

GNG1103 - Deliverable E: Project Plan & Cost Estimate

Hydroponics

Group B4

Finalize Design - Oct. 11, 2018

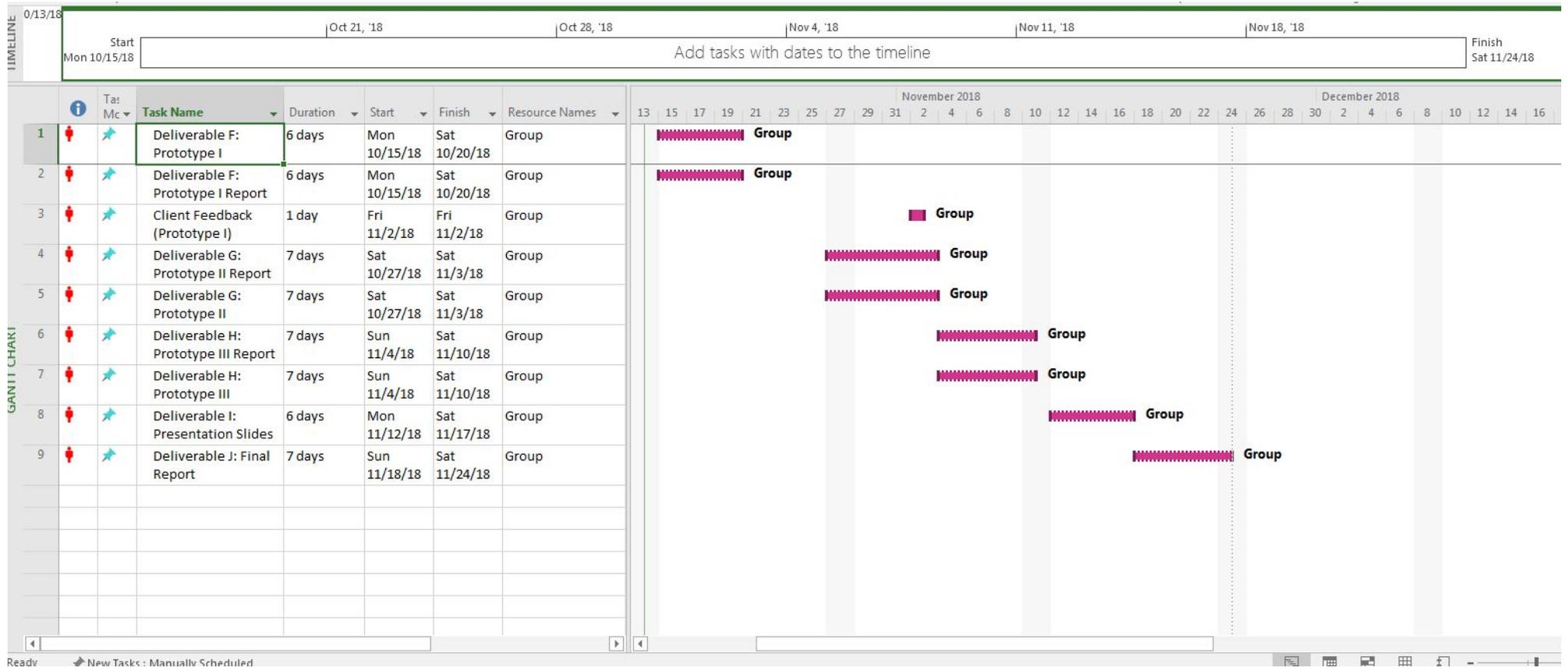
Approximately 1-2 weeks for parts to come in/buy them

FINAL Client Meeting - Nov. 2 (Have a Prototype Ready)

Build the project - approximately 2-3 lab sessions

Design Day - Nov. 28

Project Plan



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Cost Estimate:

