Name: **Date:** **Class:**

Recycled Water Assessment Sheet

Pre-Activity Assessment: To understand the treatment of wastewater, one must understand the water cycle and nitrogen cycle.

1. Watch the 10-minute video: How do Wastewater Treatment Plants work? (https://youtu.be/FvPakzqM3h8)

2. Answer the following questions about WWTP.

   If the Earth's water cycle goes through these four stages:
   Evaporation → Condensation → Precipitation → Collection

   a. Which of these four stages are we taking too much of and overusing, which is contributing to our drought?

   b. Why is it important to remove the large objects with a Bar Screen in the pretreatment process?

3. Watch the 12-minute video: Nitrogen Removal Basics (https://youtu.be/BosHU4ARR9w)

4. Answer the following questions about the Nitrogen Cycle. During the nitrification, ammonia (NH_{4+}) and ammonia (NH_3) is converted to nitrite (NO_{2-}), then nitrate (NO_{3-}), and finally it goes through denitrification where nitrate becomes nitrogen gas (N_2).

   a. Where is the evidence for the nitrogen gas found?

   $NH_4^+ / NH_3 \rightarrow NO_2^- \rightarrow NO_3^- \rightarrow N_2$

   b. When bacteria are breaking down nitrogen compounds, what gas do they need in order to process and break down nitrogen compounds? How does the WWTP add this gas to the bacterial sludge? Please explain.

Name: **Date:** **Class:**

Activity-Embedded (Formative) Assessment

5. Place the following processes for treating wastewater in the correct order:

    a. Secondary Clarifier
    b. Bar Screens
    c. Aeration Basin
    d. Grit Chamber
    e. Disinfection
    f. Primary Clarifier

6. Sketch and design your home wastewater treatment device in the space below.

Name: **Date:** **Class:**

7. Testing: Below is a template of a data table that an engineer would use to test your device.
   a. Think about what tests you might want to incorporate that would test the efficiency of your device – pH (acidity), solids, turbidity (clarity of water), etc.

   b. What tests do you think would be the most important to test your device's efficiency? Label your column headings. Just write the Test Type in the column headings. Do NOT fill the rest of the data table.

Rubric							
Test Type	pH (Acidity)	Solids	BOD	DO	Nitrogen Content	Clarity (Turbidity)	Other possible answers:
Initial							
Middle							
Final							

8. Engineering: Create your home wastewater treatment device using the materials provided.

9. Hand this sheet to another group and have them score your project. They should circle the appropriate score AND provide suggestions for improvement.

Rubric			
4	3	2	1
Group's sketch clearly explained their device's water-cleaning process. It covered all phases of treating blackwater. The model reflects their sketch.	Group's sketch clearly explained their device's water-cleaning process. It covered all phases of treating blackwater. The model does NOT reflect their sketch.	Group's sketch clearly explained their device's water-cleaning process. It did NOT cover all phases of treating blackwater. The model does NOT reflect their sketch.	Group's sketch did NOT explain their device's water-cleaning process. It did NOT cover all phases of treating blackwater. The model does NOT reflect their sketch.
Suggestions for improvement:			