
THE



GEORGE
BARLEY

WATER
PRIZE

PRESENTED BY
EVERGLADES FOUNDATION



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1. PRIZE VISION

Save freshwater ecosystems from the plight of phosphorus pollution by developing a globally adaptable, reliable, green, and cheap process to remove phosphorus from freshwater bodies.

It must be radically cheaper than all of the currently available technologies and it must be able to reduce phosphorus when it is also present in low concentrations without negatively impacting the environment.

2. PROBLEM STATEMENT

Globally, it is estimated that the annual accumulation of phosphorus in the Earth's freshwater and terrestrial ecosystems has almost quadrupled, from around 3.5 teragrams per year before humans began mining and farming on a large scale, to around 13 teragrams per year now¹. This accumulation has accelerated the eutrophication of some of the world's major lakes, rivers, and streams. One example of the impact of eutrophication was the 2014 harmful algal blooms in the Great Lakes and the impact on the ecosystem affecting wildlife, fisheries, and humans². In New Zealand, an increase in dairy farming and fertilizer use has worsened phosphorus pollution in hundreds of shallow lakes and streams³. By 1994, the most recent date for which worldwide data is available, significant eutrophication events as a result of excessive nutrients were being reported in 54 percent of all lakes and reservoirs in Southeast Asia, 53 percent of those in Europe, 48 percent in North America, 41 percent in South America, and 28 percent in Africa⁴.

For example, the Greater Everglades – a large watershed with interconnected wetlands and water bodies stretching from Orlando to the tip of the peninsula of Florida – is also affected. It is home to the most diverse range of natural habitats in North America; however this ecosystem, like many others around the world, is heavily affected by human activity. Protecting water quality of natural water bodies is vital to the health of the unique ecosystems that they support.

The intensive use of phosphorus-based fertilizers over the last few decades is threatening the health of the Greater Everglades ecosystem and has led to a series of ecological problems. Decadal application of nutrients over-enriches the water, generating large algal blooms which stifle the oxygen supply of aquatic life and tip fragile ecosystems towards collapse⁵. A failure to protect natural ecosystems will endanger many species and lead to the loss of unique habitats. A variety of phosphorus prevention and removal methods are required to remedy the adverse environmental conditions before more irreversible damage occurs to ecosystems.

Although it is relatively cheap to spread phosphorus-based fertilizers on farms, the current technologies implemented to remove excess phosphorus reaching and polluting water bodies are prohibitively expensive. Furthermore, costs dramatically increase when cleaning water at relatively low phosphorus concentrations. Moreover, it is often logistically difficult to remove phosphorus from water under different conditions (variable temperature, flows, concentrations, etc.). The costs and logistics of current phosphorus removal technologies are extremely high, owing to large land requirements, expensive materials, and/or high capital, operating, and maintenance costs. Furthermore, to achieve healthy water bodies, technologies that can reduce phosphorus must do so without dramatically changing the background geochemical characteristics of the water.

¹ Calhoun Yael, Seideman David (2005). Environmental Issues Water Pollution. USA: Chelsea House Publishers

² Alliance for the Great Lakes (2014) "Toledo's Toxic Algae Crisis". Accessed via: <http://www.greatlakes.org/toledotoxicalgae>

³ Kelly D, Shearer K, Schallenberg M. (2013) Nutrient Loading to Shallow Coastal Lakes in Southland for Sustaining Ecological Integrity Values. Prepared for Environment Southland. Cawthron Report No. 2375.

⁴ World Watch Institute (2002). "Short-circuiting the Global Phosphorus Cycle, It's green, but it's not good for you" World Watch Magazine, March/April 2002, Volume 15, No. 2

⁵ Orem H. William (2009). "Pollutants threaten the Everglades' future". Earth Magazine Friday February 20th



3. PRIZE STATEMENT

There is a spectrum of possible solutions to the problem of excessive phosphorus entering aquatic ecosystems. These range from implementing best management practices in agricultural and urban settings to downstream integration of constructed wetlands that filters waters through natural processes.

New, cheaper and more adaptable techniques are required to remove excess phosphorus from impaired fresh water bodies worldwide. An adaptable solution needs to process water from a range of sources in both static and flowing aquatic environments under variable conditions. This technology could augment or be an alternative to on-farm or urban management practices. In certain areas this technology could offer an alternative to downstream constructed wetlands where large parcels of land aren't available or cost is prohibitive.

The Grand Prize of **\$10 million** will be awarded to the innovation that:

- Is radically cheaper to build and run than currently available removal technologies;
- Removes enough total phosphorus from contaminated freshwater to achieve healthy water bodies;
- Is capable of removing excess phosphorus even when it is present at low-concentrations;
- Does not negatively impact the environment, and abides by appropriate regulations;
- Works in cold and warm conditions;
- Demonstrates adaptability through its easy onsite construction and deconstruction;
- Is capable of scaling to handle large flows of water

The winner will prove that their innovation works under the challenging test conditions of the Greater Everglades. In the event that the Grand Prize winning criteria is not achieved, a Secondary Prize of \$250,000 will be awarded to the contestant that meets the Secondary Prize criteria.

In addition, a \$170,000 prize purse will be awarded to the Grand Prize contestants that demonstrate the greatest value from their by-products while still cost-effectively removing phosphorus and without negatively impacting the environment.

Leading up to the Grand Challenge Stage, there will be three Stages (Stage 1, Stage 2 and the Pilot Prize Stage) in which contestants will compete to win increasing prize purses as detailed in this Prize Design Report.

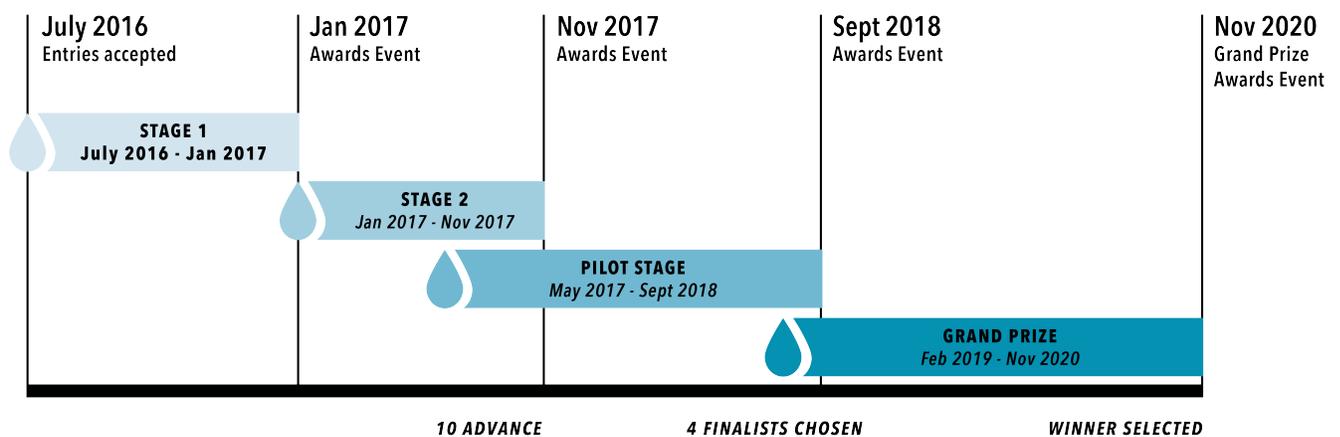


4. PRIZE TIMELINE & STRUCTURE

Stage 1, Stage 2, and the Pilot Prize aim at building a community working together toward the development of successful technologies while competing against each other in similar conditions. The stepwise nature of the prizes mimics the natural stages of technology development and optimization, and helps contestants translate early stage ideas into commercially successful technologies.

In the final stage, the Grand Challenge, up to four teams will compete for the Grand Prize of \$10m, by demonstrating their technology at scale in the Kissimmee River or in a comparable water body as determined by the challenge administrators.

TIMELINE:



As competitors advance throughout the stages, the winning criteria become progressively more difficult and are designed to push competitors to innovate.

All prize stages and requirements will be overseen by the challenge administrators. The challenge administrators are two separate entities, the Everglades Foundation and prize manager Verb, Inc. References herein to “challenge administrators” are intended to refer to Everglades Foundation and/or Verb, Inc.

