

COSEE TEK ~ University of Connecticut VIRTUE Settlement Array

Material List and Fabrication Instructions
Version 1.0 (7/12/2016)
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Table of Contents:

Page

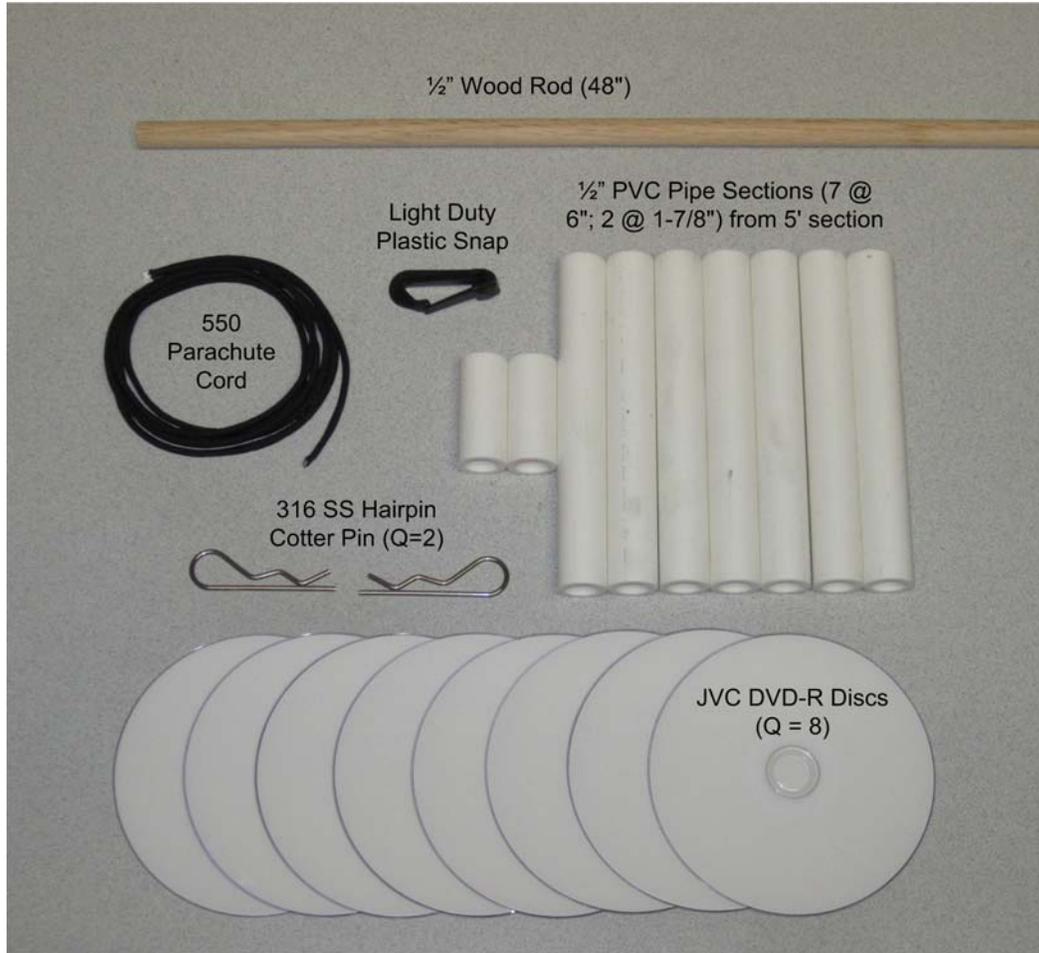
2. Basic Material List
3. Overview & Component Description
4. Fabrication Steps

Appendix 1: Quick Steps

Appendix 2: VIRTUE Settlement Array (V1) Construction Schematic

Appendix 3: Material and Price List

COSEE TEK ~ University of Connecticut
 VIRTUE Settlement Array - Basic Material List



VIRTUE Settlement Array Components		
Description	Vendor	Part Number
JVC DVD-R 4.7 GB White Inkjet Recordable Discs	B&H Photo	JVDMRIWH16BQ
Oak Rod, 48" Long, 1/2" Diameter	McMaster-Carr	96825K17
Standard-Wall PVC Pipe, 1/2 Pipe Size X 5' Length	McMaster-Carr	48925K91
316 SS Hairpin Cotter Pin, Fits 1/2"-3/4" Dia, 2-1/2" L	McMaster-Carr	92375A338
Flexible Rope - Type 550 Parachute Cord	McMaster-Carr	3696T38
Light Duty Plastic Snap	McMaster-Carr	30655T35

Note:
 B&H Photo is an online reseller of electronics & electrical supplies (see www.bhphotovideo.com).
 McMaster-Carr is an online reseller of industrial supplies (see www.mcmaster.com).
 See Appendix 3 for the complete material list.

