist of granular soil reasonably well graded suitable for embankment construction. It shall be free from frozen materials, perishable rubbish, peat, and other unsatisfactory soils/materials. It shall be of such a nature and character that it can be compacted to the specified density (Sub-Part 3.12 of this Section).
   1. Common Borrow shall have a maximum nominal particle size of 4 inches or less when placed in lifts of 12 inches (prior to compaction) or less and compacted by heavy compaction equipment (i.e. vibratory roller), unless otherwise specified. The maximum nominal particle size shall be no more than ½ of the lift thickness when placed in lifts less than 12 inches thick (prior to compaction).
   2. Common Borrow shall be certified clean from the borrow source or origin, based on analytical testing data, as approved by the Engineer.
      a. Soils shall be tested and certified "clean" relative to the NJDEP Technical Requirements pursuant to 7:26E 5.2(d) 2 .
   3. Common Borrow shall contain a minimum of 5% to a maximum of 25% (by weight) passing the No. 200 sieve.

C. The moisture content shall be sufficient to provide the required compaction and a stable embankment and/or subgrade. In no case shall the moisture content exceed 3% above optimum, which shall be determined in accordance with ASTM D 698 for structural fills and non-structural fills, or approved equal testing method.

2.05 STRUCTURAL FILL UNDER ROADWAYS

A. Location/Use:
   1. Structural Fill Under Roadways shall be placed above the Geocomposite Drainage Layer Cover Soil and below the Horizon A planting soils, as indicated on the Drawings.

B. Structural Fill Under Roadways shall conform to the NJDOT requirements for Subgrade Fill Section 901.11. Materials shall meet the gradation requirements for one of the following DOT classifications: I-5 or I-8.

Gradation Designations, percentage by weight passing square mesh sieves											
	4"	2"	1"	¾"	½"	No. 4	No. 8	No. 16	No. 50	No. 100	No. 200
I-5		100		70-100		30-80			10-35		5-12
I-8					100	95-100		45-70	5-25		0-5

C. The moisture content shall be sufficient to provide the required compaction and a stable subgrade. In no case shall the moisture content exceed 3% above optimum,

which shall be determined in accordance with ASTM D 698 or an Engineer-approved equivalent testing method.

2.06 GEOCOMPOSITE DRAINAGE LAYER COVER SOIL

A. Geocomposite drainage layer cover soil shall be placed above the geocomposite drainage layer. The cover soil will be placed in a single lift with a minimum compacted thickness of 12-inches. If temporary haul roads are utilized over the cap for truck delivery of cover soil the roads will be constructed to a minimum depth of 36 inches. The soil placed over the geocomposite shall be spread using low ground pressure equipment (or equivalent low load method) while maintaining a 1 foot minimum of cover between the equipment and the geocomposite. Small equipment such as ATV's or golf carts will be permitted to operate directly on the surface of the geocomposite subject to the approval of the engineer. Such equipment will be subject to inspection to verify that the tires are of a type and condition that will not damage the geocomposite drainage layer and that there are no fuel of hydraulic leaks. The cover soil must be spread consistent with Specification 02374.

B. The geocomposite drainage layer cover soil shall be free of trash, ice, snow, tree stumps, and other unsuitable and deleterious materials. The maximum particle size shall be 3/8" inch or less. It shall be of such a nature and character that it can be compacted to the specified dry density of 90% (measured as a percentage of the max. dry density as determined by ASTM D 698) with a reasonable compaction effort. The geocomposite drainage layer cover soil will have a compacted (90% of the maximum dry density as determined by ASTM D 698) in-place hydraulic conductivity not less than $1x10^{-4}$ cm/sec.

Geocomposite drainage layer cover soil will meet one of the two requirements shown below:

1. The materials may be analyzed directly for hydraulic performance with the geosynthetic used in the drainage composite by the gradient ratio test (ASTM D 5101). Materials will be subject to engineer's approval after results from the gradient ratio test are reviewed.

2. The following gradation, retention, and clogging requirements for contact with the drainage geocomposite:

   Gradation/Stability: For soil to be classified as both well graded and stable, it must meet the following criteria:

   Well Graded: $D_{60}/D_{10} > 4$ and
   Stable: $D_{30}^2 / (D_{10} \times D_{60}) < 3$
   Where:
   D_{10} = the diameter at which 10 percent of the soil is finer
   D_{30} = the diameter at which 30 percent of the soil is finer
   D_{60} = the diameter at which 60 percent of the soil is finer

   Retention: The ability of the geocomposite drainage geotextile to retain the cover soil can be verified using the following criterion:

$O95 / D85 < B$

Where: B is a function of coefficient of uniformity (D_{60}/D_{10})

$B = 1$ $D_{60}/D_{10} < 2$ or > 8

$B = 0.5 \times D_{60}/D_{10}$ $2 < D_{60}/D_{10} < 4$

$B = 8/ (D_{60}/D_{10})$ $4 < D_{60}/D_{10} < 8$

$B = 1.8$ for silts and clays

O95 = the 95 % opening size of the geotextile (in mm)

D85 = the diameter at which 85 percent of the soil is finer

Clogging: To minimize particulate clogging:

$O95 > 3D_{15}$

Where:

O95 = the 95 % opening size of the geotextile (in mm)

D_{15} = the diameter at which 15 percent of the soil is finer

2.07 CUSHION FILL

A. Cushion Fill material will be placed directly beneath the cover system geomembrane. The cushion fill shall be a material capable of being compacted to 90% of maximum dry density as determined by ASTM D 698 with a reasonable compaction effort. The material selected will be a clean fill with a maximum particle size of ½-inch meeting the requirements of a Unified Soil Classification System SP material.

B. A non-woven geotextile fabric may be substituted for Cushion Fill soil material. Refer to the Drawings for required material.

C. A Geocomposite Drainage layer conforming to the requirements of Section 02374 may be substituted for Cushion Fill or Non Woven geotextile.

2.08 BEDDING SAND

A. Bedding sand for piping trench shall be as follows or similar locally available aggregate acceptable to the Engineer.

Sieve Designation	Percent by Weight Passing
3/8-inch	100
No. 4	95-100
No. 8	85-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

2.09 CRUSHED STONE

A. Crushed stone shall be used around drainage control structures, pipes, and other locations as shown on the Drawings. Crushed Stone shall consist of clean, inert, hard durable grains of rock free from vegetable matter, shale, and lumps or balls of clay, meet the requirements of NJDOT 901.01, 901.02, 901.03 and 901.04 and conform to the following gradation requirements provided below.

Sieve Size	Gradation (percent passing, by dry weight)	
	1-1/2 – inch stone (NJDOT No. 4 size)	3/8 –inch stone (NJDOT No. 8 size)
1 ¾ - inch	100	
1 - ½ inch	90-100	
1 – inch	20-55	
¾ - inch	0-15	
½ - inch		100
3/8 – inch	0-5	85-100
No. 4 sieve		10-30
No. 8 sieve		0-10
No. 16 sieve		0-5
No. 200 sieve	0-2	0-2

2.10 DENSE GRADED AGGREGATE

A. Location/Use:
   1. Dense Graded Aggregate shall be used as indicated in the Construction Documents.
   2. Dense Graded Aggregate shall conform to Section 901 of the NJDOT Standard Specifications.

2.11 HISTORIC FILL

A. Location/Use:
   1. Historic Fill materials shall be used initially for surcharge material as indicated on the Construction Drawings.
   2. Historic Fill shall be screened to a 4-inch minus prior to use as surcharge material or Common Borrow. Unsuitable materials and waste shall be removed from Historic Fill prior to its reuse on site.
   3. Historic Fill meeting the requirements of Common Borrow specified herein shall be used in order to reinstate the subgrade in areas of excavation as indicated on the Drawings or as fill after surcharge of the Site has been completed.

2.12 PLANTING SOILS

Planting Soils have been designated as Horizon A, B and C. Soil Horizon A – Topsoil will be a nominal thickness of 6 inches and shall conform to the requirement noted below.

A. Topsoil - Topsoil shall be placed over the Horizon B and C planting soils to final development grades shown in the design drawings. Topsoil will have a nominal depth of 6 inches. Topsoil shall be in accordance with Section 02900, “Topsoil and Seeding”. Topsoil shall be certified clean from the borrow source or origin, based on analytical testing data, as approved by the Engineer. Topsoil shall be natural, friable, fertile loam, fine sandy loam or sandy loam with an organic matter content of 3.5% - 6% and a pH range of 5.0 – 6.5.

B. Soil Horizon B - soils will only be used in areas where the total depth of cover soils exceeds 36 inches. During the Interim Phase no Horizon B soil will be

placed. Horizon B soils will be a uniform sandy loam having the following properties:

Sandy loam classification having 80% sand, ≤ 10% silt, 10% clay.
Ph range 5.5 – 7.0.
Organic Matter (by weight) 1.5-3.5%.

C. Soil Horizon C – During Interim Grading Horizon C Soil will be placed between the root barrier and the Horizon A soil. The first 6 inches of Horizon C soils to be placed directly above the root barrier will be compacted to a minimum 90% of Standard Proctor. To meet Final Grading and planting requirements Horizon A soils will be stripped as necessary and Horizon C soils shall be re-graded to provide an appropriate depth of 18 inches. Horizon C soil shall consist of uniform sandy loam having the following properties:

1. Sandy loam classification with 70-80% sand, ≤ 10% silt, 15-20% clay.
2. pH range 5.0 – 7.5.
3. Organic Matter (by weight) 1 % max.

2.13 BORROW SOURCE TESTING

A. Borrow source testing, including geotechnical characterization requirements, shall be conducted on all soil materials proposed for construction. Minimum third-party geotechnical laboratory testing requirements and frequency for materials are listed as follows:

1. Common Borrow, Geocomposite Drainage Layer Cover Soil, Cushion Fill, Dense Graded Aggregate, Planting Soils (Horizons B and C):

Test	Methodology[1]	Frequency[2]
Particle-Size Analysis	ASTM D 422	1 test/source/material (to #200 Sieve)
Standard Proctor	ASTM D 698	3 test/source/material

2. Topsoil (Horizon A):
   Refer to Section 02900, "Topsoil and Seeding".
3. Crushed Stone:

Test	Methodology[1]	Frequency[2]
Particle-Size Analysis	ASTM D 422	1 test/source/material (to #200 Sieve)

B. Borrow Source Testing Notes:

1. Other testing methods may be considered acceptable, based on prior approval of the Engineer.
2. Testing frequency shall be as listed, at any change in borrow source, or at any discernable change in material delivered to the site (as determined by the Engineer).
   a. Common Borrow shall be certified clean from the borrow source or origin, based on analytical testing data, as approved by the Engineer.
      1. Soils shall be tested and certified "clean" relative to the NJDEP Technical Requirements pursuant to 7:26E 5.2(d)
      2.

PART 3 - EXECUTION

3.01 NOTIFICATION

A. The Contractor shall also comply with the New Jersey's Underground Facility Protection Act and notify the New Jersey's One Call System before performing Work on the Project. The One Call System can be reached by calling 1-800-272-1000.

3.02 INSPECTION

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the Engineer, in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

3.03 TOPOGRAPHIC SURVEYS

A. General:
   1. Pre-Construction, Post-Excavation, and Final/Post-Construction Topographic Surveys, at a minimum, shall be completed for the purposes of quantifying excavation volumes, backfill (i.e., Non-Chromium Impacted Fill and Common Borrow) volumes, restored surface areas (i.e. Topsoil and Seed).
   2. Topographic surveys completed for the purposes of quantifying work completed shall be performed by an independent/third-party surveyor licensed in the State of New Jersey.
   3. Topographic surveys shall correspond to the state plane coordinate system.
   4. Topographic surveys for the purposes of measurement and payment shall be surveyed on a grid with points spaced no greater than 25 feet by 25 feet with suitable detail to provide one-foot elevation contours, unless otherwise approved by the Engineer.
   5. Topographic surveys shall be submitted to the Engineer in both printed and electronic form (AutoCAD 2008 format/compatible).

B. Pre-Construction Survey:
   1. The pre-construction topographic survey shall be completed within the Limits of Disturbance, as shown on the drawings, plus 50 feet beyond the perimeter.
   2. Survey data shall provide the basis for measurements of excavation volume.

C. Post-Excavation Survey:
   1. Upon completion of excavation, the Contractor shall provide for a topographic survey of the limits and subgrade elevations of the final excavation footprint(s), as approved by Honeywell and the Engineer.
   2. The post-excavation survey shall be completed within the limits of excavation, plus 25 feet.
   3. Survey data shall provide the basis for measurements of excavation volume.

D. Final/Post-Construction Survey:

1. The Contractor shall provide for a topographic survey of the final restored surface to provide final grades.
2. The final/post-construction survey shall be completed for the final disturbed (and restored) footprint, plus 25 feet.
3. Survey data shall provide the basis for measurements of the volume of Non-Chromium Impacted Fill and Common Borrow.

3.04 EXCAVATION DEWATERING AND DISCHARGE

A. General:
   1. Perform dewatering as necessary for the control, collection, and discharge of groundwater and surface water entering excavations.
   2. Perform dewatering as necessary for provide a safe working environment.
   3. Perform dewatering in accordance with Section 02140, “Dewatering”.

3.05 STABILITY OF EXCAVATIONS

A. General:
   1. Slope sides of excavations to comply with applicable codes and ordinances.
      a. Shore and brace excavations where sloping is not possible because of space restrictions or stability of material excavated.
   2. Maintain excavations in a safe condition until completion of backfilling, or longer, if specified or directed by the Engineer.

B. Shoring, Sheeting, and Bracing:
   1. Utilize where necessary to meet safety requirements and/or as shown on the Drawings.
      a. Establish requirements for trench shoring, sheeting, and bracing to comply with codes and ordinances of authorities having jurisdiction.
   2. Provide materials for shoring, sheeting, and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
   3. Shoring, sheeting, and/or bracing shall be in accordance with Section 02150, “Temporary Excavation Support”.

3.06 COLD WEATHER PROTECTION

A. Protect exposed subgrade surfaces against freezing when atmospheric temperature is less than 35°F.
   1. Fill materials shall not be placed atop frozen subgrade surfaces.

3.07 EXCAVATION

A. General:
   1. Excavation consists of removal of material encountered when establishing required subgrade elevations/depths as shown on the Drawings.
   2. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times.
   3. Excavated materials shall be segregated as shown on the Drawings.
      a. Refer to Section 01600, “Material Handling and Management”, for additional information.

B. General Site Excavation/Grading:

1. Before removal of bituminous materials, a neat saw cut shall be performed to provide for the complete removal of the asphalt material without damage to the remaining adjacent material.
2. The work includes a total excavation depth of approximately 20 feet bgs of soils/materials which shall be completed as shown on the Contract Drawings. Phasing of the work shall allow for excavation and staging of both chromium impacted and non-chromium impacted soils/materials for future reuse on-site as backfill or for disposal.
3. Excavated material containing excess water shall be mixed with dryer soils and or absorbents prior to loading. Prior to off-site transportation and disposal, the Contractor shall inspect the truck to ensure that soil shipped off-site for disposal does not contain standing water.

3.08 POST-EXCAVATION VERIFICATION/CONFIRMATION SAMPLING

A. Preapproval of the limits excavation for chromium-impacted soils has been provided by NJDEP based on soil sampling results. As a result, a limited number of excavations will require post-excavation verification/confirmation sampling following completion of specified excavation activities. Post-excavation verification/confirmation sampling will be completed by others. The Contractor shall support sampling activities as necessary and shall not begin backfilling excavations prior to review and acceptance by the Engineer.

Conditions that would trigger the need for additional post excavation sampling may include:

1. If field observations indicate that an area previously characterized as clean is not, sampling may be conducted to help identify the source and assess the impact;
2. Observations that were not consistent with soil conditions characterized by the samples that were collected during the RI and PDI;
3. Observations of chromium blooms on the surface of soils previously thought to be clean; and
4. Any other field conditions which suggest chromium impacts may extend outside the defined limits.

3.09 TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIALS

A. Honeywell shall arrange for the off-site transportation and disposal of chromium impacted solid waste materials (exclusive of cleared materials, asphalt and concrete debris, and general rubbish/trash), under separate contract.
B. The Contractor shall be responsible for coordination and day to day scheduling of Honeywell's designated transporters for chromium impacted solid waste materials.
C. The Contractor shall provide all equipment, labor, and personnel necessary to load the transporter's trucks and/or containers in a timely manner.

3.10 SUBGRADE PREPARATION

A. General:
   1. Remove vegetation, debris, unsatisfactory soils/materials, obstructions, and deleterious materials from subgrade surfaces prior to placement of fills.
   2. Bench, plow, strip, scarify, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

B. Subgrade Compaction:
   1. After to placing of any required Common Borrow, subgrade surfaces shall be compacted to a firm and unyielding condition, as approved by the Engineer. Compaction shall be performed using a static steel drum roller loaded to provide a 1 TSF (2,000 PSF) loading to the subgrade. The roller shall be tracked over the subgrade materials until no further significant rutting or deformation of the subgrade occurs. Subgrade compaction shall be subject to engineer's approval.
      a. The Engineer's subgrade evaluation shall include visual observations, hand-rod probing, and/or compaction testing.
   2. Subgrade surfaces shall be relatively smooth/even, free of loose soil, ponded water, and debris. Any loose, soft, wet, frozen, or otherwise unsuitable/unsatisfactory soils or materials observed should either be re-compacted or undercut to a suitable subgrade, as approved by the Engineer.
   3. Any undercut/excavated material should be replaced/backfilled with Common Borrow, as approved by the Engineer.
      a. Fill materials shall be placed and compacted as specified herein.

3.11 PLACEMENT OF FILL MATERIALS

A. General:
   1. Place specified fill materials in lifts as specified herein as required to achieve specified subgrade elevations.
   2. Do not place fill material on surfaces that are muddy, frozen, or contain frost or ice.
   3. Backfill excavations as promptly as work permits, but not until completion of the following:
      a. Acceptance by Engineer of any construction below finish grade.
      b. Removal of trash and debris.

B. Fill Placement:
   1. Place fill materials in layers not more than 12 inches (prior to compaction) for material to be compacted by heavy compaction equipment (i.e. vibratory roller, sheepsfoot roller, etc.), unless otherwise specified.
   2. Place fill materials in layers not more than 8 inches (prior to compaction) for material to be compacted by hand-operated walk-behind equipment, unless otherwise specified.
   3. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density (Sub-Part 3.13).
   4. Three feet of fill thickness above the GDL will be maintained in areas where loaded trucks will be operating. Thickness of less than 3 feet will be acceptable if LGP equipment is used to spread cover.

3.12 COMPACTION

A. General:
   1. Provide soil compaction during construction as necessary to achieve minimum percent/degree of compaction, as specified herein.

B. Percent Compaction Requirements:
   1. All structural fill shall be compacted to at least 95% maximum dry density as determined by ASTM D 698, unless otherwise approved by the Engineer.
   2. All structural fill under roadways shall be compacted to at least 95% maximum dry density as determined by ASTM D 698, unless otherwise approved by the Engineer.
   3. All non-structural fill shall be compacted to at least 90% maximum dry density as determined in accordance with ASTM D 698, unless otherwise approved by the Engineer.
   4. Crushed stone is to be compacted in 8”-9” loose lifts, and compacted using 2-3 passes of a hand operated vibratory plate compactor weighing approximately 200 lbs, unless otherwise approved by the Engineer.
   5. Re-used on-site historic fill material will be compacted by 2 to 3 passes of a suitable vibratory roller.

C. Moisture Control:
   1. Where the subgrade or a layer of fill/backfill must be moisture-conditioned before compaction, uniformly apply water to the surface, in proper quantities to prevent free water appearing on surface during or subsequent to compaction operations.
   2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
   3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled as specified herein or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory level.

3.13 FIELD QUALITY CONTROL TESTING

A. Quality Control Testing During Construction:
   1. Allow testing service to examine and test subgrade surfaces and fill/backfill layers. Before further construction work is performed, test results meeting the requirements of this Section shall be obtained.
   2. Perform field density tests on imported materials in accordance with ASTM D 6938 (nuclear method), or other Engineer approved methods, as applicable.
      a. For each layer of fill placed, conduct at least 1 compaction test for every 2,500 square feet, but in no case less than 3 tests per lift.
      b. Re-used on-site historic fill material will not be tested for compaction.
      c. The 6 inches of Horizon C soil immediately above the root barrier will be conducted at the start of the project to develop a correlation of compaction results between Procedure A and Procedure B as defined in ASTM D 6938. A minimum of 15 results will be used to develop the correlation. Procedure B (backscatter) will be used in conjunction with the correction factor developed through the correlation testing to test for conformance with the specified

compaction. The pin shall be fitted with a collar or other device to limit the maximum depth to prevent puncture of the root barrier geotextile.

3. The frequency of testing, for each layer of fill placed, may be reduced to 5 tests per acre provided it can be demonstrated by statistical analysis of a data set of at least 40 samples that there is a 95% confidence level that the required compaction is being achieved.
4. If in opinion of Engineer, based on testing service reports and inspection, subgrade soils or fill/backfill materials which have been placed are below specified density, the Contractor shall provide additional compaction and testing at no additional expense to Honeywell.

3.14 ASPHALT RESTORATION

A. Asphalt areas shall be restored as indicated in the Construction Documents.
B. Refer to Section 02741, “Road Construction”.

3.15 TOPSOILING

A. Refer to Section 02900, “Topsoil and Seeding”.

3.16 FINAL GRADING

A. General:
   1. The Contractor shall uniformly grade areas within the Limits of Work/Disturbance, as shown on the Drawings. Smooth finished surface within specified tolerances, with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

3.17 MAINTENANCE

A. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
C. Reconditioning Compacted Areas:
   1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

--END OF SECTION--

SECTION 02372

CAP GEOMEMBRANE LINER

PART 1 - GENERAL

1.01 DESCRIPTION

Work provided in this Section includes furnishing labor, materials, equipment and incidentals required to install a 60-mil textured (both sides) Linear Low Density Polyethylene (LLDPE) geomembrane as part of the multi-layer cap construction as shown on the Drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01330: Submittal Procedures
B. Section 02315: Earthwork
C. Section 02374: Geocomposite Drainage Layer

1.03 REFERENCES

The publications listed below, latest edition unless otherwise noted, form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbs/ft^3 (600 kN-m/m^3)
ASTM D 792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 1004	Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
ASTM D 1238	Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D 1505	Standard Test Method for Density of Plastics by the Density-Gradient Technique
ASTM D 1603	Standard Test Method for Carbon Black in Olefin Plastics
ASTM D 3895	Standard Test Method for Oxidative-Induction Time of Polyolefins By Differential Scanning Calorimetry
ASTM D 4218	Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique

ASTM D 4437	Standard Practice for Non-destructive Testing (NDT) Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes
ASTM D 4833	Standard Test Method for Index Puncture Resistance of Geotextile, Geomembranes and Related Products
ASTM D 5321	Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
ASTM D 5323	Standard Practice for Determination of 2% Secant Modulus for Polyethylene Geomembranes
ASTM D 5596	Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
ASTM D 5617	Standard Test Method for Multi-Axial Tension Test for Geosynthetics
ASTM D 5721	Standard Practice for Air-Oven Aging of Polyolefin Geomembranes
ASTM D 5885	Standard Test method for Oxidative Induction Time of Polyolefin Geosynthetics By High-Pressure Differential Scanning Calorimetry
ASTM D 5994	Standard Test Method for Measuring the Core Thickness of Textured Geomembrane
ASTM D 6392	Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
ASTM D6693	Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes

GEOSYNTHETIC RESEARCH INSTITUTE (GRI) STANDARDS

GRI GM11	Accelerated Weathering of Geomembranes using a Fluorescent UVA-Condensation Exposure Device
GRI GM12	Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gage
GRI GM17	Test Properties, Testing Frequency and Recommended Warranty for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

1.04 SUBMITTALS

Submit the following in accordance with Section 01330, “Submittal Procedures”.

A. Submittals relating to liner Manufacturer and liner material:
   1. Manufacturing:
      a. List of material properties of the liner proposed for the project meeting the requirements herein with attached certified test results.
      b. Manufacturer's quality control program and manual including description of in-house laboratory facilities.
      c. A list of ten completed facilities totaling a minimum of ten million square feet, for which the Manufacturer has manufactured LLDPE geomembrane. The following information shall be provided for each facility.
         1. Name and purpose of facility, its location and date of installation.
         2. Name of Owner, Project Manager, Design Engineer and Installer.
         3. Geomembrane thickness and surface area.
      d. Qualifications statement in accordance with Section 1.06 “Qualifications”.
      e. Manufacturer’s recommendations for geomembrane installation procedures.
   2. The origin of the resin to be used in the manufacturing of geomembrane used on-site including the suppliers name and production plant, as well as brand name and tracking number.
   3. Copy of quality control certificates in conformance with Section 2.01. Certifications that the LLDPE geomembrane and extrudate produced for this project have compatible properties. Quality control reports for the time period materials were produced for this project.
   4. A "Sample Warranty" in accordance with Section 1.08.
   5. Prior to shipment of liner material to the site, provide 5 samples (roll width by 3 feet) from 5 random rolls to be provided. Only ship to site, material that is approved by the Contractor.
      Submittals relating to the Installer:
   6. Installation Capabilities:
      a. Information on equipment and personnel.
      b. Anticipated average daily production.
      c. Number of crews employed and number available for this work.
      d. Qualifications in accordance with Section 1.06 “Qualifications”.
   7. A list of five completed facilities totaling 2 million square feet for which the Installer has installed LLDPE geomembrane. The following information shall be provided for each facility:
      a. Name and purpose of facility, its location and date of installation.
      b. Name of Owner, Design Engineer, Manufacturer and name and telephone number of Manufacturer’s Representative at the facility who can discuss the project.
      c. Surface area of the installed LLDPE geomembrane.

d. Type of seaming, patching and tacking equipment.
e. A copy of the Manufacturer's certification or approval letter.

8. As-built drawings reflecting the actual installation of geomembrane liner, including the location of seams, the location of destructive samples, and the location of repair work.

B. Within 10 days prior to liner installation submit the following:

1. Shop Drawings:
   a. Proposed panel layout showing the installation layout identifying field seams as well as any variance or additional details which deviate from the Drawings.
   b. Details of seaming the geomembrane, anchoring, connections, penetrations and other construction details, which deviate from these specifications.
2. Installation Quality Control:
   a. A quality control manual that specifically defines the quality control program during installation for this project. The manual shall include daily procedures, welding techniques, field testing procedures, lab testing procedures, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority and other information necessary to ensure a high quality geomembrane installation consistent with Manufacturer recommendations and these specifications.
   b. Resume of the Installation Supervisor to be assigned to and on-site during the project.
   c. Resume of the Master Seamer to be assigned to and on-site during the project.
   d. A list of personnel performing field seaming operations along with pertinent experience information.

1.05 QUALITY CONTROL

A. In addition to Manufacturer and Installer requirements for qualifications and certification specified in Paragraph 1.06, Quality Control consists of conformance testing of the material prior to delivery to the site and field quality control during installation.

B. Manufacturer conformance testing requirements are specified in Paragraph 2.02. The purpose of conformance testing is to verify that the supplied material conforms to the Specifications and to the Manufacturer's quality control certificates.

C. Field quality control testing requirements are specified in Paragraph 3.06 and 3.07. The purpose of field quality control procedures is to verify that the geomembrane has been installed in accordance with the specifications and Manufacturer's recommendations.

D. Field Quality Control Forms:
The forms in attached Appendix A shall be used for field installation documentation. Alternative forms may be used for documentation as submitted and approved by the Contractor and Engineer.

E. Geomembrane Quality Control Documentation:

1. Project Files:

b. Two duplicate project files shall be maintained. One shall be maintained by the Contractor's Field Representative and the other shall be maintained by the Installer. The Installer shall provide the Contractor's Field Representative with complete daily documentation by the end of the following work day. At the end of each work week, the Contractor and Installer will update and check the files to assure that copies of pertinent project information are included in each file.

c. Blank copies of the project forms shall be available onsite throughout the duration of the project and are included in attached Appendix A.

1.06 QUALIFICATIONS

A. Manufacturer:
The Manufacturer of the lining material described hereunder shall have previously demonstrated its ability to produce this geomembrane by having at least 5 years continuous experience in the manufacturing of LLDPE geomembrane and successfully manufactured a minimum of 10 million square feet of similar material for hydraulic liner installations.

B. Installer:
The Installer shall be the Manufacturer or a Manufacturer approved Installer trained to install the Manufacturer's geomembrane. Installation shall be performed under the constant direction of a single Installation Supervisor who shall remain on site and be in responsible charge, through the subgrade approval, geomembrane installation, for geomembrane layout, seaming, patching, testing, repairs and other site activities required by the Installer. The Installer shall also provide a Master Seamer (who may also be the Installation Supervisor). The Installation Supervisor/Master Seamer shall have installed or supervised the installation and seaming of a minimum of two million square feet of LLDPE geomembrane liner.

1.07 DELIVERY, STORAGE AND HANDLING

A. The geomembrane rolls shall be packaged and shipped by appropriate means to prevent damage of the geomembrane rolls. Off-loading, handling, and storage of the geomembrane is the responsibility of the Installer. The Installer shall be responsible for replacing any damaged or unacceptable material at no additional cost to the Contractor.

B. Roll Identification:
The Manufacturer shall provide geomembrane rolls marked or tagged with the following information:
1. Manufacturer's name;
2. Product identification;
3. Thickness;
4. Roll dimensions;
5. Manufacturer's roll and lot number; and
6. Date of manufacture.

C Damage during off-loading shall be documented by the Contractor's Field Representative. Damaged rolls must be separated from the undamaged rolls and removed by the Manufacturer.

D. The geomembrane rolls shall be stored so as to be protected from puncture, dirt, grease, water, mud, mechanical abrasions and excessive heat or cold that may damage the geomembrane material. The rolls shall be stored on a prepared surface (not wooden pallets or hard abrasive surfaces) and shall not be stacked more than two rolls high.

1.08 MATERIAL WARRANTY

The LLDPE geomembrane Manufacturer shall warrant the geomembrane against manufacturing defects and material degradation under outdoor exposure for a period of 5 years on a prorated basis from the date of final payment and acceptance. The Manufacturer shall repair or replace, including material and labor, at no expense to Honeywell, any material which fails from the above causes within the warranty period. The Manufacturer shall furnish a written warranty covering the requirements of this Paragraph.

1.09 GUARANTEE

The Installer shall guarantee the LLDPE geomembrane against defects in installation and workmanship for the period of 1 year commencing with the date of final payment and acceptance by the Contractor. The guarantee shall include the services of qualified personnel, all materials required for the repairs and testing at no expense to the Contractor.

1.10 DEFINITIONS AND RESPONSIBILITIES

A. Contractor:
The Contractor is the firm or corporation with whom Honeywell has entered into agreement to construct the project. The Contractor is responsible for review of submittals by the Manufacturer and the Installer as required by the Specifications. The Contractor is also responsible for scheduling and coordination of the required work with the Manufacturer and the Installer to complete the project.

B. Contractor's Field Representative:
The Contractor's field representative shall oversee the installation of the geomembrane by the Installer. The Contractor's field representative will be responsible for inspections and reviewing testing results for conformance with the specified requirements. The Contractor's field representative will compile QC test results daily and document all QC activities in weekly reports.

