



# Ecological Restoration **Drafting & Design Guidelines**

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**PHILADELPHIA  
WATER**

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# 1.0 INTRODUCTION

This resource provides standardized drawing requirements that must be used when drafting contract plans for all stream and ecological restoration projects for Philadelphia Water. The following information is to be used throughout the design process by Philadelphia Water staff, providers of professional engineering services contracted by Philadelphia Water, and other agencies/partner organizations that are working with the Department.

This document serves as a supplement to the Philadelphia Water Department *Water & Sewer Design Manual*. In general, the ecological restoration drawings follow the same guidelines that are used by the Department for the preparation of sewer reconstruction drawings as found in Section 3 Sewer Contract Drawings of the *Water & Sewer Design Manual*. These stream guidelines provide additional drafting and design information pertinent to the preparation of stream restoration design drawings.

Consultants are encouraged to use the *GSI CAD Standards* contained within the *GSI Survey & Drawing Standards* (section 4 for instructions on CAD Standards). These CAD standards provide a framework for setting up new CAD files, standard title blocks, ctb files, line types, and block libraries for existing conditions in accordance with PWD standards. While the rest of the *GSI CAD Standards* are specific to green stormwater projects and the proposed features templates may not be applicable to ecological restoration projects, the baseplan template files should be utilized.

## References

- Water & Sewer Design Manual: <http://www.phillywaterdesign.org/>
- GSI Survey & Drawing Standards (see section 4 for instructions on CAD standards):  
[http://documents.philadelphiawater.org/gsi/GSI\\_Survey\\_and\\_Drawing\\_Standards.pdf](http://documents.philadelphiawater.org/gsi/GSI_Survey_and_Drawing_Standards.pdf)
- GSI Survey & Drawing Standards CAD Templates:  
[http://documents.philadelphiawater.org/gsi/GSI\\_CAD\\_Standards.zip](http://documents.philadelphiawater.org/gsi/GSI_CAD_Standards.zip)

## 2.0 GENERAL PLAN INFORMATION

### 2.1 Drawing Size

1. All drawings must be on 30" x 42" paper and conform to the PWD *Water & Sewer Design Manual* requirements except where noted below.
  - a . Sheet – 30" x 42"
  - b . Outside Border – 29" x 41" (1/2" from left, top, bottom, right)
  - c . Inside Border – 27" x 39" (1" from left, top, bottom, right) (See Appendix IIb of *Water & Sewer Design Manual*)
  - d . Title Block – 5" x 9" in lower right corner (See Appendix IIc of *Water & Sewer Design Manual*).

### 2.2 Materials

1. Final Drawing shall be on mylar, with an erasable ink.
2. Mylar shall be .004 inch thick polyester base, insensitized and matted on both sides.

### 2.3 Sheet Layout

1. The Design Consultant's name or in-house unit shall be shown on the plan to the left of the title block on each sheet stipulating who prepared the plan or design.
2. The plan and/or design completion date shall be shown directly beneath the Consultant's name. At each submission ensure that this date is updated to aid in version tracking.
3. During design development, label plans in accordance with their submission milestone:
  - a. Baseplan (PWD 30%)
  - b. Preliminary Design (PWD 50%)
  - c. Substantially Complete Design (PWD 70%)
  - d. Plans, Specs, and Estimate (PWD 90%)
  - e. Final Design Package (PWD 100%)
4. Final plans are to be stamped by a registered Professional Engineer in the State of Pennsylvania.
5. Provide the following on each drawing above the title block as shown in the PWD *Water & Sewer Design Manual*:
  - a. Ward Number
  - b. Sewer Plat Number
  - c. Highway District Number
  - d. Streets Department Survey District Number
  - e. One Call Serial Number
  - f. Outfall Number (if applicable)
6. Plan legend shall be shown in the upper right hand corner of the plan whenever possible.
7. Work numbers are to conform to the requirements outlined in Section 1 Project Initiation of the *PWD Water & Sewer Design Manual*.

8. Page numbers are to be as follows (unless approved by PWD):
  - a. T – Index Sheet
  - b. SC – Survey Control Plans including survey line plans and survey point tables
  - c. S – Site & Grading Plan Sheets
  - d. P – Profile Sheets
  - e. CS – Cross-Section Sheets
  - f. D – Detail Sheets
  - g. EC – Erosion Control Plan Sheets
  - h. L – Landscaping Sheets (plans and details)
9. Show connecting plan sheets with appropriate use of match lines.
10. Proposed legend must be included on all sheets.
11. Plan view, sections, and profiles should generally be included for all systems.

## 3.0 DRAFTING

### 3.1 Scales

1. Draft the location plans at an appropriate scale to fit the site content and maintain legibility.
2. On new construction, where 1" = 30' scale can reduce the number of sheets, it may be used, with approval of the Ecological Restoration Group supervisor.