The challenge administrators reserve the right to reschedule and/or rework any requirements for the prize, especially as caused by broken or malfunctioning equipment, natural disasters, drought, floods, hurricanes, terrorism or acts of God affecting the prize outside of and beyond the challenge administrators’ control.



PRIZE CRITERIA TABLE:

	STAGE 1	STAGE 2	PILOT	GRAND PRIZE
Total Prize Purse	\$35,000	\$80,000	\$800,000	\$10 Million Grand Prize \$250,000 Secondary Prize \$170,000 Phoenix Prize
# of Target Entries	No Limit	No Limit	10	4
Years	2016- 2017	2017	2017-2018	2018-2020
Testing Duration	NA	2 weeks	3 months	14 months
Judging Periods	Phase 1: Aug 31-Sept 15 Phase 2: Oct 31-Nov 15 Phase 3: Dec 30-Jan 16	Pilot Qualifiers: Sept 1- Sept 30 Stage 2: Sept 30-Nov 1	Pilot: Jun 29-Aug 1	Grand: Sept 30 - Oct 30
Materials to be reviewed	<ul style="list-style-type: none"> • Performance indicators • Experiment description • Environmental outcome assessment • Overall presentation 	<ul style="list-style-type: none"> • Total phosphorus (TP) lab results • Time stamped video • Environmental outcome assessment • 2-page scalability plan summary 	<ul style="list-style-type: none"> • TP results from pilot testing • Cost calculations • Background water characteristics • Waste disposal plan • Environmental outcome assessment • 20-page scalability plan 	<ul style="list-style-type: none"> • TP results from grand stage testing • Cost calculations • Background water characteristics • Waste disposal plan • Environmental outcome assessment • By-product recovery income plan • 20-page scalability plan
Scoring Areas	<ol style="list-style-type: none"> 1. Phosphorus Removal 2. Environmental Sustainability 3. Overall Presentation 	<ol style="list-style-type: none"> 1. Phosphorus Removal 2. Environmental Sustainability 3. Scalability 	<ol style="list-style-type: none"> 1. Cost 2. Phosphorus Removal 3. Environmental Sustainability 4. Scalability 	<ol style="list-style-type: none"> 1. Cost 2. Phosphorus Removal 3. Environmental Sustainability 4. Scalability 5. By-Product Recovery Income



5. GRAND CHALLENGE

The final ‘Grand Challenge’ stage of the George Barley Water Prize will be the robust testing of contestants under field conditions in the Greater Everglades to validate whether these leading technologies can remove phosphorus from the Kissimmee River or a comparable water body under real conditions at significantly lower cost than currently possible.

5.1 - Overview

Contestants will qualify from the Pilot Prize to compete against each other in the Grand Challenge for a period of fourteen months with testing starting May 2019. Teams will be responsible for testing their technologies in a real field application, under comparable water composition and flow regimes. Challenge administrators will supervise the testing. Daily random sampling of inflow and outflow treated water will be taken during this period and results will be compiled into monthly flow weighted mean total phosphorus concentration averages.

To win the Grand Challenge, contestants must achieve an average outflow weighted mean (FWM) total phosphorus (TP) concentration of 10 parts-per-billion (ppb) or below over the duration of the Grand Prize Stage and an average monthly FWM TP concentration not exceeding 15ppb more than twice in the duration of the Grand Challenge. Moreover, phosphorus must be removed at a not-to-exceed cost threshold as provided in Appendix A.

The total footprint area for the technology must be less than 1 acre, and effluents and residuals management must meet all Florida Department of Environmental Protection (FDEP) 62.302 discharge / management requirements as set forth in the individual technologies’ respective permit requirements (per Chapter 62.302 of the Florida Administrative Code (FAC)). Contestants will be required to process on average two (2) million gallons per day (MGD), with a flow variability ranging from no flow (0 MGD) to four (4) MGD over the 14 month period. The flow hydrograph is provided in Appendix B.

5.2 - Prize Fund

\$10 million will be awarded to the winning contestant, based on the scoring criteria below.

If two or more contestants meet the minimum criteria and finish with the same score after the first tie breaker, the Grand Prize winning contestant will be the one with the lowest cost per kilogram of total phosphorus (TP) removed.

If no contestant meets the Grand Prize criteria, a Secondary Prize of \$250,000 will be awarded to the contestant that: 1) meets phosphorus removal criteria listed in Section 5.4B; 2) meets environmental sustainability criteria listed in Section 5.4C; 3) meets scalability criteria listed in Section 5.4D; and 4) has the lowest cost amongst the contestants.

If no contestant meets the Secondary Prize criteria, neither the Grand Prize nor the Secondary Prize will be awarded.

5.3 - Qualification Criteria

A maximum of four contestants will qualify and be selected to compete for the Grand Challenge based on their performance in the Pilot Prize as judged by the judging panel.

To be eligible to enter the Grand Challenge, contestants will be required to demonstrate that they have been granted all required permits for construction and operation by the FDEP and all other federal and state agencies, as well as compliance with all relevant environmental and health and safety legislation



and appropriate procedures. Contestants will be responsible for acquiring all permits associated with competing in the Grand Challenge Stage prior to the commencement of the Grand Challenge Stage. The Everglades Foundation will assist contestants with understanding permit requirements, refunding the costs of permit application and engaging with FDEP. If contestants are having problems with permit acquisition, or it is envisioned that permits may delay the Grand Challenge Stage, the challenge administrators will determine whether to delay the final Grand Challenge Stage.

The total footprint area for the technology must be less than 1 acre (4047 m²), create less than 2 acres of impervious surface area, and result in less than 10 acres of land being impacted (through requirements for assembly, disassembly and maintenance.)

5.4 - Judging Criteria & Assessment

The criteria provided below describe the standards that contestants must meet to win the Grand Challenge (\$10m) of the George Barley Water Prize. Contestants must show:

A. COST

A1 Cost per kilogram of total phosphorus removed [Pass/Fail] [Marks 0-5]

The winning technology must achieve a breakthrough in low-cost removal of total phosphorus (TP) from water. The contestants will compete to provide the cheapest innovation with a cost that meets or falls below the do-not-exceed cost threshold listed in Appendix A.

The challenge administrators and designated independent financial auditors will collect cost information beginning in Stage 2 and throughout the Pilot Prize. Should the challenge administrators determine, in their sole discretion, the Grand Prize do-not-exceed cost target is unachievable, they may increase the do-not-exceed cost threshold.

Method of Assessment:

Costs will be assessed periodically throughout the Grand Challenge Stage. Costs will be monitored by an independent financial auditing partner, to be appointed by the challenge administrators.

Costs include but are not limited to:

Capital costs: Contestants' capital costs required to set up the technology in order to run over a 20-year period. Capital costs will take into account the technology's useful life and incorporate necessary costs to upgrade or replace the technology across the 20-year span. Capital costs must take into account and appropriately capitalize heavy equipment, research and development, design and engineering costs, construction and other set up costs and decommissioning costs per generally accepted accounting principles.

Operation and Maintenance costs: Contestants will provide the cost information on the costs necessary to run the technology both during the Grand Challenge Stage and provide cost estimates for running annually over 20 years. Costs include labor; energy; fuel; water; chemicals/materials/consumables; treatment/disposal of waste and replacement costs.

Contestants may also submit potential income associated with the sale of value added by-products, but this will be broken out separately from the operating and capital costs and will not factor into the Grand Prize cost calculation winning



criteria. Challenge administrators working with a team of experts will compare the income to a standard value based on market prices in the U.S. for each of the common by-products.

Total cost will then be measured against the calculated TP removed during the Grand Challenge Stage in order to capture a cost per kilogram of TP removed.