C. Engineer:
The Engineer shall be the individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications and shall provide technical guidance and review when required.

D. Manufacturer:
The Manufacturer is the firm or corporation contracted by the Contractor for production of the geomembrane material to be used in the project. The Manufacturer shall produce a consistent product meeting or exceeding the project specifications and shall provide quality control documentation for the product specified herein.

E. Installer:
The Installer is the firm or corporation contracted by the Contractor for installation of the geomembrane. The Installer shall be the Manufacturer or a Manufacturer approved Installer trained and certified to install the Manufacturer's

geomembrane. The Installer shall be responsible for field handling, storing, placing, seaming, sampling, testing, protecting and other aspects of the geomembrane installation.

F. Quality Control Laboratory:
An independent Quality Control Laboratory (QCL) hired by the Contractor to perform conformance testing of the liner material with demonstrated qualifications for conducting required testing.

G. Quality Assurance (QA). QA inspections will be conducted by an Independent Third Party specializing in Geoemembrane QC/QA. The QA inspector will collect samples and conduct independent QA testing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:
1. The resin from which the geomembrane is made shall generally be in the density range of 0.926 g/cc or lower, and have a melt index value per ASTM D 1238 of less than 1.0 g/10 min. Formulated sheet density shall be 0.939 g/cc or lower.
2. The blended resin shall contain two to three percent carbon black, anti-oxidants and heat stabilizer, but no fillers or extenders. The resin shall be virgin material, with no more than ten (10) percent rework. If rework is used, it must be of the same formulation as the parent material. No post-consumer resin of any type shall be added to the formulation.
3. The geomembrane material shall be so produced as to be free of holes, blisters, thin areas, inconsistent texturing, undispersed raw materials, or any sign of contamination by foreign matter.
4. The sheets shall be manufactured in a minimum 15-ft seamless width.

B. Properties:
1. The geomembrane rolls shall be textured LLDPE and shall meet the specified physical, mechanical, and chemical property requirements listed in attached Table 02372-1. Manufacturing Quality Control testing shall be conducted at the frequencies recommended in GRI GM 17 unless otherwise noted.

C. Other Materials:
1. Extrudate welding rods (for fusion welds) shall be compatible and similar to the geomembrane and supplied by the Manufacturer and shall be delivered in the original sealed containers. Each container shall have a label bearing the brand name, Manufacturer's lot number and complete directions as to proper storage.
2. Boots and shrouds for pipe penetration shall fit snugly around the pipe. Prefabricated material shall be designed to fit site specific conditions for the intended slope and size of pipe and be made of compatible and identical materials as the geomembrane.

2.02 CONFORMANCE TESTING

A. Tests:
Conformance testing shall be performed by the independent Quality Control Laboratory (QCL) provided and paid for by the Contractor. The Manufacturer shall obtain the samples from the roll, mark the machine direction and identification number and ship the samples to the QCL. The following conformance tests shall be conducted at the laboratory prior to shipment to the site:

1. Thickness
2. Density
3. Tensile properties
4. Tear resistance
5. Puncture resistance
6. Carbon black content
7. Carbon black dispersion
8. Asperity height
9. Interface Strength

B. Frequency:
These conformance tests shall be performed in accordance with Table 02372-1 and paragraph 2.1.B.2 for interface strength, at a frequency of one sample per 100,000 square feet unless otherwise noted or approved by the Contractor.

C. Acceptance or Rejection:
Conformance test results shall be reviewed by the Contractor and accepted or rejected, prior to shipment of the geomembrane. Test results shall meet, or exceed, the property values listed in Table 02372-1. The course of action implemented for retesting failing tests shall be approved by the Contractor. In case of failing test results, the Manufacturer may request that another sample be retested by the independent laboratory with Manufacturer's technical representative present during the testing procedures. This retesting shall be paid for by the Manufacturer. The Manufacturer may also have the sample retested at two different laboratories approved by the Contractor, paid for by the Manufacturer. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, geomembrane material from the lot or bracketed square footage representing the failing sample will be considered out of specification and rejected.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

A. Preparation of the subgrade using cushion fill for the cover system geomembrane (60-mil geomembrane) shall be as specified in Section 02315, “Earthwork”.

B. The surface of the subgrade shall be smooth, uniform, relatively free from abrupt changes in grade, rocks and stones greater than 1/2-inch for 60-mil geomembrane, sharp objects, debris and deleterious materials. During actual placing and seaming of the geomembrane, the subgrade surface shall be kept free of standing water. If the subgrade below the geomembrane becomes wet and unstable, it shall be recompacted in accordance with Section 02315, “Earthwork”. Before the

geomembrane installation begins, the Contractor and Installer shall verify and sign off that the surface area to be lined has been properly prepared.

3.02 ANCHOR TRENCH

A. The anchor trench shall be constructed as shown on the Drawings and/or as specified herein.
B. The anchor trench shall be adequately drained to prevent water ponding and softening of adjacent soils. The anchor trench shall be backfilled and compacted.
C. Geosynthetic material in the anchor trench shall be temporarily anchored with sandbags or other suitable materials until final approvals are obtained.
D. Backfilling of the anchor trench shall be conducted when the geomembrane is in its most contracted (taut) state.
E. Care shall be taken when backfilling and compacting the trenches to prevent any damage to the lining materials.

3.03 GEOMEMBRANE PLACEMENT

A. Weather Conditions:
Geomembrane placement shall not proceed at an ambient temperature below 32 degrees F or above 104 degrees F unless otherwise authorized, in writing, by the Contractor. Geomembrane placement shall not be performed during precipitation, excessive moisture, in an area of ponded water, or excessive winds that adversely affect the geomembrane placement.
B. Method of Placement:
1. Each panel of the geomembrane shall be rolled out and installed in accordance with the approved shop drawings prepared by the Installer. The layout shall be designed to keep field seams of the LLDPE geomembrane liner to a minimum and consistent with proper methods of LLDPE geomembrane installation. Panel layout and deployment shall be such that seams run down slope (i.e., perpendicular to top of slope). End seams across slopes greater than 4:1 (4 horizontal and 1 vertical) shall be avoided. See additional seam requirements in Section 3.04.
2. Geomembrane rolls shall be placed in a manner to prevent the material from being stretched during deployment.
3. The Contractor’s field representative shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Also, inspect geomembrane prior to geocomposite drainage layer installation. Defective or damaged panels shall be replaced or repaired, in accordance with Section 3.07.G of the specifications.
4. The Installer shall avoid dragging the geomembrane sheets on rough soil subgrade.
5. Geomembrane shall be anchored as shown on the Drawings and/or consistent with Manufacturer's recommendations.
6. Personnel working on the geomembrane shall not smoke, wear damaging shoes or involve themselves in any activity that may damage the geomembrane.
7. Edges and large exposed areas of the geomembrane shall be properly weighted to avoid uplift due to wind and to prevent lateral movement of the geomembrane.

8. Vehicular traffic except for proper installation vehicles (ATVs) across the geomembrane shall not be allowed. Any vehicle used prior to or after liner placement shall be first approved by the Contractor's field representative.
9. Repaired areas and destructive sample locations shall be recorded and indicated on the as-built drawings.
10. When tying into previously installed geomembrane, excavation, if required, adjacent to installed liner shall be performed by hand to prevent damage.
11. The geomembrane shall be kept free of debris, unnecessary tools and materials. In general, the geomembrane area shall remain neat in appearance.
12. Equipment necessary to perform the installation (generators, compressors, etc) at a minimum shall have a scrap geomembrane sheet placed underneath to protect the installed geomembrane from possible damage.
13. No welder or testing equipment shall be allowed to remain on top of the installed geomembrane overnight. Equipment must be removed and stored off the installed geomembrane.
14. No fueling of equipment will be allowed on top of the installed geomembrane. No fuel containers shall be allowed on the geomembrane.

C. Liner Boots (Penetrations):
1. LLDPE boots or shrouds for liner penetrations shall be furnished and installed where indicated on the Drawings. Prefabricated material shall be designed to fit site specific conditions for the intended slope and size of pipe and be made of compatible and similar materials as the geomembrane.
2. The geomembrane end of the boots shall terminate in a skirt section suitable for welding to the geomembrane liner. The overlap between the boot and the geomembrane shall be approximately 18-in. The boot shall be welded to the geomembrane as specified herein.
3. Boots and shrouds shall fit snugly around the pipe, pole, wells or vaults.
4. A neoprene rubber gasket and/or silicone caulking shall be used between the boot or shroud and the penetration structure and secured with a 1-in wide stainless steel clamp. An LLDPE sacrificial sheet shall be used between the boot or shroud and the clamp for protection.
5. For pipes, poles, wells, vaults larger than 4-in diameter, a second clamp shall be used. The fastener of the second clamp shall be located on the opposite side from the first clamp, to compensate for uneven pressure and elongation.

3.04 FIELD SEAMS

A. Individual panels of geomembrane shall be laid out and overlapped by a minimum of 4-inches for fusion welding and 6 inches for extrusion welding prior to welding. The area to be welded shall be cleaned and prepared in accordance with the quality control welding procedures approved by the Contractor's field representative.
B. Double track hot wedge fusion welds shall be used for straight long seams to the maximum extent possible.
C. Extrusion welds shall be used in areas inaccessible for double track hot wedge fusion welding, including patches, repairs and penetration boots.

D. The welding equipment used shall be capable of continuously monitoring and controlling the temperatures in the zone of contact where the machine is actually fusing the geomembrane material so as to ensure that changes in environmental conditions will not affect the integrity of the weld.

E. No "fish mouths" or wrinkles will be allowed within the seam area. Where "fish mouths" or wrinkles occur, the material shall be cut, overlapped and an extrusion weld patch shall be applied. Welds upon completion of the work shall be tightly bonded. Any geomembrane area showing injury due to excessive scuffing, puncture, or distress from any cause shall be replaced or repaired with an additional piece of geomembrane. The number of patches per 100-ft length of seam length shall not exceed five. If more than five patches per 100-ft length are necessary, then the entire 100-ft length of seam shall be removed. Further welding will cease at this time and the Contractor's field representative shall be notified.

F. Seams shall have a seam number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the as-built drawings. Seam numbers shall be derived from the combination of the two panel numbers that are to be welded together. Patches, boots and repairs shall be numbered using a system that includes the panel number where the patch, boot or repair is located.

G. Fusion welded "T" seams (i.e., the result of the geomembrane panels placed perpendicular to each other) shall be double welded where possible. The extrusion process shall be used for the second weld.

H. Extrudate shall be free of dirt, dry and protected from damage.

I. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat degraded extrudate. Purged extrudate shall not be placed on the installed geomembrane.

J. Seams constructed on sloped surfaces shall be perpendicular to the top and toe of the slope (vertical seams).

K. Panels placed on sloped surfaces (steeper than 4:1) shall extend a minimum of 5-ft inward (on the flat) from the top of slope or edge of trench.

L. End seams shall be staggered a minimum of 5-ft in length between contiguous panels. No end seams are allowed on slopes 4:1 (4 horizontal and 1 vertical) or greater, unless otherwise approved by the Contractor.

M. To prevent moisture buildup during fusion welding, it may be necessary to place a movable protective layer of plastic (skid sheet) directly below each overlap of geomembrane that is to be seamed.

N. Seam welds shall extend the full extent into the anchor trench.

O. Factory seams, field seams and repair welds shall meet seam strength requirements specified in Table 02372-2.

P. Seams shall be "shingled" or "rain-lapped."

3.05 SEAMING WEATHER CONDITIONS

A. Normal Weather Conditions:

1. The normal required weather conditions for seaming are:
   a. Ambient temperature higher than 32 degrees F and lower than 104 degrees F.
   b. No precipitation or other excessive moisture, such as fog or dew.
   c. No excessive winds.
2. These weather conditions shall be fulfilled during seaming process.

B. Cold Weather Conditions:
   1. If the ambient air temperature is below 32 degrees F seaming activity is to be avoided. If necessary, Contractor shall provide separate plan for approval.

C. Warm Weather Conditions:
   1. If the ambient air temperature is above 104 degrees F, no seaming of geomembrane shall be permitted unless the Installer can demonstrate, to the satisfaction of the Contractor's field representative that geomembrane seam quality is not adversely impacted.
   2. Test seams shall be performed under similar ambient air temperature conditions as the actual seams.
   3. Additional destructive tests shall be taken at the discretion of the Contractor's field representative.

3.06 FIELD QUALITY CONTROL

A. Start-up Testing:
   1. A test weld 3-ft long from each welding machine shall be run upon the beginning of each shift and every five hours thereafter, under the same conditions as exist for the geomembrane welding. The test weld shall be marked with date, time of day, Seamer's initials, temperature and speed settings (for fusion welds) or temperature and preheat settings (for extrusion welds), and machine number. The Installer shall provide a calibrated tensiometer, on-site before and during geomembrane installation for the purpose of testing samples. Six 1-in wide specimens shall be cut from each test weld and tested on-site in the presence of the Contractor's field representative (three for peel and three for shear strength) in accordance with Table 02372-2. To account for minor variations in conditions, the Seamer may reduce the weld speed by a maximum of 15% without the need to perform additional test welds.
   2. Test seams shall be performed under the same conditions as the actual seams and shall be at least 3-ft long and 1-ft wide after seaming. Material for test seams shall be cut out of the approved geomembrane rolls.

B. Nondestructive Seam Testing:
   1. The Installer shall perform a nondestructive test on field seams over their full length. The purpose of this test is to assure continuity and integrity of the seams. Vacuum and air pressure tests shall be used for nondestructive testing. The vacuum test shall be used for extrusion welds. The air pressure test shall be used for double track fusion welds.
   2. Vacuum Testing:
      a. Equipment for testing extrusion seams shall be comprised of the following:
         1. A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly and a vacuum gauge.
         2. A vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
         3. A rubber pressure/vacuum hose with fittings and connections.

4. A plastic bucket and wide paint brush or mop.
5. A soapy solution.

b. The following procedures shall be followed by the Installer:
1. Excess sheet overlap shall be trimmed away.
2. Clean the window, gasket surfaces and check for leaks.
3. Energize the vacuum pump and reduce the tank pressure to approximately 5 psi.
4. Wet a strip of geomembrane approximately 12-in by 48-in (length of box) with the soapy solution.
5. Place the box over the wetted area and compress.
6. Close the bleed valve and open the vacuum valve.
7. Ensure that a leak-tight seal is created.
8. For a minimum period of 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
9. If no bubbles appear after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3-in overlap and repeat the process.
10. Areas where soap bubbles appear shall be marked and repaired in accordance with Paragraph 3.07.G and then retested.

c. If the seam is not accessible to vacuum box equipment and cannot be tested prior to final installation, the seaming operations shall be observed by the Contractor's field representative for uniformity and completeness.

3. Air Pressure Testing (for double track fusion seams only):
a. The following procedures are applicable to those processes which produce a double seam with an enclosed space.
b. Equipment for testing double fusion seams shall be comprised of the following:
1. An air pump equipped with pressure gauge capable of generating and sustaining a pressure between 25 and 30 psi and mounted on a cushion to protect the geomembrane.
2. A manometer equipped with a sharp hollow needle, or other approved pressure feed device.

c. The following procedures shall be followed by the Installer:
1. Seal both ends of the seam to be tested. The length of seam shall not exceed 500-ft without approval by the Contractor's field representative.
2. Insert needle or other approved pressure feed device into the tunnel created by the double wedge fusion weld.
3. Energize the air pump to a pressure between 25 and 30 psi. After allowing two minutes for relaxation, the pressure shall be monitored over a test period not less than five minutes.
4. If the loss of pressure exceeds 4-psi or the pressure does not stabilize, the weld shall be considered faulty (unless the Installer can demonstrate that monitoring for an

additional five minutes does not cause an additional loss in pressure in excess of 1 psi, and that the pressure stabilizes within the second monitoring period). Locate the faulty area, repair in accordance with Paragraph 3.07.G and retest.

5. If the pressure loss is less than 4 psi after five minutes, cut the air channel on the opposite end the pressure device to confirm there is no blockage and verify the length of the seam tested. Remove needle or other approved pressure feed device and seal penetrations with extrusion weld.

3.07 DESTRUCTIVE SEAM TESTING

A. Purpose:

The purpose of the destructive testing is to evaluate seam strength properties. An initial minimum sampling interval of one test per 500-ft of performed seam length shall be used for a minimum start-up batch of 25 samples. With 0 to 1 failures out of 25 samples, the sampling interval may be increased to a maximum of one test per 1500-ft of seam length with the approval of the Contractor's field representative. With more than 2 failures out of 25 samples, the sampling interval may be decreased as determined by the Contractor's field representative. The location of samples shall be determined by the Contractor's field representative. Selection of such locations may be prompted by suspicion of overheating, contamination, or other potential cause that may adversely impact the welds. Location of samples shall not be revealed to Installer in advance. Sampling shall be performed by the Installer. Testing of field samples shall be performed by the Contractor's QCL.

B. Sampling Procedures:

1. Samples shall be cut by the Installer at locations chosen by the Contractor's field representative as the seaming progresses.
2. The seams shall not be covered by another material before they have been tested and accepted by Contractor's field representative.
3. Upon obtaining each sample, assign a number to the sample and mark it accordingly.
4. Record sample location on layout drawing.
5. Record purpose of the sample, statistical routine or suspicious weld area.
6. Holes in the geomembrane resulting from destructive seam testing shall be immediately repaired in accordance with Paragraph 3.07.G.

C. Size and Disposition of Samples:

1. Two samples, 12-inch wide by 6-inch shall be taken for field testing. Each of these samples shall be cut with a 1-in wide die, with the seam centered parallel to the width. The distance between these two samples shall be 36-in. If all samples pass the field test described in Paragraph 3.07.D, a sample for laboratory testing shall be taken from the 36-inch portion.
2. The laboratory sample shall be cut into three parts and distributed as follows:
   a. One portion to the Installer for optional laboratory testing, 12-in by 12-in.
   b. One portion for QCL testing, 12-in by 12-in.
   c. One portion to the Contractor for archive storage, 12-in by 12-in.

D. Field Testing:

1. The following shall be performed by the Installer in the presence of the Contractor's field representative:
    a. The Installer shall cut six 1-in wide replicate specimens from the field testing samples to be tested for shear and peel strength, in accordance with the criteria set in Table 02372-2.
    b. The Installer shall test three specimens for shear seam strength and three for peel strength. Replicate test specimens shall pass for the seam to be acceptable.
    c. Samples shall be tested with a tensiometer equipped with a drive/pull apparatus adjusted to a pull rate of 20 inches per minute for both peel and sheer testing in accordance with ASTM D 6392. Each sample shall be tested until film tearing bond (FTB) is achieved. At a minimum, the required pass criteria for peel shall be as specified in Appendix A.
    (Note: The machine shall be capable of pulling the geomembrane seams at either 2 or 20 inches per minute. At the start of the first production work day. If the results are similar, both numerically and visually, the specified test speed shall be 20 inches per minute for all field and laboratory destructive seam tests. If it appears that the faster speed may be affecting the testing results, then the specified speed shall be 2 inches per minute for all field and laboratory destructive seam testing.)
    d. Any specimen that fails through the weld or through the fusion at the weld sheet interface is a non-FTB break and shall be considered a failure even if it achieves the acceptable strengths.
    e. A specimen that does not break at the full extent of the test apparatus will be considered a passing test.
    f. Alternate testing to evaluate both sides of dual wedge welds.

E. Quality Control Laboratory Testing:

1. The Installer shall package and ship destructive test samples to the Contractor's independent Quality Control Laboratory (QCL) as directed by the Contractor's field representative by overnight delivery service. Shipping costs and destructive tests are to be paid by the Contractor.
2. Laboratory testing shall include shear and peel strength tests performed in accordance with ASTM D 6392. The minimum acceptable values obtained in these tests shall be in accordance with Table 02372-2.
3. At least five specimens shall be tested each for shear and peel strength. A passing test shall meet the minimum required values in the five specimens tested for each method.
4. The QCL shall provide verbal test results to the Contractor's field representative no more than 24 hours after they receive the samples. The Contractor's field representative shall review the laboratory results as soon as they become available.

F. Procedures for Destructive Test Failure:

1. The following procedures shall apply whenever a sample fails a destructive test, whether that test is conducted in the field or by the QCL. The Installer has two options:

a. The Installer can repair the seam between (1/2 distance or as directed by the Contractor's field representative) any two passing test locations in accordance with Paragraph 3.07.G.
b. The Installer can retrace the welding path to an intermediate location a minimum of 10-ft on each side of the failed sample. The sample shall be tested in the field. Subsequent failure of test samples shall cause the testing to move further down the seam until the extent of faulty seam has been determined.

2. Acceptable repaired seams shall be bound by two passing locations on each side of the original sample. In cases where repaired seam exceeds 150-ft, a sample taken from the zone in which the seam has been repaired must pass destructive testing. Repairs shall be made in accordance with Paragraph 3.07.G.
3. The Contractor's field representative shall document all actions taken in conjunction with destructive test failures.

G. Repair Procedures:
1. Any portion of the geomembrane exhibiting signs of any kind of defect, or failing a destructive or a nondestructive test, shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be made by the Contractor's field representative.
2. The repair procedures available include:
a. Patching, used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
b. Spot welding or seaming, used to repair small tears, pinholes, or other minor, localized defects.
c. Capping, is used to repair large lengths of failed seams.
d. Removing bad seam and replacing with a strip of new material welded in place.
3. For any repair method, the following provisions shall be satisfied:
a. Surfaces of the geomembrane which are to be repaired using extrusion methods shall be abraded no more than one hour prior to the repair.
b. Surfaces shall be clean and dry at the time of the repair.
c. Seaming equipment used in repairing procedures shall be qualified.
d. Patches and caps shall extend at least 4-inches beyond the edge of the defect.
e. Patches shall have rounded corners.

H. Repair Verification:
Each repair shall be numbered and logged by the Installer. Each repair shall be nondestructively tested using the methods described in Paragraph 3.6 as appropriate. Repairs which pass the nondestructive test shall be taken as an indication of an adequate repair. Repairs more than 150-ft long may be of sufficient length to require destructive test sampling, at the discretion of the Contractor's field representative. A failed test of the repaired section indicates that the repair shall be redone and retested until passing test results are achieved. The Contractor's field representative shall observe nondestructive testing of repairs. The Installer shall record the number of each repair, date and test outcome.

I. Wrinkles:
Large wrinkles that remain in the sheet as result of temperature expansion or uneven surface preparation may need removal as determined by the Contractor's field representative in consideration of applied loads on the wrinkle. Should the wrinkle need removing, the lower down-slope edge of the wrinkle shall be cut, overlapped and repaired as described in 3.7.G. Both ends of the wrinkle repair shall be patched. Caution must be taken in removing any wrinkles.

J. Sufficient slack shall be placed in the geomembrane to compensate for the coldest temperatures envisioned so that no tensile stresses are generated in the geomembrane or in its seams either during installation or subsequently after the geomembrane is covered.

K. The geomembrane shall have adequate slack such that is does not lift up off the subgrade or substrate material at any location within the facility, i.e., no "trampolining" of the geomembrane shall be allowed to occur at any time.

L. The geomembrane shall not have excessive slack to the point where creases fold over upon themselves either during placement and seaming, or when the protective soil or drainage materials are placed on the geomembrane.

M. Permanent (fold-over type) creases in the covered geomembrane should not be permitted at any time.

The amount of slack to be added to the deployed and seamed geomembrane should be carefully considered and calculated, taking into account the type of geomembrane and the geomembrane's temperature during installation versus its final temperature in the completed installation.

3.08 DISPOSAL OF WASTE MATERIAL

Upon completion of installation, the Installer shall properly remove and dispose of all trash, waste material, tools, and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

3.09 AS-BUILT DRAWINGS AND INSTALLATION DOCUMENTATION

The Installer shall prepare and submit to the Contractor an as-built drawing reflecting the actual installation of geomembrane liner, including the location of seams, the location of destructive samples, and the location of repair work. The as-built drawing shall be submitted to the Contractor within seven days of the completion of the geomembrane. In addition, a copy of the complete installation documentation package will accompany the as-built drawing.

3.10 AS-BUILT DRAWINGS AND INSTALLATION DOCUMENTATION

Following QC approvals geosynthetic drainage layer will be placed directly over the liner. The GDL will be placed in accordance with section 02374 of the specifications. Fill placement and allowable loading will be as stated in section 02374 3.3G.

TABLE 02372-1
MATERIAL PROPERTIES
LINEAR LOW DENSITY POLYETHYLENE (LLDPE) GEOMEMBRANE
TEXTURED (Both Sides) SHEET

Property	Unit	Test Method	Value	Frequency
Thickness – specified	Mils	ASTM D 5994	60	
Thickness – min average.	Mils	ASTM D 5994	57	
• lowest individual for 8 of 10 values	Mils	ASTM D 5994	54	Per Roll
• lowest individual for any 10 values	Mils	ASTM D 5994	51	
Asperity height (min. avg.)[1, 2]	Mils	GRI GM12	10	Every second roll
Tensile Properties (min. avg.)[3]		ASTM D 6693 (Type IV)		
1. Break Strength	lb/in		90	20,000 lbs
2. Break Elongation	%		250	
Tear Resistance (min. avg.)	lb	ASTM D 1004	33	45,000 lbs
Puncture Resistance (min. avg.)	lb	ASTM D 4833	66	45,000 lbs
Density (max.)	g/cc	ASTM D 1505/D 792	0.92	200,000 lbs
Carbon Black Content (range)	%	ASTM D 1603[4]	2.0 to 3.0	20,000 lbs
Carbon Black Dispersion	N/A	ASTM D 5596	Note 5	45,000 lbs
Oxidative Induction Time (OIT) (min. avg.)[6]				
- Standard OIT		ASTM D 3895	100	100,000 lbs
or				
- High Pressure OIT		ASTM D 5885	400	
Axi-Symmetric Break Resistance Strain (min.)	%	ASTM D 5617	30	
Oven Aging at 85º C -		ASTM D 5721		

Property	Unit	Test Method	Value	Frequency
retained after 90 days (min. ave.) [9]				
- Standard OIT	%	ASTM D 3895	35	
- High Pressure OIT	%	ASTM D 5885	60	
UV Resistance – High Pressure OIT – retained after 1600 hrs (min. ave.) [7][8]	%	ASTM D 5885	35	

Table 02372-1 Notes:

1. Of 10 readings, 8 of 10 must be ≥ 7 mils, and the lowest individual reading must be ≥ 5 mils.
2. Alternate the measurement side for double sided textured sheet.
3. Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Break elongation is calculated using a gage length of 2.0 inches at 2.0 in./min.
4. Other methods such as ASTM D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to ASTM D 1603 (tube furnace) can be established.
5. Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2 and 1 in Category 3.
6. The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
7. The condition of the test should be 20 hr. UV cycle at 75º C followed by 4 hr. condensation at 60º C.
8. UV resistance is based on percent retained value regardless of the original HP-OIT value.
9. It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

The above tests shall be performed by the manufacturer of the LLDPE geomembrane for identification of the manufacturer's product. The above test results shall be submitted to the Contractor for approval of the product. The geomembrane to be supplied for the project shall meet these properties.

TABLE 02372-2

SEAM PROPERTIES
LINEAR LOW DENSITY POLYETHYLENE (LLDPE) GEOMEMBRANE
TEXTURED (Both Sides) SHEET

Property	Unit	Test Method		60-mil Value
Shear Strength (min. avg.)	lb/in	ASTM 6392	D	90
Peel Strength (extrusion) (min. avg.)	lb/in	ASTM 6392	D	66 & FTB
Peel Strength (hot wedge) (min. avg.)	lb/in	ASTM 6392	D	75 & FTB

-- END OF SECTION --

SECTION 02372 - APPENDIX A

PROJECT FORMS
FOR
INSTALLATION OF
LINEAR LOW DENSITY POLYETHYLENE (LLDPE) GEOMEMBRANE

Geosynthetics Inventory and Certification Log

Sheet # _____

Project Name		Material Desc.						
Project No.		Layer	Primary		Secondary			Tertiary
Owner/Contr.		Material Type	HDPE	GN	GT	GC	GCL	OTHER
QA Monitor		Texture:	Smooth		Thickness:			Width:

	Roll Number	Lot/Batch Number	Roll Length	Roll Area	Date Roll Received	Date Cert.'s Received	Date Roll Approved
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
	Total		-	-			
	Running Total			-			

Notes, Observations, Comments:

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 001

Defect Log

Sheet # _____

Project Name	Material Desc.
Project No.	Layer — Primary / Secondary / Tertiary
Owner/Contr.	Material Type — HDPE GN GT GC GCL OTHER
QA Monitor	CELL No.

Seam or Panel No.	Date	Reason for Repair	Detailed Location of Repair	Repair's Date	Repair's Tech	QC NDT Result's Date	QC NDT Result's Tech	QC NDT Result's P/F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F
								P F

Retest of Failed Repairs

		Defect No.					
Repair's	Date						
	Tech						
QC NDT Result's	Date						
	Tech						
	P/F	P F	P F	P F	P F	P F	P F

Sketch's:

Notes, Observations, Comments:

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 002

Seam Control and Non-Destructive Test Log

Sheet # ______

Project Name	Material Desc.	Machine/Operator
Project No.	Layer Primary Secondary Tertiary	Previous Cumulative
Owner/Contr.	Notes:	Last DS (LF)
QA Monitor	CELL No:	Next DS (LF)

Seam Control								Non-Destructive Testing								
Date Time	Seam No.	Seam Length Cumulative	Mach. Temp.	Mach. Speed	Amb. Temp.	Weather/ Winds	Test Date	Test Type	Tech. ID	Time Start	Time Finish	Pressure Start	Pressure Finish	Pressure Net	Test P/F	Defects/Destructive Samples & Comments
Date								AT VB							P F	
Start								AT VB							P F	
Finish								AT VB							P F	
Date								AT VB							P F	
Start								AT VB							P F	
Finish								AT VB							P F	
Date								AT VB							P F	
Start								AT VB							P F	
Finish								AT VB							P F	
Date								AT VB							P F	
Start								AT VB							P F	
Finish								AT VB							P F	
Date								AT VB							P F	
Start								AT VB							P F	
Finish								AT VB							P F	
Date								AT VB							P F	
Start								AT VB							P F	
Finish								AT VB							P F	
Date								AT VB							P F	
Start								AT VB							P F	
Finish								AT VB							P F	

MACTEC Representative ______________________________ Date ____________

Owner Representative ______________________________ Date ____________

CQA Form 003

Panel Placement Log

Sheet # _____

Project Name Project No. Owner/Contr. QA Monitor	Material Desc. Layer — Primary / Secondary / Tertiary Material Type — HDPE GN GT GC GCL OTHER CELL No:

	Date	Panel No.	Roll No.	Panel Length	Panel SF	Panel Visual Condition, Inspection and Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
	Total					
	Running Total					

Notes, Observations, Comments:	Sketch's:

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 004

Daily Panel As-Built

Sheet # _____

Project Name	Material Desc.
Project No.	Layer — Primary / Secondary / Tertiary
Owner/Contr.	Material Type — HDPE GN GT GC GCL OTHER
QA Monitor	CELL No:

Scale: Vertical / Horizontal

Adjacent Sheet No. ____

Indicate North

Adjacent Sheet No. ____

Adjacent Sheet No. ____

Adjacent Sheet No. ____

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 005

Trial Weld Log

Sheet # ______

Project Name		Material Desc.	60 mil Texture		
Project No.		Layer	Primary	Secondary	Tertiary
Owner/Contr.		Material Type	HDPE GN	GT GC	OTHER
QA Monitor		CELL No:			

Date & Time	Weather/ Winds/ Temp.	Machine/ Operator	Machine Settings Fusion Extrusion	Peel (ppi)	Shear (ppi)	Result (P/F)	FTB (Y/N)	Test Number	Comments/ Observations
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		
						P F	Y N		
						P F	Y N		
			Fusion Extrusion			P F	Y N		

Notes, Observations, Comments:

MACTEC Representative ______________________ Date ____________

Owner Representative ______________________ Date ____________

CQA Form 006

Destructive Seam Field Test

Sheet # _____

Project Name		Material Desc.			
Project No.		Layer	Primary	Secondary	Tertiary
Owner/Contr.		Sheet Thickness	Top		Fusion
QA Monitor			Bottom		Extrusion

Seam Location		Temp. @ Test	Sample Size 1x4'

Sample ID	Date Welded		Seam No.
Cumulative Weld Total	Date Tested		Welder ID
Number of Destruct's	Test Location		QC Tester ID

Reason for Test	Destructive Sampling Requirements

Coupon No.	Peel				Shear	
	Inside Track		Outside Track			
	Load (ppi)	Failure Mode	Load (ppi)	Failure Mode	Load (ppi)	Failure Mode
P1						
P2						
P3						
P4						
P5						
Average						

Tensiometer Gauge No.	Pass	Fail
ST-033		

Material Strength Specifications		
Material Description	Peel (ppi)	Shear (ppi)
60 mil Smooth	78	120
60 mil Textured	78	120

Notes, Observations, Comments:

Tracking for Failed Samples

DS-_____ Original Sample DS-_____

_____ Compass Direction of Seam

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 007

Certificate of Soil Surface

Sheet # _____

Project Name	Material Desc.			
Project No.	General Desc.	Subgrade	Operations	LCRS
Owner/Contr.	CELL No.			
QA Monitor	Date			

Description of Soil Surface to be lined:

I hereby certify that the above surface area is suitable for the installation of geosynthetics, and I shall be responsible for its integrity and suitability in accordance with the specifications from this date to the completion of the installation.