#### 3.1.1 Plan

1. 1" = 20' except as otherwise specifically approved.

#### 3.1.2 Sections

1. 1/4" = 1'0" or as otherwise appropriate

#### 3.1.3 Profile

1. Horizontal: 1" = 20' (or match plan)
2. Vertical: 1" = 5'

### 3.2 Lettering

1. All text size, style and orientation shall conform to the examples shown in Appendix II of the *Water & Sewer Design Manual*, except the size of the call out for proposed sewer in profile only shall be 0.24' and the style and orientation shall be as shown in the sample plans for sewers in Appendix IX of the *Water & Sewer Design Manual*.
2. Existing utilities shall be indicated using upper and lower case lettering and shall be slanted. The word existing shall not be used.
3. Proposed work shall be in bold upper case letters without a slant.
4. The word proposed shall be used in the plan and cross sections only to call out the proposed water main, sewer, and ecological restoration structures. It should not be used with any appurtenances (like manholes, collars, or inlets) but the letters calling out the appurtenances should still be bold upper case. Should the drawing include an appurtenance that is proposed to be installed in an existing water main or sewer, the word proposed shall be used, but only if there is no new water main or sewer included in design. See the Sample Plans shown in Appendix IX of the *Water & Sewer Design Manual*.
5. Ordinance Date (where applicable) shall be 0.175".
6. Preliminary Assessment (where applicable) shall be 0.14".
7. Name of sewer system (where applicable) shall be 0.24" Arial.
8. Title block information shall be as shown on Appendix II of the *Water & Sewer Design Manual*.
9. The words street, road, avenue, etc., should be spelled out on streets and abbreviated on intersecting streets.
10. For Private Cost Contracts, the words "PRIVATE COST" in a 0.24" arial font shall be placed above the title block.

### 3.3 Line Weight

1. Listed in descending order of line weight – see Appendix IIe of *Water & Sewer Design Manual*.
  - a. Proposed contours
  - b. Existing contours

### 3.4 Symbols and Abbreviations

1. Symbols and abbreviations shown in Appendix II of the *Water & Sewer Design Manual* shall be used.
2. Any other symbols and abbreviations shall be defined on the Contract Drawings.
3. The Legend shown in the Appendix IIj of the *Water & Sewer Design Manual* shall be shown on all sheets.

### 3.5 Drawing Orientation

1. The drawing should be generally oriented with the stream, street, wetland, or primary feature rotated horizontally across the sheet with the north arrow oriented up in reference to the horizontal line.

### 3.6 Index Sheet

1. All ecological restoration Contract Drawings shall contain an index sheet.

### 3.7 Profiles

1. All ecological restoration Contract Drawings shall contain a Profile.
2. Profiles shall be orientated with upstream on the left to downstream on the right.

### 3.8 Cross Sections

1. All ecological restoration Contract Drawings shall contain cross sections.
2. Cross sections on ecological restoration sheets shall be taken looking downstream, except where the cross section is generated in conjunction with a 'detail' for the purpose of showing additional construction information relative to a specific type of bank treatment or other type of in-stream structure. In those cases, orientation will be at the discretion of the consultant or design engineer and must be clearly identified on the sheet.

### 3.9 Sheet Index Order

1. Index Sheet/Cover Sheet
2. Survey Control Sheets
3. Site & Grading Plans
4. Profile Plans
5. Cross Sections
6. Details
7. Erosion & Sediment Pollution Control Plans
8. Erosion & Sediment Pollution Control Details
9. Landscape Plans
10. Landscape Details

**NOTE:** If there are multiple, disconnected sites associated with an ecological restoration contract, sections c), d), and e) are to have each site grouped separately, traveling in the upstream to downstream direction. All other sections are to have the sheets from all sites grouped together, also traveling in the upstream to downstream direction.



## 4.0 ECOLOGICAL RESTORATION PLAN INFORMATION

### 4.1 Index Sheet

1. In the title block, the Index Sheet shall be numbered using the letter T (i.e., Sheet T-X of X). Total number of pages in ecological restoration plans shall be printed below index sheet number.
2. Index Sheet should contain the name the City of Philadelphia Water Department, and provide the location and Work Number of the project.
3. Sheet index shall be located in a block on the index sheet in chart form with two columns, with Sheet No. in the left column and Title in the right column, and number of rows commensurate with the number of different sheet titles. Each row is to be 0.25" high, with total height of block depending on number of rows.
4. In the center of the Index Sheet there shall be a location map which shows the approximate location of the project within the city limits of Philadelphia.
5. A template for the Index Sheet is provided in the *GSI CAD Standards*. If this template is utilized, the following updates should be made for ecological restoration projects:
  - a. Specify drawing type as Ecological Restoration Project, instead of Green Stormwater Infrastructure
  - b. Update General Notes as necessary for the project.
  - c. Update Sheet Index.