The cost assessment procedure is outlined below:

1. **COST MODEL** - A cost model will be provided outlining a consistent methodology for contestants to input their costs. This model will include an explanation of **assumptions** that have been made and **standard rates**, where appropriate. The cost model and associated standard rate assumptions will be made available to contestants at the start of the Pilot Prize. Contestants will be required to use the cost model to determine the cost of their technology.
2. **CAPITAL COSTS** - Using the cost model, contestants will submit their capital costs to set up and run the technology over a 20-year life. Capital costs will be amortized over a 20-year life using a standard discount rate to be provided as a key assumption. The discount rate will be based on prevailing rates used to assess water projects in the U.S.
3. **CAPITAL COSTS: AUDIT** - An independent financial auditing partner chosen by the challenge administrators will undertake an audit of the submitted capital costs to ensure that they are accurate. Contestants will be expected to work with the auditors and provide answers and information to determine the capital costs.
4. **OPERATION AND MAINTENANCE COSTS** - Every quarter, contestants will submit their Operation and Maintenance costs into the cost model. All invoices from suppliers must be submitted by contestants along with Operation and Maintenance costs.
5. **OPERATION AND MAINTENANCE COSTS: AUDIT** - On a quarterly basis, the independent financial auditing partner will undertake an audit of the submitted Operation and Maintenance costs to ensure that they are accurate. Contestants will be expected to work with the auditors and provide answers and information to determine the operating costs.
6. **JUDGING PANEL** - The independent financial auditing partner will produce a report outlining the total costs, the cost per kilogram of TP removed and other relevant information relating to cost. This will be submitted to the judging panel for their consideration and scoring.

To receive a passing mark, contestants must demonstrate that their cost per kilogram of TP removed as calculated per the cost model and audited by the independent financial auditor does not exceed the cost threshold set by the challenge administrators and outlined in Appendix A.

To calculate the 0-5 score, the cost (A1) is scored as follows:

- The contestant with the lowest cost per kilogram (and not exceeding the cost threshold), will be awarded 5 points.
- The contestant with the highest cost per kilogram (but not exceeding the cost threshold) will be awarded 1 point.
- Contestants that exceed the cost threshold will receive 0 points and do not qualify for the Grand Prize.
- Contestants with costs below the cost threshold and between the highest and lowest costs will have a point score that is proportional based on the standard formula $Y = mX + b$ where Y equals the to be calculated point score, m is the slope of the line between the known highest and lowest points and costs, X equals the contestant's cost and b equals the Y intercept.



Non-disclosure agreements will be signed by the Everglades Foundation, judging panel members, independent financial auditors, challenge administrators and any other person that may require access to financial information.

Supporting evidence:

The following documentation must be completed and submitted by contestants:

Capital cost worksheet provided by the challenge administrators

Operation and Maintenance cost worksheet (Quarterly) provided by the challenge administrators

The following documentation will be completed by the independent financial auditing partner for each contestant and submitted to the judging panel and the challenge administrators:

Audit Report - Capital costs

Audit Report - Operation and Maintenance costs (Quarterly)

Final Cost Analysis Report

B. PHOSPHORUS REMOVAL

Contestants must demonstrate that their treatment can reduce total phosphorus (TP) to very low concentrations consistent with historic natural background levels in the Everglades and in Ontario lakes. Contestants will be provided historic average total phosphorus concentrations for planning considerations. If the Kissimmee River site is selected for the final test, the last 40 years observed daily TP concentrations ranging between 30 and 450 ppb, and contestants will be expected to meet the following removal criterion:

B1 Achieve low total phosphorus concentrations [Pass/Fail]

The technology must achieve 1) an average outflow weighted mean (FWM) total phosphorus (TP) concentration of 10 parts-per-billion (ppb) or below over the duration of the Grand Challenge and 2) an average monthly FWM TP concentration not exceeding 15ppb more than twice during the duration of the Grand Challenge. **Should the challenge administrators determine, in their sole discretion, the Grand Prize do-not-exceed 10 ppb / 15 ppb total phosphorus concentration targets are unachievable, they may increase the concentration targets.**

Method of Assessment:

The judging panel will determine whether each contestant has met the stated reduction goal of a FWM TP concentration of 10 ppb as follows.:

Inflow and outflow samples will be taken randomly daily for the duration of Grand Challenge. Daily inflow TP concentrations will be assumed constant among all four contestants for any given day. The standard operating procedures (SOPs) for sampling will include:

- 250 ml water sampling containers, labeled with contestant name and date and time of sampling.



- Sample containers will be acid washed prior to sampling, and placed mid-stream of effluent discharge. Sample container will be washed twice with effluent discharge and sampled on third sampling event. Similar protocol will occur for the inflow sample.
- A second sample, under the same SOPs will be taken as a duplicate where necessary, as determined by the challenge administrators.
- All samples will be appropriately preserved by freezing shortly after collection on site.
- A DI Water blank (Blank) will also be created and placed with sample set.
- All samples will be placed in a cooler, with dry ice, along with a temperature blank and thermometer and sent to a certified third party testing laboratory where the samples will be thawed for testing.

The sampling process described above will be carried out by or on behalf of the challenge administrators.

Samples will be tested for total phosphorus utilizing standard operating procedures in a third party certified testing lab. Samples will take up to 28 days for analysis and processing. Duplicate samples will only be tested as necessary, as determined by the challenge administrators. Blanks will be processed under the same SOPs. Total phosphorus data will be provided to challenge administrators, and the challenge staff will then provide each contestant with the data resulting from the analysis of its samples as soon as the data has passed quality assurance/quality control protocol (QA/QC). If Blanks are found to be contaminated in a certain sample, and no duplicates were collected on that day, the TP concentration average of the immediately preceding day and immediately following day will be taken as the TP concentration for that sample.

Flow measurements of contestants will be verified daily by challenge staff. Additional weekly flow measurement will be random and will occur on the same day for all contestants. Contestants will also have to have flow monitors on all discharge outlets, with flow being recorded electronically on an hourly basis. Flow data records must be submitted to challenge staff weekly. Challenge flow measurements will be compared against flow records to determine level of accuracy of measurements.

To receive a passing mark, contestants must meet the do-not-exceed TP concentration target as stated above.

C. ENVIRONMENTAL SUSTAINABILITY

The technology must not negatively alter background water quality characteristics such as pH, hardness and electrical conductivity and it must also minimize environmental pollution, including from any by-products resulting from the TP removal process. Any waste product that is created must be safely disposed of. Water quality parameters in the Kissimmee River are provided in Appendix B.

C1 Background water quality characteristics [Pass/Fail]

The technology must not alter the background water quality/characteristics as set out in the Florida Department of Environmental Protection's (FDEP) Florida Class III Freshwater Water Quality Standards⁶ and according to all permit compliance requirements specific to the technology. Characteristics include, but are not limited to:

Water chemistry: pH, nitrogen, sulfates, metal content, total suspended solids, alkalinity, salinity, dissolved oxygen, temperature, turbidity, color, calcium, etc.

⁶ <https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-302>



Ecosystem: water quantity, fish entrainment during pumping.
Accident risks: Potential risks to water quality in case of accident and incident.

Method of Assessment:

All contestants will have submitted toxicity samples from the Pilot Prize for analysis to receive their respective NPDES Industrial Wastewater Discharge permits. Each contestant will have specific and case-by-case testing to be completed during the Grand Prize Stage. Toxicity assurance testing will be based on FDEP requirements, as well as permit compliance requirements, and sent to an approved Florida toxicology laboratory for testing. Toxicity samples will be collected at random from contestants' discharge outlets by challenge staff. Challenge staff will follow appropriate QA/QC handling, storage and chain of custody SOPs, and will provide DI water Blanks for comparison. All contestants will be sampled at substantially the same time. Judging will be based on receipt of the NPDES permit, the passing of required tests per the permit, the passing of exceedance frequency of the parameters indicated in the permits, and the quality of the contestant's environmental sustainability report as outlined below.

Additional supporting evidence:

Contestants will provide an environmental sustainability report that outlines the results of toxicity tests and any other tests required by their permits. The report will summarize the overall impact on the environment and shall include, but which need not be limited to, the technology's energy consumption during the Grand Prize Stage.

C2 Waste disposal [Pass/Fail]

Any waste product that is created must be disposed of safely without negatively impacting the environment. This includes the fate and toxicity of chemicals, materials, waste and by-products and the impact of waste generation on biodiversity. All permits associated with waste disposal will have to be secured prior to the commencement of the Grand Prize Stage of the Challenge.