CQA Monitor
Name:
Date:
Title:
Representing:
Signature:

Installer Representative
Name:
Date:
Title:
Representing:
Signature:

Owner Representative
Name:
Date:
Title:
Representing:
Signature:

Notes, Observations, Comments:

CQA Form 008

Certificate of Completion

Sheet # _____

Project Name	Material Desc.			
Project No.	Layer	Primary	Secondary	Tertiary
Owner/Contr.	Type	Partial	Substantial	Final
QA Monitor	Date			

Description and Area of Work Being Certified:

I hereby certify that the above identified work has been inspected and it has been properly installed. I further certify all required testing has been completed and the results are acceptable to the CQA Officer. The liner system is suitable for its intended use.

CQA Monitor

Name:
Date:
Title:
Representing:
Signature:

Installer Representative

Name:
Date:
Title:
Representing:
Signature:

Owner Representative

Name:
Date:
Title:
Representing:
Signature:

Notes, Observations, Comments:

CQA Form 009

Daily Inspection Report

Sheet # _____

General Project Information		Site Condition		
Project Name		Weather		
Project No.		Type Precip. / Amount		
Owner/Contr.		Wind Speed / Direction		
Engineer		Liner Temperature	Max.	Min.
Sub-Contractor		Site Conditions		
QA Monitor				

Project Schedule		Meetings
Date		Purpose
Original Comp. Date		
Revised Comp. Date		
Construction Day	Working Day's Remaining	Attendees
Contracted Working Days	Revised No. of Working Days	

Construction Activities
Activities Started/Completed (by Contractor)
Extra Works, Potential Change Orders
Materials Delivered to Site
Permanent Materials Installed
Contractor and Crew Size
Site Visitor's
Additional Comments

DUDEK Personnel Activity					
	Hours Onsite	Arrive	Depart	Hours Offsite	Total Hours
	Hours Onsite	Arrive	Depart	Hours Offsite	Total Hours

List Daily QA Documents					
	Sheet #'s	Comment		Sheet #'s	Comment
Inventory Log- CQA Form 001.			DS Tracking Summary- CQA Form 011.		
Defect Log- CQA Form 002.			Photo Log- CQA Form 012.		
Seam Control- CQA Form 003.			NC / Corrective Action- CQA Form 013.		
Panel Placement Log- CQA Form 004.			Laboratory Test Results		
Daily Panel As-Built- CQA Form 004.			*List Other:*		
Trial Welds- CQA Form 006.					
Destructive Field Sample- CQA Form 007.					
Subgrade Surface- CQA Form 008.					
Completion Certification- CQA Form 009.					

CQA Form 010

In-Use Construction Equipment (Include machine numbers and data) by Subcontractor	

Summary of Construction Activities

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 010

Destructive Sample Tracking Summary

Sheet # _____

Project Name Project No. Owner/Contr. QA Monitor	Material Desc. Layer Primary Secondary Tertiary	Notes, Observations, Comments:

DS No.	Seam No.	Machine/ Operator	Date Welded	Roll No.	Lot No.	QA Monitor	Average Test Results Lab (P/F) Peel	Lab (P/F) Shear	Field (P/F) Peel	Field (P/F) Shear	Overall (P/F)	Comments and Subsequent Tracking No.'s

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 011

Photograph Log

Sheet # _____

Project Name Project No. Owner/Contr. QA Monitor	Notes, Observations, Comments: CELL No:

Date/Time	Roll No.	Photo No.	Plant Area/Location *(Show Location of Photograph on Daily As-Built)*	Photo Description

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 012

Notice of Non-Compliance and Corrective Action

Sheet # _____

General Project Information	
Project Name	Date
Project No.	Contractor in NC
Owner/Contr.	Non-Compliance No.
QA Monitor	Notes:

Reference	
Item	Drawing No.
Specification Sec. No.	Other:

Description of Non-Compliance

Cross Reference (QA Inspection Form & Sheet No.):

Contractor's Response

Follow Up Action Required

Recommended by:

DUDEK Representative _____ Date _____

Approved by:

Owner Representative _____ Date _____

Follow Up Action Taken

Cross Reference (QA Inspection Form & Sheet No.):

MACTEC Representative _____ Date _____

Owner Representative _____ Date _____

CQA Form 013

SEAM TESTING
CHAIN OF CUSTODY FORM

SEND YOUR SEAMS TO

PROJECT NAME / PROJECT NUMBER: _____

PROJECT LOCATION: _____

No.	Seam ID *(Include seam ID, panel ID, welder, etc.)*	MATERIAL DESCRIPTION	FUSION	EXTRUSION	Solvent Weld
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

TEST METHOD
(Please check which test method is applicable)

- O SHEAR- ASTM D4437 / PEEL - ASTM D4437
- O SHEAR - ASTM D6214 / PEEL - ASTM D6214
- O SHEAR- ASTM D4437 NSF Modified Crosshead Speed = 2"/min / PEEL - ASTM D4437 NSF Modified Crosshead Speed = 2"/min
- O SHEAR- ASTM D4437 NSF Modified Crosshead Speed = 20"/min / PEE - ASTM D4437 NSF Modified Crosshead Speed = 20"/min
- O SHEAR- ASTM D6392 / PEEL-ASTM D6392 HDPE
- O SHEAR - ASTM D3083 Crosshead Speed = 20"/min / PEEL - ASTM D413 Crosshead Speed = 2"/min
- O SHEAR - ASTM D6392 / PEEL - ASTM D6392 LLDPE/PVC
- O SHEAR - ASTM D751 / PEEL - ASTM D413 Crosshead Speed = 2"/min

SPECIFICATIONS/NOTES:
OPEN on SATURDAYS for SEAM TESTING.
To ensure that your package is delivered/received on Saturdays; please fax, e-mail or call to let us know the AIRBILL # of your package. This helps us track for SATURDAY DELIVERY.

Thickness required? O Yes O NO
SOLVENT WELD
Curing Time:_____ Curing Temp:_____

REPORT TO:
NAME:_____
COMPANY:_____
ADDRESS:_____
_____
TEL NO:_____
FAX NO:_____
E-MAIL:_____

FIELD CONTACT:
NAME:_____
Pager:_____
Mobil:_____
Phone:_____
FAX:_____
E-mail:_____

RELEASED BY:
NAME:_____
COMPANY:_____
DATE/TIME:_____

RECEIVED BY:
NAME:_____
Precision Geosynthetic Labs
DATE/TIME:_____

Shipped Via
O Fedex
O UPS
O Airborne
O DHL
O US Mail
O Hand Carry
O Others

Page _____ of _____

white- REPORT/SAMPLE, yellow- LAB, pink- CLIENT

CONFORMANCE TEST CHAIN OF CUSTODY FORM

Page ____ of _____

PROJECT NAME / PROJECT NUMBER: _____

PROJECT LOCATION: _____

GEOMEMBRANE TESTING

SAMPLE ID	Thickness ASTM D5199 or D5994	Density ASTM D1505 or D792	Carbon Black Content ASTM D1603	Carbon Dispersion D3015/ D5596	Tensile ASTM D638 GM13 / NSF54	Tear Resistance ASTM D1004 (Die C)	Puncture D4833 /101CM2065	Melt Flow Index ASTM D1238, cond. E	Dimensional Stability ASTM D1204	Low Temp Brittleness D746/ D1790	NCTL ASTM D5397 Hours ____	Other ASTM ____

NONWOVEN OR WOVEN GEOTEXTILE TESTING

SAMPLE ID	Thickness ASTM D5199 or D1777	Mass Per Area ASTM D5261 or D3776	Grab Tensile ASTM D4632	Trapezoid Tear ASTM D4533	Puncture Resistance ASTM D4833	Mullen Burst ASTM D3776	Permittivity ASTM D4491	AOS ASTM D4751	Wide Width Tensile ASTM D4595	UV (hrs ____) ASTM D4355	Other ASTM ____	Other ASTM ____

GEOCOMPOSITE / GEONET / GEOGRID TESTING

SAMPLE ID	Thickness ASTM D5199 or D1777	Density ASTM D1505 or D792	Carbon Black Content ASTM D1603	Mass Per Area ASTM D5261 or D3776	Melt Flow Index ASTM D1238, cond. E	Peel ASTM D413, F904 or GRI-GC7	Transmissivity * ASTM D4716	Compression ASTM D1621	Tensile Strength ASTM D1682 or D5035	Wide Width Tensile ASTM D4595	Rib Tensile Strength GRI-GG1	Junction Strength GRI-GG2

* Transmissivity Test Parameters: Normal Load:_____, Gradient:_____, Seating Time:_____, Boundary Condition:_____

GCL TESTING

SAMPLE ID	Thickness ASTM D5199	Mass Per Area ASTM D5993	Grab Tensile ASTM D4632	Peel Strength ASTM D6496	Moisture Content ASTM D4643 or D2216	Hydraulic Conductivity ASTM D5084	Index Flux ASTM D5887	Swell Index ASTM D5890	Fluid Loss ASTM D5891	Internal Shear Strength ASTM D6243	Other ASTM ____	Other ASTM ____

SEND REPORT TO:
Name:_____
Company:_____
Address:_____
Phone:_____
Fax:_____
e-mail:_____

FIELD CONTACT:
Name:_____
Pager:_____
Mobil_____
Phone:_____
Fax:_____
e-mail:_____

Released by:
Name:_____
Date/Time_____

Received by:
Name:_____
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O Fedex
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O Airborne
O DHL
O US Mail
O Others

SECTION 02374

GEOCOMPOSITE DRAINAGE LAYER

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish labor, materials, tools, and equipment and perform operations necessary to furnish, deploy, and install the geocomposite drainage layer (GDL) in the areas indicated on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01010: Summary of Work.
B. Section 01330: Submittal Procedures.
C. Section 01450: Contractor Quality Control.
D. Section 02315: Earthwork.
E. Section 02372: Cap Geomembrane Liner.

1.03 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The reference is made to the most current version/edition of the publication, unless otherwise noted. The publications are referred to in the text by the basic designation only.

A. ASTM International, Inc. (ASTM):

1. ASTM D1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
2. ASTM D 1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
3. ASTM D 1603 Standard Test Method for Carbon Black in Olefin Plastics
4. ASTM D 4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique
5. ASTM D 4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus
6. ASTM D 4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
7. ASTM D 4533 Standard Test Method for Trapezoidal Tearing Strength of Geotextiles
8. ASTM D 4595 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
9. ASTM D 4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
10. ASTM D 4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

11. ASTM D 4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile
12. ASTM D 4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
13. ADTM D 5035 Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
14. ASTM D 5199 Standard Test Method for Measuring Nominal Thickness of Geosynthetics
15. ASTM D 5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles
16. ASTM D 5321 Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
17. ASTM D 6241 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
18. ASTM F 904 Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar laminates Made from Flexible Materials
19. ASTM G 154 Standard Practice for operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

B. Geosynthetic Research Institute (GRI):
1. GRI GC-7 Determination of Adhesion and Bond Strength of Geocomposites
2. GRI GC-8 Determination of the Allowable Flow Rate of a Drainage Geocomposite

C. Environmental Protection Agency (EPA):
1. EPA/600/R-93/182 Daniel, D.E. and R.M. Koerner, (1993), *Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities*

1.04 DEFINITIONS

A. Contractor: The Contractor is the firm or corporation with whom Honeywell has entered into agreement to construct the project. The Contractor is responsible for submittals by the Manufacturer and the Installer as required by the Specifications. The Contractor is also responsible for scheduling and coordination of the required work with the Manufacturer and the Installer to complete the project.
B. Engineer: The individual or firm responsible for the design and preparation of the Drawings and Specifications.
C. Geocomposite Manufacturer (Manufacturer): The Manufacturer is the firm or corporation contracted by the Contractor for production of the GDL to be used in the project. The Manufacturer shall produce a consistent product meeting the project specifications and shall provide quality control documentation for the product specified herein.
D. Quality Assurance Laboratory (QAL): Party independent from the Manufacturer and Installer, hired by the Contractor, responsible for conducting laboratory tests

on samples of GDL obtained at the site or during manufacturing. The QAL shall have a GRI certification.

E. Installer: The Installer is the firm or corporation hired by the Contractor to install the GDL. The Installer shall be the Manufacturer or a Manufacturer-approved Installer trained and certified to install the Manufacturer's product. The Installer shall be responsible for field handling, storing, placing, seaming, sampling, testing, and other aspects of the GDL.

F. Lot: A quantity of resin (usually the capacity of one rail car) used to manufacture polyethylene geocomposite rolls. The finished rolls shall be identified by a roll number traceable to the resin lot.

1.05 QUALIFICATIONS

A. Manufacturer: Manufacturer shall have manufactured a minimum of 10,000,000 square feet of GDL during the previous year.

B Installer:

1. Installation shall be performed by a Manufacturer-approved Installer. The Installer shall have installed a minimum of 1,000,000 square feet of GDL in the last 3 years.
2. Installer shall have worked in a similar capacity on at least 3 projects similar in complexity to the project described in the Contract Documents.
3. The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.

1.06 SUBMITTALS

The Contractor shall submit the following to the Engineer, at a minimum, in accordance with Section 01330, “Submittal Procedures”:

A. Manufacturer qualifications (see Paragraph 1.5A).

B. Installer Qualifications (see Paragraph 1.5B).

C. Prior to transporting the GDL to the Site, the Contractor shall submit the following information to the Engineer:

1. Mill Certificate: Copy of the mill certificate or affidavit signed by a legally authorized official of the Manufacturer attesting that the GDL meets the physical and manufacturing requirements stated in this Section.
2. Sample: One 12” x 12” sample of the GDL product.
3. A copy of the Manufacturer’s product specification data sheet listing test methods and property values as listed in this Section.
4. Manufacturer’s Quality Control Plan.
5. Manufacturer’s recommendations for shipping, handling, and storage of the GDL.

D. The Contractor shall submit to the Engineer the following information for the GDL delivered to the site:

1. Manufacturing quality control certificates for each shift’s production, signed by the responsible parties employed by the Manufacturer.
2. The quality control certificate shall include:
   a. Roll numbers and identification;

b. The results of quality control tests, including identification of the test methods, frequency used. At a minimum, the Manufacturing Quality Control test results and frequency of testing shall be as shown in Table 02374-3 in Paragraph 2.2.

1.07 WARRANTY

A. Material: Material shall be warranted, on a pro-rated basis against defects for a period of 1-year from the date of substantial completion of work.
B. Installation: Installation shall be warranted against defects in workmanship for a period of 1-year from the date of substantial completion of work.
C. Provide copies of warranty certificates to the Engineer.

1.08 MATERIAL LABELING, DELIVERY, STORAGE, AND HANDLING

A. Labeling: Each roll of GDL delivered to the site shall be wrapped and labeled by the Manufacturer. The label will identify:
   1. Manufacturer's name;
   2. Product identification;
   3. Roll dimensions;
   4. Geotextile type;
   5. Finished product lot; and
   6. Roll number.
B. Delivery: Rolls of GDL will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.
C. Storage and Handling: The Installer shall be responsible for the handling, storage and care of the GDL from the time of delivery to the site until final acceptance of the completed work by the Contractor. Material storage and handling practices shall meet the Manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 GEOCOMPOSITE DRAINAGE LAYER

A. Geocomposite Drainage Layer:
   1. The GDL shall be manufactured by extruding polyethylene to form a drainage net structure (a geonet) with a non-woven geotextile bonded to both sides.
   2. The locations where the GDL is to be installed are shown on the Drawings.
   3. Provide a material meeting or exceeding the requirements specified in Table 02374-1.

TABLE 02374-1

Geocomposite Drainage Layer		
Property	**Test Method**	**Value[(b)]**
Geonet Component [(a)]		
Thickness, mil	ASTM D 5199	200 (MAV)
Density, g/cm^3	ASTM D 1505	0.94 (MAV)
Tensile Strength (MD), lb/in	ASTM D 4595	45 (MAV)
Carbon Black Content, %	ASTM D 1603/D 4218	2 to 3 (range)
Geotextile Component [(a)]		
Mass Per Unit Area, oz/yd^2	ASTM D 5261	6 (MARV)
AOS, US Sieve (mm)	ASTM D 4751	0.25 (MaxARV)
Permittivity, sec^{-1}	ASTM D 4491 (Falling Head)	0.5 (MARV)
Flow Rate, gpm/ft^2	ASTM D 4491 (Falling Head)	100 (MARV)
Grab Tensile, lbs	ASTM D 4632	158 (MARV)
Sewn Seam Strength, lbs	ASTM D 4632	142 (MARV)
Tear Strength, lbs	ASTM D 4533	57 (MARV)
Puncture Strength, lbs	ASTM D 4833	57 (MARV)
UV Resistance, % retained	ASTM D 4355/G 154 (after 500 hours)	90 (MARV)
Geocomposite		
Ply Adhesion, lb/in	GRI GC-7 or ASTM F 904 (mod.)	0.5 (MAV)
Ultimate Transmissivity[(c, d)], m^2/sec	ASTM D 4716	(MAV) 8.0x10^{-4} @ gradient 0.316

Table 02374-1 Notes:

(a) Component properties prior to lamination.
(b) Values: minimum average values (MAV); minimum average roll value (MARV) in the weakest principal direction; maximum average roll value (MaxARV).
(c) The normal compressive load shall be 750 psf at a hydraulic gradient 0.316. Testing boundary conditions shall be steel plate/site-specific cover soil (Common Fill)/GDL/steel plate with a minimum seating time of 100 hours.
(d) The GDL Manufacturer shall provide a recommended creep reduction factor to the Engineer for use in evaluating the allowable transmissivity of the GDL. The recommended value shall be supported by product-specific testing data.

B. Resin:

1. Resin used to manufacture the geonet core shall be new first quality, compounded polyethylene resin. No post-consumer reclaimed polymer shall be added to the resin during the manufacture of the geonet material. Natural resin (without carbon black) shall meet the following additional minimum requirements provided in Table 02374-2.

TABLE 02374-2

Natural Resin		
Property	**Test Method**	**Value**
Density (g/cm^3)	ASTM D 1505	>0.94
Melt Flow Index (g/10 min)	ASTM D 1238	$\leq$ 1.0

C. Ties:
   1. Ties used to secure adjacent sheets of GDL shall be plastic fasteners or polymer braid.
   2. Metallic ties will not be allowed.
   3. Ties shall be yellow or white to facilitate inspection.

D. Thread:
   1. Thread used to seam the geotextile portion of the GDL shall be polymeric material with chemical resistance properties equal to or exceeding those of the geotextile. The thread shall be a different color than the geotextile to facilitate inspection.

2.2 MANUFACTURING QUALITY CONTROL

A. The GDL shall be manufactured in accordance with the Manufacturer's Quality Control Plan, as submitted to and approved by the Engineer. The GDL shall be tested according to the test methods and frequencies listed in Table 02374-3:

TABLE 02374-3

Characteristics	Test Method	Units	Frequency
Resin			
Polymer Density	ASTM D 1505	g/cm^3	Once Per Lot
Melt Flow Index	ASTM D 1238	g/10 min	Once Per Lot
Geonet Test			
Thickness	ASTM D 5199	mil	50,000 ft^2
Carbon Black	ASTM D 1603/D4218	%	50,000 ft^2
Tensile Strength, MD	ASTM D 4595	lbs/ft	50,000 ft^2
Geotextile Tests			
Mass per Unit Area	ASTM D 5261	oz/yd^2	Every 100,000 ft^2
Grab Tensile	ASTM D 4632	lbs	Every 100,000 ft^2
Tear	ASTM D 4533	lbs	Every 100,000 ft^2
Puncture	ASTM D 4833	lbs	Every 100,000 ft^2
AOS, US Sieve	ASTM D 4751	mm	Every 500,000 ft^2
Permittivity	ASTM D 4491	sec^{-1}	Every 500,000 ft^2
UV Resistance	ASTM D 4355/G 154 (after 500 hrs)	%	Once per resin formulation
Geocomposite Tests			
Ply Adhesion	GRI GC-7 or ASTM F 904 (mod.)	lbs/in.	100,000 ft^2
Transmissivity	ASTM D 4716	m^2/sec	200,000 ft^2

2.3 SITE-SPECIFIC REQUIREMENTS

A. Conduct interface friction and transmissivity testing using site-specific soils. The test methods and required results shall be as outlined in Table 02374-4.

TABLE 02374-4

GDL Site-Specific Properties[a]		
Property	**Test Method**	**Minimum Value**
Interface – GDL/Geomembrane[b][c]	ASTM D 5321	See Section 02372, "Cap Geomembrane Liner"
Interface – GDL/Cover Soil [b][c]	ASTM D 5321	Peak = 26 degrees[e] Residual = 22.5 degrees[e]
Transmissivity, m^2/sec[d]	ASTM D 4716	See Table 02374-1

Table 02374-4 notes:

(a) Site-specific testing shall be conducted at the frequency of 1 test/100,000 square feet unless otherwise noted.
(b) Perform interface tests at normal stresses of 1.5, 3.0, and 4.5 psi with a displacement rate of 0.04 in/min, under wet conditions, report peak and residual values.
(c) The Contractor shall provide site-specific soils (Common Fill) to the QCL along with the Manufacturer provided site-specific GDL.
(d) See Table 02374-1 for transmissivity testing parameters.
(e) For cohesion/adhesion intercept = 0 psf. Interface friction values less than those specified but containing cohesion/adhesion will be evaluated for acceptance by the Engineer.

PART 3 - EXECUTION

3.1 FAMILIARIZATION

A. Prior to installation, the Installer shall carefully inspect the subgrade verify that work is complete to the point where the installation of the GDL may properly commence without adverse impact. If the Installer has any concerns regarding the subgrade, he shall notify the Contractor.

3.2 PROTECTION

A. Prior to installation, the GDL shall not be placed on the ground and shall be covered in such a manner as to keep it dry and out of direct sunlight.

3.3 INSTALLATION

A. General:
   1. The GDL shall be installed in accordance with the Manufacturer's recommendations, as shown on the Drawings, and as specified herein.
B. Handling and Placement:
   1. The Installer shall handle the GDL in such a manner as to ensure it is not damaged.
   2. The predominant flow direction of the GDL is in the machined direction (roll direction) and the GDL shall be installed in the direction of flow

(deploying the GDL directly down the slope) unless an alternative drainage path is approved or specified by the Engineer.

3. The installation shall be conducted by using full length rolls from the top of the slope to the toe.
4. Minimize dragging of the GDL over the subgrade during installation.
5. No equipment shall be operated directly on the GDL surface.
6. At obstructions or penetrations, the GDL shall be cut and/or a penetration formed in a manner to fit around the object without a gap. The bottom geotextile and geonet shall be in close contact with the object. Provide excess upper geotextile material at the penetration to allow the excess material to be tucked back under the GDL to protect the geonet core and prevent soil particles from migrating into the geonet core.
7. Following deployment, folds or excessive wrinkles shall be removed to the extent practicable.

C. Seaming Procedures:

1. Horizontal seams shall not be allowed, except as part of a patch. If horizontal seams are required as part of a patch, offset adjacent horizontal seams.
2. Seams shall be along (running up/down the slope), not across the slope. At a minimum, the following requirements shall be met:
   a. Adjacent rolls/sheet of GDL shall be overlapped so that the geonet overlaps by 2 to 3 inches and the geotextiles overlap by at least 4 inches.
   b. Geonet tying shall be at a maximum of every 5 feet along the slope, every 6 inches in the anchor trench.
   c. Once the geonet is tied, the top geotextile of the GDL be continuously sewn. Thermally bonded seaming may be permitted as approved by the Engineer. Spot sewing or bonding is not allowed. The Installer shall pay particular attention to seams to ensure that no cover soil could be inadvertently inserted beneath the geotextile.
   d. Sewing shall be done using polymeric thread with chemical and ultraviolet light resistance properties equal to or exceeding those of the geotextile. Sewing shall be done using sewing machines specifically designed for this purpose as recommended by the GDL Manufacturer or as approved in writing by the Engineer.
   e. Thermally bonded seams, if approved by the Engineer, may be bonded using hot plate, hot knife, or ultrasonic devices. For thermally bonded seams, adjacent geotextile panels shall overlap 6-inches prior to seaming. The geotextile panels shall be completely clean prior to seaming. The geotextile panel edges shall lay flat against each other prior to seaming such that no gaps are formed in the seam. Manual or automatic machine driven seaming devices may be used; however, machine driven seaming equipment is preferred. Locations where heat bonding has melted through either geotextile panel shall be repaired. Heat seaming shall not be performed during rain or snow. Ambient temperatures for seaming should be above freezing, i.e. 32^{o}F, unless it can be demonstrated that satisfactory seams (comparable to seams conducted a higher temperatures without melt through) can be

fabricated at lower temperatures. The use of a seaming board or slip sheet is recommended for some seaming operations. A seaming board or slip sheet may be a wood board or piece of geomembrane which is placed below the geotextile panels at the location of seaming. The board or sheet may be pulled with a rope or strap as seaming progresses. The purpose of the seaming board or slip sheet is to provide a firm, clean surface for seaming.

f. The bottom layer of geotextile shall be overlapped.

g. No end seams shall be installed in areas with 3H:1V slopes unless approved by the Engineer. Provide adequate anchorage and/or on run-out prior to placing cover on 3H:1V slopes, to prevent sliding of GDL on the subgrade.

D. Inspection:

1. Prior to covering installed GDL with cover soils, all areas shall be inspected by the Contractor and the Installer. During the inspection, the Installer shall repair defect areas identified to the satisfaction of the Contractor. A surface verification form shall be prepared indicating covering of the GDL can be conducted following a successful inspection.

E. Repair:

1. Rips, tears, or damaged areas of the GDL shall be removed and patched.
2. The patch for damaged geonet shall be secured to the deployed geonet by tying every 6 inches with plastic fasteners or polymeric braid. The patch shall be extended 12 inches beyond the edges of the damaged area.

F. Anchor Trench:

1. Where shown on the Drawings, GDL shall be secured in an anchor trench prior to the placement of cover soils. Sand bags or suitable weights may be utilized. The anchor trench shall not be backfilled until the cover soils have been placed and any slack, folds, or wrinkles that have developed in the GDL at the crest of the slope or in the anchor trench have been pulled taut.
2. Prevent compaction equipment from coming into direct contact with the GDL during trench backfilling.

G. Cover Soil (Common Fill) Placement:

1. The guidelines below apply to all soil placed over the GDL; including but not limited to, Cover Soil, Common Fill, etc.
2. See Section 02315, “Earthwork”, for additional requirements.
3. When placing material a minimum of 36 inches of loaded material shall be placed under loaded trucks operating over the GDL.
4. Cover soil shall be placed in such a manner as to prevent damaging or unnecessarily stressing the GDL.
5. Placement of the cover soil is recommended to proceed immediately. If cover soil placement can not be conducted immediately, cover the GDL with a temporary cover (black plastic sheeting). The GDL shall not be left exposed to sunlight for more than 2 weeks or as recommended by the GDL Manufacturer.
6. In applying cover material, no equipment shall drive directly on the GDL.
7. The specified cover material shall be placed and spread utilizing vehicles with a low ground pressure (LGP). The cover soils shall be placed on the GDL from the bottom of the slope proceeding upwards and in a manner which prevents instability of the cover soil or damage to the GDL.