### 4.2 Survey Control Sheets

1. In the title block, the Survey Control sheets shall be numbered using the letters SC (i.e. Sheet SC-X of X).
2. Sheets shall show the entire length of stream to be restored, with Stations indicated on the Survey and Construction baseline, which should advance along the proposed stream centerline in an upstream to downstream direction. Station numbers should also increase in the downstream direction.
3. Match lines shall be shown on all Survey Control sheets when required.
4. For entire length of stream to be restored, all Points on Tangent (P.O.T.), Points of Tangent (P.T.), Points of Curve (P.C.), and Points of Intersection (P.I.) must be identified and accompanied by a chart which identifies the station, coordinates, and bearing for each.
5. Horizontal coordinates and all bearings shall be based on the Pennsylvania State Plane Coordinate System (NAD-83 South Zone), in U.S. survey feet. Elevations shall be based on the City of Philadelphia vertical datum.
6. All curves must be identified and labeled, and accompanied by a chart which identifies the radius, length, delta, tangent, and chord bearing for each.

## 4.3 Site & Grading Plans

1. In the title block, the Site & Grading Plan sheets shall be numbered using the letter S (i.e. Sheet S-X of X).
2. Private property owners shall be shown on site plans, along with property limits and any right-of-ways that have been granted by the property owner to the City of Philadelphia.
3. All above ground structures shall be indicated along with type of construction (e.g. 3 sty. brick bldg., retaining wall, concrete abutment).
4. Where sewer line work is required, or sewer line is within the limits of disturbance, all existing sewer manholes shall be identified with field surveyed invert and rim elevations. Otherwise, Sewer Return Plan elevation is sufficient. Where sewer return plan elevation is used, it should be identified as Inv. El. – SRE on the plan sheet.
5. Match lines shall be shown on all Site & Grading Plan sheets when required.
6. All existing infrastructure, trees (including diameter), manhole covers, utility poles, existing paving, existing chain link fence, and existing soil trails shall be identified.
7. Utility information shall be given as follows:
  - a. The following utilities shall be identified: (water, PECO, sewer, Bell (Verizon), PGW, Streets Traffic, SEPTA, Public Property – Communication, Public Property – Transit, Cable TV, etc.)
  - b. Each former utility if so identified on manholes or Highway Supervisor’s drawing shall be identified (i.e. Keystone, City Transit, PTC, etc.)
  - c. Duct size shall be shown as width x height, except sewer which shall be height x width.
  - d. Brick Sewers shall be labeled in feet and inches (e.g. 2’6” x 1’8”)
  - e. Reinforced concrete pipe shall be labeled in inches (e.g. 36” RCP)
  - f. Box sewers, whether brick or reinforced concrete shall be labeled in feet and inches.
  - g. All circular pipe (with the exception of brick sewer) shall be labeled in inches of diameter.
  - h. High voltage electrical conduits shall be separately labeled with voltage, and boxed in.
  - i. SEPTA and railroad tracks shall be shown as accurately as possible, but not dimensioned. Their status (active, inactive, or paved over) shall also be stated.
  - j. Utility lines shall be drawn using the type of line shown in Appendix IIe of the *Water & Sewer Design Manual*.
  - k. Existing sewer inlets shall be accurately shown and indicated as to size and type.
  - l. Abandoned utilities shall be labeled abandoned.
8. Sheets shall progress, and station numbers shall increase, in an upstream to downstream direction.
9. Stations shall be marked along the centerline of the proposed stream.
10. Each contour line shall represent a 1 foot change in elevation, and every 5<sup>th</sup> line shall have its elevation identified on the plan, except as otherwise specifically approved.
11. All proposed work is to be shown in bold type and labeled in capital letters (i.e. addition, repair, or removal of manholes, changes in grading, addition of in-stream structures).
12. Each sheet shall have schedules for all proposed riffles and pools, as well as for all proposed in-stream structures which appear on that sheet.

## 4.4 Plan Profiles

1. In the title block, the Profile Plan sheets shall be numbered using the letter P (i.e. Sheet P-X of X).
2. Proposed and existing sewers and manholes located within the stream bankfull limits shall be shown and identified on the stream profile with stations as well as field invert elevations.
3. Both proposed and existing grade and elevations at stream centerline shall be shown.
4. Match lines shall be shown on all Profile Plan sheets, when required.
5. All proposed in-stream structures shall be shown with their locations, along with the locations of proposed pools and riffles.