Method of Assessment:

Contestants will have to keep an accurate record of any chemical use. Chemical use must be receipted to challenge staff, and residuals management accounted for. Residuals disposal fees (e.g. distance to disposal, and cost per ton of disposal of respective residuals) will be determined for all contestants by the challenge administrators. Disposal of material that would require a special permit, or a landfill other than the normal disposal area, will incur additional costs as deemed by challenge staff based on logistics of travel, permit costs, and residuals acceptance charges. Judges will grade this section based on two criteria: 1) whether contestants had an appropriate plan for residuals management as outlined below; and 2) whether and to what extent they executed on that plan. Costs will not factor into this section but will go into the cost threshold calculation.

Additional supporting evidence:

Contestants producing residuals will need to create and implement a residuals management plan. A residuals management protocol is required by FDEP for permitting, and will also be required by challenge administrators. A residuals management plan must take into consideration risks and remedies for waste tank failures, spills, and other factors that may compromise the integrity of the residuals management systems.

C3 Value-added by products [Pass/Fail]

Contestants will be required to describe or demonstrate how their technology generates or has the potential to generate by-products that have potential income.

Method of Assessment:



Contestants will provide a summary report that lists the value-added by-products that their technology generates and how they are able to or have the potential to generate income from the by-products.

To receive a passing mark for Section C, C1, C2 and C3 must receive passing marks.

D. SCALABILITY

The technology must have potential to scale and be used extensively without disproportionate costs.

D. Scalability plan [Pass/Fail and Marks 0-5]

Teams must submit a business plan of no more than 20 pages, covering the following points:

- Financial and business sustainability
- Results of financial audit including operation and maintenance and capital costs
- Amount of private/public funding received to date
- Scalability of Technology
- Ability of technology to scale to water volumes 100x average flows of Grand Prize Stage
- Ability of technology to handle higher and lower concentrations of total phosphorus
- Environmental sustainability including residuals management, size of footprint and energy consumption as the technology scales
- Ability of technology to generate value-added by-products and generate income at scale
- Financial forecasts that capture costs and revenues to achieve scale (capital and operating and maintenance costs as well as revenue and costs from by-products)
- Detail of any additional capital or operating costs required to scale that were not applicable in the Grand Stage testing costs including, for example, land acquisition costs
- Implementation Plan
- Proposed use of winning funds
- Implementation plan including set up and scale up
- Sales and marketing strategy, both for the technology and any value-added by-products
- Key implementation milestones
- Intellectual Property strategy

Method of assessment:

The judging panel will make an assessment of the scalability of the contestants' solutions, based on the submitted business plans, and will award two marks – both a Pass/Fail and a score from 0 to 5 for each contestant. The judging panel will determine first if the contestant provided sufficient information to indicate the scalability of the technology and give either a Pass or Fail mark. Second the judging panel will grade the scalability plans on a 0-5 scale with a score of 0 corresponding to a Fail mark, and 5 being the highest and best score.

E. INCOME FROM BY-PRODUCTS

E. By-Product Net Income [Marks 0-5]

Contestants will be asked to submit how their technologies can generate positive net income from selling value added by-products. Judges will assess and score as part of the tie break



process the teams' submissions based on the ability to generate the greatest net income from demonstrating the potential sale of value-added by-products that are created during the Grand Prize Stage. Teams will show that the technology and operating plan can deliver net positive income after factoring in the costs of recovering, selling, marketing and distributing the products. The supporting information requested below will be used to calculate a net value per KG of TP removed and to provide an overview of the recovery and marketing approach.

Method of assessment:

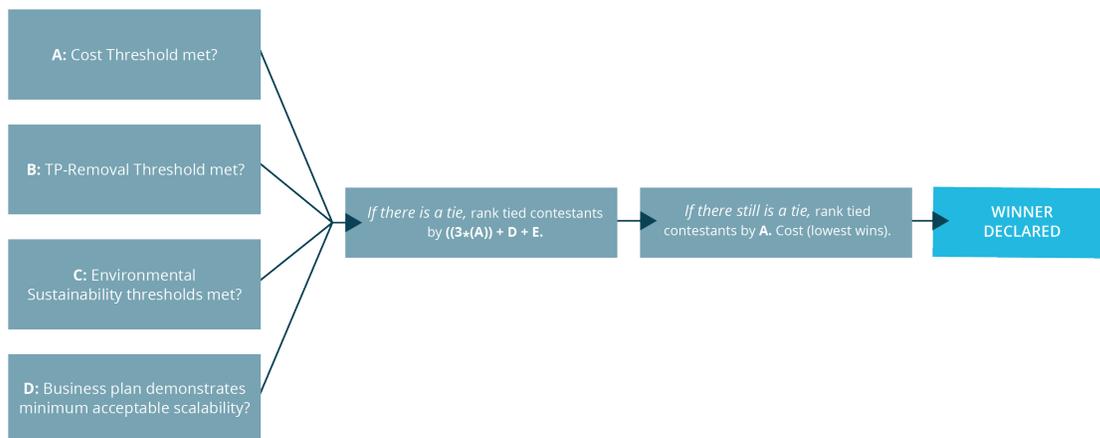
Teams will submit a summary that shows the technology's potential to deliver positive net income for the recovery and resale of TP and/or other by-products. The judging panel will score the contestants based on the quality and outcomes of the supporting information listed below. The judging panel will score the submission on a 0-5 basis with 5 being the highest score.

Supporting information required:

Contestants will be required to submit the following information to validate the value of the by-product:

- Prior to the commencement of the testing: a list of by-products that they wish to be considered in the calculation.
- A valuation analysis of the generated by-product, including market analysis demonstrating the demand and market value of the by-product in various sectors.
- The estimated costs associated with converting the by-products to be resold including manufacturing, marketing, distribution and other selling costs.
- Costs and potential sales value will be compared to prevailing US market prices and verified by an independent auditor appointed by challenge administrators.
- Summary total net income per KG of TP removed

DECLARING A WINNER



The Grand Prize is awarded to the contestant who achieves a passing mark for cost threshold, TP removal, environmental sustainability and scalability.

If more than one team meets these criteria, they are ranked according to the following formula:

$$3(A)+D + E$$



Should more than one team have the same score, the winner will be decided based on which of the tied contestants has the lowest (A) cost per kilogram of total phosphorus removed.

The challenge administrators reserve the right to reschedule and/or rework any requirements for the prize, especially as caused by broken or malfunctioning equipment, natural disasters, drought, floods, hurricanes, terrorism or acts of God affecting the prize outside of and beyond the challenge administrators' control.

SECONDARY PRIZE

If no contestant meets all the judging criteria to win the Grand Prize, a Secondary Prize of \$250,000 will be awarded to the contestant that achieves the following: 1) meets total phosphorus removal criteria; 2) meets environmental sustainability criteria; 3) meets scalability criteria; and 4) has the lowest cost amongst the contestants.

If no contestant meets the Secondary Prize criteria, neither the Grand Prize nor the Secondary Prize will be awarded.

5.5 - Phoenix Prize

\$170,000 will be awarded to the Grand Challenge contestant that can demonstrate the greatest value of the by-products they produce. Prices and marketability will be verified by an independent auditor. Challenge administrators working with a team of experts will provide a standard rate for the common value added by-products.

This Phoenix Prize exists to incentivize, recognize and reward a broad range of solutions to the problem of phosphorus recycling without any preconceptions about how these might work. For instance, contestants may win through producing and demonstrating the potential sale of unusually valuable and pure value-added by-products. Any value-added by-product that is produced by the technology (for instance recovered phosphorus, algae, or heat generated) is eligible.

Determining a winner:

The judging panel will assess and rank the contestants' submissions and determine the winner to be the contestant demonstrating the greatest potential sale of value-added by-products. To win the Phoenix Prize, the winner must show that the technology and operating plan will deliver net positive income after factoring in the costs of recovering, selling, marketing and distributing the products.