8. Unless otherwise specified by the Engineer, all equipment for spreading fill materials atop the GDL shall comply with the following:

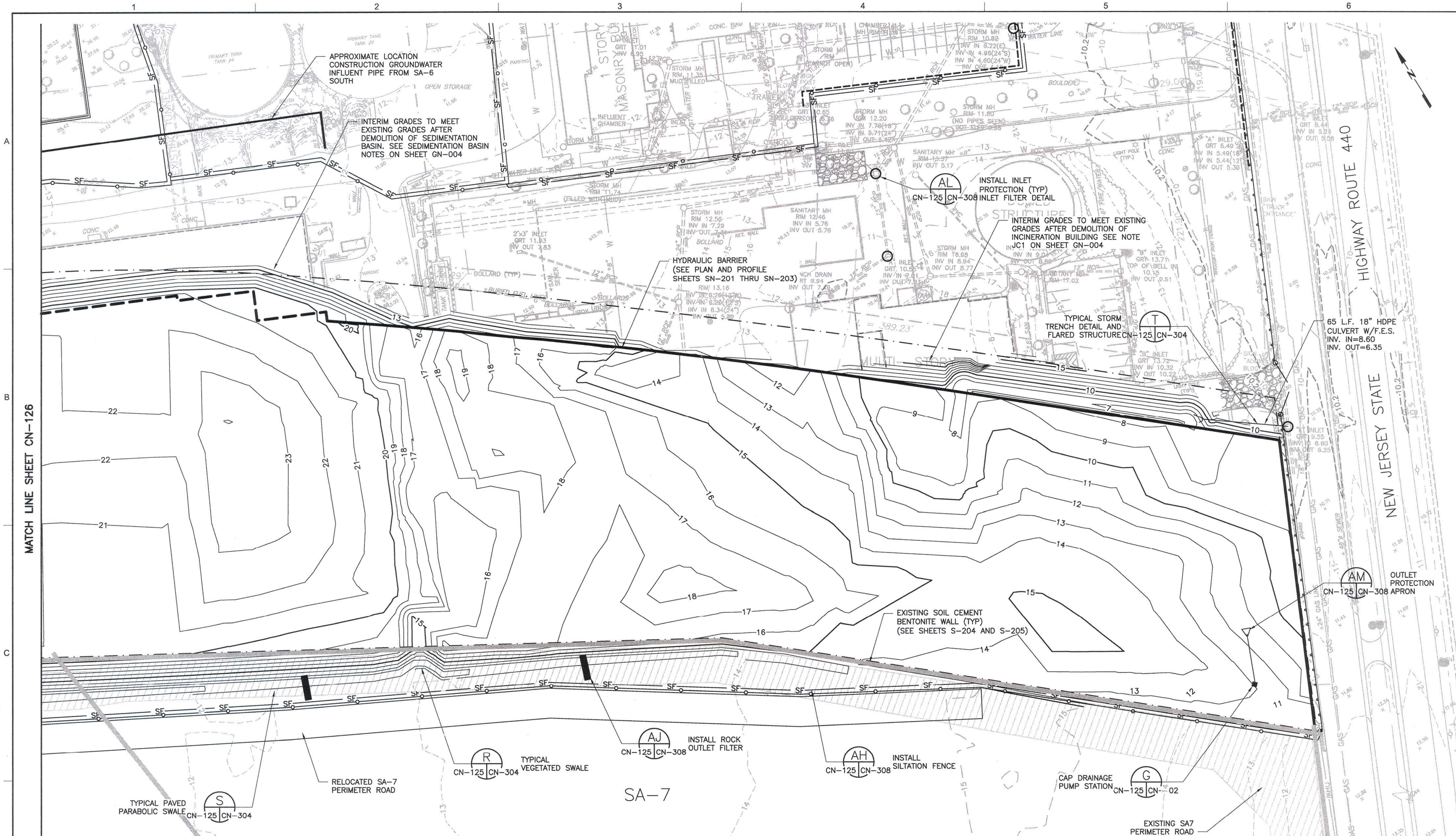
Max. Equipment Ground Pressure (psi)	Min. Separation Thickness (inches)
Max 5psi (low ground pressure related)	Min. 12”
Max 10 psi	Min. 18”
Max 40 psi	Min. 24”
Max 80 psi (fully loaded highway truck)	Min. 36”

9. Compaction of the initial lift of cover soil placed atop the GDL shall be performed in a manner that does not damage the GDL.
10. In the presence of wind, all geocomposites shall be weighted down with sandbags or the equivalent. Such sandbags shall be used during placement and remain until replaced with cover material.

-- END OF SECTION --

EXHIBIT 3

INTERIM GRADING PLANS



NOTES:

1. REFER TO SHEET GN-003 AND GN-004 FOR GENERAL NOTES.
2. REFER TO SHEET GN-002 FOR LEGEND AND ABBREVIATIONS.
3. CONTOURS BASED ON MINIMAL FILL THICKNESS REQUIREMENTS. FINAL GRADES MAY VARY AFTER CONSTRUCTIBILITY REVIEW.
4. REFER TO APPENDIX K CONCEPTUAL REDEVELOPMENT PLANS (100% REMEDIAL DESIGN REPORT) FOR FUTURE UTILITY ALIGNMENTS AND PRELIMINARY ALTERNATIVE GRADING CONCEPTS.

0 20 40 80
SCALE IN FEET

SAMUEL G. SHALLARD
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 43507

NO.	DATE	REVISION	BY	APVD
0	06/07/13	ISSUED FOR CONSTRUCTION	TDD	SGS

DSGN	DR	CHK	APVD
TDD	TDD	RJR	TDD

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

CHROMIUM REMEDY
STUDY AREA 6 NORTH
SITES 087 AND 088
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

INTERIM GRADING, DRAINAGE, AND SOIL EROSION SEDIMENT CONTROL PLAN

amec
Environment & Infrastructure, Inc.
200 American Metro Blvd, Suite 113
Hamilton, NJ 08619
(609) 689-2829
NJ Certificate of Authorization Number 24GA28010900

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-125
SHEET	30 OF 70

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6N\100 Percent\CR30-C-125 Final Grade Drain SESC Plan.dwg PLOT DATE: Fri, 24 May 2013 PLOT TIME: 7:12 AM

NOTES:

1. REFER TO SHEET GN-003 AND GN-004 FOR GENERAL NOTES.
2. REFER TO SHEET GN-002 FOR LEGEND AND ABBREVIATIONS.
3. CONTOURS BASED ON MINIMAL FILL THICKNESS REQUIREMENTS. FINAL GRADES MAY VARY AFTER CONSTRUCTABILITY REVIEW.
4. REFER TO APPENDIX K CONCEPTUAL REDEVELOPMENT PLANS (100% REMEDIAL DESIGN REPORT) FOR FUTURE UTILITY ALIGNMENTS AND PRELIMINARY ALTERNATIVE GRADING CONCEPTS.

EA8 INTERIM RESTORATION PENDING BULKHEAD RESTORATION

APPROXIMATE LOCATION OF OUTFALL

PIERHEAD AND BULKHEAD LINE AS ADOPTED DECEMBER 9, 1929

HACKENSACK RIVER

FINAL RESTORATION GRADE (TYP)

CONCRETE OUTFALL STRUCTURE

GROUNDWATER TREATMENT PLANT (SEE NOTE GN23 ON SHEET GN-003)

1 STORY MASONRY BUILDING

(5) CARGO CONTAINERS

(4) CARGO CONTAINERS

WOOD SHED

TRAILER

OPEN STORAGE

EMERGENCY OUTFLOW STRUCTURE

CONSTRUCTION WATER TREATMENT AREA SEE SHEET CN-106

INSTALL INLET PROTECTION (TYP) INLET FILTER DETAIL CN-126 CN-308

INTERIM GRADES TO MEET EXISTING GRADES AFTER DEMOLITION OF SEDIMENTATION BASIN. SEE SEDIMENTATION BASIN NOTES ON SHEET GN-004

HYDRAULIC BARRIER (SEE PLAN AND PROFILE SHEETS SN-201 THRU SN-203)

MONITOR WITH CHAIN LINK FENCE

EXISTING SOIL CEMENT BENTONITE WALL (TYP) (SEE SHEETS SN-204 AND SN-205)

RELOCATED SA7 PERIMETER ROAD

TYPICAL PAVED PARABOLIC SWALE S CN-126 CN-304

INSTALL ROCK OUTLET FILTER AJ CN-126 CN-308

TYPICAL VEGETATIVE SWALE R CN-126 CN-304

MATCH LINE SHEET CN-125

0 20 40 80
SCALE IN FEET

SAMUEL G. SHALLARD
6/24/13
NO. 43507
PROFESSIONAL ENGINEER
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 43507

NO.	DATE	DSGN	DR	CHK	APVD
0	06/07/13	TDD	TDD	RJR	APVD

BY	APVD	REVISION
TDD	SGS	ISSUED FOR CONSTRUCTION

SGS

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CHROMIUM REMEDY
STUDY AREA 6 NORTH
SITES 087 AND 088
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

INTERIM GRADING, DRAINAGE, AND SOIL EROSION SEDIMENT CONTROL PLAN

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Hamilton, NJ, 08619
(609) 889 - 2829
NJ Certificate of Authorization Number 24GA28019800

VERIFY SCALE
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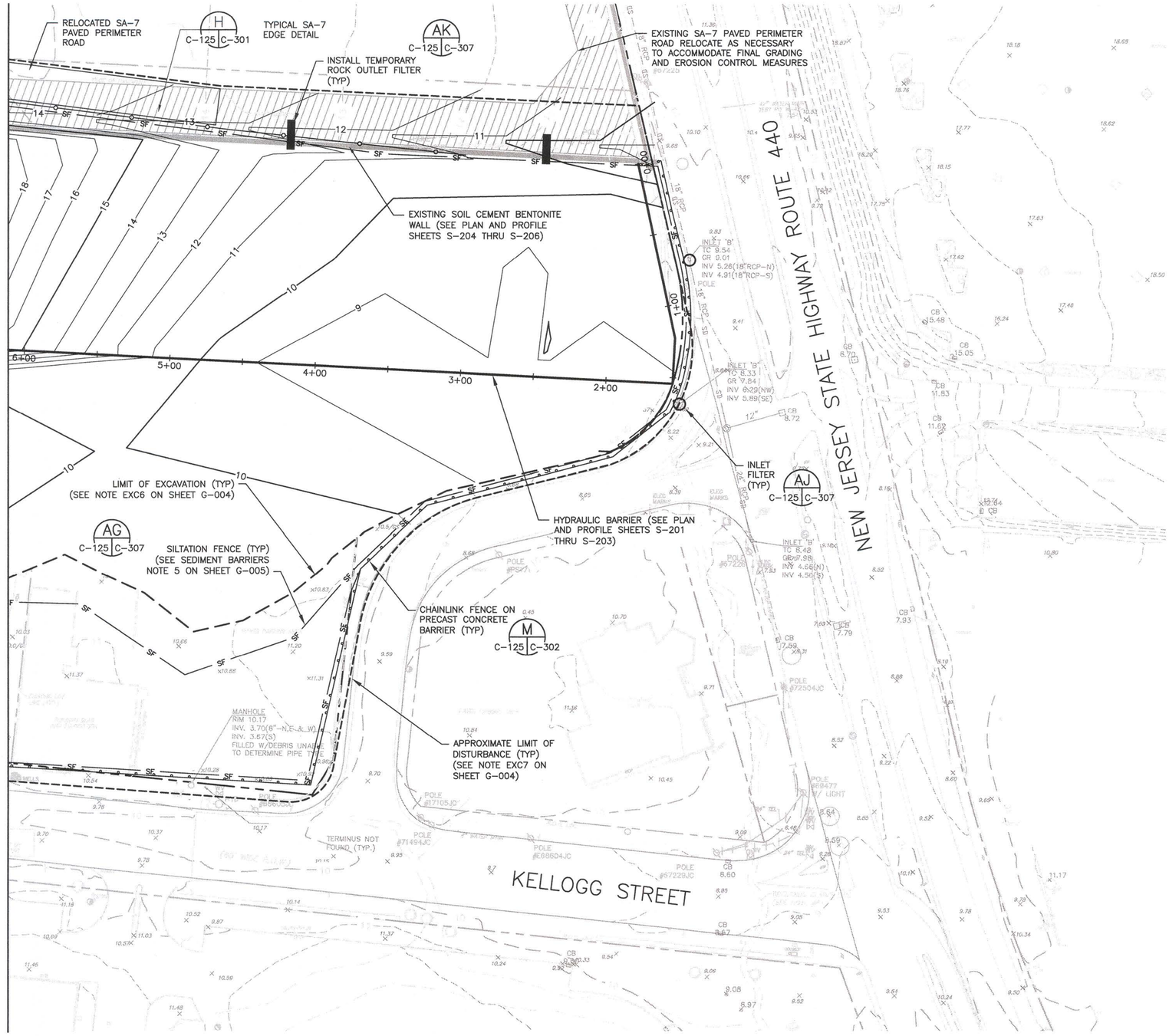
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-126
SHEET	31 OF 70

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SABN\100 Percent\CR31-C-126 Final Grade Drain SESC Plan.dwg PLOT DATE: Fri, 24 May 2013 PLOT TIME: 7:13 AM



NOTES:

1. REFER TO GENERAL NOTES SHEET G–003 AND G–004.
2. REFER TO LEGEND AND ABBREVIATIONS SHEET G–002

0 20 40 80
SCALE IN FEET

STEPHEN H. MITCHELL
5/24/13
STATE OF NEW JERSEY
STEPHEN H. MITCHELL
NO. 21932
PROFESSIONAL ENGINEER
NJ PROFESSIONAL ENGINEER
SHM LICENSE NUMBER 24GE04322400

NO.	DATE		BY	APVD
0	06/07/13	ISSUED FOR CONSTRUCTION	TDD	SHM
DSGN	TDD	DR RJP CHK TDD		APVD

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

CHROMIUM REMEDY
STUDY AREA 6 SOUTH
SITES 073, 124, 125, 134, 140, AND 163
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CIVIL

REMEDIATION FINAL GRADING, DRAINAGE, AND SOIL EROSION SEDIMENT CONTROL PLAN

amec
Environment & Infrastructure, Inc.
200 American Metro Blvd, Suite 113
Hamilton, NJ, 08619
(609) 689 - 2829
NJ Certificate of Authorization Number 24GA28010900

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	
PROJ	3480-12-0317
DWG	C-125
SHEET	30 OF 66

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6S\CR30-C-125 Final Grade Plan.dwg PLOT DATE: Fri, 24 May 2013 PLOT TIME: 10:26 AM

SA-7

H C-126 C-301 TYPICAL SA-7 EDGE DETAIL

L C-126 C-302 TEMPORARY CONSTRUCTION FENCE

INSTALL TEMPORARY ROCK OUTLET FILTER (TYP)

AK C-126 C-307

SILTATION FENCE (TYP) (SEE SEDIMENT BARRIERS NOTE 5 ON SHEET G-005)

AG C-126 C-307

EXISTING SOIL CEMENT BENTONITE WALL, SEE PLAN AND PROFILE SHEETS S-204 THRU S-206

EXISTING SA-7 PERIMETER ROAD RELOCATE AS NECESSARY TO ACCOMMODATE FINAL GRADING AND EROSION CONTROL MEASURES

RELOCATED SA-7 PAVED PERIMETER ROAD

Q C-126 C-303 TYPICAL VEGETATED SWALE

HYDRAULIC BARRIER, SEE PLAN AND PROFILE SHEETS S-201 THRU S-203

CB-3
RIM = 7.90
INV OUT = 5.50

T C-126 C-303

SILTATION FENCE (TYP) (SEE SEDIMENT BARRIERS NOTE 5 ON SHEET G-005)

AG C-126 C-307

INLET FILTER (TYP) AJ C-126 C-307

STORM TRENCH (TYP) U C-126 C-303

LIMIT OF EXCAVATION (TYP) (SEE NOTE EXC6 ON SHEET G-004)

TEMPORARY CONSTRUCTION TRAILERS

INSTALL 186 LF 12" HDPE @ 0.5%

MATERIAL STORAGE AREA

CHAINLINK FENCE ON PRECAST CONCRETE BARRIER (TYP)

M C-126 C-302

INSTALL 77 LF 12" HDPE @ 0.5%

INSTALL 200 LF 12" HDPE @ 0.5%

CB-5
RIM = 6.50
INV. IN = 3.10
INV OUT = 3.00

KELLOGG STREET

CHAIN LINK FENCE WITH DOUBLE GATE

J C-126 C-302

STABILIZED CONSTRUCTION ACCESS

AH C-126 C-307

APPROXIMATE LIMIT OF DISTURBANCE (TYP) (SEE NOTE EXC7 ON SHEET G-004)

DROYERS COVE

MATCH LINE SHEET C-127

MATCH LINE SHEET C-125

NOTES:

1. REFER TO GENERAL NOTES SHEET G-003 AND G-004.
2. REFER TO LEGEND AND ABBREVIATIONS SHEET G-002.

0 20 40 80
SCALE IN FEET

STEPHEN H. MITCHELL 5/24/13
NEW JERSEY PROFESSIONAL ENGINEER NO. GE 53324
N.J. PROFESSIONAL ENGINEER
N.J. LICENSE NUMBER 24GE04532400

NO.	DATE	DSGN	DR	CHK	APVD
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ISSUED FOR CONSTRUCTION

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TDD	SHM

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CHROMIUM REMEDY
STUDY AREA 6 SOUTH
SITES 073, 124, 125, 134, 140, AND 163
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CIVIL

REMEDIATION FINAL GRADING, DRAINAGE, AND EROSION SEDIMENT CONTROL PLAN

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(609) 689 - 2829
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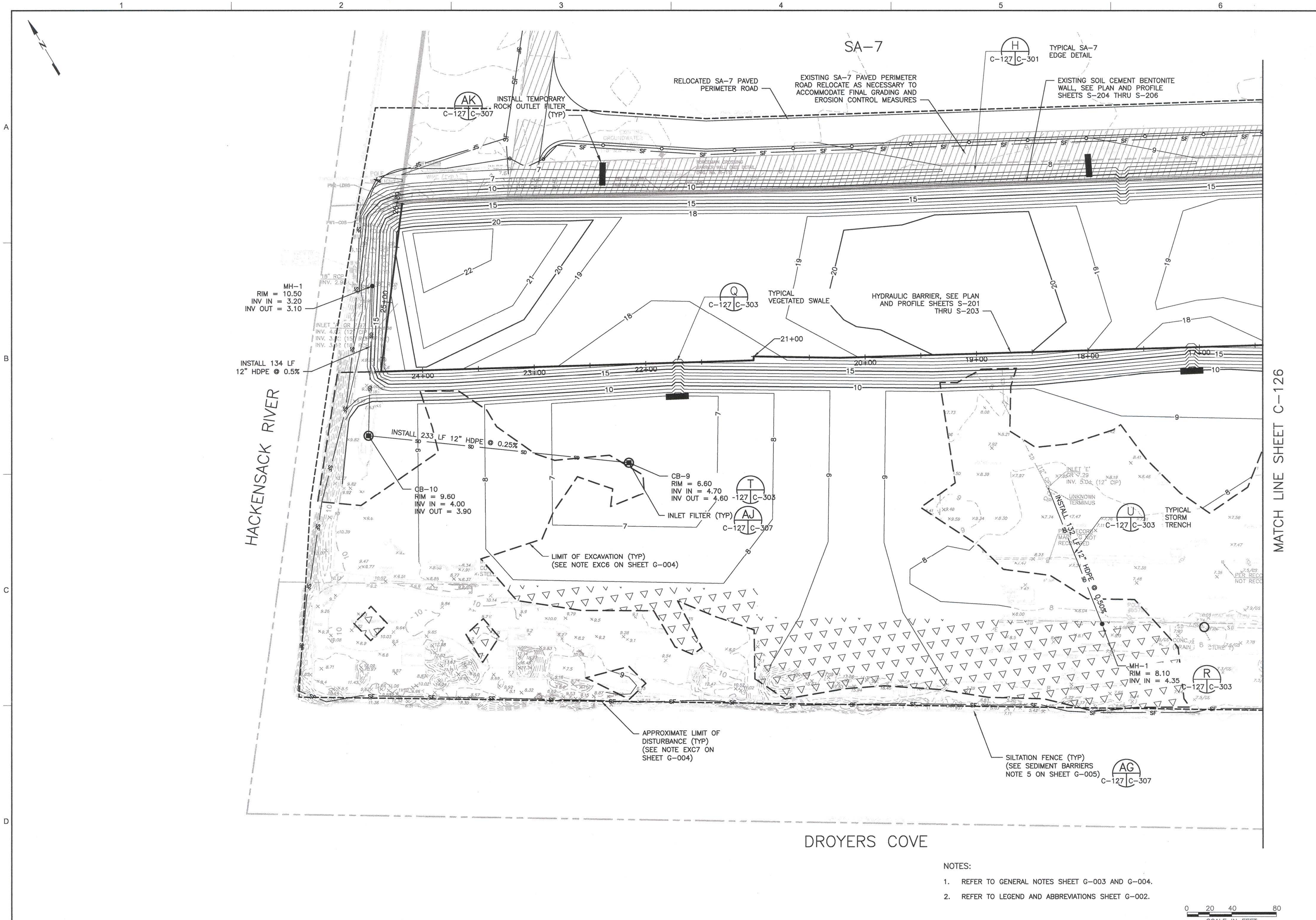
0 1"

DATE	
PROJ	3480-12-0317
DWG	C-126
SHEET	31 OF 66

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6SICR31-C-126 Final Grade Plan.dwg PLOT DATE: Fri, 24 May 2013 PLOT TIME: 10:49 AM



NOTES:

1. REFER TO GENERAL NOTES SHEET G-003 AND G-004.
2. REFER TO LEGEND AND ABBREVIATIONS SHEET G-002.

STEPHEN H. MITCHELL
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 24GE04322400

NO.	DATE	REVISION	BY	APVD
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DATE	
PROJ	3480-12-0317
DWG	C-127
SHEET	32 OF 66

EXHIBIT 4

SURCHARGE PILE HEIGHT PLANS

GROUNDWATER TREATMENT PLANT BUILDING (SEE NOTE GN23 ON SHEET GN–003)

BH CN–109 | CN–309 72" FORCE MAIN PROTECTION DETAIL

K CN–109 | CN–303 CONCRETE BARRIER

K CN–109 | CN–303 CONCRETE BARRIER

EXISTING 72" PCCP FORCE MAIN (SEE NOTE 10)

EXISTING 72" PCCP FORCE MAIN (SEE NOTE 10)

HYDRAULIC BARRIER

TEMPORARY BRIDGE (SEE NOTE 14)

EXISTING FORCE MAIN AND CONDUIT

A CN–109 | CN–601

EXISTING POWER SUPPLY (SEE NOTE 2)

SA–7 PERIMETER POOL FILL PIPE (SEE NOTE 9)

EXISTING SOIL CEMENT BENTONITE WALL

VRC1

VRC2

VRC3

SA–7 FINAL GRADE (ACTUAL GRADES VARY)

EXISTING SA–7 PERIMETER ROAD (SEE NOTE SS7 ON SHEET GN–003)

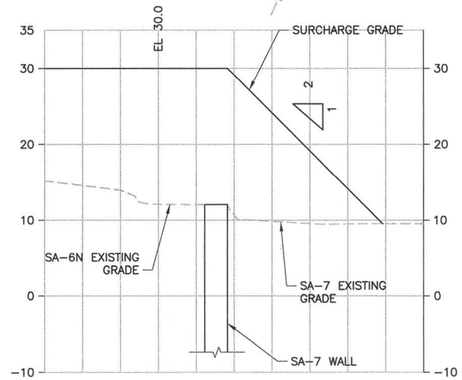
NEW SA–7 PERIMETER ROAD

BL CN–109 | CN–309 EXISTING SA–7 PAVED PERIMETER ROAD TO BE RELOCATED TO ACCOMMODATE SA–6 NORTH SURCHARGE PILES

ACCESS RAMP (SEE NOTE GN22 ON SHEET GN–003)

NOTES:

1. REMOVE SA–7 FENCE AND SA–7 FLOODLIGHTS PRIOR TO SURCHARGE PLACEMENT.
2. RELOCATE POWER SUPPLY TO PW1 AND PW2 PRIOR TO SURCHARGE.
3. GEOTECHNICAL MONITORING INSTRUMENTATION TO BE INSTALLED PRIOR TO SURCHARGE PLACEMENT.
4. TOE OF SURCHARGE PILE EXTENDS INTO THE SEDIMENTATION BASIN.
5. BEGIN SURCHARGE PLACEMENT PROXIMATE TO THE SEDIMENTATION BASIN IN AREAS REQUIRING THE MOST FILL AND WORK TOWARDS THE RIVER.
6. SURCHARGE PILE TO BE SLOPED TO SHED SURFACE WATER TO THE NORTH.
7. COORDINATE WITH SA–7 ENGINEER TO MAINTAIN ACCESS AND FUNCTION TO PERIMETER POOL INSTRUMENTATION AND RECHARGE SYSTEM.
8. SURCHARGE PILE SLOPE EXTENDS ONTO SA–7.
9. OBSERVATION, RECHARGE, AND MONITORING WELLS ON SA–7 WILL BE EXTENDED AS NECESSARY TO MAINTAIN OPERATIONAL CAPABILITY WHILE SURCHARGING.
10. EXISTING JCMUA 72" FORCE MAIN PROTECTIVE MEASURES TO BE COMPLETED PRIOR TO PLACING SURCHARGE WITHIN 50 FEET OF THE FM. SEE SHEET SN–206 FOR INSTALLATION OF GEOFOAM BLOCK PROTECTION FOR THE FM.
11. SOIL EROSION AND SEDIMENT CONTROL, (SESC) MEASURES WILL BE INSTALLED PRIOR TO COMMENCEMENT OF ROLLING SURCHARGE AND SHALL BE REMOVED, RELOCATED, AND ADJUSTED AS NECESSARY IN CONJUNCTION WITH THE ROLLING SURCHARGE. SESC MEASURES SHALL BE REMOVED FOLLOWING SURCHARGE COMPLETION.
12. THE DIVISION OF THE SURCHARGE AREAS MAY BE SUBJECT TO CHANGE. THE TOTAL AMOUNT OF SURCHARGE AND THE INSTRUMENT LOCATIONS AS SHOWN WILL DEPEND ON ANY REVISIONS TO THE INTERNAL BOUNDARIES BETWEEN THE SURCHARGE AREAS.
13. CONTRACTOR MAY ELECT TO BUILD VERTICAL MECHANICAL STABILIZED EMBANKMENT SLOPE IN LIEU OF TOE OF SLOPE SHOWN IN SURCHARGE PILE.
14. TEMPORARY BRIDGE BY OTHERS RELOCATED BY CONTRACTOR AS REQUIRED.
15. FILL LOW AREAS AND EXISTING DEPRESSIONS TO TARGET SURCHARGE ELEVATION.CUTS ARE NOT REQUIRED T OBE COMPLETED DURING SURCHARGE GRADING.
16. REFER TO GENERAL NOTES ON SHEETS GN–003 AND GN–004.
17. REFER TO LEGEND AND ABBREVIATIONS ON SHEET GN–002.



SECTION A–A

0 15 30 60
SCALE IN FEET

SAMUEL G. SHALLARD 5/9/13
NO. 43507
STATE OF NEW JERSEY
PROFESSIONAL ENGINEER

NO.	DATE	DSGN	DR	CHK	APVD
0	06/07/13	TDD	RJR	TDD	TDD

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REVISION	BY	APVD
	TDD	SGS

NJ PROFESSIONAL ENGINEER SGS LICENSE NUMBER 43507

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CHROMIUM REMEDY
STUDY AREA 6 NORTH
SITES 087 AND 088
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CAP AREA SURCHARGE
GRADING PLAN
AREA 1N

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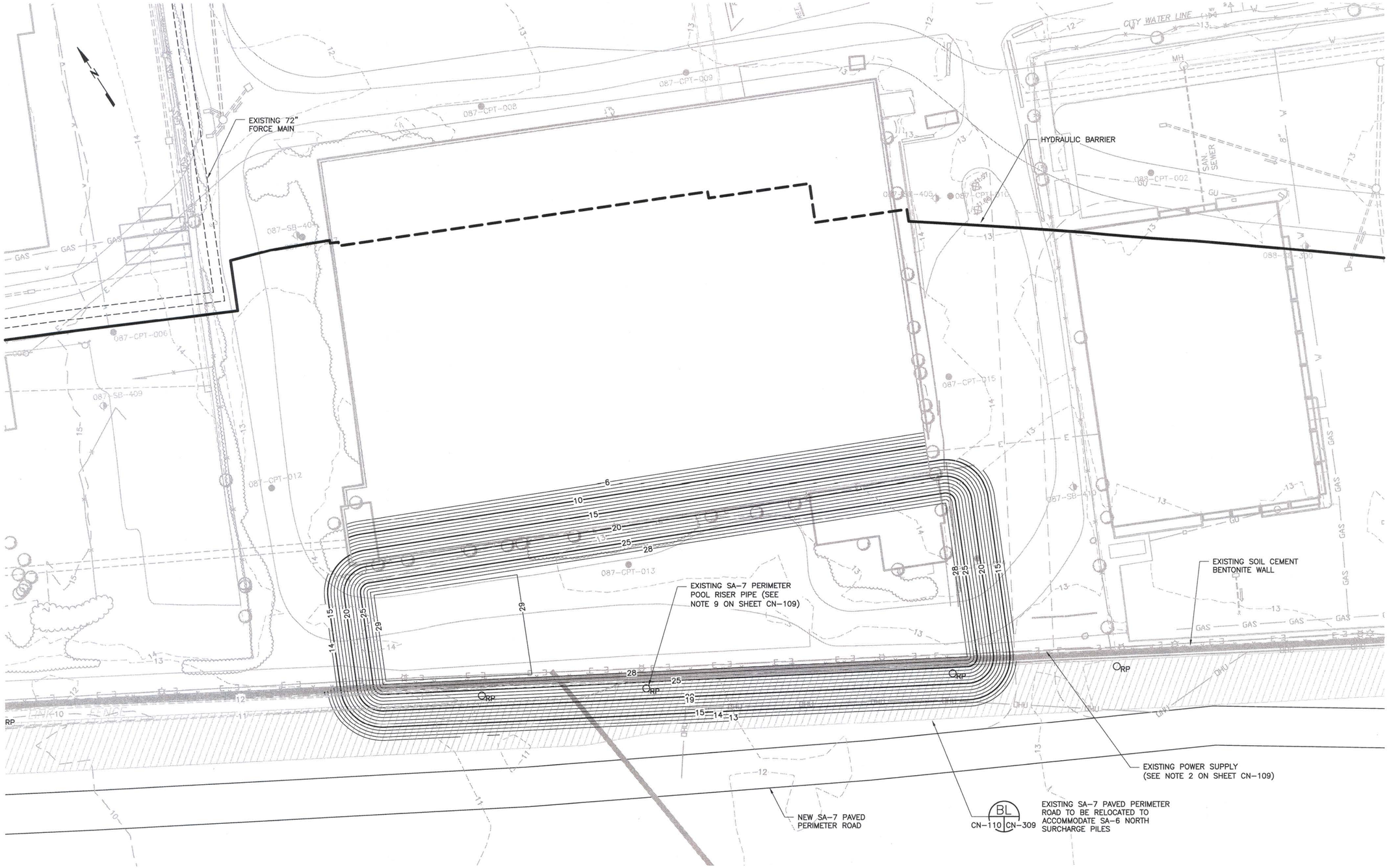
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-109
SHEET	14 OF 70

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6N\100 Percent\CR14-C-109 Grading Surcharge Plan - Area 1.dwg PLOT DATE: Thu, 23 May 2013 PLOT TIME: 2:43 PM



NOTES:

1. REFER TO SHEETS GN-003 AND GN-004 FOR GENERAL NOTES.
2. REFER TO SHEET GN-002 FOR LEGEND AND ABBREVIATIONS.
3. REFER TO SHEET CN-109 FOR ADDITIONAL NOTES.

