I. Designing of a PPBPS Bed System

PPBPS bed systems can help to provide an even smaller total footprint than what can be achieved using PPBPS in trench formation. While PPBPS beds can be installed in less space, there are typically over 40% more panels present in a bed formation when compared with an equivalent trench formation, meaning greater effluent treatment and storage capacity. Another benefit of PPBPS beds is that they utilize 50% more backfill sand than the equivalent PPBPS trench formation, adding even more treatment and storage capacity.

PPBPS bed systems use horizontal panels in bed formation. There are several reasons we use horizontal rather than vertical panels in beds. Horizontal panels can be placed in shallower soils than vertical panels. Horizontal panels also have an advantage in that both chambers are dosed, meaning more area for biomat growth and aerobic treatment. Horizontal panels better utilize the bottom infiltrative area of a bed system, whereas vertical panels better utilize sidewalls in trench formation. Distribution boxes or pressure manifolds are usually located outside of the bed area.

The typical design process for a PPBPS bed system is as follows:

1. Determine Required Nitrification Area
    a. Design Daily Flow / LTAR x 1.5 = Required Conventional Nitrification Area for Bed
    b. Required Conventional Nitrification Area for Conventional Bed x 0.5 = Required Nitrification Area for PPBPS Bed
2. Determine a Length and Width to attain the Required Nitrification Area for PPBPS Bed
    a. Width is typically in multiples of three feet to achieve three foot on center spacing
    b. Width typically should be 24 feet or less.
    c. In designing a bed system (where available space allows), the greater the length is in comparison to the width, the more advantageous to avoid hydraulic overloading.
3. Determine Number of Nitrification Lines and Nitrification Line Lengths
    a. Number of Nitrification Lines = Width / 3
    b. If the result is not a multiple of three, round down to allow at least for at least 18 inches of space from sides of bed to the center of the outermost nitrification lines.
4. Nitrification Line Lengths = Bed Length
5. Determine the Number of Panels in each Nitrification Line
    a. Nitrification Line Length x 12 /52 = Number of Panels per Nitrification Line (If the result is a decimal of .5 or higher round up and if .4 or lower round down).
    b. Spacing between panels can be adjusted to allow for the proper number of panels to be installed in each line (may be closer than 6 inches if you have to round up).

II. Installation of a PPBPS Bed System

1. Excavate the required area for the bed system to permitted depth. Beds can be excavated incrementally to allow for ease of installation
2. When working in clay mineralogy, sidewalls should be raked to bring smeared areas back to their original structure before a light dusting of lime is applied
3. Place 6 inches of backfill sand in the excavated area
4. In true Group I soils, the 6 inches of sand below the system is unnecessary, thus the panels can be placed in the natural soil. This can allow for the trench bottom to be 6 inches shallower (separations to unsuitable soil and/or wetness conditions must be met).
5. Place 1x6 inch boards in the bed
   a. Start by placing the center of the first board 18 inches from the length side of the bed
   b. Place boards for the adjacent nitrification lines three foot on center
6. Place panels on the boards about 6 inches apart. Spacing of the panels can be slightly adjusted to allow proper fitment into the nitrification line, provided that the correct number of panels are installed in the line. Utilize 1.5-inch PVC (smaller diameter pipe may be used for LPP systems) to span from panel to panel, making sure that the pipe ends in the inner chambers of each panel (same process as trench installation)
7. Utilize a T&J approved foam sealer to construct partial seals in the inner cutouts and full seals on the outer cutouts of each panel (same process as trench formation)
8. Place cap blocks on each end of the panel
9. Use backfill sand to fill up to level with the top of the panel block in the entire area of the bed (including between panels)

Below is an Example of the Design and Installation of a PPBPS Bed System

A four-bedroom home with an LTAR of 0.8 gpd/ft^2

1. Determine Required Nitrification Area

a. Bottom Area Needed for Conventional Bed = 480 gpd / 0.8 gpd/ft^2 x 1.5 = 900 ft^2

b. Bottom Area Needed for PPBPS Bed = 900 ft^2 x 0.5 = **450 ft^2**

2. Determine a Length and Width to attain the Required Nitrification Area for PPBPS Bed

a. 450 ft^2 = **25 ft x 18 ft**

b. 25 ft will be the Length; 18 feet will be the Width

3. Determine Number of Nitrification Lines and Nitrification Line Lengths

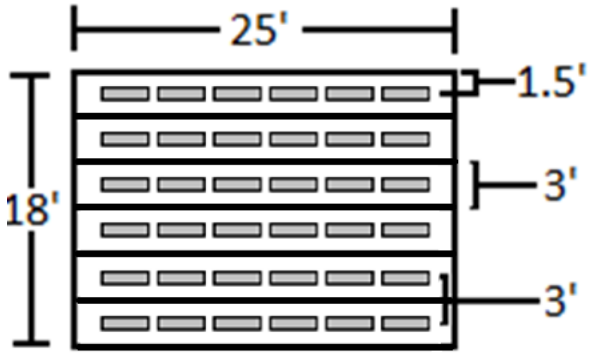
a. Number of Nitrification Lines = 18 ft / 3 = **6 Lines**

b. Nitrification Line Lengths = **25 ft**

4. Determine Number of Panels in each Nitrification Line

a. Number of Panels per Nitrification Line = 25ft x 12 / 52 = 5.77; **6 Panels/Line**

The figure below shows the layout of this PPBPS Bed System design



If designed as a conventional trench formation, the resulting footprint would be approximately 1,500 ft^2. The above PPBPS bed formation offers a 70% reduction in area needed on the lot.

III. Inspection of a PPBPS Bed System

1. Ensure that the bed area was excavated to proper length and width
2. Determine that the proper number of panels were installed in each nitrification line
3. Shoot grade off the cap blocks to see if lines are level or less than 0.25-inch of fall per ten feet
4. Lift several cap blocks to ensure the PVC pipe extends from inner chamber of one panel to the inner chamber of the following panel and inspect inner and outer seals
5. Ensure that the proper backfill sand was used (either a clean, screened river sand or a concrete sand; naturally occurring sands, no man-made sands)