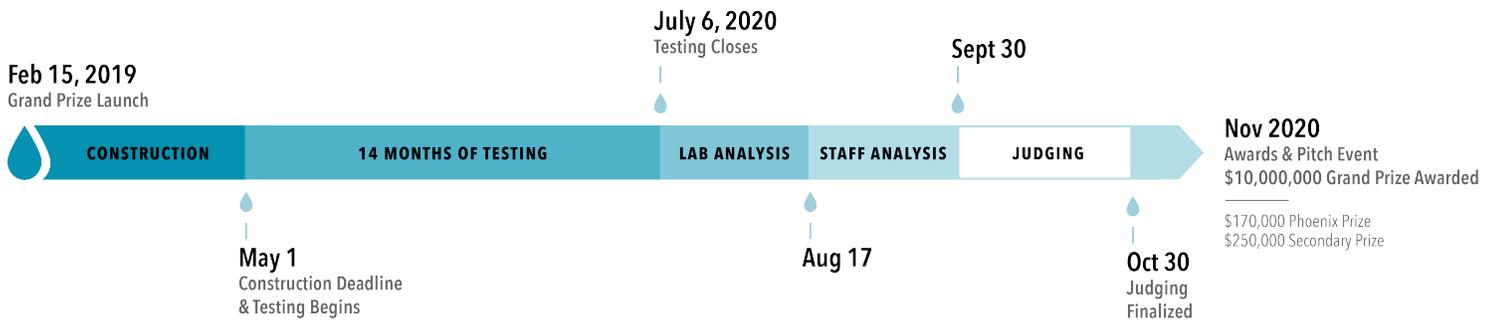
Supporting information required:

Contestants will be required to submit the following information to validate the value of the by-product:

- Prior to commencement of the testing: a list of by-products that they wish to be considered in the calculation.
- List should include type of by-product, quality/composition, estimated quantity and estimated market potential value across sectors as applicable. Contestants will complete a worksheet provided by the challenge administrators.
- Documentation in the form of lab analysis results, metering, etc. will aid judges in the verification of recovered by-products.
- A description of the recovery mechanisms used.
- A scaled by-product cost model of sales and a market analysis as the volume of water treated increases.
- An independent auditor appointed by challenge administrators will audit and verify the results by comparing the potential sale values to prevailing US market prices.



5.6 – Timeline: Grand Challenge: February 2019 – November 2020



6. STAGE 1

The first stage of the George Barley Water Prize will be launched in July 2016. Anyone meeting the Eligibility Criteria as outlined in the Rules and Terms and Conditions can compete and a total of \$35,000 will be awarded to the contestants that demonstrate the most promising early-stage ideas. There will be three phases for judging, one at the end of each Stage 1 Phase, including a possible Pitch Event at the end of Stage 1 Phase 3.

6.1 - Overview

Stage 1 aims to incentivize the demonstration and development of new ideas that can be further improved and 'scaled-up' at later stages of the Challenge. Contestants will be encouraged to compete from the widest possible pool of innovators. The function of this stage is to:

- forge a spirit of **competition** to encourage researchers and businesses from within and from outside of the field by showcasing, comparing and rewarding promising early-stage technologies,
- create a **collaborative community** of innovators and engage researchers, technologists and companies on the topic and
- **select and qualify** early-stage promising technologies to the later stages of the Challenge.

Contestants will be asked to describe the use of their technologies in reducing total phosphorus (TP) (not only focusing on soluble reactive phosphorus) in water. Contestants are required to highlight the geochemical characteristics of the processed water to showcase its discharge readiness. Outcomes of testing are submitted to the George Barley Water Prize website in the form of a written report. Additionally contestants will complete a set of profile questions and provide answers to questions related to their experiment design approach.

The judging panel will provide feedback on the submissions that may guide contestants to make improvements to their technologies.

Contestants will compete against each other during Stage 1's three phases, culminating at the end of the Stage (6 months) with a \$25,000 reward for the highest and best score across all phases in Stage 1.

6.2 - Prize Fund

A \$5,000 Prize will be awarded to the contestant who achieves the best score in Phase 1 of Stage 1 (July 21 – August 31, 2016).

A \$5,000 Prize will be awarded to the contestant who achieves the best score in Phase 2 of Stage 1 (September 1 – October 31, 2016). This score does not have to be better than the Phase 1 winner to win the Phase 2 award.

The winner at the end of Phase 3 (November 1 – December 30, 2016) who has achieved the highest and best score at any point over the entire Stage 1 is awarded \$25,000.

Prize money is awarded without restrictions.



6.3 - Qualification Criteria

There are no restrictions on entry, however, all contestants must agree and adhere to the rules listed in the Terms and Conditions. Contestants can submit one entry per Phase. A contestant entering in Phase 1 who does not win a prize may enter again into any later Phase in Stage 1. All entries will be considered for the third phase assessment as long as new Phase 3 entries are entered by the commencement of the Phase 3 assessment.

6.4 - Judging Criteria & Assessment

Contestants will be judged on the information given in their submission, applying the judging criteria below. Contestants will be judged on the following categories:

1) outflow TP concentration; 2) percentage reduction in TP concentration; 3) quality of experiment design ;4) environmental impact and 4) overall presentation of their approach.

In Stage 1, contestants will provide Performance Indicators that show both total percentage reduction in TP and remaining outflow TP concentrations. As part of the Experiment Description, contestants will describe how their technologies could perform well when treating water with other physical-chemical parameters other than TP. In the environmental impact section, contestants will describe their technology's environmental impact and sustainability. Lastly, contestants will be assessed based on the overall presentation of their approach.

In later stages of this competition, contestants will deal with different types of water, and as such are advised to check Appendix B for Kissimmee River water quality parameters and Appendix C for the testing site water quality parameters in Ontario, Canada.

Contestants will complete Sections A1, A2, A3, B and C detailed below in the Stage 1 Application Form.

A. PHOSPHORUS REMOVAL

Method of Assessment:

Contestants will be judged on the following categories: 1) outflow TP concentration; 2) percentage reduction in TP concentration and 3) quality of the experiment.

Supporting evidence:

As part of their submission, Contestants must submit total phosphorus removal (**A1 and A2**) **Performance Indicators** and an (**A3**) **Experiment Description**. This includes:

A1 and A2 Performance Indicators

- Inlet/outlet TP concentrations. Submitted data may represent an average or point in time [Marks 0 –5]
- Percentage decrease between inlet and outlet TP concentrations [Marks 0 – 5]

A1 and A2 Scoring will be determined using the following formulas:

To calculate the 0–5 score for lowest TP outflow concentration (A1):

- The contestant with the lowest concentration will be awarded 5 points.
- The contestant with the highest concentration will be awarded 1 point.
- Contestants with concentrations between the highest and lowest concentrations will have a point score that is proportional based on the standard formula $Y = mX + b$ where Y equals the to be calculated point score, m is the slope of the line between the known



highest and lowest points and concentrations, X equals the contestant's concentration and b equals the Y intercept.

- Contestants that do not provide a result will receive 0 points.

To calculate the 0–5 score for greatest TP percentage reduction (A2):

- The contestant with the greatest percentage reduction will be awarded 5 points.
- The contestant with the lowest percentage reduction will be awarded 1 point.
- Contestants with percentage reductions between the highest and lowest percentage reductions will have a point score that is proportional based on the standard formula $Y = mX + b$ where Y equals the to be calculated point score, m is the slope of the line between the known highest and lowest points and percentage reductions, X equals the contestant's percentage reduction and b equals the Y intercept.
- Contestants that do not provide a result will receive 0 points.

A3 Experiment Description [Marks 0-5]

- Materials/equipment/conditions
- Duration of testing
- Availability of the materials used
- Batch/continuous mode
- Lab testing protocols and the QA/QC
- Frequency and methods of analysis/sampling
- Inflow water physicochemical characteristics
- Type of phosphorus removed
- Volume/flow of water treated

Contestants will be scored on the quality and completeness of their answers.

Supporting evidence could include, but is not limited to: peer-reviewed published research information, technical reports, peer-review evaluations, open cost-models of production and implementation, and beta-test results.

B. ENVIRONMENTAL SUSTAINABILITY

Method of Assessment:

Contestants will be judged and scored based on the potential environmental impact of the technology from their submitted experimentation results.

Supporting evidence:

Contestants will submit an (B1) **Environmental Outcome Assessment** outlining the potential impact of the technology. This will include:

B1 Environmental Outcome Assessment [Marks 0-5]

- Alteration to and impact on major water chemistry parameters (pH, N, metals, alkalinity, sulfates...);
- Formulation of all chemicals used during the process;
- Fate of chemicals/materials used;
- Toxicity of chemicals and materials used;
- List any potentially recoverable by-products;
- List any waste and its fate/disposal;
- Alignment of discharge effluent with FDEP Class III water standards.