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VIRTUE Settlement Array – Overview & Component Description

The COSEE-TEK VIRTUE Settlement Array, Version 1.0 project has been developed based on the fundamental array design of the VIRTUE project by scientists at the University of Gothenburg, Sweden. The design provided herein offers a simple, affordable means to the fabrication of a disc-based settlement array geared toward the collection and analysis of settling marine organisms. This activity offers a hands-on approach to facilitate the introduction and study of these unique organisms to students of all ages. This document and activity provides a complete material list (Appendix 3), fabrication instructions, and detailed schematics (Appendix 2) to facilitate the construction of a turnkey settlement array for completion within a single laboratory or classroom session.

For more information on the VIRTUE Project, visit the project website at (<http://science.gu.se/english/cooperation/virtue>).

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VIRTUE Settlement Array – Fabrication Steps

Recommended Tools:

1. Tape measure
2. Fine tip marker or other marking pen
3. PVC pipe cutter or handsaw
4. Hand Drill
5. 1/8" Drill Bit

See Appendix 2 for a complete assembly schematic

Preparation of Disc Dividers:

The basic settlement array described herein is based on the distribution of eight settlement collection discs spaced equidistantly across the 4' length of the array frame. It should be noted that this particular spacing of discs is not necessary for the collection of settling organisms and was merely a convenient measure for the development of this activity. As such, this activity can be easily customized to utilize greater or fewer discs, or to change the spacing of discs for specific tests or studies of settling organisms.

- 1) Use the tape measure, marking pen and PVC pipe cutter (or other cutting tool) to mark out and cut seven (7) pieces of PVC pipe, each being six inches (6") in length.
- 2) In a similar fashion, measure and cut two (2) additional pieces of PVC pipe from the remaining section, each being approximately 1-7/8" in length.

Preparation of the Deployment Line:

This settlement array is designed to be hung in the water column at a depth suitable for colonization of settling organisms. Often this involves the deployment of the array off a dock or other fixed structure, with the top of the array positioned a short distance (e.g. 1') below the water surface. The material list for this activity calls for the use of a 5' section of type 550 parachute cord as a baseline length, often suitable for near surface deployment when attached to a floating dock or platform. This length of line may be lengthened or shortened based on individual needs or desires. Local tidal conditions should be considered in determining the length of line used to secure the array in place.

- 3) Working with the type 550 parachute cord, tie an overhand loop-knot at each end of your cord. Both knots should be formed to have a final loop with an inside diameter of approximately 5/8", or just large enough to slip over the 1/2" wood rod.



- 4) The light duty plastic snap clips are delivered from the vendor in an open, or unlatched position. Use your fingers to adjust the clip arm, moving it across and behind the catch to secure the arm in a closed and operational position.



- 5) Clip your plastic snap clip onto the loop formed at one end your type 550 parachute cord, and reposition the loop so it sits within the belly of the snap clip.



Preparation of the Array Core:

The core structure of this settlement array is made up of a single piece of 1/2" diameter solid wood rod, used to accommodate the discs and spacers making up the primary components of this sampling device.

- 6) To begin, measure and mark one face of the wood rod approximately 3/4" from each end. These marks will be used to assist you in drilling holes through the rod in the following step.
Note: when selecting a face of the rod to mark, make your selection so that your holes will be drilled perpendicular to the grain of the wood. Drilling along the grain may cause the wood to split lengthwise.