SAMUEL G. SHALLARD
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 43507
SGS

NO.	DATE	DSGN	DR	CHK	APVD
0	06/07/13	TDD		RJR	TDD

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REVISION

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DRAWING STATUS
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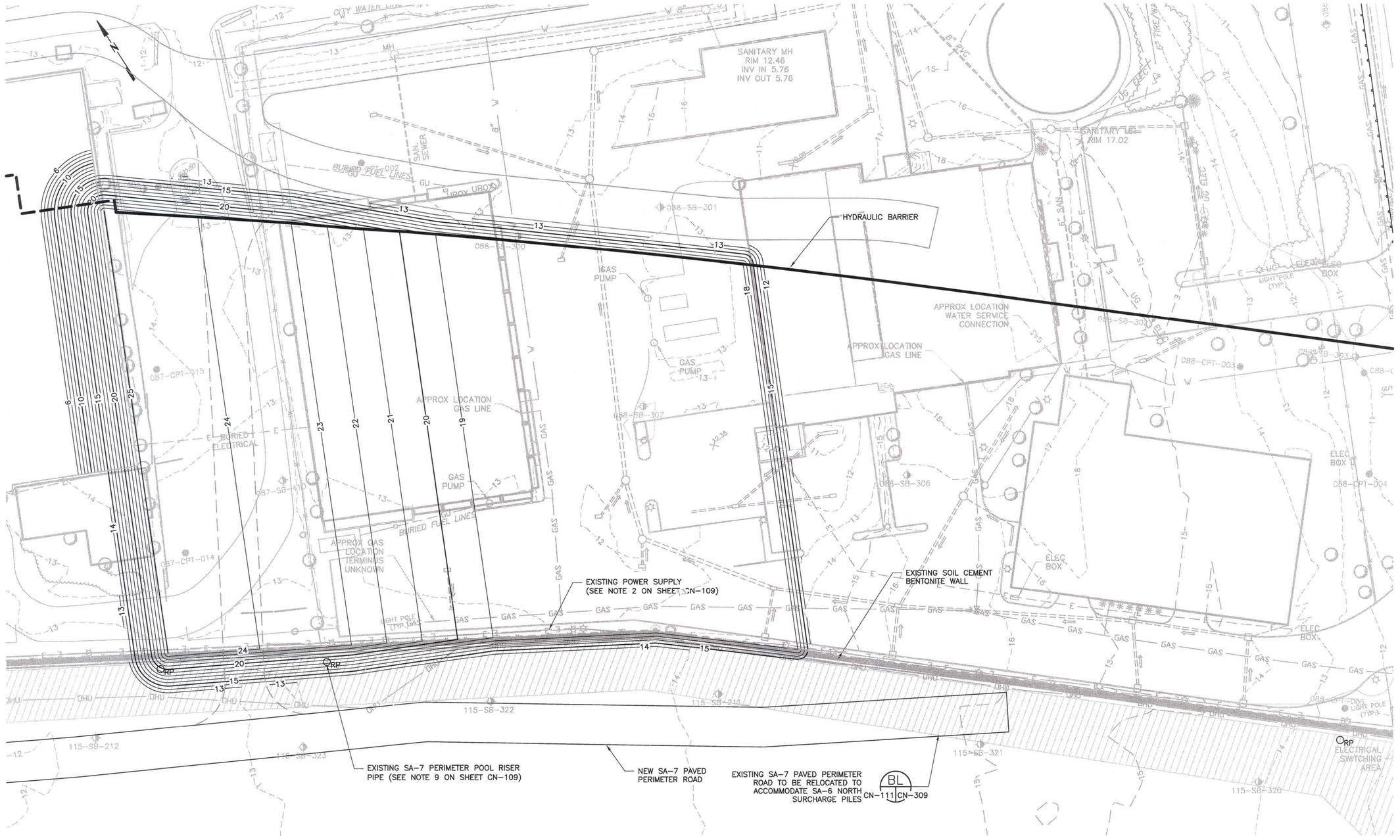
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-110
SHEET	15 OF 70

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6N\100 Percent\CR15-C-110 Grading Surcharge Plan - Area 2.dwg PLOT DATE: Thu, 23 May 2013 PLOT TIME: 2:44 PM



NOTES:

1. REFER TO SHEETS GN-003 AND GN-004 FOR GENERAL NOTES.
2. REFER TO SHEET GN-002 FOR LEGEND AND ABBREVIATIONS.
3. REFER TO SHEET CN-109 FOR ADDITIONAL NOTES.

0 15 30 60
SCALE IN FEET

SAMUEL G. SHALLARD
5/9/13
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 43507
SGS

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CHROMIUM REMEDY
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DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CAP AREA SURCHARGE
GRADING PLAN
AREA 3N

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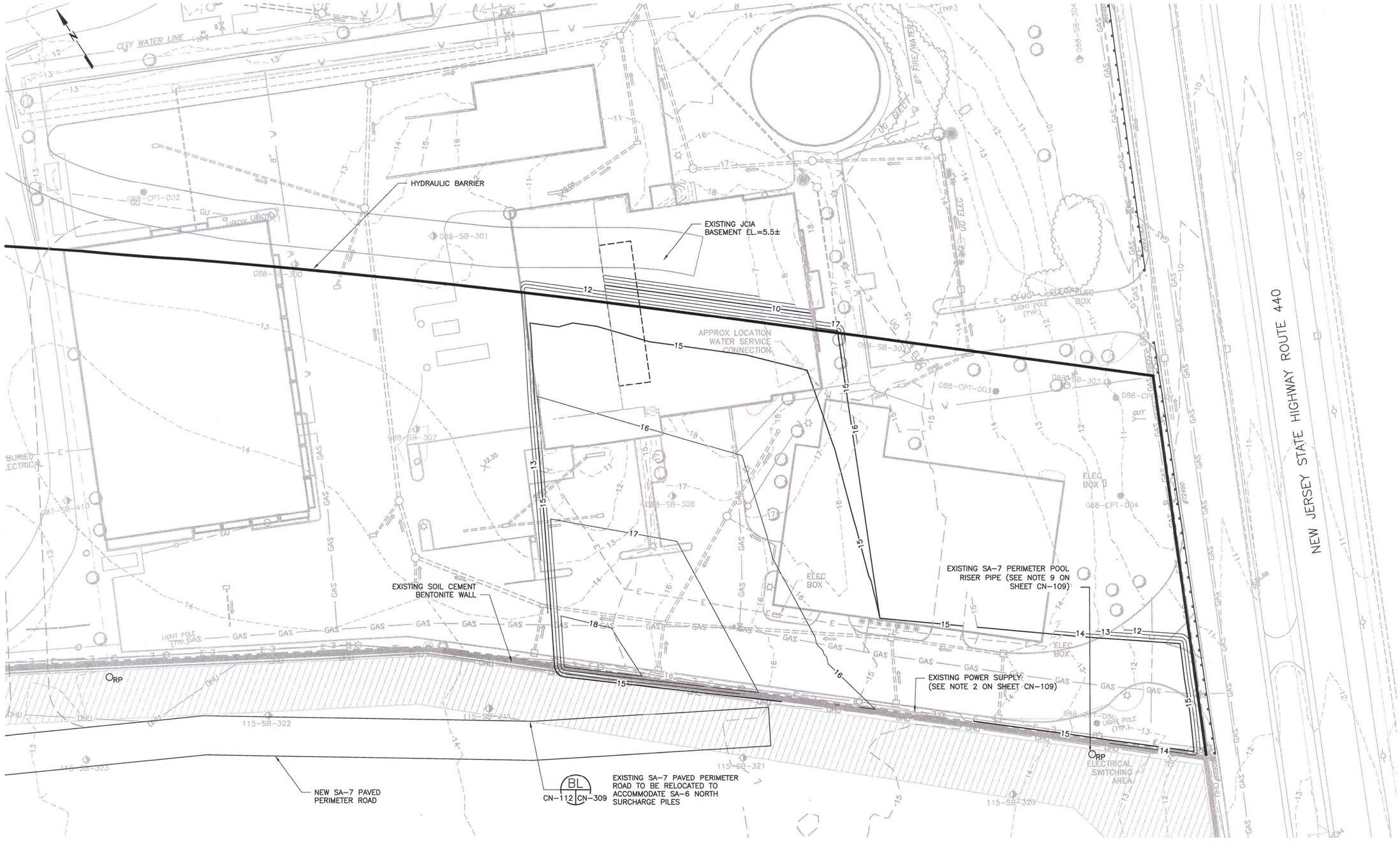
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-111
SHEET	16 OF 70



NOTES:

1. REFER TO SHEETS GN-003 AND GN-004 FOR GENERAL NOTES.
2. REFER TO SHEET GN-002 FOR LEGEND AND ABBREVIATIONS.
3. REFER TO SHEET CN-109 FOR ADDITIONAL NOTES.

0 15 30 60
SCALE IN FEET

SAMUEL G. SHALLARD
NO. 43507
STATE OF NEW JERSEY
PROFESSIONAL ENGINEER
6/28/13

NO.	DATE	REVISION	BY	APVD
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DSGN	TDD	DR RJR CHK TDD	APVD	SGS

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LICENSE NUMBER 43507

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CHROMIUM REMEDY
STUDY AREA 6 NORTH
SITES 087 AND 088
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DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CAP AREA SURCHARGE
GRADING PLAN
AREA 4N

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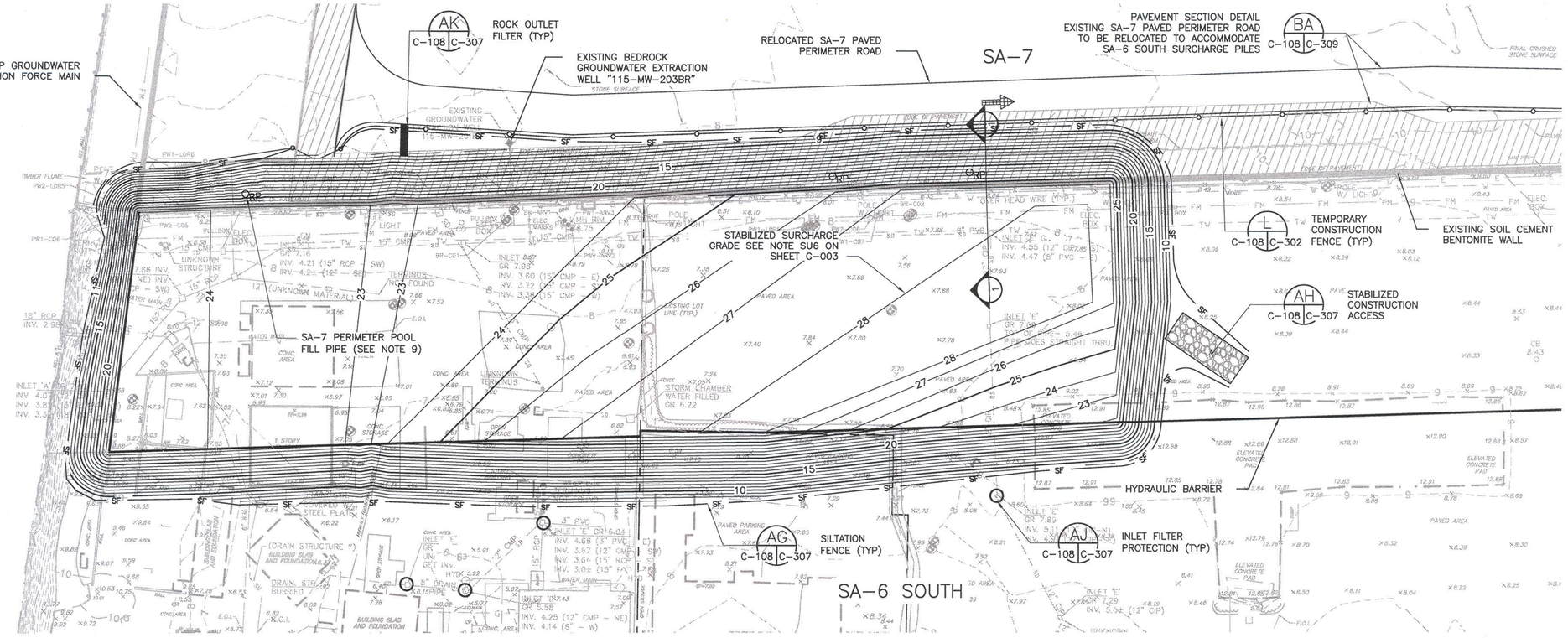
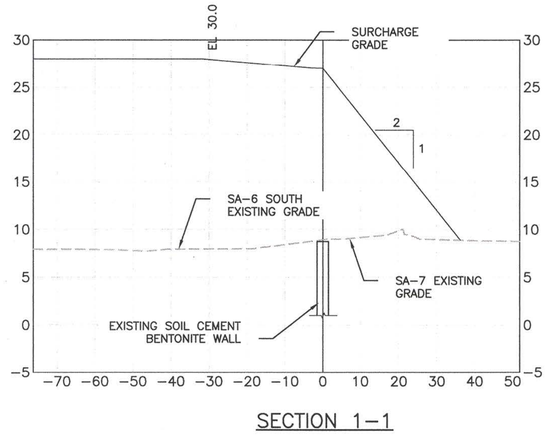
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-112
SHEET	17 OF 70





SECTION 1–1

NOTES:

1. REFER TO GENERAL NOTES SHEETS G–003, G–004, AND THE SURCHARGE MONITORING PLAN FOR SA–6 SOUTH.
2. REFER TO LEGEND AND ABBREVIATIONS SHEET G–002.
3. REFER TO NOTES ON SHEET C–107.

0 20 40 80
SCALE IN FEET

STEPHEN H. MITCHELL
STATE OF NEW JERSEY
24GE04322400
PROFESSIONAL ENGINEER
6/24/13

NO.	DATE	DSGN	DR	CHK	APVD
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TDD SHM

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CHROMIUM REMEDY
STUDY AREA 6 SOUTH
SITES 073, 124, 125, 134, 140, AND 163
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CIVIL
CAP AREA SURCHARGE GRADING PLAN AREA 1S

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0 1"

DATE	
PROJ	3480-12-0317
DWG	C-108
SHEET	13 OF 66

SA–7

PAVEMENT SECTION DETAIL
EXISTING SA–7 PAVED PERIMETER ROAD TO BE RELOCATED TO ACCOMMODATE SA–6 SOUTH SURCHARGE PILES
BA
C–109 | C–309

RELOCATED SA–7 PAVED PERIMETER ROAD

SA–7 PERIMETER POOL FILL PIPE (SEE NOTE 9 ON SHEET C–108)

L
C–109 | C–302
TEMPORARY CONSTRUCTION FENCE (TYP)

EXISTING SOIL CEMENT BENTONITE WALL

STABILIZED SURCHARGE GRADE SEE NOTE SU6 ON SHEET G–003

SA–6 SOUTH

AH
C–109 | C–307
STABILIZED CONSTRUCTION ACCESS

AC
C–109 | C–307
SILTATION FENCE (TYP)

HYDRAULIC BARRIER

AU
C–109 | C–307
INLET FILTER PROTECTION (TYP)

NOTES:

1. REFER TO GENERAL NOTES SHEETS G–003, G–004, AND THE SURCHARGE MONITORING PLAN FOR SA–6 SOUTH.
2. REFER TO LEGEND AND ABBREVIATIONS SHEET G–002.
3. REFER TO NOTES ON SHEET C–107.

0 20 40 80
SCALE IN FEET

STEPHEN H. MITCHELL
5/24/13
STATE OF NEW JERSEY · STEPHEN H. MITCHELL · NO. 24GE04932400 · PROFESSIONAL ENGINEER
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 24GE04932400

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STUDY AREA 6 SOUTH
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100 PERCENT DESIGN DRAWINGS

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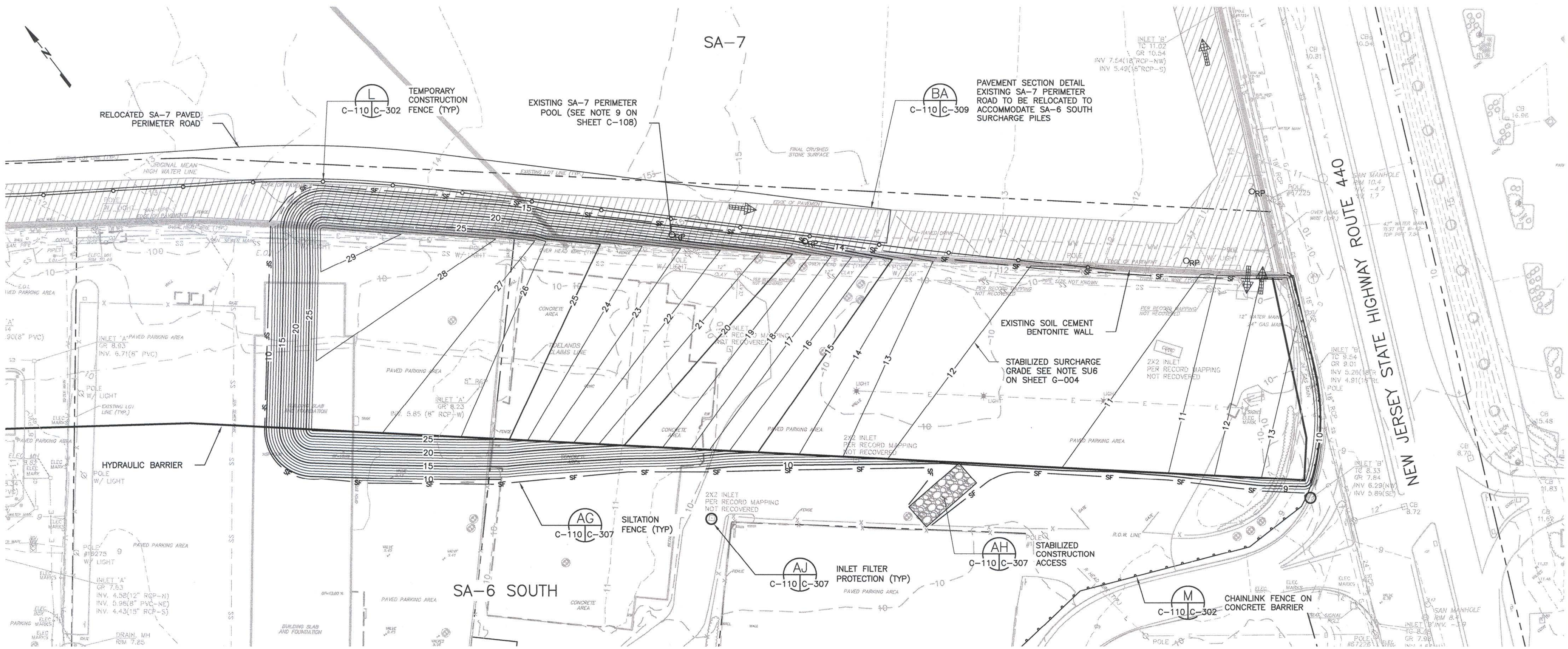
DATE	
PROJ	3480-12-0317
DWG	C-109
SHEET	14 OF 66

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CADISA6S\CR14-C-109 Cap Area Surcharge Grading Plan Area 2.dwg PLOT DATE: Fri, 24 May 2013 PLOT TIME: 10:17 AM



0 20 40 80
SCALE IN FEET

NOTES:

1. REFER TO GENERAL NOTES SHEETS G-003, G-004, AND THE SURCHARGE MONITORING PLAN FOR SA-6 SOUTH.
2. REFER TO LEGEND AND ABBREVIATIONS SHEET G-002.
3. REFER TO NOTES ON SHEET C-107.

STEPHEN H. MITCHELL
5/24/13
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 24GE04322400

NO.	DATE	REVISION	DSGN	DR	CHK	APVD	BY	APVD
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CHROMIUM REMEDY
STUDY AREA 6 SOUTH
SITES 073, 124, 125, 134, 140, AND 163
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CIVIL
CAP AREA SURCHARGE
GRADING PLAN
AREA 3S

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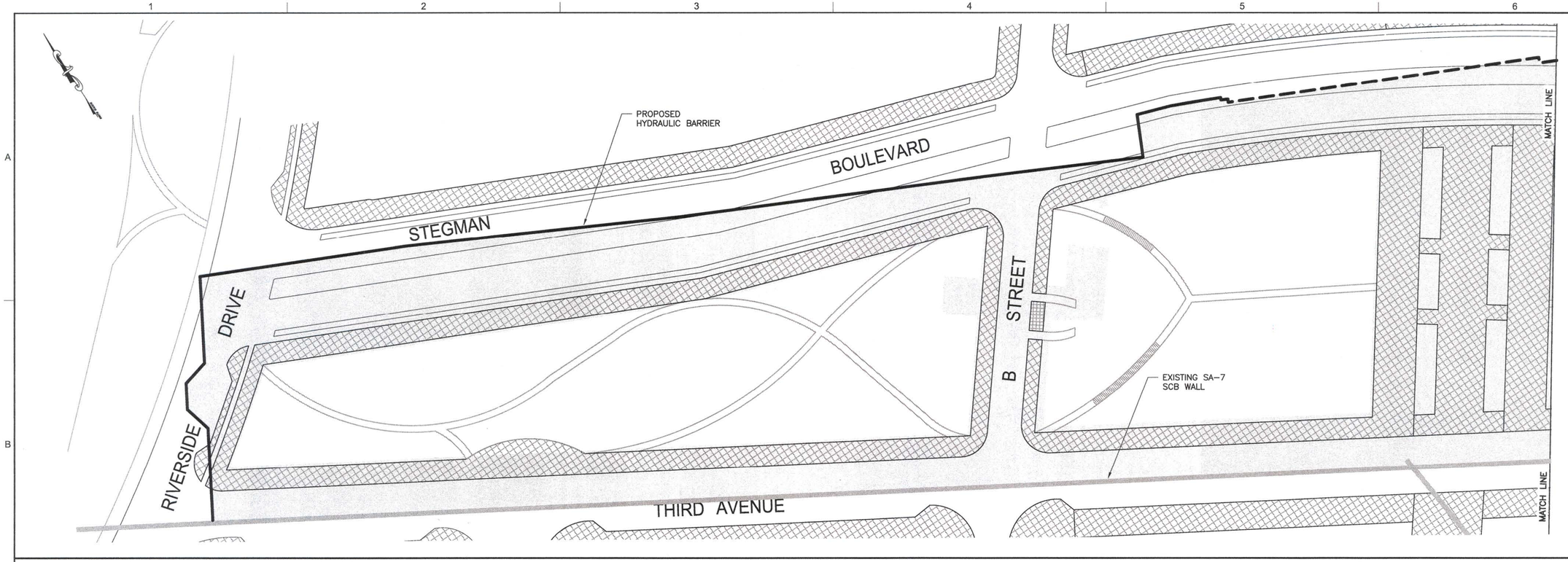
0 1"

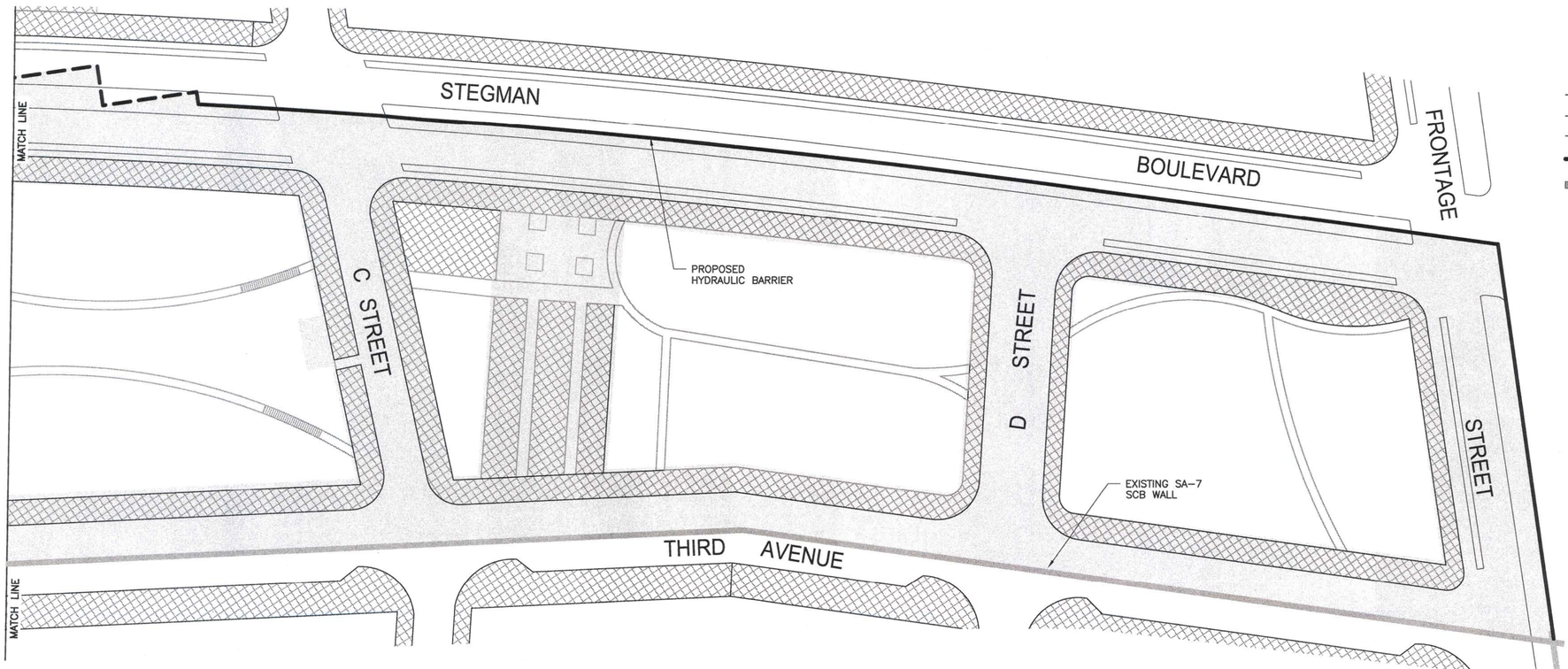
DATE	
PROJ	3480-12-0317
DWG	C-110
SHEET	15 OF 66

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6S\CR15-C-110 Cap Area Surcharge Grading Plan Area 3.dwg PLOT DATE: Fri, 24 May 2013 PLOT TIME: 10:18 AM

EXHIBIT 5

UTILITY CORRIDORS





LEGEND

- STORM SEWER
- FORCE MAIN
- WATER
- HYDRAULIC BARRIER
- SA–7 SCB WALL
- MANHOLE
- CATCH BASIN
- BRICK PAVING/SIDEWALK
- UTILITY CORRIDOR

NOTES:

1. UTILITY LOCATIONS REPRESENT PRELIMINARY UTILITY LAYOUTS PERFORMED BY CLOUGH HARBOR ASSOCIATES DATED JULY 28, 2011.
2. UTILITY CORRIDORS MAY BE SUBJECT TO AMENDMENT AS UTILITY DESIGNS ARE FINALIZED. AMENDED DESIGN WILL BE SUBJECT TO REVIEW AND APPROVAL CONSISTENT WITH THE CONSENT DECREE.

0 20 40 80
SCALE IN FEET

SAMUEL G. SHALLARD
6/28/13
NJ PROFESSIONAL ENGINEER
LICENSE/NUMBER 43507

NO.	DATE	DSGN	DR	CHK	APVD	BY	APVD
0	06/07/13	TDD	TDD	RJR	TDD	TDD	SGS

ISSUED FOR CONSTRUCTION
REVISION

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

CHROMIUM REMEDY
STUDY AREA 6 NORTH
SITES 087 AND 088
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

UTILITY CORRIDOR LOCATIONS

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Hamilton, NJ, 08619
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24GA28016900

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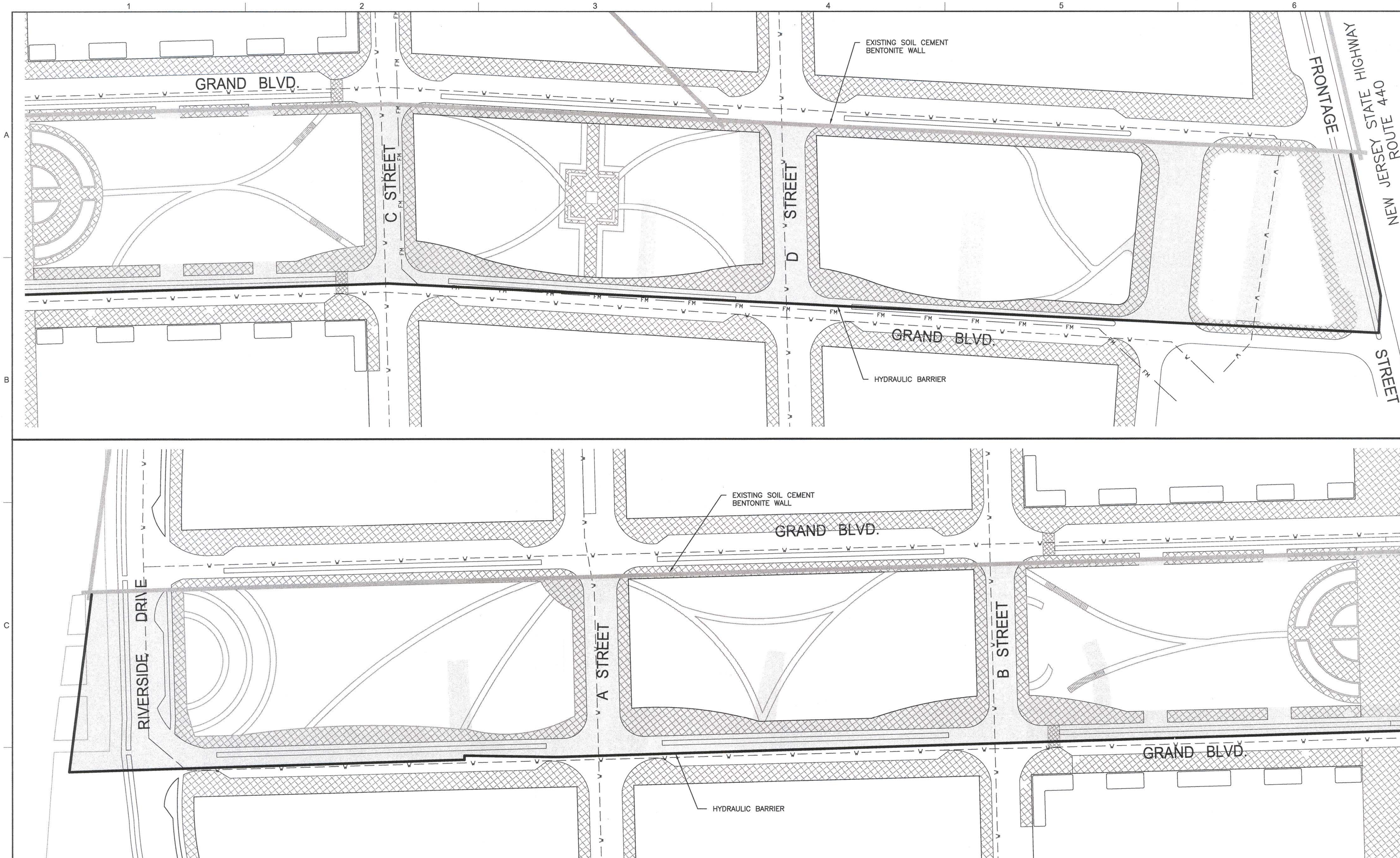
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-515
SHEET	51 OF 70

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6N\100 Percent\CR51-C-515 Corridor Locations.dwg PLOT DATE: Fri, 24 May 2013 PLOT TIME: 8:58 AM



LEGEND

SW — SW	STORM SEWER
FM — FM	FORCE MAIN
W — W	WATER
(heavy line)	HYDRAULIC BARRIER WALL
(grey band)	EXISTING SOIL CEMENT BENTONITE WALL
O	MANHOLE
▪	CATCH BASIN
(cross-hatch)	BRICK PAVING/SIDEWALK
(grey shading)	UTILITY CORRIDOR

0 20 40 60
SCALE IN FEET

STEPHEN H. MITCHELL
5/24/13
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 24GE04322400

NO.	DATE	REVISION	BY	APVD
0	06/07/13	ISSUED FOR CONSTRUCTION	TDD	SHM

DSGN TDD | DR RJR | CHK TDD | APVD SHM

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

CHROMIUM REMEDY
STUDY AREA 6 SOUTH
SITES 073, 124, 125, 134, 140, AND 163
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CIVIL

UTILITY CORRIDOR LOCATIONS

amec
Environment & Infrastructure, Inc.
200 American Metro Blvd, Suite 113
Hamilton, NJ, 08619
(609) 689 - 2829
NJ Certificate of Authorization Number 24GA28010900

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	
PROJ	3480-12-0317
DWG	C-516
SHEET	51 OF 66

FILE NAME: Z:\Projects\HONEYWELL\JERSEY CITY\Cap Design-SA6-C3D\CAD\SA6S\CR51-C-516 Utility Corridor Locations.DWG PLOT DATE: Fri, 24 May 2013 PLOT TIME: 11:41 AM

EXHIBIT 6

EXCERPTS FROM AMERICAN STANDARDS FOR NURSERY STOCK



AMERICAN STANDARD FOR NURSERY STOCK

ANSI Z60.1–2004

Approved May 12, 2004

AN&LA™
American Nursery &
Landscape Association



Approved American National Standard
ANSI

DEDICATION

This edition of the *American Standard for Nursery Stock* is dedicated in memory of Ronnie Swaim, Gilmore Plant & Bulb Co., Inc. (NC)

American Nursery & Landscape Association
1000 Vermont Avenue, NW, Suite 300
Washington, DC 20005
www.anla.org

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SECTION 4 FIGURES AND TABLES

Section 5: Rose Grades

SECTION 5 FIGURES AND TABLES

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SECTION 7 TABLES

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FOREWORD

One of the early activities of the American Nursery & Landscape Association, formerly the American Association of Nurserymen, was the development of a standardized system of sizing and describing plants to facilitate the trade in nursery stock. Since 1921, the Association has maintained an active committee on standards. Its first edition of "Horticultural Standards" was published in 1923. From time to time, these standards were revised and expanded to meet the needs of the industry.