C. OVERALL PRESENTATION

Method of Assessment:

Contestants will be judged and scored based on their overall summary that includes their profile submission (as referenced below), their description of their approach and how their submission can be an effective technology to remove excess phosphorus.

Supporting evidence:

Contestants will complete their profile on the George Barley Water Prize competition website and submit an **Overall Presentation Summary** describing the technology, providing a background story on the technology and providing insights on the potential viability of the technology for commercialization. This will include:

C1 Overall Presentation Summary [Marks 0-5]

- Completion of online profile
- Technology description summary
- Assessment of the viability of the technology (commercial viability, implementation feasibility)
- Recommendations on how technology would be marketed
- Summary of why this approach is innovative
- Background and inspiration as to why the applicant chose this technology
- Video summarizing and highlighting the contestant and team and describing the innovative solution

SCORING

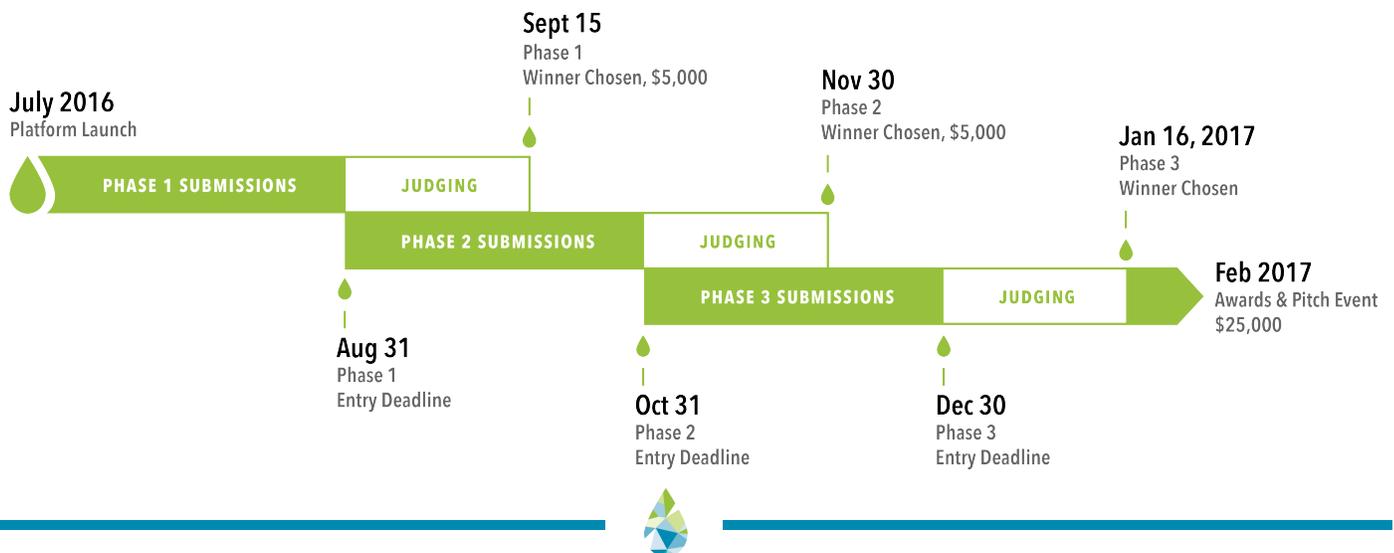
Contestants will receive a Stage 1 score using the following scoring formula:

$$(A1+A2 +A3+B) + 4(C)$$

For sections A1 and A2, point calculation is detailed above and gives highest scores to contestants that show lowest outflow TP concentration and for those that show greatest percentage reduction in TP. For sections, A3, B and C, judges will assign scores based on the quality and completeness of answers.

The contestant with the highest total score will win each Phase. For Phase 3, the challenge administrators may also ask the top teams to pitch their proposals at an Everglades Foundation event.

6.5 Timeline: Stage 1: July 2016 – January 2017



7. STAGE 2

Stage 2 of the George Barley Water Prize will be opened for applications in January 2017 following the conclusion of Stage 1. Anyone can compete pursuant to the Eligibility Criteria detailed below and a total of \$80,000 will be awarded among the top three contestants (as set forth below) that perform the best in consistent testing conditions. Two-week testing runs will be carried out by teams at any point up to August 31, 2017.

7.1 - Overview

Stage 2 aims to incentivize the demonstration and development of new ideas that can be further improved and 'scaled-up' at later stages of the Challenge Program. Contestants will be encouraged to compete from the widest possible pool of innovators. The function of this stage is:

- To **test the technologies** under similar conditions, providing better scope for comparison and competition.
- To **judge, reward and select promising technologies** for the later rounds of the Challenge Program.
- To provide contestants the opportunity to test their technologies against a set of water quality parameters.
- To help contestants gain a **better understanding** of their own processes.

Contestants will be testing their technologies in their own laboratory facilities adhering to and documenting quality assurance, quality control (QA/QC) protocols. Contestants will be sending their samples to certified laboratories of their choosing (subject to any laboratory being disqualified by the challenge administrators in their sole but reasonable discretion) in their respective countries, and/or states.

The Stage 2 Prize testing period will be open until August 31, 2017. From the beginning of Stage 2 to August 31, 2017, contestants can use their facilities to prove their technology's performance in treating water with variable phosphorus concentrations in the lab. Each test period will be required to run for 2 weeks. Contestants can run their 2-week test as often as they like, and can request phosphorus standards from challenge administrators a maximum of three times. Contestants will only be allowed to submit one set of test results to be evaluated for Stage 2 prize monies. Contestants may begin testing at any point after their acceptance into Stage 2. The judging panel and challenge administrators will announce the winners in November 2017.

During Stage 2, the challenge administrators will gather information about the contestants' costs to inform the cost criterion in the Grand Challenge. Contestants will not be judged on this information but they are expected to collaborate with the challenge administrators as they gather this information.

7.2 - Prize Fund

The 1st place contestant will be awarded \$50,000.
 The 2nd place contestant will be awarded \$20,000.
 The 3rd place contestant will be awarded \$10,000.

7.3 - Qualification Criteria

Stage 2 is open to all contestants who wish to participate in accordance with the Eligibility Criteria, without any pre-assessment or qualification criteria.



Contestants from Stage 1 will be automatically enrolled into Stage 2 and will follow the above submission steps.

New applicants will have to submit an application form and complete an online profile providing information about their team and proposed technology.

There is no upper-limit to the number of competing contestants at this Stage.

7.4 - Judging Criteria & Assessment

Contestants will be asked to demonstrate their technology at the laboratory scale. They will select their laboratory in which they will conduct their experiments, and submit laboratory documentation to challenge administrators along with QA/QC protocols of the lab, as well as respective Blanks and duplicate data as a result of their respective analyses.

Contestants will be sent phosphorus standards. Contestants can request standards from the challenge administrators up to a maximum of three times. Phosphorus standards, as well as inflow and outflow samples must be sent to the certified laboratory for total phosphorus analysis. Contestants will have to utilize the received phosphorus standard to create varying concentrations in the below determined volume of water for testing. Contestants will only be allowed to submit one set of results to compete in Stage 2.

Contestants will be required to treat a target volume of 150 gal / day of water for 14 days with required inflow TP concentrations:

75 ppb TP for the first 7 days
220 ppb TP for the last 7 days

The contestants' technology does not need to operate continuously as long as the contestant treats the required volume of water every day.

Contestants must successfully fulfill the criteria outlined below and will be marked against a scoring formula outlined below to establish 1st, 2nd and 3rd place winners:

A. PHOSPHORUS REMOVAL

Contestants must report their technology's performance as an average outflow flow-weighted mean TP concentration (FWM).

Method of Assessment:

Contestants' effluent concentrations must be tested daily to determine the contestants' ability to achieve low TP concentrations. Daily inflow (or mixing chamber) and daily outflow samples must be taken and analyzed for TP. Contestants, depending on removal technology, may operate under either flow through conditions or a static tank system.

Contestants must adhere to QA/QC protocols as dictated by their selected laboratory. QA/QC protocols and chain of custody forms must be completed for all samples taken, and the respective documentation submitted to the challenge administrators.