Cost	Item	Seller
\$12.97	Strong Box Black/Yellow 102L (There are also 64L and 204L options) 29" x 20" x 15"	Home Depot https://www.homedepot.ca/en/home/p.strong-box-lockable-tote-in-blackyellow-102-l.1000706729.html
\$12.98	Pawfly 8" Air Stone Cylinder ASC200 Bubble Diffuser Airstones for Aquarium Fish Tank Air Pump and Hydroponics (Only 1, 8" Airstone)	Amazon https://www.amazon.com/Pawfly-Cylinder-Diffuser-Airstones-Hydroponics/dp/B076LYX13B/ref=sr_1_2_sspa?ie=UTF8&qid=1539539277&sr=8-2-spons&keywords=air+stone+for+hydroponics&psc=1
\$6.77	Pawfly pack of 4, 4" Air Stone Bar Bubblers	Amazon https://www.amazon.com/dp/B01MZ01SM6/ref=s_spa_dk_detail_5?psc=1&pd_rd_j=B01MZ01SM6&pf_rd_m=ATVPDKIKX0DER&pf_rd_p=f52e26da-1287-4616-824b-efc564ff75a4&pf_rd_r=Y223NHG6TZ7KFSD4DDH6&pd_rd_wg=feuof&pf_rd_s=desktop-dp-sims&pf_rd_t=40701&pd_rd_w=afYMt&pf_rd_i=desktop-dp-sims&pd_rd_r=1b6f3351-cf-db-11e8-ab44-9143b7b890b1
\$32.77	Pawfly 4 Outlet Aquarium Air Pump with Built-In Check Valve for Up to 300 Gallon Fish Tank, 12 L/Min, 6 W	https://www.amazon.ca/Pawfly-Outlet-Aquarium-Built-Gallon/dp/B07B8QDFKL/ref=sr_1_98_sspa?ie=UTF8&qid=1539551954&sr=8-98-spons&keywords=hydroponics+air+pump&psc=1

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<p>\$20.80</p>	<p>Pawfly Adjustable Aquarium Air Pump 4-LPM 2 Outlets with Oxygen Accessories for 20-100 Gallon Fish Tank Pond</p>	<p>https://www.amazon.ca/Pawfly-Adjustable-Aquarium-Outlets-Accessories/dp/B01EBXI7PG/ref=sr_1_6?ie=UTF8&qid=1539563131&sr=8-6&keywords=hydroponics+air+pump&dpID=41s892kC-CL&preST=_SY300_QL70_&dpSrc=srch</p>
<p>\$5.28</p>	<p>CANADA TUBING Polyethylene Tubing, 3/16 Inch Inside Diameter X 5/16 Inch Outside Diameter X 10 Ft Coil</p>	<p>https://www.homedepot.ca/en/home/p.polyethylene-tubing-316-inch-inside-diameter-x-516-inch-outside-diameter-x-10-ft-coil.1001002303.html</p>
<p>\$11.99</p>	<p>Pawfly 1.6" Air Stone Bubble for Aquarium Fish Tank Hydroponics Pump Ceramic Airstones Diffuser</p>	<p>https://www.amazon.ca/Pawfly-Aquarium-Hydroponics-Airstones-Diffuser/dp/B01N2YM3OR/ref=sr_1_10?ie=UTF8&qid=1539552614&sr=8-10&keywords=hydroponics+air+stone</p>
<p>12.99</p>	<p>Water valve drain 15mm diameter Looks simple and easy to use Made of plastic and is cheaper</p>	<p>https://www.amazon.ca/OUNONA-Adapter-Faucet-Connector-Fittings/dp/B07CKMZLFL/ref=sr_1_8?s=kitchen&ie=UTF8&qid=1539546910&sr=1-8&keywords=drain+valve</p>
<p>10.25</p>	<p>Brass draining valve ¾ "</p> <p>Smaller water flow but made of brass so more durable. Good reviews say that it is non leaking, can save water.</p>	<p>https://www.amazon.ca/Brass-Water-Heater-Drain-Valve/dp/B00002NCOK/ref=sr_1_16?s=kitchen&ie=UTF8&qid=1539547084&sr=1-16&keywords=drain+valve</p>

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9.30	Nylon tubing 10 feet length and $\frac{3}{8}$ internal diameter	https://www.amazon.ca/LDR-516-B3810-Braided-Tubing/dp/B004CR4OQI/ref=sr_1_2?s=kitchen&ie=UTF8&qid=1539547293&sr=1-2&keywords=tubing
\$13.76	1/2 in. Barrel Bulkhead Union with EPDM Washer	https://www.homedepot.com/p/Everbilt-1-2-in-Barrel-Bulkhead-Union-with-EPDM-Washer-800469/207176895
\$13.80	1/2 in. Brass 1/4 Turn MPT x MHT Hose Bibb	https://www.homedepot.com/p/Everbilt-1-2-in-Brass-1-4-Turn-MPT-x-MHT-Hose-Bibb-VHBQTCC3EB/205811565
\$9.05	Neo Sci 01-1177 High Impact Plastic Flower Pot, 6" Diameter (Pack of 10)	https://www.amazon.ca/Neo-01-1177-Impact-Plastic-Diameter/dp/B00FGE5P4G/ref=asc_df_B00FGE5P4G/?tag=googleshopc0c-20&linkCode=df0&hvadid=292982225180&hvpos=1o2&hvnetw=g&hvrand=6628339428159237764&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlochy=9000671&hvtargid=pla-309171878121&psc=1