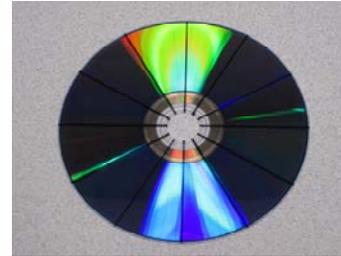


- 7) Carefully drill one hole, approximately 1/8" in diameter, through the center of the wood rod at each of your two marked locations. Note, if a smaller

drill bit is available, it is often advantageous to drill a pilot hole through the rod before finishing with your 1/8" bit. These holes will ultimately accommodate the SS cotter pins used to retain the sections of PVC pipe and DVDs that make up the core of your settlement array. **Refer to the construction schematic within Appendix 2 for a visual representation of the location and application of these holes.**

Preparation of Array Discs (optional):

Standard DVD discs are used as the settlement plates for this activity for their simplicity and low cost. Although not a requirement for the collection of settling organisms, it is recommended that the bottom-side of your discs be marked with a regular grid pattern to assist in counting and in determining percent cover of different settling organisms. The example shown here divides the disc into 12 equal area, pie shaped segments of approximately 30 degrees each.



Note, through trial and error, it has been discovered that not all DVD discs are created equal. Some brands of DVD media has been found to delaminate when submerged in water. Although the particular JVC media called out in the material list for this activity can be replaced with other suitable options, this particular media has been found to hold up to the rigors associated with the ongoing collection of settling organisms.

Preparation of the Array Weight (optional):

Although this settlement array is designed to be slightly negative in water (i.e. it sinks), it is often necessary for a weight to be used to ensure that the array stays in a vertical orientation when deployed. One option presented here utilizes a recycled water or soda bottle as a simple means of securing a variable amount of sand or other dense substrate to the bottom of the array as a weighting mechanism.



- 8) To prepare the array weight, begin by inserting the remaining section of your 1/2" PVC pipe into the opening of a recycled water or soda bottle until it bottoms out against the base of the bottle.



- 9) Using the hand drill with a 1/8" bit, carefully drill a hole through the neck of the bottle, just below the stop flange for the lid (see image below). This hole should be centered on and drilled straight through the bottle and the PVC pipe until it exits the other side. It is recommended to hold the bottle with the threads resting on the edge of a table when performing this operation (see below).



- 10) Remove the PVC pipe and fill the bottle approximately half way full with sand, rocks, or other dense material to provide weight for the settlement array.



Settlement Array Assembly:

- 11) Begin the final assembly of your settlement array by inserting one of the stainless steel (SS) cotter pins through the hole at one end of your wood rod. This will form the bottom of your settlement array.



- 12) Working from the opposite end of your wood rod, slide one of your short sections (1-7/8") of 1/2" PVC pipe over and down the rod until it settles on the SS cotter pin at the opposite end.

- 13) Next, insert the first of your eight (8) DVD discs over and down the length of the rod until it sits atop the section of PVC pipe. **Be sure to insert your DVD discs bottom side first to ensure that the darker portion of the disc is on the bottom of the settlement array where the majority**

of settlement will occur. This will make it easier to see settling organisms on the disc surface.

- 14) Continue adding one long section (6") of ½" PVC pipe, followed by one DVD disc until you have used up all long pipe sections and all discs.
- 15) Complete the core assembly of your settlement array by adding the last of your short PVC pipe sections. This will form the top section of your settlement array. **Refer to the construction schematic within Appendix 2 for a visual representation of the arrangement of all PVC pipe sections and DVD discs on your settlement array.**

- 16) Slide the second loop of your parachute cord over the topmost end of your wood rod until it is snug against the top section of PVC pipe.



- 17) Insert the second of your stainless steel (SS) cotter pins through the hole at the top end of your wood rod, securing the parachute cord and all array components in place.



- 18) With the array complete, slide the mouth of the bottle weight up and over the bottom end of your wood rod until it makes contact with the SS cotter pin. Remove the pin temporarily and continue to slide the bottle further over the rod until the hole through the neck of the bottle aligns with the hole through the rod. Reinsert the cotter pin through the bottle and wood rod together, until it secures the bottle weight to the settlement array assembly.



Congratulations! You have just completed the preparation and fabrication of your VIRTUE Settlement Array!