Contestants are required to test TP using the following assessment:

- Daily inflow or mixing chamber samples (total of 14)
- Daily outflow samples (total of 14)
- 20% duplicates on all inflow and outflow samples
- Blanks submitted with all samples



Contestants are advised to test their technology's performance with the presence of interfering ions. In later stages of this competition, contestants will deal with different types of water and as such are advised to check Appendix B for Kissimmee River water quality parameters and Appendix C for the testing site in Ontario. The use of interfering ions will be one of the factors the judges will check when selecting the contestants to compete in the Pilot Prize Stage.

Contestants will be responsible for all laboratory and analysis costs, including shipping costs to their certification laboratory.

Contestants will submit their daily results in a one time comprehensive report. In addition they will submit a time stamped video that captures footage of the sampling process as noted below.

Supporting evidence:

A report that captures the 14 daily sample results as tested by the contestants' respective certified laboratories.

A time-stamped video will be required where the contestants demonstrate the sampling, testing, and analyzing of the technology to remove TP, at both inflow (mixing chamber) and outflow. Real-time video evidence must show:

- Initial sample (0-3 days) collection, bottling, and show signatory over the sample container (on tape where the signature is half on the tape and half on the bottle). Certified laboratory will be required to take a picture of the respective sample bottle documenting that the bottle has not been tampered with upon arrival.
- Mid-sample (4-9 days) collection, bottling, and show signatory over the sample container (on tape where the signature is half on the tape and half on the bottle). Certified laboratory will be required to take a picture of the respective sample bottle documenting that the bottle has not been tampered with upon arrival.
- Final sample (10-14 days) collection, bottling, and show signatory over the sample container (on tape where the signature is half on the tape and half on the bottle). Certified laboratory will be required to take a picture of the respective sample bottle documenting that the bottle has not been tampered with upon arrival.

All sampling containers will need to be sealed with the following information displayed across the container seal:

- Date of sample
- Day (e.g. 1-14) of sample
- Signature that runs from seal onto the container

Furthermore, certified laboratories will be required to test for the following:

- A tracer, as defined by the challenge administrators, will need to be analyzed on all inflow and outflow samples
- Laboratories will have to verify signature seals on all outflow samples sent by the respective contestants with photographic or videographic evidence.

Additional evidence must include:

- Certified laboratory internal QA/QC and technology calibration protocols.
- Laboratory credentials with respective state, federal or other governmental organizations.
- Documentation of contestants' alignment with QA/QC sampling, handling, storage, and shipping protocols.

Method of Assessment

Each contestant will be scored based on its technology's ability to remove TP.

A. Total Phosphorus Removal [Marks 0-5]



To calculate the 0–5 score, the total phosphorus removal (A) is scored as follows:

- The contestant with the lowest outflow TP – FWM will be awarded 5 points
- The contestant with the highest outflow TP – FWM will be awarded 1 point.
- Contestants with TP-FWM between the highest and lowest levels will have a point score that is proportional based on the standard formula $Y = mX + b$, where Y equals the to-be-calculated point score, m is the slope of the line between the known highest and lowest points and concentrations, X equals the contestant's concentration and b equals the Y intercept.
- Contestants will receive a 0 if the materials are not submitted or are found to be insufficient.

B. ENVIRONMENTAL SUSTAINABILITY

Method of Assessment:

Contestants will be judged and scored based on their performance in the lab testing and the potential environmental impact of the technology from their submitted experimentation results.

Supporting evidence:

Each contestant will submit evidence from its laboratory results outlining its technology's impact on the background water characteristics and an **Environmental Outcome Assessment (B)** outlining the potential impact of the technology. Contestants will be required to submit results of their laboratory testing to the challenge administrators to be scored by the judging panel.

This will include:

B. Environmental Outcome Assessment [Marks 0-5]

- Summary of technology's impact on the background water characteristics based on lab results
- Fate of chemicals/materials used
- Toxicity of chemicals and materials used
- List any potentially recoverable by-products
- List type and amount of waste and its fate/disposal
- List and characterize emissions
- Estimated energy consumption
- Interfering ions used during testing

The judging panel will judge and rate the materials on a 0–5 score with 5 being the highest and best score. Contestants that do not submit Section B will receive a score of 0.

C. SCALABILITY

Contestants shall submit a summary business plan of up to two sides of one sheet of paper (US Letter or A4, no less than 10 point type) or up to 10 slides. Contestants will also be asked to complete additional profile questions and to provide a short video to accompany their summary business plan.

Judges shall give these 0–5 points for the demonstrated scalability of the solution with 5 being the highest and best score. Contestants that do not submit Section C will receive a score of 0. Contestants should articulate how their technology could scale to be applied to larger bodies of water.



SCORING

Contestants will receive a total score using the following scoring formula:

$$(5(A)+2(B) +C)$$

Top contestants may be asked to present and pitch their proposals to the Everglades Foundation in a live pitch event.

The contestants with the three highest scores will win the Stage 2 Prizes described above, subject to the tiebreak protocols.

If there is a tie among contestants after the scoring tally, the winners will be ranked by their environmental impact score (B). If there is a further tie, the prizes in Stage 2 (i.e., 1st and 2nd, or 2nd and 3rd) will be split equally among the tied contestants.

7.5 – Timeline: Stage 2, January – November 2017



8. PILOT PRIZE

The third stage of the George Barley Water Prize will be opened for applications in May 2017. The top three contestants from Stage 2 will be automatically accepted into the Pilot Prize Stage and the next seven best applicants (from Stage 2 or contestants new to the George Barley Water Prize) can compete for a slot as determined by the judging panel and challenge administrators.. A total of \$800,000 will be awarded among the top four contestants (\$200,000 each) that perform the best over a 3-month period in the field at a pilot scale. The Pilot Prize testing phase will take place in Ontario, Canada in February – May of 2018.

8.1 - Overview

The Pilot Prize aims to:

- Judge and qualify the top four technologies that will compete in the Grand Challenge Stage.
- Give contestants the opportunity to test their technologies at a scale that constitutes a significant stepping stone in the development of technologies and proof-of-concept.
- Test the ability of technologies to operate and adapt under cold weather conditions.

Contestants will demonstrate their projects for a period of 3 months, under conditions that are set by the challenge administrators.

Prizes will be awarded to the top 4 contestants based on the criteria laid out below.

During the Pilot Prize Stage, the challenge administrators will gather information about the contestants' costs to be judged in the Pilot Prize Stage and to inform the cost criteria for the Grand Challenge.

8.2 - Prize Fund

The top 4 contestants that meet the winning criteria will each be awarded \$200,000. These four contestants will qualify for the Grand Challenge. If one or more of the four contestants declines to take part in the Grand Challenge, the next-placed contestant or contestants that has or have met all the criteria will be allowed to compete in the Grand Challenge. Additionally, if fewer than 4 contestants achieve the criteria and win the \$200,000 Pilot Prize award, the judging panel may advance a contestant or contestants that has (or have) not won any amount of the Pilot Prize to the Grand Prize Stage if the judging panel and challenge administrators, in their sole discretion, determine that the technology (or the technologies) of such contestant(s) could perform in the Grand Stage test environment.

If no teams in the Pilot Prize Stage meet the winning criteria, then no contestant will receive the Pilot Prize award and it is up to the judging panel and challenge administrators to determine if any contestants will move to the final stage of the Grand Challenge.

Challenge administrators will cover the costs of the testing facility space and set up of overall power, pipes and pumps to enable water to flow to the testing site. All costs to set up and run each contestant's specific Pilot Prize Stage technology will be borne by that contestant. Travel and accommodation costs will also be borne by the contestants.



8.3 - Qualification Criteria

The top three contestants from Stage 2 automatically qualify to compete in the Pilot Prize Stage. The other contestants from Stage 2 are automatically considered as applicants in the Pilot Prize and the decision on their selection will be made by the judging panel and challenge administrators.

Contestants can also apply directly to the Pilot Prize without having to enter Stage 2. These submissions should include:

- Description of the technology
- Performance data (reports, peer-reviewed journal articles, patent documents)
- Any additional data that the judging panel and challenge administrators find necessary to make an informed decision on the application. Data may include, but is not limited to, information pertaining to phosphorus removal mechanisms, environmental sustainability, scalability and economics.

If contestants from Stage 2 wish to re-submit new data in order to enter the Pilot Prize, they should inform the challenge administrators which data set should be considered for selection.