Explanation of costs:

Reservoir:

The current best option for the water reservoir appears to be a 29" x 20" x 15" plastic container that can be found at Home Depot. It costs \$12.97. One problem is that we don't know what type of plastic it is made of. Some plastics are not to be used for growing plants, as toxins can leech into the water over time. We would have to confirm whether that is the case with this reservoir before purchasing

Pump:

As the device that keeps the plants alive, it is important that a quality air pump is purchased. Two pumps were found that could suit the needs of our system. The first pump is 6W and has 4 tubing connections. This means that 4 air stones can be connected to a single pump. This item can be purchased on Amazon for \$32.77. The second option is a 4W pump that includes an airline, T-connector, return valve, and 2 small airstones. The two included airstones could be small and may not be able to aerate all the water in the reservoir, so it may be best to buy additional air stones and use the included T-connector to add them to the system. Pump maximum output is 4 LPM, so if using this pump ensure that the rated LPM of all airstones sums to under that value.

Air Stones:

There are several options that would fit this project. There is a single 8-inch cylinder for \$12.98, a package of 4 4-inch rectangular air stones of lower quality for \$6.77, and there is a package of 4 1.6-inch circular air stones for \$11.99. These have good reviews, but are small. The size of air stones and their resulting effect on the amount of oxygen added to the water is unknown at this time.

Tubing:

Tubing is needed to lead from the air pump to each air stone in the bottom of the reservoir. 10 feet of polyethylene tubing with the right inner diameter to connect to the air pump and air stones costs \$5.28 at Home Depot. A clear Nylon Tubing option was listed as well.

Drainage Mechanism:

To make drainage of the reservoir during water replacements/cleaning easier, it would be best to have a valve at the bottom of the bucket that can be turned to allow drainage. The solution that was found involves a bulkhead union with washer so that leaks do not occur. A Hose bib could be attached to the bulkhead union. A bulkhead union was found for \$13.76 and a Hose Bibb was found for \$13.80. Other options are listed, but they also add significant cost to the system. Looking for cheaper alternative to this option, whether by looking for used items online, or designing and 3D printing a similar item could be effective ways to save money.

Styrofoam:

It would be smart to repurpose styrofoam found in packaging of TV's or other larger products to save money.

Planting Pots:

A package of 10 6-inch planting pots was found for \$9.05. This would allow for 8 large plants to be planted in the reservoir. Alternatively, smaller pots could be found for smaller plants.

Cost estimation option 1:

Pawfly 4 Outlet Aquarium Air Pump - \$32.77

29" x 20" x 15" plastic box - \$12.97

Pawfly 1.6" Air Stone 4 pack - \$11.99

10 feet 3/16 inch polyethylene tubing - \$5.28

Barrel Bulkhead with EPDM washer + Brass Hose Bibb - \$27.56

10 pack 6-inch plastic planting pots - \$9.05

Subtotal: \$99.62

Total: \$112.57

Updated Total without tax: \$81.37

Updated total with tax: \$91.95

If a cheaper solution was found for the drainage system, then the total with tax would be \$81.43. This option would be able to supply plenty of air to all airstones, but is costly.

Cost estimation option 2:

Pawfly Aquarium Air Pump 2 Outlets with 2 included small air stones, 6.5 feet air line, 2 return Valves, and 2 T-connectors - \$20.80

29" x 20" x 15" plastic box - \$12.97

Pawfly pack of 4, 4" Air Stone Bar Bubbler -\$6.77

Barrel Bulkhead with EPDM washer + Brass Hose Bibb - \$27.56

10 pack 6-inch plastic planting pots - \$9.05

Subtotal: \$64.18

Total: \$72.52

Updated Total without tax: \$51.21

Updated Total with tax: \$57.87

This option is well under budget, however reviews of the air pump kit state that the included air stones do not work well, and that the included tubing is low quality. Some owners have had the airline connectors on the pump snap under strain, so care would have to be taken that the unit is not damaged. The lower cost would allow us to purchase extra air stones and tubing if needed, as well as allowing more budget to go into the prototypes.