## 4.5 Cross Sections

1. In the title block, the Cross Section sheets shall be numbered using the letters CS (i.e. Sheet CS-X of X).
2. This section is to be used for calculating earthwork quantities and showing cut/fills only. 'Detail' cross sections meant to show additional construction information relative to a specific type of bank treatment or other type of in-stream structure will be addressed in other sections.
3. All utilities located within the limits of disturbance shall be identified. Abandoned utilities shall be labeled as abandoned.
4. All cross sections shall fit within the width of single sheet. Where  $1/4" = 1'0"$  scale cannot be accommodated, scale shall be adjusted as necessary.
5. Cross sections are to be taken every 25 feet, except where there is an existing or proposed structure or landform of significance, in which case a cross section of the structure or landform of significance should replace the regular cross section. Significance is to be determined by the contractor or design engineer. At no point should the distance between cross-sections exceed 40 feet.
6. All proposed or existing infrastructure or in-stream structures present at the cross sectional location shall be shown and identified.
7. Existing channel bed elevation shall be shown as a dashed line, and proposed channel bed elevation shall be shown as a boldface solid line.
8. Each cross section shall be accompanied by an estimate of cut and fill area, measured in square feet.
9. All cross sections are to be identified by their station with the x-axis showing offset from the proposed stream centerline, and the y-axis showing elevation.

## 4.6 Details

1. In the title block, the Details sheet shall be numbered using the letter D (i.e. Sheet D-X of X).
2. Show plan and cross section views of all proposed in-stream structures, as well as profile views as necessary.
3. Show all construction notes as well as any applicable tables or design summaries.

## 4.7 Erosion & Sediment Pollution Control Plans

1. In the title block, the Erosion & Sediment Pollution Control Plan sheets shall be numbered using the letters EC (i.e. Sheet EC-X of X).
2. Match lines shall be shown on all Erosion & Sediment Pollution Control Plan sheets, where required.
3. Identify all wetland areas.
4. Locate and identify soil types for entire site.
5. Define the limits of disturbance (LOD), as well as the boundary of the FEMA 100-year flood plain.
6. Show the path of any rock construction entrances (RCE) from where they leave the paved surface to the work site, and include this area in the LOD.
7. Show all trees larger than 8" diameter at breast height (DBH). Identify which are specifically to be protected, and which are to be removed.
8. Show limits of grading.
9. Identify all staging and stockpile areas.
10. Show locations of all silt fencing, tree protection fencing, and orange construction fence, and identify what they are meant to protect (i.e. stockpile area, tree save area, etc.)
11. Show location of all natural fiber matting.
12. Show all temporary structures including coffer dams and access points, stream crossings, and water diversion elements.
13. Show and number work cells for projects that require construction sequencing.
14. List all applicable notes, including, but not limited to: General Construction Sequence, General Erosion and Sediment Pollution Control notes, and Erosion and Sediment Pollution Control maintenance.

## 4.8 Erosion & Sediment Pollution Control Details

1. In the title block, the Erosion & Sediment Pollution Control Details sheets shall be numbered using the letters EC (i.e. Sheet EC-X of X), and shall continue the numbering from the Erosion & Sediment Pollution Control Plan sheets.
2. Show details of all erosion and sediment pollution control measures that may be utilized (i.e. Water Management BMP options, Stabilized Rock Construction Entrance/Exit, Sediment Filter Bags, Silt Barrier Fence, Natural Fiber Matting, Wooden Stakes, etc.).

## 4.9 Landscape Plans

1. In the title block, the Landscape Plan sheets shall be numbered using the letter L (i.e. Sheet L-X of X).
2. Match lines shall be shown on all Landscape Plan sheets, where required.
3. Identify all land to be landscaped and categorize it as Floodplain, Forest understudy, or Meadow/Open.
4. Show the area (in square feet), as well as the total number of trees and total number of shrubs to be planted on each type of land.
5. List each specific type of tree or shrub to be planted, as well as how many will be planted on each type of land. Also list types of seed mix to be used, as well as what percentage of total seed it comprises for each type of land.
6. Trees and shrubs are to be placed randomly within the planting area. They shall not be arranged in row, nor at fixed distances or in predictable patterns.
7. For all information regarding acceptable plantings and all associated planting details, refer to the Philadelphia Parks and Recreation project specifications for tree, shrub, and seed installation.

## 4.10 Landscape Details

1. In the title block, the Landscape Detail sheets shall be numbered using the letters LS (i.e. Sheet L-X of X), and shall continue the numbering from the Landscape Plan sheets.
2. Show details of all planting and other landscaping methods may be utilized (i.e. Tree Planting detail, Shrub Planting detail, Live Stakes, Natural Fiber Mat with Live Stakes, etc.).

## 4.11 Sample Drawings

1. Sample drawings are available from PWD upon request.