After World War II the Association elected to make the standards a national standard by adhering to the procedures of the American Standards Association. The first edition published under the procedures of the American Standards Association (forerunner of the current American National Standards Institute, or "ANSI") was published on June 22, 1949.

The revisions included in the 2004 edition were developed by the Association's Horticultural Standards Committee from January, 1997, through May, 2003. The proposed revisions were then submitted to interested national and regional societies, associations, companies, individuals, and government agencies for their review and endorsement.

Nomenclature

The following manuals are suggested for general nomenclature use:

List of Names of Woody Plants; List of Names of Perennials. Research Station for Nursery Stock, P.O. Box 118, NL-2770 AC BOSKOOP, The Netherlands. 5th Revised Ed., 1995.

Datascape Guide to Commercial Nomenclature, American Nurserymen Publishing Co., Chicago, IL, 1996.

An Annotated Checklist of Woody Ornamental Plants of California, Oregon and Washington, Division of Agricultural Sciences, University of California, February, 1979.

Hillier's Manual of Trees and Shrubs, 6th Edition, 1993.

Manual of Cultivated Conifers, Den Ouden & Boon, 3rd Edition, 1982.

The following botanical manuals are suggested for nomenclature as well as descriptive and technical data:

Trees and Shrubs Hardy in the British Isles, Beam (four volumes).

Hortus Third, Liberty Hyde Bailey Hortorium, 1976.

Dictionary of Gardening, Royal Horticulture Society (five volumes).

A Technical Glossary of Horticultural and Landscape Terminology, Horticultural Research Institute, 1971.

HOW TO USE THIS PUBLICATION

A. General Information.

The purpose of the American Standard for Nursery Stock is to provide buyers and sellers of nursery stock with a common terminology in order to facilitate transactions involving nursery stock. For instance, the standards establish common techniques for (a) measuring plants, (b) specifying and stating the size of plants, (c) determining the proper relationship between height and caliper, or height and width, and (d) determining whether a root ball or container is large enough for a particular size plant. In other words, this book is a communication tool, and does not provide buyers with any assurance of the health or quality of the nursery stock being specified or sold.

In order to locate the specifications for a particular plant, you should know (a) what type of plant it is, such as whether it is a shade or flowering tree, a coniferous or broadleaf evergreen, a young plant (seedlings, ground covers, or lining out stock), a perennial or bulb, etc., (b) the growth habit of the particular species, (e.g., upright, conical, spreading, multi-stemmed, etc.), and (c) the method of production of the plant and the manner in which the plant will be sold (e.g., balled and burlapped, bare root, containerized, etc.).

B. Organization and Procedure

1. Locate the plant group to which the plant belongs. There are thirteen plant groups: Shade and Flowering Trees, Deciduous Shrubs, Coniferous Evergreens, Broadleaf Evergreens, Roses, Young Plants, Fruit Trees, Small Fruits, Understock, Seedlings, Bulbs, Corms, and Tubers, Perennials, and Christmas Trees.

2. Locate the section within that plant group which most likely contains the type of information you want to find. The first portion of each plant group section contains general information on how the plants in that group are measured, the conventions regarding how measurements are to be stated, and how different types of plants within the plant group are divided. Each plant group is further divided depending on the most important considerations for plants in that group. The sections for trees and shrubs, for instance, are divided based on growth habit and methods of production and sale. Other sections are divided based on propagation methods, specific plant families within the plant group, or other factors.

Examples of plant types within certain plant groups are only to clarify the factors used to determine plant types within each section. Only a few examples are listed, and are not complete lists of all genera within each plant type. Users must have horticultural knowledge or access to horticultural resources to determine the plant type of an unlisted species.

3. If you are unable to locate the information under the first plant group selected, you should go back to the Table of Contents and determine whether there may be another plant group to which the plant belongs.

4. The Appendix provides both a glossary of terms used in the Standard as well as a metric conversion table

1.6 Root ball guidelines

1.6.1 Root ball diameters - field grown trees

The following tables represent the recommended minimum root ball sizes for trees that are (a) grown in the ground in the nursery without artificial root restriction devices, such as containers or fabric bags, (b) grown under favorable growing conditions, having received the proper cultural treatment to develop a well branched root system, and (c) harvested with the ball of earth in which they are growing remaining intact (e.g., balled and burlapped).

Many factors affect the minimum root ball size. Although minimum ball size is not a required specification, parties to nursery stock transactions are encouraged to address minimum ball size in personal communications or specification documents prior to the transaction. The objective in all nursery stock transactions is for root balls to meet the following general requirement:

Ball sizes should always be of a diameter and depth to encompass enough of the fibrous and feeding root system as necessary for the full recovery of the plant.

Given the variety of acceptable cultural practices in the industry, the ball sizes set forth in this section are based on those factors which are objectively observable and measurable: the height or caliper measurement. Other cultural practices in the nursery, such as transplanting or root pruning practices or watering techniques, or soil types and local growing conditions, certainly affect the density of the roots, but are much more difficult to observe and measure within the context of the Standard.

It is recognized that plants having a coarse or wide-spreading root system because of natural habit of growth, soil condition, infrequent transplanting practice, or plants that are moved out of season, would require a root ball larger than the recommended size. It is also recognized that there may be circumstances where the sizes recommended may be excessive, such as stock grown in pots or other containers, field plants recently planted out from containers or with smaller balls, or plants which have been frequently transplanted or root pruned.

For example, if root density is of particular importance to a seller, buyer, or specifier, the nursery stock may be designated in marketing materials or in specification documents as being transplanted or root pruned a certain number of times. In such cases, the grower may ship the nursery stock with a root ball size smaller than shown in Table 6. **This approach is intended to assist those members of the trade who recognize the value of enhanced cultural practices in the nursery industry.**

Table 6 – Root ball diameters - field grown trees

Type 1 and Type 2 Shade Trees		Type 3 and Type 4 Small Upright and Small Spreading Trees	
Caliper	**Minimum diameter root ball**	**Height (to 5-6') Caliper (6' and over)**	**Minimum diameter root ball**
½ in.	12 in.	2 ft.	10 in.
¾ in.	14 in.	3 ft.	12 in.
1 in.	16 in.	4 ft.	14 in.
1 ¼ in.	18 in.	5 ft.	16 in.
1 ½ in.	20 in.	¾ in.	16 in.
1 ¾ in.	22 in.	1 in.	18 in.
2 in.	24 in.	1 ¼ in.	19 in.
2 ½ in.	28 in.	1 ½ in.	20 in.
3 in.	32 in.	1 ¾ in.	22 in.
3 ½ in.	38 in.	2 in.	24 in.
4 in.	42 in.	2 ½ in.	28 in.
4 ½ in.	48 in.	3 in.	32 in.
5 in.	54 in.	3 ½ in.	38 in.
5 ½ in.	57 in.	4 in.	42 in.
6 in.	60 in.	4 ½ in.	48 in.
7 in.	70 in.	5 in.	54 in.
8 in.	80 in.	5 ½ in.	57 in.
		6 in.	60 in.
		7 in.	70 in.
		8 in.	80 in.

1.6.2 Trunk in center of root ball

Plants dug to the specifications in the following tables should have the trunk or stem of the plant in the center of the earth ball. A tolerance of 10% of the diameter is the maximum deviation allowable (See Figure 8). For example: For a tree with a 30-inch root ball, the center of the trunk at ground level shall be within a circle 13 ½ inches from the outer edge of the ball.

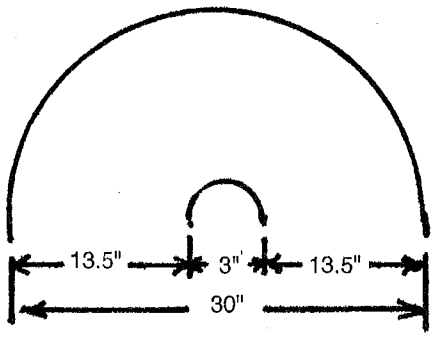


FIGURE 8 – Example: trunk in center of root ball

1.6.3 Root ball depths

Measurement: Depth of the ball is measured from the top of the ball, which in all cases shall begin at the root flare (see Figure 9). Soil above the root flare, from being deeply planted in the nursery as a young plant, as a result of maintenance practices in the nursery, or added during harvest, shall not be included in ball depth measurement, and should be removed.

Under certain soil and regional conditions, plants have root systems of proportionately less depth and greater diameter. These require a more shallow but wider ball to properly encompass the roots. Conversely, in other soils, and in certain regions, roots develop greater depth and less spread, requiring an exceptionally deep ball, which may be smaller in diameter and greater in depth than the size recommended.

For the greater part of the country, ball depths will carry the following ratios:

Balls with diameters less than 20 inches - depth not less than 65% of the diameter of the ball.

Balls with diameters of 20 inches and up - depth not less than 60% of the diameter of the ball.

EXHIBIT 7

BAYFRONT REDEVELOPMENT PLAN – PAGES 39 AND 64

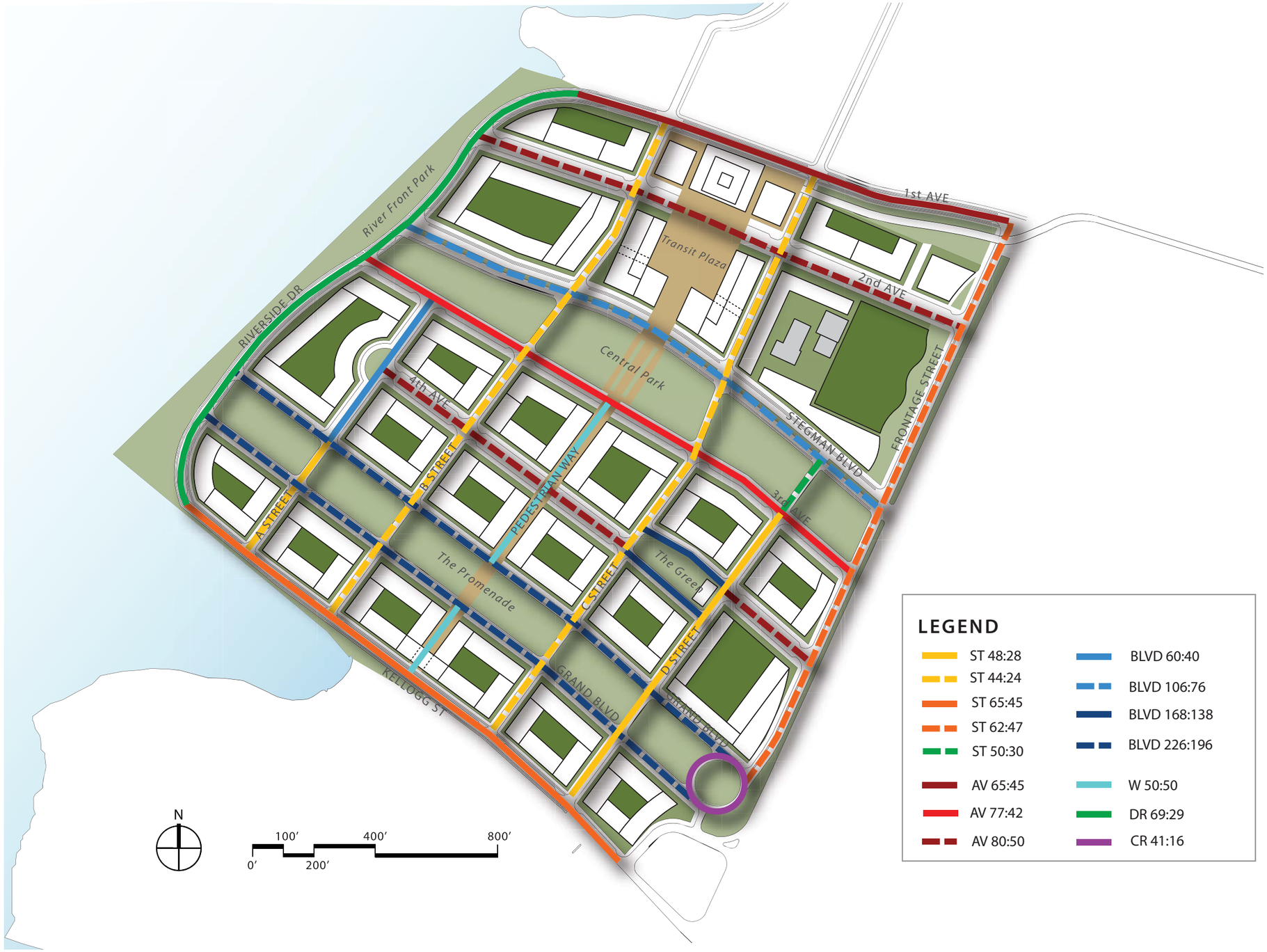


Exhibit 23
THOROUGHFARE REGULATING PLAN

The proposed Thoroughfare Regulating Plan calls for a network of boulevards, avenues, and streets distributed across the site. This network provides delineation of buildable blocks. Automobile traffic is distributed evenly across the site. Most thoroughfares have only one lane of traffic in each direction except for the entrance boulevard. Traffic is kept moving at a controlled pace with stop signs proposed at selective intersections, and most streets are buffered with curb edge parking and landscape so that pedestrian circulation is encouraged. The street network provides multiple paths to every destination, so that pedestrians can vary their routine, and drivers can avoid backups by taking alternate routes. Blocks are varied and small, also enhancing the pedestrian experience.

The Thoroughfare Plan exhibits a hierarchical interconnected network. The range of street typology corresponds with the function and form of the street. There are six (6) street categories; Boulevard, Avenue, Drive, Street, Frontage Street, and Pedestrian Way.

The thoroughfare labels refer to specific street designs included in the Thoroughfare Standards (Exhibits 25 through 40). The following labels are used for the thoroughfares:

ST – Street
AVE – Avenue
BLVD – Boulevard
W – Pedestrian Way
DR – Riverside Drive
CR – Circle

LEGEND

ST 48:28	BLVD 60:40
ST 44:24	BLVD 106:76
ST 65:45	BLVD 168:138
ST 62:47	BLVD 226:196
ST 50:30	
AV 65:45	W 50:50
AV 77:42	DR 69:29
AV 80:50	CR 41:16

The labels indicate the right-of-way width and cartway width. For example, ST:80:38 is a "Street" with an 80 foot right-of-way and a 38 foot cartway width from curb to curb.

Streets are generally parallel to Route 440 and the river, where Boulevards and Avenues are generally perpendicular to the river and Route 440. Two exceptions to this are the Pedestrian Way and Riverside Drive which are parallel to the River.

The thoroughfare network defines 23 blocks of varied sizes. The landscaping layout and street-parking arrangements are indicated in the Thoroughfare Standards. The streetscape for key thoroughfares is illustrated graphically in the Streetscape Section of this Redevelopment Plan.

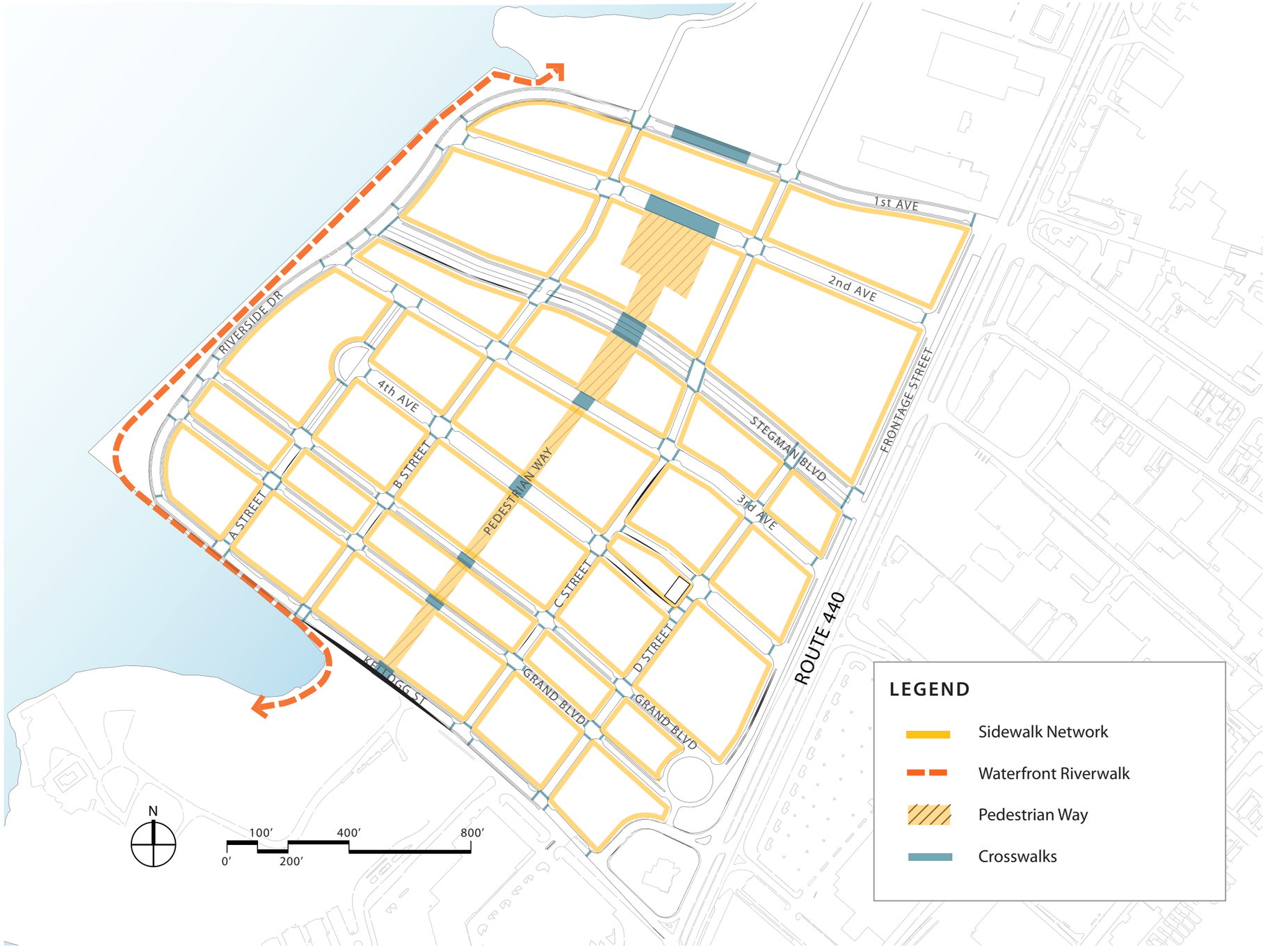


Exhibit 47
PEDESTRIAN PLAN

A network of wide sidewalks with crosswalks will be incorporated into the Bayfront I Redevelopment Plan, as shown in Exhibit 47. A successful sustainable urban neighborhood requires large numbers of people walking on the sidewalks. A typology of sidewalks based on adjacent use with specific design quality will be incorporated into the Plan to enhance the walking experience and encourage walking. The sidewalks should be safe and pleasant. The landscape treatment of the pedestrian realm requires street trees, pedestrian scaled lighting and texturing.

The type, location, and width of sidewalks are indicated in the thoroughfare sections (see Exhibits 25 to 40) along with the building frontages regulations (see Exhibits 18 to 21).

The pedestrian realm is more than sidewalks and crosswalks. For the pedestrian realm to be successful and engaging in the Bayfront I Redevelopment Area, specific details should be adhered to in order to create a safe, efficient, interesting, aesthetic and walkable urban environment. The pedestrian realm will emphasize relationships between the sidewalk, crosswalk, intersection, street plantings, and various amenities. In addition to those features, the pedestrian realm in residential areas will have a semi-public edge providing a green buffer between building edge and sidewalk, and a safety buffer between first floor residential units and the public sidewalk. Retail and office uses will meet the sidewalk at grade to provide easy and equal access.

Peak pedestrian travel times are morning work trips, during lunch, on weekends, and during evening dining hours. People will walk if there are pleasant and engaging places to walk and destinations on both ends of the walk. The Pedestrian Circulation Plan is designed to encourage walking to retail shops and offices, and to adjacent and integrated recreational, institutional uses, and to the Light Rail Station and circulator bus stops. The Pedestrian Circulation Plan is a network of sidewalks, crosswalks, pathways and a dedicated street network designed to maximize pedestrian activity. See the Pedestrian Circulation Plan for this network. In addition, crosswalks will be placed at each intersection through using a paved pattern.

Unique to the Bayfront I Redevelopment Plan is the Pedestrian Way regulated in the Thoroughfares Section. The Pedestrian Way provides a primary north/south pedestrian spine connecting the light rail station with Droyers Point and a direct unobstructed pedestrian access to the major retail opportunities. The

EXHIBIT 8

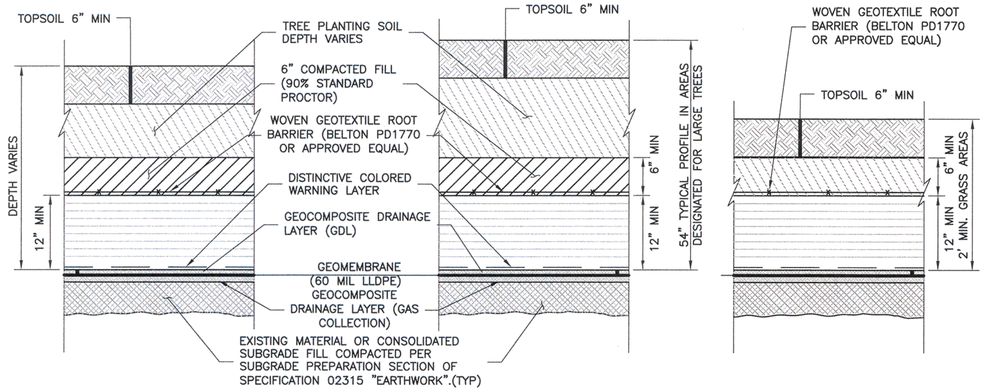
DESIGN DRAWINGS – CN-301 AND C-301

CONSENT DECREE NOTES:

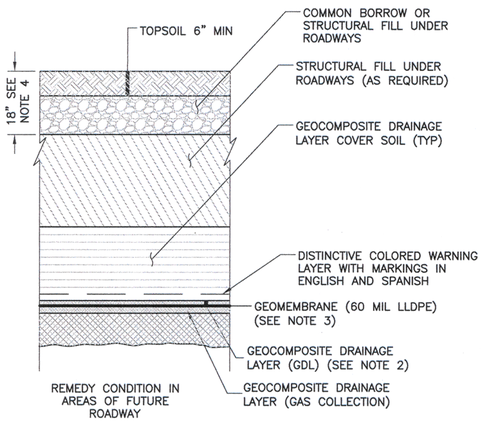
THE CAP SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE UNITED STATES DISTRICT COURT, DISTRICT OF NEW JERSEY, CONSENT DECREE REGARDING REMEDIATION AND REDEVELOPMENT OF STUDY AREA 6 NORTH AS FOLLOWS:

- ARTICLE III CHROMIUM REMEDIATION, SECTION A CHROMIUM REMEDY, SUBSECTION 56(a): EXCLUSIVE OF ROADWAYS, THE CAP SHALL BE OVERLAIN BY LAYERS OF CLEAN FILL, BACKFILL AND/OR OVERBURDEN WITH AN AVERAGE DEPTH OF AT LEAST THREE FEET AND A MINIMUM DEPTH OF AT LEAST TWO FEET PROVIDED THAT ANY LAYER THAT INCORPORATES OVERBURDEN SHALL BE BELOW AT LEAST TWO FEET OF CLEAN FILL. ONE FOOT OF CLEAN FILL, COVERED WITH BITUMINOUS BLACKTOP, SHALL BE SUFFICIENT COVER WHERE ROADS, WALKWAYS, OR OTHER PAVED SURFACES ARE LOCATED WITHIN THE AOC 1 OPEN SPACE AREA.
- ARTICLE III CHROMIUM REMEDIATION, SECTION B LONG-TERM MONITORING, MAINTENANCE, AND PROTECTION OF ENGINEERING AND INSTITUTIONAL CONTROLS, SUBSECTION 60(j)(v)(6): IF THE LOWEST ELEVATION FOR THE BEDDING FOR ANY UTILITY LINE, INCLUDING IRRIGATION OR SPRINKLER LINES, IS TWO FEET FROM THE TOP OF THE WARNING LAYER OF THE CAP, THE UTILITY LINE SHALL BE PLACED IN A UTILITY CORRIDOR.
- ARTICLE III SUBSECTION 56(a) "AND A DISTINCTIVE COLORED WARNING LAYER WITH MARKINGS IN ENGLISH AND SPANISH THAT WOULD DETER PENETRATION OF THE CAP IN THE EVENT THAT DIGGING OCCURRED IN THE VICINITY OF THE CAP.

LANDSCAPING AREAS



INTERIM GRADING | FINAL GRADING TREE AND SHRUB PLANTING AREAS | FINAL GRADING GRASS AREAS



REMEDY CONDITION IN AREAS OF FUTURE ROADWAY

CAP AREA BUILD UP DETAIL A

NTS

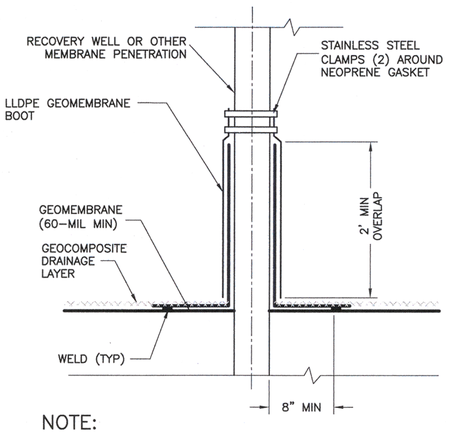
CN-123 | CN-301
CN-124
CN-302
CN-304
CN-306
CN-516

NOTES:

1. THE INITIAL 12 INCHES OF MATERIAL PLACED OVER THE GDL THE SHALL MEET THE SPECIFICATION FOR GEOCOMPOSITE DRAINAGE LAYER PROTECTIVE COVER SOIL.
2. THE CONSENT DECREE REQUIRES INSTALLATION OF A WARNING LAYER ABOVE THE GEOMEMBRANE LINER. (SEE CONSENT DECREE NOTES.) THIS REQUIREMENT MAY BE MET BY THE FOLLOWING.
   (A) SUPPLYING AND INSTALLING A GDL WHICH IS FABRICATED WITH TOP LAYER OF GEOTEXTILE THAT BOTH MEETS THE TECHNICAL SPECIFICATIONS FOR THE GDL AND THE CONSENT DECREE REQUIREMENTS FOR THE WARNING LAYER
   (B) INSTALLING A SEPARATE WARNING LAYER THAT MEETS THE REQUIREMENTS OF THE CONSENT DECREE.
3. STRUCTURAL FILL UNDER ROADWAYS SPECIFICATION 2315. NJDOT I-5 & I-8 COMPACTED TO 95% ASTM D698.
4. FOR FINAL DEVELOPMENT CUT OUT "ROADBOX" 18" DEEP AND REPLACE WITH 12" SUBGRADE FILL AND 6" PF FLEXIBLE PAVEMENT OR AS REQUIRED BY JERSEY CITY STANDARD ENGINEERING.

NOTE:

1. REFER TO SHEET GN-003 AND GN-004 FOR GENERAL NOTES.
2. REFER TO SHEET GN-002 FOR LEGEND.

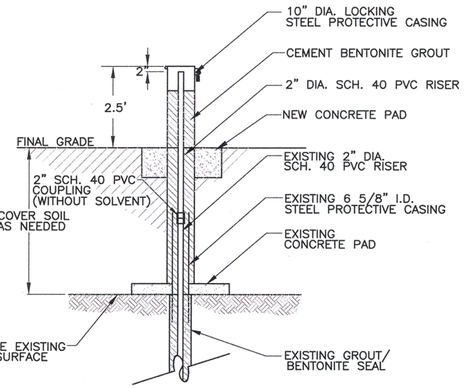


NOTE:
THIS DETAIL APPLIES TO ALL MEMBRANE PENETRATIONS.