See Appendix 2 for a complete assembly schematic

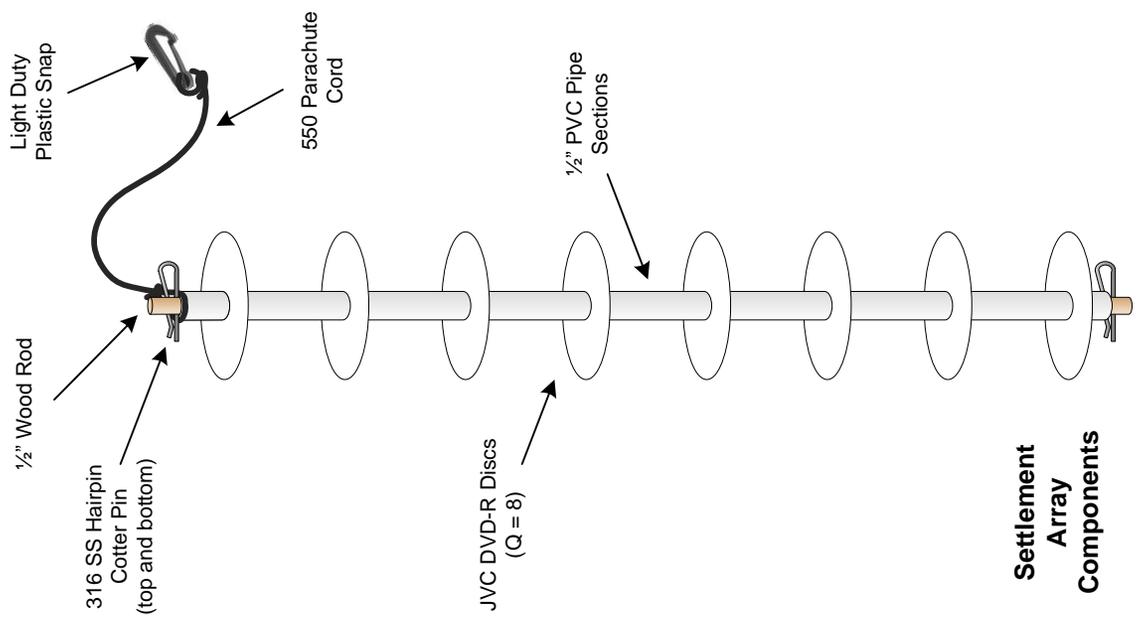
Simplified Instructions for Settlement Array Fabrication:

1. Cut the ½" PVC pipe into seven 6" sections, and two 1-7/8" sections.
2. Tie an overhand loop-knot, with an inside diameter of approximately 5/8", at each end of your type 550 parachute cord.
3. Move the arm of your plastic snap clip across and behind the catch to secure the arm in a closed and operational position.
4. Clip your snap clip onto the loop formed at one end your parachute cord and reposition the loop so it sits within the belly of the snap clip.
5. Measure and mark one face of the wood rod approximately ¾" from each end.
6. Drill a 1/8" diameter hole through the center of the wood rod at each of your two marked locations.
7. OPTIONAL ~ Mark the bottom-side of your discs with a regular grid pattern to assist in counting organisms and determining percent cover.
8. OPTIONAL ~ Insert the remaining section of your ½" PVC pipe into the opening of a recycled water or soda bottle until it bottoms out against the base of the bottle.
9. OPTIONAL ~ Drill a 1/8" diameter hole all the way through the neck of the bottle, just below the stop flange for the lid.
10. OPTIONAL ~ Remove the PVC pipe and fill the bottle half way with sand or small rocks.
11. Insert a stainless steel cotter pin through the hole at one end of your wood rod.
12. Slide one 1-7/8" section of PVC pipe over and down the rod until it settles on the SS cotter pin.
13. Slide one DVD disc, bottom side first, over and down the rod until it settles on the PVC pipe section.
14. Add one long section (6") of ½" PVC pipe, followed by one DVD disc until you have used up all long pipe sections and all discs.
15. Add the last short section of PVC pipe.
16. Slide the second loop of your parachute cord over the top end of your wood rod until it is snug against the top section of PVC pipe.
17. Insert the second stainless steel cotter pins through the hole at the top end of your wood rod.
18. OPTIONAL ~ Slide the mouth of the bottle weight up and over the bottom end of your wood rod, securing it in place with the stainless steel cotter pin added in step 11.

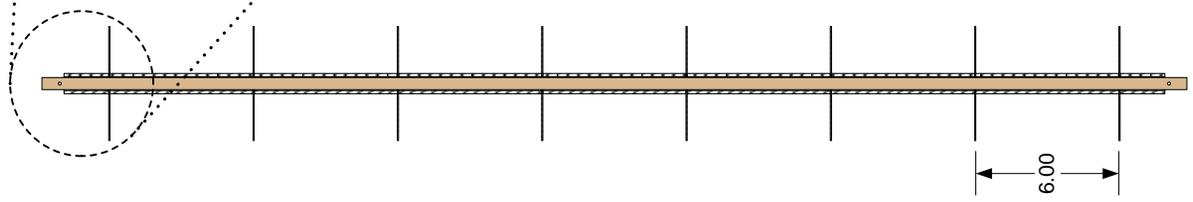
Northeast Underwater Research Technology & Education Center at the University of Connecticut
 1080 Shennecossett Road * Groton, CT * 06340 *
 TEL: 860-405-9121

COSEE TEK VIRTUE Settlement Array Design Schematic (v.1)

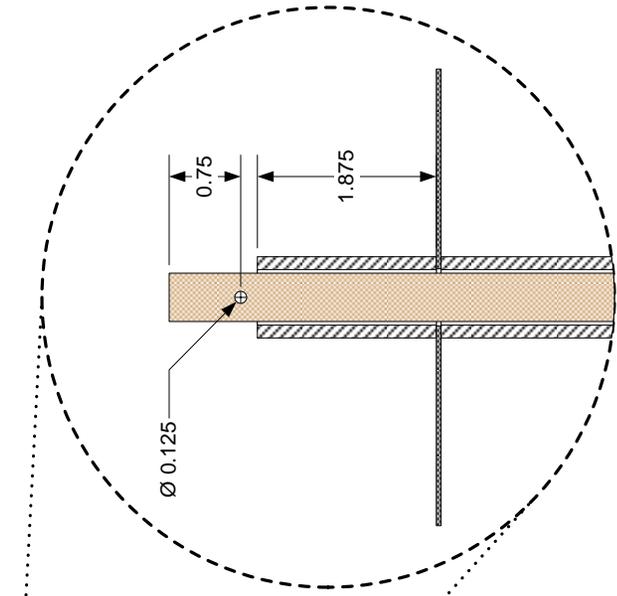
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Settlement Array Section View



Settlement Array (Expanded Section View ~ 4X)



Appendix 3. Material & Price List for COSEE TEK VIRTUE Settlement Disc Array 1.0 ~ 7/7/2016

<u>Item</u>	<u># Reg</u>	<u>Distributor</u>	<u>Distributor Part#</u>	<u>Price</u>	<u>Quantity</u>	<u>Per Unit Price</u>	<u>Total Price</u>
JVC DVD-R 4.7 GB White Inkjet Recordable Discs	8	B&H Photo	JVDMR1WH16BQ	\$39.99	100	\$0.40	\$3.20
Oak Rod, 48" Long, 1/2" Diameter	1	McMaster-Carr	96825K17	\$2.62	1	\$2.62	\$2.62
Standard-Wall PVC Pipe, 1/2 Pipe Size X 5' Length	1	McMaster-Carr	48925K91	\$2.73	1	\$2.73	\$2.73
316 SS Hairpin Cotter Pin, Fits 1/2"-3/4" Dia, 2-1/2" L	2	McMaster-Carr	92375A338	\$7.28	10	\$0.73	\$1.46
Flexible Rope - Type 550 Parachute Cord	5	McMaster-Carr	3696T38	\$4.00	50	\$0.08	\$0.40
Light Duty Plastic Snaps	1	McMaster-Carr	30655T35	\$2.86	10	\$0.29	\$0.29

Single Unit Price \$59.48 Multi-Build Price \$10.69

note: single unit pricing may be reduced by purchasing some hardware in reduced quantities at a local hardware store.

Distributor Contact Information:

P&H Photo and Video (<http://www.bhphotovideo.com>)
 McMaster-Carr (www.mcmaster.com or 609-689-3415)