PIPE BOOT B

NTS

CN-201 | CN-301
CN-202
CN-306



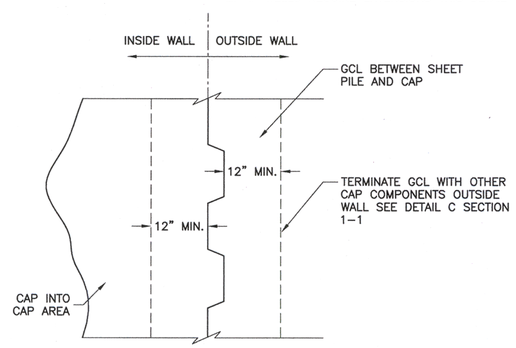
PIEZOMETER/WELL EXTENSION DETAIL D

NTS

TYP | CN-301

NOTE:

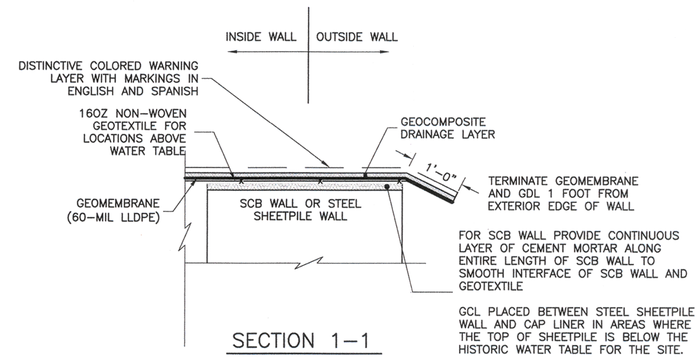
1. WELL EXTENSION CONCRETE SHALL BE PERFORMED IN ACCORDANCE WITH THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, FIELD SAMPLING PROCEDURE MANUAL, APPENDIX 6.1, AUGUST 2005, EXCEPT DEPTH OF NEW CONCRETE PAD SHALL BE AS SHOWN.
2. IF WELLS REQUIRE EXTENSIONS THIS DETAIL WILL BE USED.



CAP LINER CONNECTION TO STEEL SHEET PILE IN WALL AREAS BELOW HISTORIC WATER TABLE E

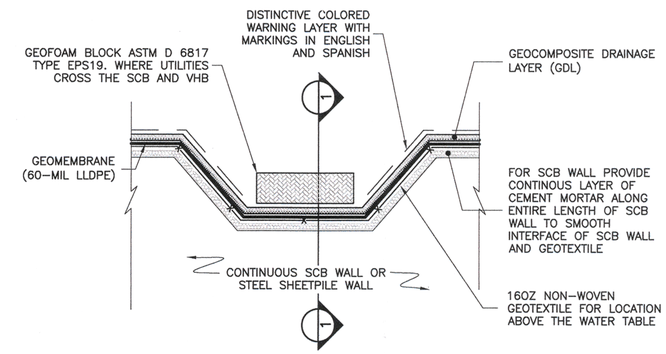
NTS

CN-516 | CN-301



SECTION 1-1

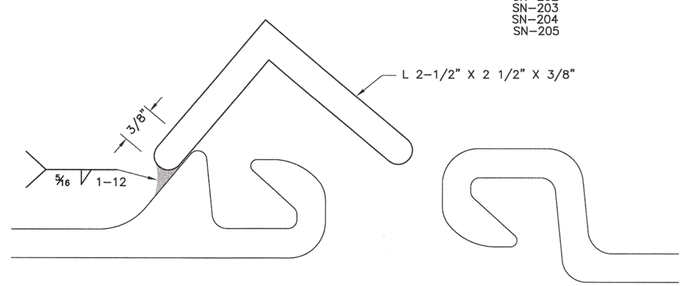
NTS



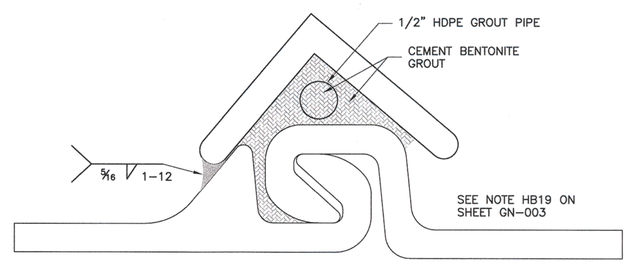
TYPICAL UTILITY CORRIDOR/ HYDRAULIC BARRIER WALL CROSSING DETAIL C

NTS

CN-123 | CN-301
CN-124
SN-201
SN-202
SN-203
SN-204
SN-205



BEFORE DRIVING SHEETS



DETAIL TO BE UTILIZED BETWEEN STA 0+00 TO STA 5+00

SHEET SEALING DETAIL F

NTS

SN-201 | CN-301

SAMUEL G. SHALLARD 9/6/13
NJ PROFESSIONAL ENGINEER
LICENSE NUMBER 43507

NO.	DATE	DSGN	DR	CHK	APVD	BY	APVD
0	06/07/13	TDD	RJR	TDD	TDD	TDD	SGS

ISSUED FOR CONSTRUCTION
REVISION

Honeywell
101 COLUMBIA RD. BOX 2108, MORRISTOWN, NJ 07962

CHROMIUM REMEDY
STUDY AREA 6 NORTH
SITES 087 AND 088
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CAP DETAILS

amec
Environment & Infrastructure, Inc.
200 American Metro Blvd, Suite 113
Hamilton, NJ 08619
(609) 689 - 2829
NJ Certificate of Authorization Number 24GA28010900

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

DATE	
PROJ	3480-12-0317
DWG	CN-301
SHEET	36 OF 70

CONSENT DECREE NOTES:

THE CAP SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE UNITED STATES DISTRICT COURT, DISTRICT OF NEW JERSEY, CONSENT DECREE REGARDING REMEDIATION AND REDEVELOPMENT OF STUDY AREA 6 NORTH AS FOLLOWS:

- ARTICLE III CHROMIUM REMEDIATION, SECTION A CHROMIUM REMEDY, SUBSECTION 56(a): EXCLUSIVE OF ROADWAYS, THE CAP SHALL BE OVERLAIN BY LAYERS OF CLEAN FILL, BACKFILL AND/OR OVERBURDEN WITH AN AVERAGE DEPTH OF AT LEAST THREE FEET AND A MINIMUM DEPTH OF AT LEAST TWO FEET PROVIDED THAT ANY LAYER THAT INCORPORATES OVERBURDEN SHALL BE BELOW AT LEAST TWO FEET OF CLEAN FILL. ONE FOOT OF CLEAN FILL, COVERED WITH BITUMINOUS BLACKTOP, SHALL BE SUFFICIENT COVER WHERE ROADS, WALKWAYS, OR OTHER PAVED SURFACES ARE LOCATED WITHIN THE AOC 1 OPEN SPACE AREA.
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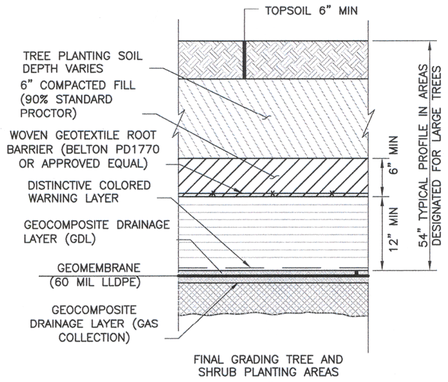
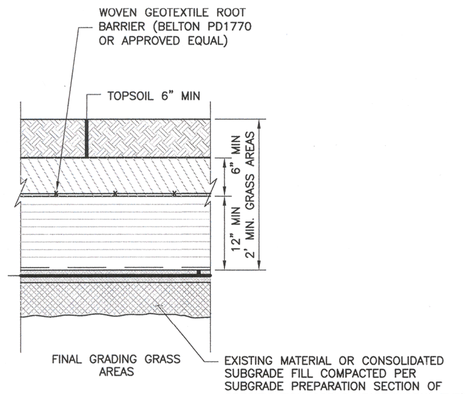
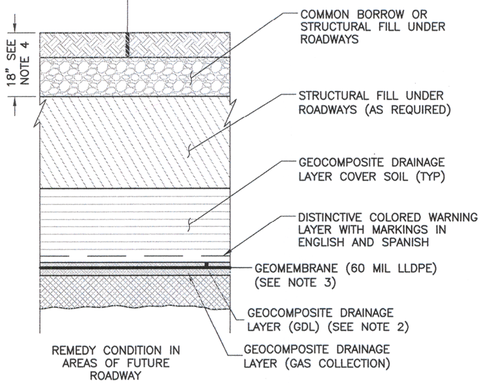
- ARTICLE III SUBSECTION 56(a) "AND A DISTINCTIVE COLORED WARNING LAYER WITH MARKINGS IN ENGLISH AND SPANISH THAT WOULD DETER PENETRATION OF THE CAP IN THE EVENT THAT DIGGING OCCURRED IN THE VICINITY OF THE CAP.

LANDSCAPING AREAS

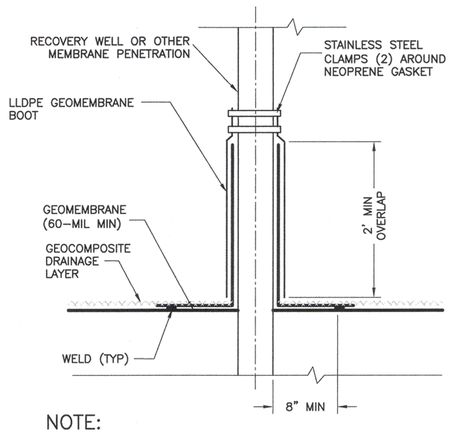






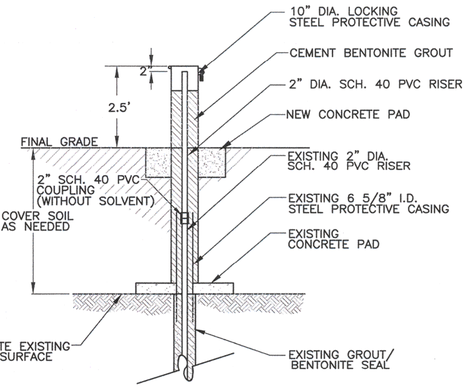
NOTES:

1. THE INITIAL 12 INCHES OF MATERIAL PLACED OVER THE GDL THE SHALL MEET THE SPECIFICATION FOR GEOCOMPOSITE DRAINAGE LAYER PROTECTIVE COVER SOIL.
2. THE CONSENT DECREE REQUIRES INSTALLATION OF A WARNING LAYER ABOVE THE GEOMEMBRANE LINER. (SEE CONSENT DECREE NOTES.) THIS REQUIREMENT MAY BE MET BY THE FOLLOWING.
   (A) SUPPLYING AND INSTALLING A GDL WHICH IS FABRICATED WITH TOP LAYER OF GEOTEXTILE THAT BOTH MEETS THE TECHNICAL SPECIFICATIONS FOR THE GDL AND THE CONSENT DECREE REQUIREMENTS FOR THE WARNING LAYER
   (B) INSTALLING A SEPARATE WARNING LAYER THAT MEETS THE REQUIREMENTS OF THE CONSENT DECREE.
3. STRUCTURAL FILL UNDER ROADWAYS SPECIFICATION 2315. NJDOT I-5 & I-8 COMPACTED TO 95% ASTM D698.
4. FOR FINAL DEVELOPMENT CUT OUT "ROADBOX" 18" DEEP AND REPLACE WITH 12" SUBGRADE FILL AND 6" PF FLEXIBLE PAVEMENT OR AS REQUIRED BY JERSEY CITY STANDARD ENGINEERING.



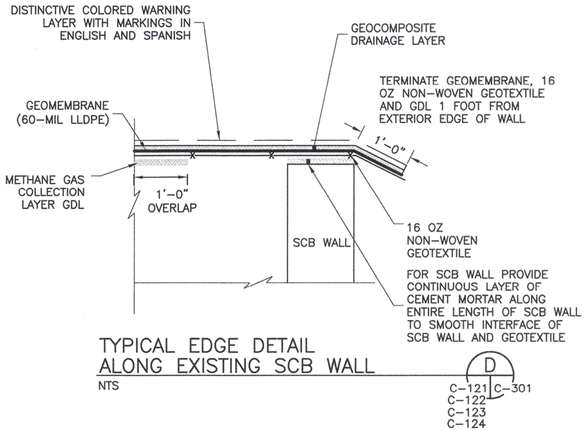
NOTE:
THIS DETAIL APPLIES TO ALL MEMBRANE PENETRATIONS.

PIPE BOOT C
NTS — TYP C-301

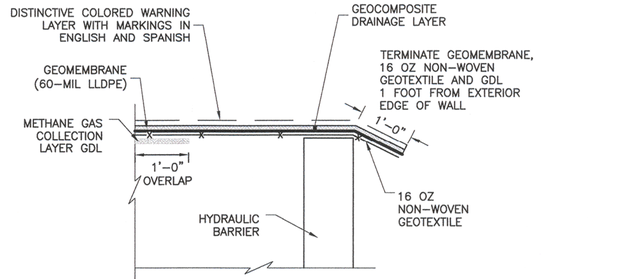


PIEZOMETER/WELL EXTENSION DETAIL E
NTS — TYP C-301

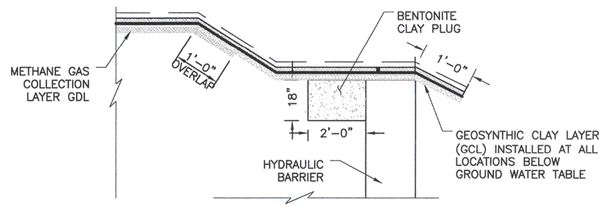
NOTE:
1. WELL EXTENSION CONCRETE SHALL BE PERFORMED IN ACCORDANCE WITH THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, FIELD SAMPLING PROCEDURE MANUAL, APPENDIX 6.1, AUGUST 2005, EXCEPT DEPTH OF NEW CONCRETE PAD SHALL BE AS SHOWN.



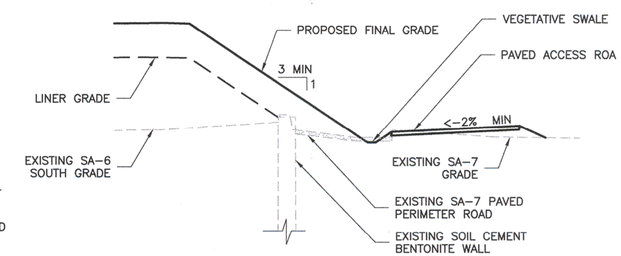
TYPICAL EDGE DETAIL ALONG EXISTING SCB WALL D
NTS — C-121 C-122 C-123 C-124 | C-301



TYPICAL EDGE DETAIL ALONG HYDRAULIC BARRIER F
NTS — C-121 C-122 C-123 C-124 | C-301

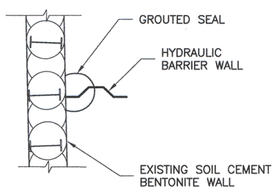


TYPICAL EDGE DETAIL GCL INSTALLATION BELOW GROUNDWATER TABLE G
NTS — C-121 C-122 C-123 C-124 | C-301

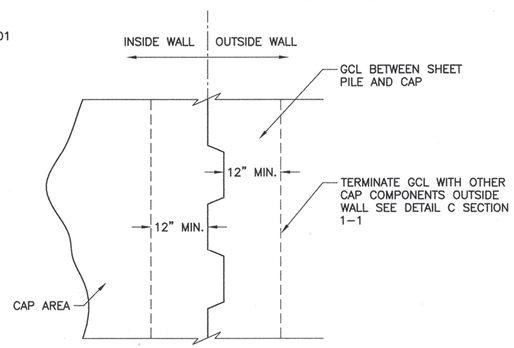


TYPICAL SA-7 EDGE DETAIL H
NTS — C-125 C-126 C-127 | C-301

CAP AREA BUILD UP DETAIL A
NTS — C-121 C-122 C-123 C-124 C-305 | C-301



TYPICAL HYDRAULIC BARRIER/SCB CONNECTION DETAIL B
NTS — C-122 C-124 S-201 S-203 S-204 S-206 | C-301



CAP LINER CONNECTION TO STEEL SHEET PILE IN WALL AREAS BELOW HISTORIC WATER TABLE BE
NTS — TYP C-301

NOTE:
1. REFER TO SHEET G-003 AND G-004 FOR GENERAL NOTES.
2. REFER TO SHEET G-002 FOR LEGEND AND ABBREVIATIONS.

STEPHEN H. MITCHELL
5/21/13
N.J. PROFESSIONAL ENGINEER
LICENSE NUMBER 24GE04322400

NO.	DATE	DSGN	
0	06/07/13	TDD	ISSUED FOR CONSTRUCTION
		DR	REVISION
		TDD	CHK
		APVD	APVD
		SHM	SHM
		BY	APVD

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

CHROMIUM REMEDY
STUDY AREA 6 SOUTH
SITES 073, 124, 125, 134, 140, AND 163
JERSEY CITY, NEW JERSEY

DRAWING STATUS
100 PERCENT DESIGN DRAWINGS

CIVIL
CAP DETAILS

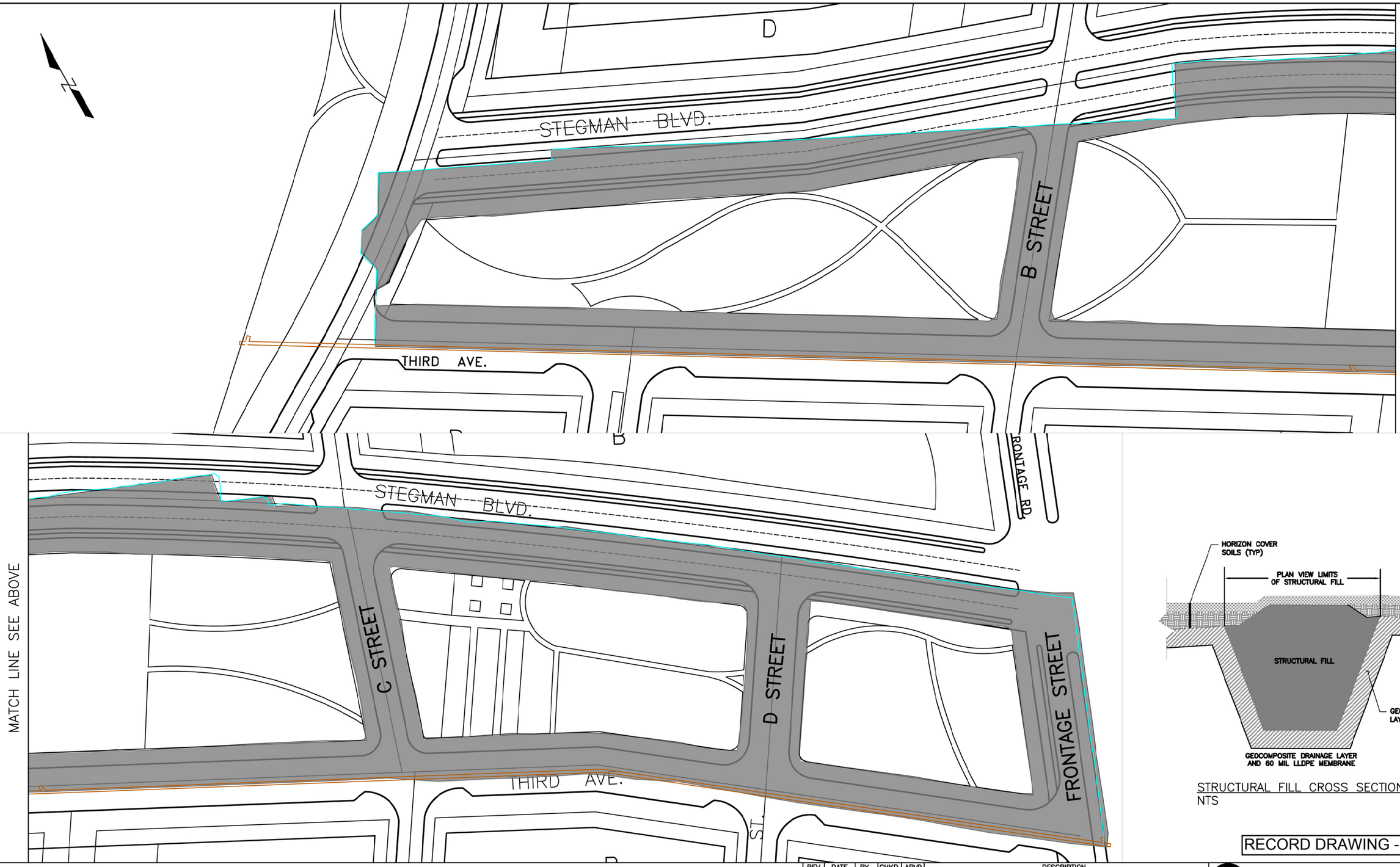
amec
Environment & Infrastructure, Inc.
200 American Metro Blvd, Suite 113
Hamilton, NJ, 08619
(609) 689 - 2829
NJ Certificate of Authorization Number 24GA28019900

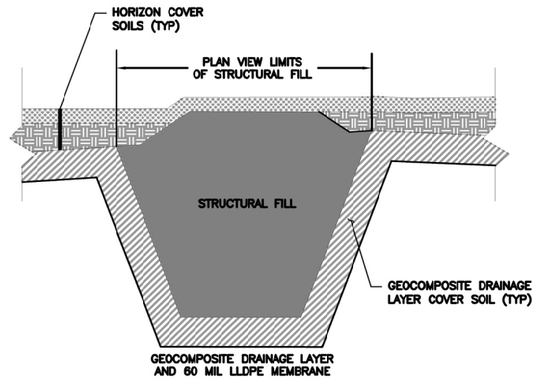
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	
PROJ	3480-12-0317
DWG	C-301
SHEET	37 OF 66

EXHIBIT 9

AS-BUILT DRAWINGS – STRUCTURAL FILL UNDER ROADWAYS, GEOMEMBRANE GRADING PLAN, AND AS-BUILT RESTORATION PLAN





STRUCTURAL FILL CROSS SECTION
NTS

RECORD DRAWING - 12/15/16

LEGEND

- Structural Fill Under Roadways
- SCB WALL
- HB WALL (Inner Edge)

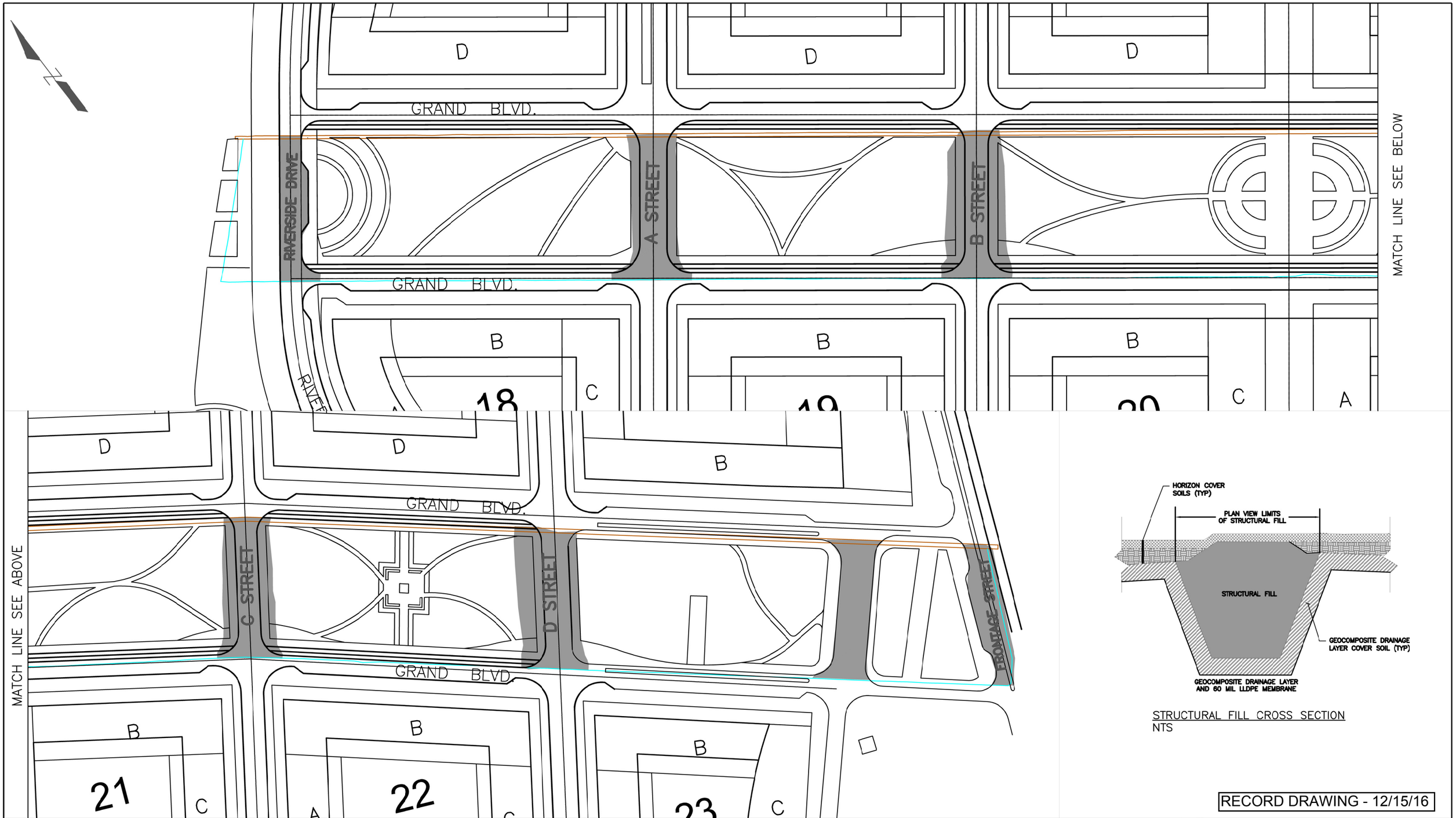
0 80 160 Feet
SCALE

REV	DATE	BY	CHKD	APVD	DESCRIPTION
0	12/7/16	EJP	AE	AE	STRUCTURAL FILL UNDER ROADWAYS – NORTH CAP
1	12/15/16	EJP	AE	AE	ADDED FUTURE DEVELOPMENT LAYOUT & STRUCTURAL FILL X-SECTION

ENTACT 302 Unity Plaza Latrobe, PA 15650

DRAWING NAME
Structural Fill Under Roadways
NORTH CAP
12/15/16

PROJECT NAME & LOCATION
HONEYWELL SA-6 REMEDIATION
JERSEY CITY, NJ



STRUCTURAL FILL CROSS SECTION
NTS

RECORD DRAWING - 12/15/16

LEGEND

- Structural Fill Under Roadways
- SCB WALL
- HB WALL (Inner Edge)

0 80 160 Feet

SCALE

REV	DATE	BY	CHKD	APVD	DESCRIPTION
0	12/7/16	EJP	AE	AE	STRUCTURAL FILL UNDER ROADWAYS – SOUTH CAP
1	12/15/16	EJP	AE	AE	ADDED FUTURE DEVELOPMENT LAYOUT & STRUCTURAL FILL X-SECTION

ENTACT 302 Unity Plaza Latrobe, PA 15650

DRAWING NAME
STRUCTURAL FILL UNDER ROADWAYS
SOUTH CAP
12/15/16

PROJECT NAME & LOCATION
HONEYWELL SA-6 REMEDIATION
JERSEY CITY, NJ

LEGEND:

- MAJOR CONTOUR
- MINOR CONTOUR
- ROADWAY / UTILITY CORRIDOR (STRUCTURAL FILL)
- POTENTIAL LOCATIONS OF UTILITIES OUTSIDE OF ROADWAY / UTILITY CORRIDORS

NOTE: WOOD MODIFIED THIS ORIGINAL AS BUILT DRAWING PREPARED BY MASER CONSULTING TO INCLUDE FINAL ROADWAY AND UTILITY CORRIDOR LOCATIONS

GENERAL NOTES

1. *AS-BUILT GEOMEMBRANE GRADING LOCATIONS AND ELEVATIONS WERE OBTAINED BY MASER CONSULTING P.A. ON MULTIPLE FIELD VISITS FROM JUNE 2016 THROUGH AUG. 2016. GEOMEMBRANE GRADING SURFACES AND CONTOURS WERE GENERATED BY ENTACT, CHECKED BY AMEC AND CONFIRMED BY MASER CONSULTING P.A.*
2. *HORIZONTAL DATUM NAD 1983, VERTICAL DATUM NGVD29.*

0 20 40 80
SCALE IN FEET

R. THOMAS HUGG
NJ PROFESSIONAL LAND SURVEYOR
LICENSE NUMBER GS36737

NO.	DATE	REVISION	DR	CHK	APVD
1	8/10/20	ROADWAY AND UTILITY CORRIDOR LOCATIONS	TDD	DEN	APVD

MASER CONSULTING, P.A. PH: 609.390.1927 - FAX: 609.390.0040
ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS - ENVIRONMENTAL SCIENTISTS
MARMORA OFFICE - 156 STAGECOACH ROAD - MARMORA, NJ 080223

FILE NUMBER 12001511A

DRAWING STATUS
AS BUILT DRAWINGS

CIVIL
NORTH CAP GEOMEMBRANE GRADING PLAN

wood.
Environment & Infrastructure, Inc.
511 Congress Street, Suite 200
Portland, ME, 04112
(207) 775 - 5401

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

STUDY AREA 6 SOUTH
CHROMIUM REMEDY
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37394

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	11/16/16
PROJ	3480-10-0027
DWG	CN-123
SHEET	1 OF 2

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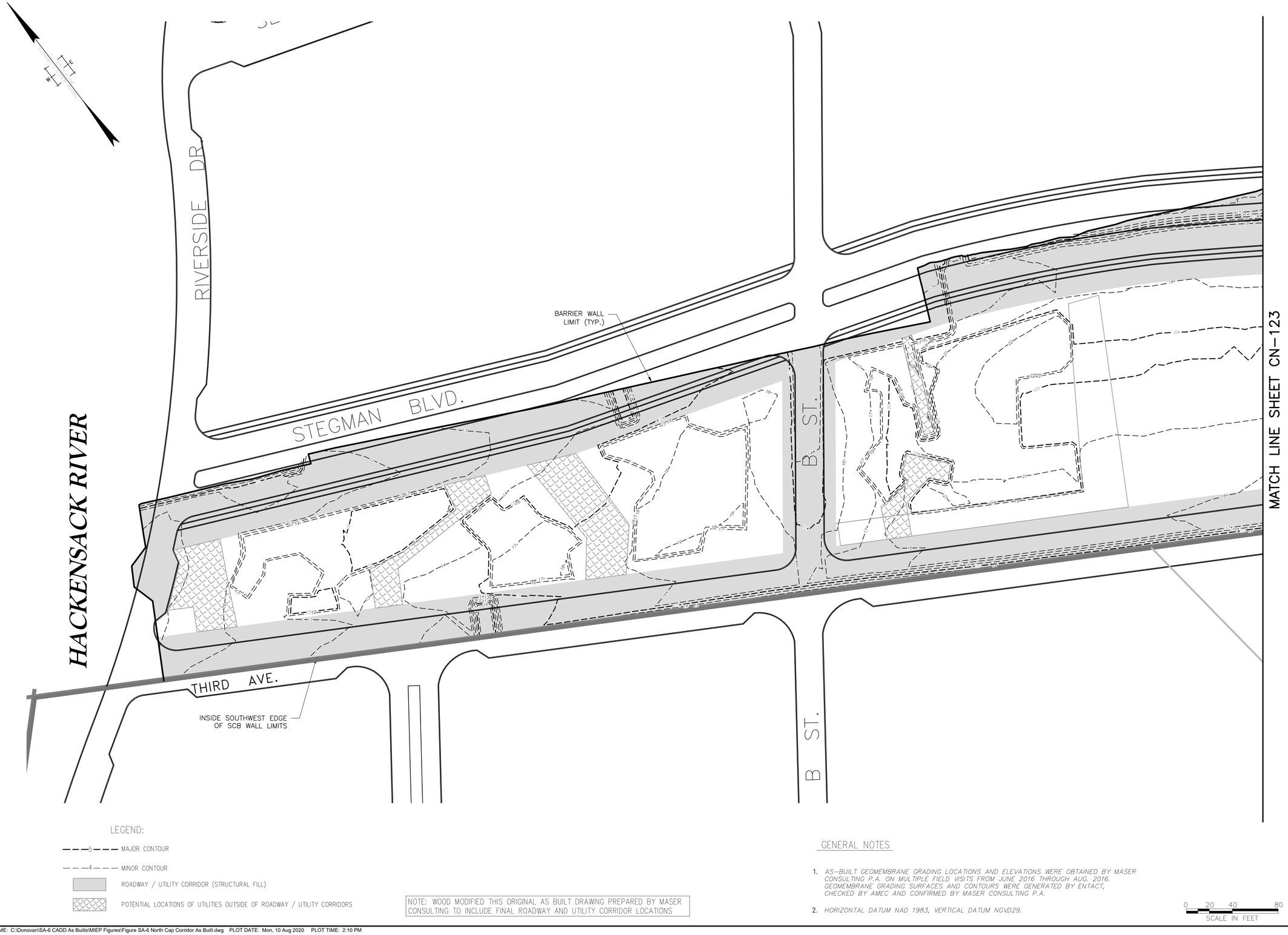

NO.	DATE	REVISION	CHK	APVD
1	8/10/20	ROADWAY AND UTILITY CORRIDOR LOCATIONS	TDD	DEN
			BY	APVD

R. THOMAS HUGG

NJ PROFESSIONAL LAND SURVEYOR
LICENSE NUMBER GS36737

Honeywell
101 COLUMBIA RD., BOX 2105, MORRISTOWN, NJ 07962

STUDY AREA 6 SOUTH
CHROMIUM REMEDY
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37394

FILE NUMBER 12001511A

DRAWING STATUS
AS BUILT DRAWINGS

CIVIL
NORTH CAP GEOMEMBRANE GRADING PLAN

MASER CONSULTING, P.A. PH: 609.390.1927 - FAX: 609.390.0040
ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS - ENVIRONMENTAL SCIENTISTS
MARMORA OFFICE - 156 STAGECOACH ROAD - MARMORA, NJ 08223

wood.
Environment & Infrastructure, Inc.
511 Congress Street, Suite 200
Portland, ME, 04112
(207) 775 - 5401

VERIFY SCALE
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0 1"

DATE	11/16/16
PROJ	3480-10-0027
DWG	CN-124
SHEET	2 OF 2

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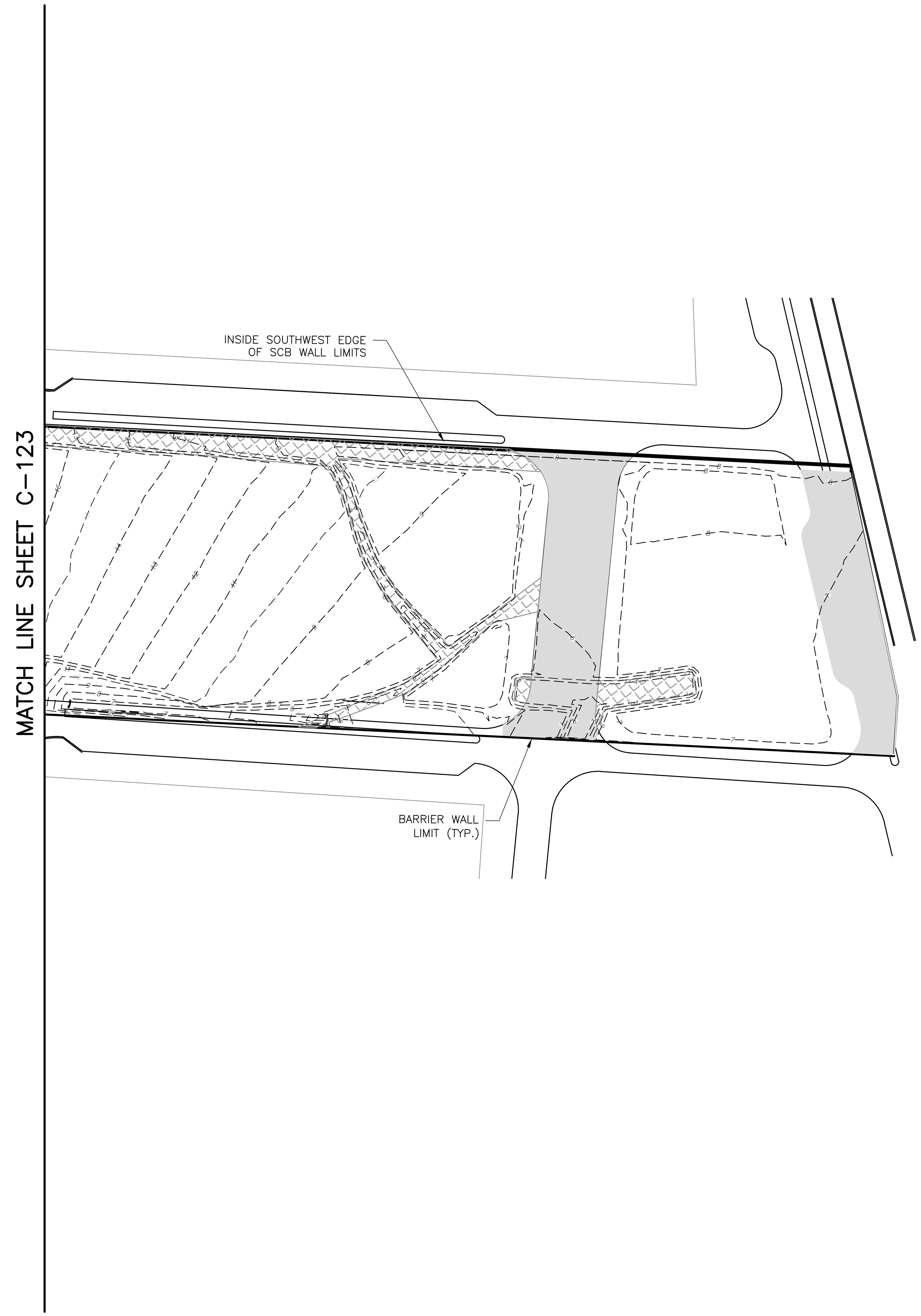


LEGEND:

- MAJOR CONTOUR
- MINOR CONTOUR
- ROADWAY / UTILITY CORRIDOR (STRUCTURAL FILL)
- POTENTIAL LOCATIONS OF UTILITIES OUTSIDE OF ROADWAY / UTILITY CORRIDORS

NOTE: WOOD MODIFIED THIS ORIGINAL AS BUILT DRAWING PREPARED BY MASER CONSULTING TO INCLUDE FINAL ROADWAY AND UTILITY CORRIDOR LOCATIONS

GENERAL NOTES

AS-BUILT GEOMEMBRANE GRADING LOCATIONS AND ELEVATIONS WERE OBTAINED BY MASER CONSULTING P.A. ON MULTIPLE FIELD VISITS FROM JUNE 2016 THROUGH AUG. 2016. GEOMEMBRANE GRADING SURFACES AND CONTOURS WERE GENERATED BY ENTACT, CHECKED BY AMEC AND CONFIRMED BY MASER CONSULTING P.A.

HORIZONTAL DATUM NAD 1983, VERTICAL DATUM NGVD29.

0 20 40 80
SCALE IN FEET

MASER CONSULTING, P.A. PH: 609.390.1927 - FAX: 609.390.0040
ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS - ENVIRONMENTAL SCIENTISTS
MARMORA OFFICE - 156 STAGECOACH ROAD - MARMORA, NJ 080223

FILE NUMBER 12001511A

DRAWING STATUS
AS BUILT DRAWINGS

CIVIL
GEOMEMBRANE GRADING PLAN

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

STUDY AREA 6 SOUTH
CHROMIUM REMEDY
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37394

amec foster wheeler
Environment & Infrastructure, Inc.
200 American Metro Blvd, Suite 113
Hamilton, NJ 08619
(609) 689-2829

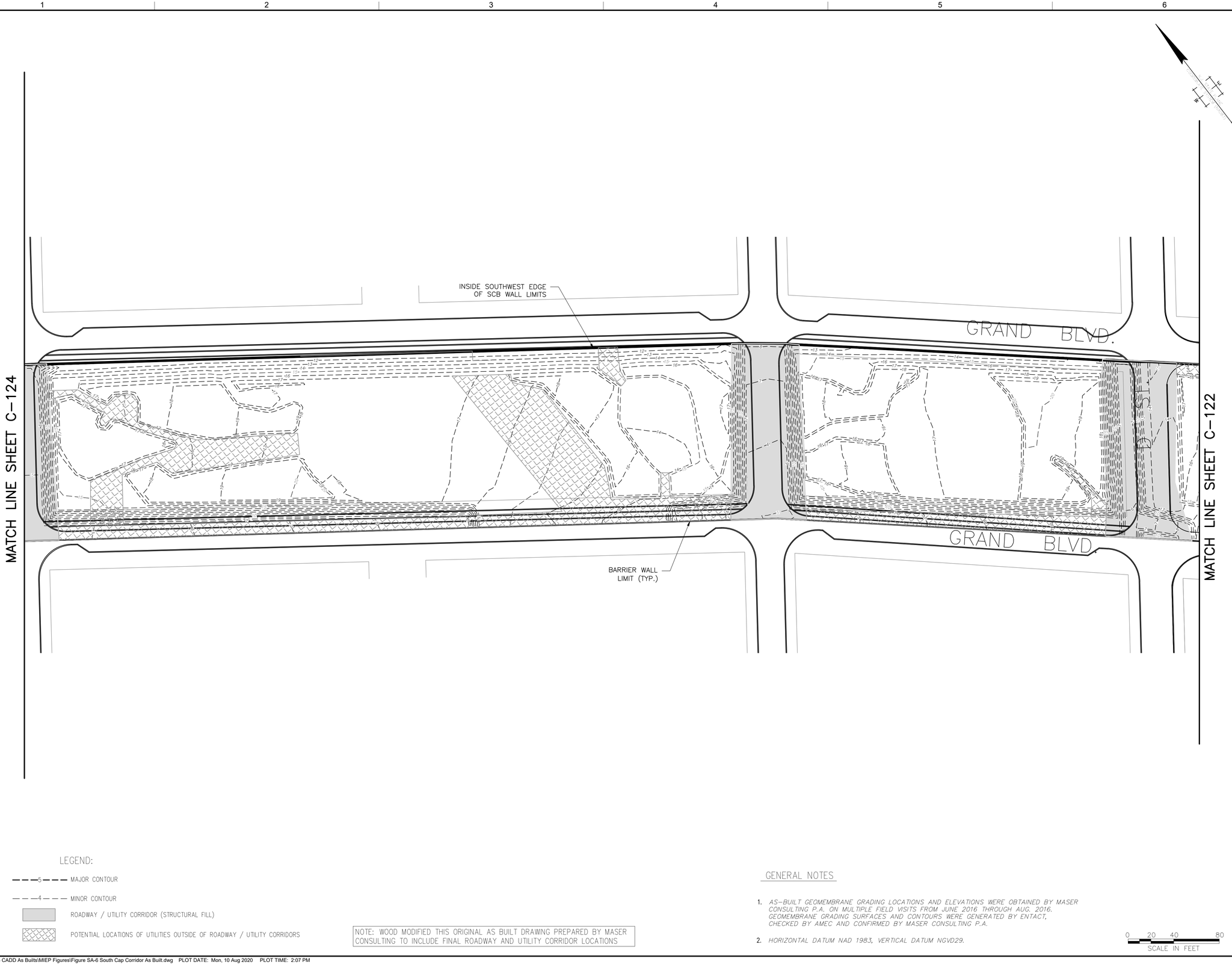
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	2/11/16
PROJ	3480-10-0027
DWG	C-122
SHEET	1 OF 3

NO.	DATE	REVISION	BY	APVD
1	8/10/20	ROADWAY AND UTILITY CORRIDOR LOCATIONS	TDD	DEN

DSGN | DR | CHK | APVD

R. THOMAS HUGG
NJ PROFESSIONAL LAND SURVEYOR
LICENSE NUMBER GS36737



LEGEND:

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- MINOR CONTOUR
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2. *HORIZONTAL DATUM NAD 1983, VERTICAL DATUM NGVD29.*

0 20 40 80
SCALE IN FEET

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ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS - ENVIRONMENTAL SCIENTISTS
MARMORA OFFICE - 156 STAGECOACH ROAD - MARMORA, NJ 080223

FILE NUMBER 12001511A

NO.	DATE	REVISION	CHK	APVD
1	8/10/20	ROADWAY AND UTILITY CORRIDOR LOCATIONS	TDD	DEN
DSGN		DR	BY	APVD

R. THOMAS HUGG
NJ PROFESSIONAL LAND SURVEYOR
LICENSE NUMBER GS36737

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

STUDY AREA 6 SOUTH
CHROMIUM REMEDY
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37394

DRAWING STATUS
AS BUILT DRAWINGS

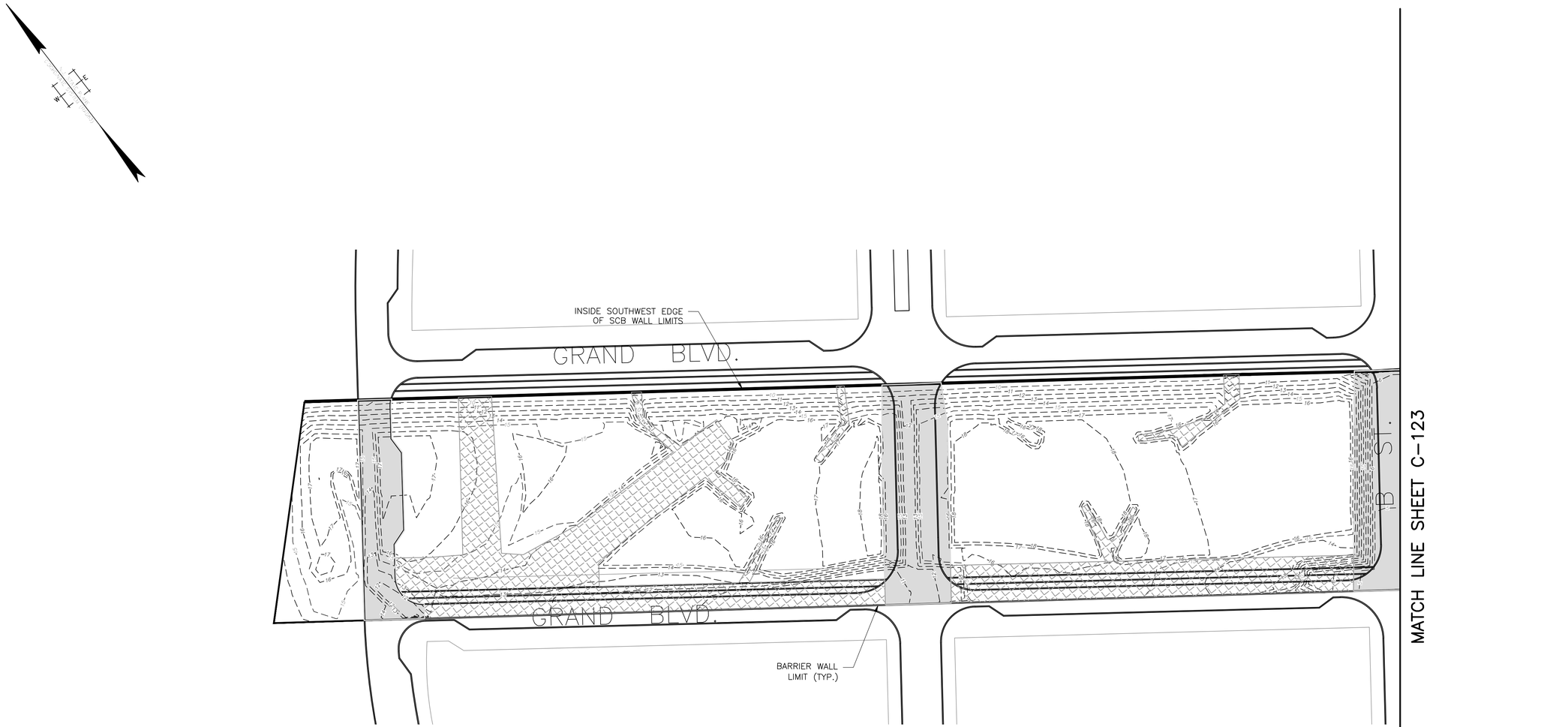
CIVIL
GEOMEMBRANE GRADING PLAN

amec foster wheeler
Environment & Infrastructure, Inc.
200 Horizon Center Blvd, Suite 113
Hamilton, NJ 08619
(609) 689 - 2829

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	2/11/16
PROJ	3480-10-0027
DWG	C-123
SHEET	2 OF 3

FILE NAME: C:\Donovan\SA-6 CADD As Builts\MIEP Figures\Figure SA-6 South Cap Corridor As Built.dwg PLOT DATE: Mon, 10 Aug 2020 PLOT TIME: 2:07 PM



LEGEND:

- MAJOR CONTOUR
- MINOR CONTOUR
- ROADWAY / UTILITY CORRIDOR (STRUCTURAL FILL)
- POTENTIAL LOCATIONS OF UTILITIES OUTSIDE OF ROADWAY / UTILITY CORRIDORS

NOTE: WOOD MODIFIED THIS ORIGINAL AS BUILT DRAWING PREPARED BY MASER CONSULTING TO INCLUDE FINAL ROADWAY AND UTILITY CORRIDOR LOCATIONS

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2. *HORIZONTAL DATUM NAD 1983, VERTICAL DATUM NGVD29.*

0 20 40 80
SCALE IN FEET

MASER CONSULTING, P.A. PH: 609.390.1927 - FAX: 609.390.0040
ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS - ENVIRONMENTAL SCIENTISTS
MARMORA OFFICE - 156 STAGECOACH ROAD - MARMORA, NJ 080223

FILE NUMBER 12001511A

NO.	DATE	REVISION	DR	CHK	APVD
1	8/10/20	ROADWAY AND UTILITY CORRIDOR LOCATIONS	TDD	DEN	APVD

R. THOMAS HUGG
NJ PROFESSIONAL LAND SURVEYOR
LICENSE NUMBER GS36737

Honeywell
101 COLUMBIA RD. BOX 2105, MORRISTOWN, NJ 07962

STUDY AREA 6 SOUTH
CHROMIUM REMEDY
JERSEY CITY, NEW JERSEY
HONEYWELL SITE ID - 37394

DRAWING STATUS
AS BUILT DRAWINGS

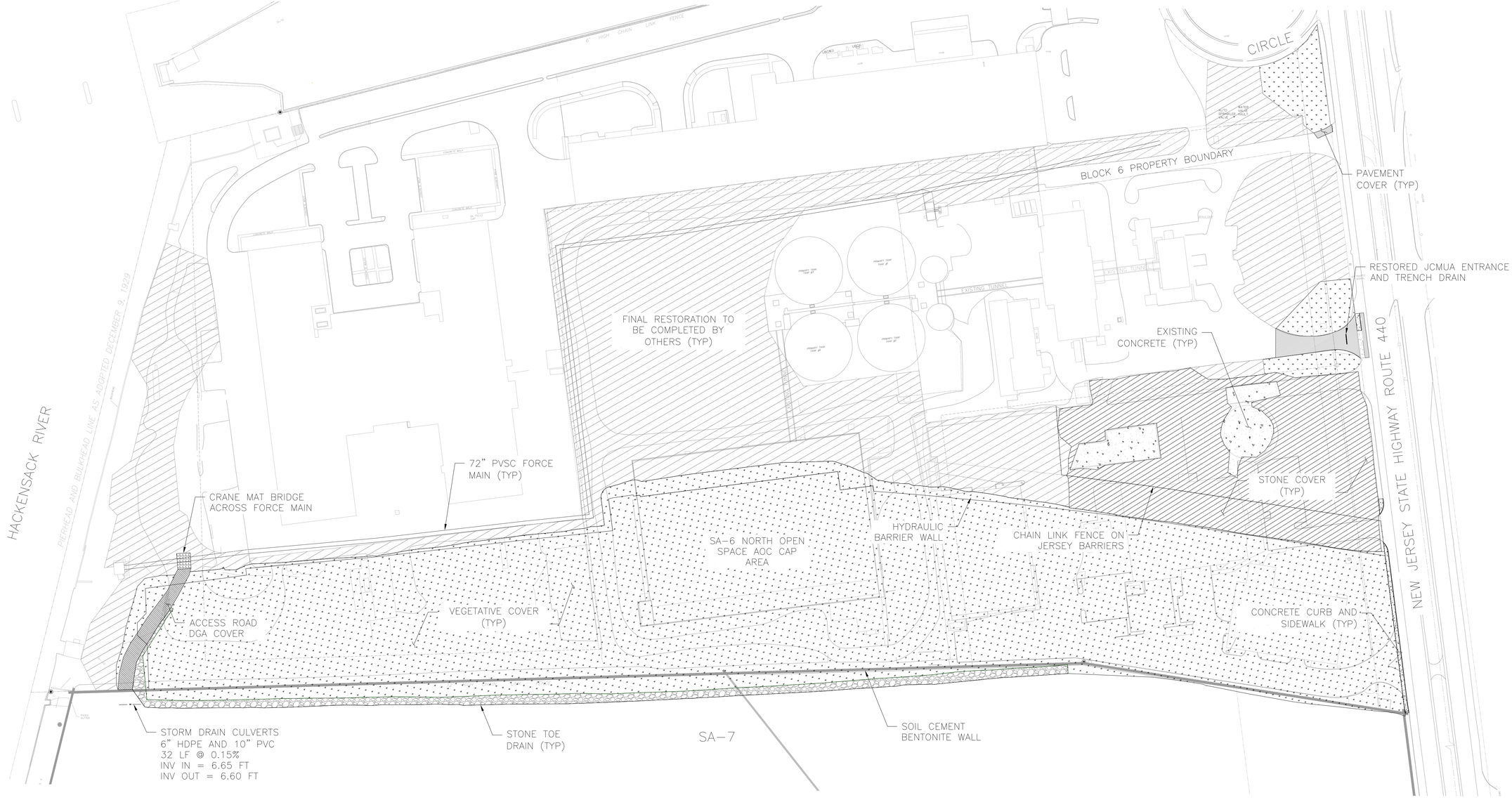
CIVIL
GEOMEMBRANE GRADING PLAN

amec foster wheeler
Environment & Infrastructure, Inc.
200 Horizon Center Blvd, Suite 113
Hamilton, NJ 08619
(609) 689 - 2829

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	2/11/16
PROJ	3480-10-0027
DWG	C-124
SHEET	3 OF 3

FILE NAME: C:\Donovan\SA-6 CADD As Builts\MIEP Figures\Figure SA-6 South Cap Corridor As Built.dwg PLOT DATE: Mon, 10 Aug 2020 PLOT TIME: 2:08 PM



NOTE:

1. REFER TO CONSTRUCTION CONTROL GRID FIGURE AND ATTACHED TABLES FOR SURVEY DOCUMENTATION OF 6 INCH GRAVEL HISTORIC FILL CAP INSTALLATION.
2. OPEN SPACE CAP AREA WITHIN LIMITS OF THE BARRIER WALLS IS COVERED WITH CLEAN IMPORTED SOILS TO THE DEPTHS IDENTIFIED IN THE DESIGN. THE VEGETATED SLOPE WITHIN THE DEVELOPMENT AREA IS COVERED WITH A MINIMUM OF 12 INCHES OF CLEAN IMPORTED FILL. THE VEGETATED SLOPE ALONG SA-7 WAS CONSTRUCTED ENTIRELY FROM CLEAN IMPORTED FILL.
3. REMAINING RESTORATION AREAS IDENTIFIED ON THE CHROMIUM REMEDY 100% DESIGN DRAWINGS WILL BE ADDRESSED AS PART OF THE NON CHROMIUM REMEDIATION WORK CURRENTLY BEING COMPLETED. FINAL RESTORATION OF ALL AREAS IS SCHEDULED TO BE COMPLETE IN MARCH 2017.

STONE COVER
VEGETATED COVER
PAVEMENT COVER
CONCRETE COVER
DGA COVER
RESTORATION BY OTHERS
STONE TOE DRAIN
SD STORM DRAIN PIPE

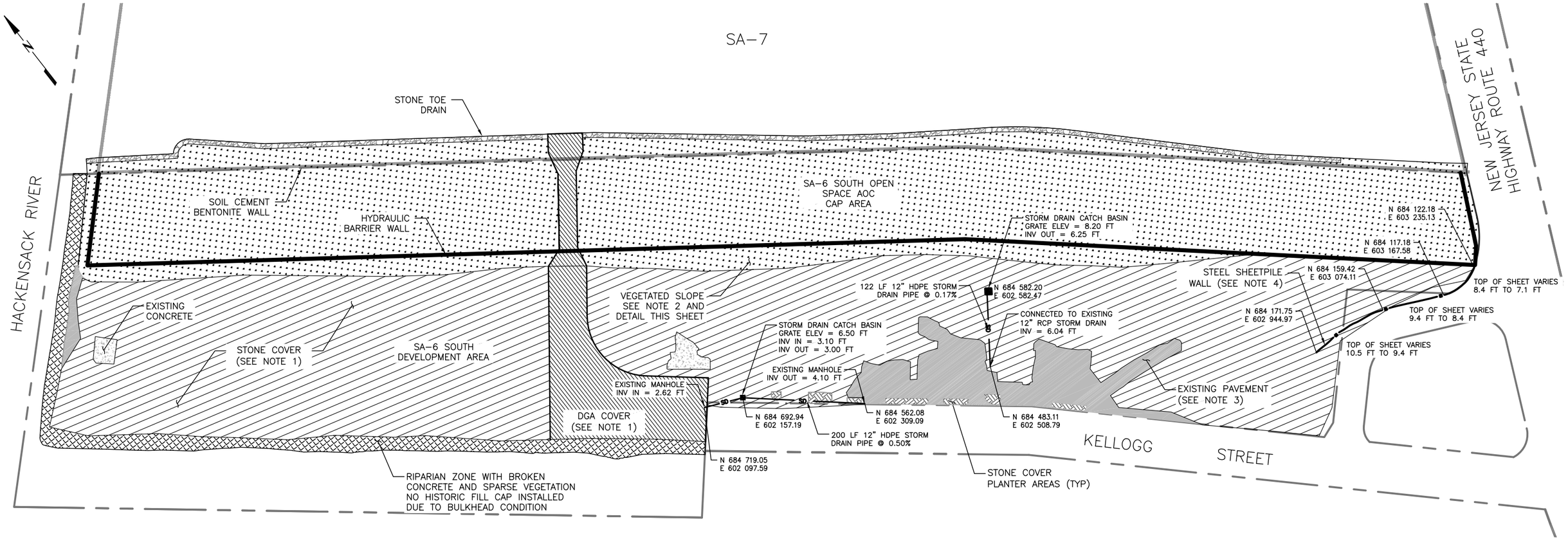
0 80 160 FEET
SCALE

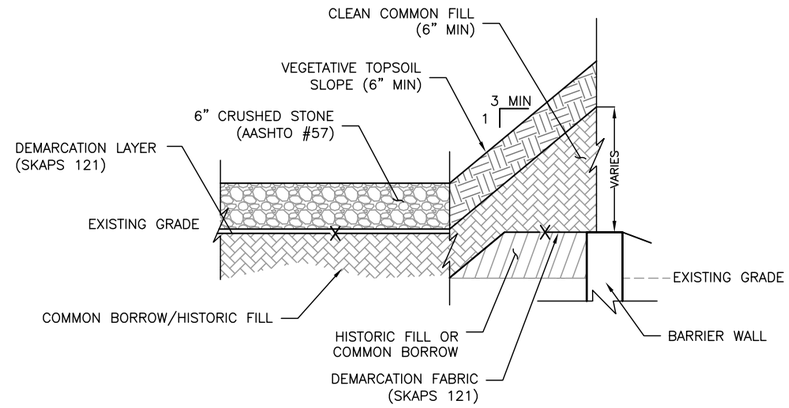
REV	DATE	BY	CHKD	APVD	DESCRIPTION
0	1/7/17	EJP	AE	AE	AS BUILT RESTORATION PLAN

ENTACT 302 Unity Plaza Latrobe, PA 15650

DRAWING NAME
AS BUILT RESTORATION PLAN
SA-6 NORTH - SHEET 001
1/6/17

PROJECT NAME & LOCATION
HONEYWELL SA-6 REMEDIATION
JERSEY CITY, NJ





NOTE: NO HISTORIC FILL SHALL BE PLACED ON SA–7

TYPICAL VEGETATED SLOPE
NTS

NOTE:

1. REFER TO FIGURE 2 FOR CONSTRUCTION CONTROL GRID AND ATTACHED TABLES FOR SURVEY DOCUMENTATION OF 6 INCH GRAVEL HISTORIC FILL CAP INSTALLATION.
2. OPEN SPACE CAP AREA WITHIN LIMITS OF THE BARRIER WALLS IS COVERED WITH CLEAN IMPORTED SOILS TO THE DEPTHS IDENTIFIED IN THE DESIGN. THE VEGETATED SLOPE ON THE DEVELOPMENT AREA IS COVERED WITH A MINIMUM OF 12 INCHES OF CLEAN IMPORTED FILL AS SHOWN ON THE TYPICAL VEGETATED SLOPE DETAIL. THE VEGETATED SLOPE ALONG SA–7 WAS CONSTRUCTED ENTIRELY FROM CLEAN IMPORTED FILL.
3. EXISTING PAVEMENT WAS FIELD INSPECTED BY LSRP AND SUBJECT TO MINOR CRACK FILLING TO SATISFY HISTORIC FILL CAP REQUIREMENTS.
4. STEEL SHEETPILE WALL WAS INSTALLED AS EXCAVATION SUPPORT ALONG THIS AREA AND THEN CUT BELOW CURRENT GRADE AND LEFT IN PLACE. THE TOP OF SHEETPILE IS GENERALLY 0.5 TO 2.0 FT BELOW CURRENT GRADES.

STONE COVER
VEGETATED COVER
PAVEMENT COVER
CONCRETE COVER
STONE COVER IN PLANTER AREAS
RIPARIAN ZONE
DGA COVER
STONE TOE DRAIN
STEEL SHEETPILE WALL
SD STORM DRAIN PIPE
STORM DRAIN CATCH BASIN

0 80 160 FEET
SCALE

REV	DATE	BY	CHKD	APVD	DESCRIPTION
0	12/12/16	EJP	AE	AE	AS BUILT RESTORATION PLAN

ENTACT 302 Unity Plaza Latrobe, PA 15650

DRAWING NAME
AS BUILT RESTORATION PLAN
SA–6 SOUTH – SHEET 001
12/12/16

PROJECT NAME & LOCATION
HONEYWELL SA–6 REMEDIATION
JERSEY CITY, NJ