8.4 - Judging Criteria & Assessment

A three-month flow regime will be set under cold conditions in order to mimic dynamic conditions found in real field applications. Water quality parameters in the testing site (municipal wastewater treatment facility) in Ontario are provided in Appendix C.

The Pilot Stage will be held according to the following conditions:

- Three-month continuous testing period (February, March, April, 2018).
- Each month will have a different flow treatment requirement:
 - 1st month - 2,500 gallons per day (GPD)
 - 2nd month - 8,500 GPD
 - 3rd month - 2,500 GPD
- The average inflow TP concentration at the testing site is approximately 530 ppb with a standard deviation of 70 ppb.

Pilot Prize contestants' technologies must fit in a 9m² spatial footprint.

The challenge administrators reserve the right to reschedule and/or rework any requirements for the Pilot Prize, especially as caused by broken or malfunctioning equipment, natural disasters, freezing, terrorism or acts of God affecting the Pilot Prize outside of and beyond the challenge administrators' control.

The judging panel will determine Pilot Prize winners based on the following categories: 1) cost per kg of TP removed; 2) outflow TP concentration; 3) environmental sustainability and 4) scalability. Up to four winning teams will each receive \$200,000. To be judged across all judging categories, contestants must first demonstrate that their technology achieved an average outflow FWM TP concentration of 10 ppb or less. Challenge administrators may, in their sole discretion, raise the FWM-TP concentration target if they find the 10ppb level is not achievable.

A. COST

This criterion is based on the estimated costs of the technology to remove one kilogram of total phosphorus under pilot testing conditions.



Method of Assessment:

Costs will be assessed at the end of the three-month testing period. Operating costs will be actual costs incurred over the testing period. These costs will be evaluated against the amount of total phosphorus each contestant removed to calculate a cost per kilogram of total phosphorus removed.

A cost spreadsheet will be provided to the contestants to calculate their respective costs during the Pilot Prize Stage. Description of these costs is included in Appendix A. An independent financial auditor will validate costs.

Contestants will also be asked to estimate the cost of their technology scaled to function at the Grand Challenge site.

Supporting evidence:

Contestants' must submit their (A) **Cost Calculations**.

A. Cost [Marks 0-5]

- **Operation and Maintenance costs:** Contestants will be asked to input the costs of running their technology for the testing period. This includes but is not limited to labor; energy/fuel; chemicals/ materials/ consumables; treatment/ disposal of waste and by-products; replacement and maintenance costs. An independent financial auditor will audit the costs. Costs do not include the set up costs that are covered by the challenge administrators.
- **Removal:** decommissioning costs.
- **Kilograms of Total Phosphorus (TP) Removed:** Contestants will record the overall amount of total phosphorus (TP) removed as outlined in Section B below in order to calculate a cost per kilogram of TP removed.

Contestants will complete Section A at the end of the Pilot period. Evidence in the form of receipts must be submitted if applicable. An independent financial auditing partner will audit each of the contestants' submissions and an audit report will be sent to the judging panel.

In addition, contestants will provide estimated capital and operating costs to participate in the Grand Prize Stage. This information will be audited but not used in the judging calculation for the Pilot Prize Stage. The information gathered will inform the cost threshold for the Grand Challenge.

To calculate the 0-5 score, the cost (A) is scored as follows:

- The contestant with the lowest cost per kilogram of TP removed will be awarded 5 points.
- The contestant with the highest cost per kilogram of TP removed will be awarded 1 point.
- Contestants with costs between the highest and lowest costs will have a point score that is proportional based on the standard formula $Y = mX + b$ where Y equals the to be calculated point score, m is the slope of the line between the known highest and lowest points and costs, X equals the contestant's cost and b equals the Y intercept.
- Contestants that fail to provide their cost per kilogram of TP removed will receive a score of 0 points.



B. PHOSPHORUS REMOVAL

During the three-month testing period, the technology must achieve an average outflow weighted mean TP concentration (FWM) of 10 ppb or less. Challenge administrators may raise the TP concentration target if they find the 10ppb level is not achievable.

Only contestants that achieve the targeted TP concentration level will be eligible to be considered for the \$200,000 Pilot Prize award per winner (up to 4 winners total).

Method of Assessment:

Daily inflow and outflow samples will be recovered randomly by or on behalf of the challenge administrators. Sampling handling, storage, shipping and analyses will be utilizing established QA/QC protocols of the designated laboratory. All samples will be tested and analyzed for TP under identical conditions and equipment at the challenge administrators' designated verification laboratory. Duplicates will be taken 20% of the time, including necessary Blanks, and temperature blanks. Additional weekly water quality samples will be taken randomly weekly, occurring at substantially the same time for all contestants.

Flow measurements of contestants will be made daily by challenge staff. Additional weekly flow sampling will be random and will occur on the same day for all contestants. Contestants will also have to have flow monitors on all discharge outlets, with flow being recorded electronically on an hourly basis. Flow data records must be submitted to challenge staff weekly. Challenge flow measurements will be compared against flow records to determine level of accuracy of measurements.

Challenge administrators will provide all flow and water quality data to contestants as data is available and has been QA/QC'ed.

Supporting evidence:

Other than the flow data records referenced above in Method of Assessment, there are no supporting documents needed from the contestants under this criterion.

B Phosphorus Removal [Pass/Fail] and [Marks 0-5]

To calculate the 0-5 score, TP removal (B) is scored as follows:

- Contestants who do not meet the TP concentration target will receive a score of 0, which is a Fail mark.
- The contestant with the lowest FWM outflow TP concentration that is at or below the TP concentration target will be awarded 5 points.
- The contestant with the highest FWM outflow TP concentration that is at or below the TP concentration target will be awarded 1 point.
- Contestants with concentrations between the highest and lowest concentrations will have a point score that is proportional based on the standard formula $Y = mX + b$ where Y equals the to be calculated point score, m is the slope of the line between the known highest and lowest points and concentrations, X equals the contestant's TP concentration and b equals the Y intercept.

C. ENVIRONMENTAL SUSTAINABILITY

The technology must not negatively alter background water quality characteristics such as pH, hardness and electrical conductivity, and it must minimize environmental pollution, including by-products resulting from the P extraction process. Any waste product that is created must be



easy to dispose of safely. The technology and associated processes should not contribute to other environmental problems.

C1 Background water quality characteristics [Marks 0-5]

The technology must not alter the background water quality/characteristics as set out in the Florida Department of Environmental Protection's (FDEP) Florida Class III Freshwater Water Quality Standards⁷. Characteristics include, but are not limited to:

Water chemistry: pH, nitrogen, sulfates, metal content, alkalinity, salinity, dissolved oxygen, temperature, turbidity, color, calcium and discharge of elements in the effluent that are not already specified. Additional parameters may be added if the challenge staff has reason to believe the technology will add or remove elements measured by such parameters. Contestants must provide information describing chemical formulation of all chemical additions to be made during the pilot testing.

Method of Assessment:

Contestants will be judged and scored based on their performance in the Pilot Prize Stage testing. Each contestant will need to ensure that its processes do not impact the background water quality characteristics. Highest scores will be given to contestants whose technologies have the least impact and meet or exceed the FDEP Standards. The judging panel will score contestants on a scale of 0-5 points with 5 being the highest and best score. Contestants will receive a 0 if they fail to submit this section.

Additional supporting evidence:

Contestants will be required to send samples (prior to testing or during testing) to an approved toxicity laboratory to ensure all permit requirements for the Grand Prize Stage are met. Screening toxicity tests on influent and effluent will be needed in accordance with FDEP and EPA guidelines.

Conditional approval, approval, or receipt of NPDES Industrial Discharge permit will be required to meet this criterion.

C2 Waste disposal and by-product recovery [Marks 0-5]

Any waste product that is created must be easy to dispose of safely without negatively impacting the environment. This includes the fate and toxicity of chemicals, materials, waste and the impact of waste generation on biodiversity. Contestants will also describe the value-added by-products that are recovered.

Method of Assessment:

The judging panel will assess the possible impact of the waste products and assess the strength of the waste management plan. The judging panel will also assess the list of recovered by-products. The judging panel will score contestants on a scale of 0-5 points with 5 being the highest and best score. Contestants will receive a 0 if they fail to submit this section.

Additional supporting evidence:

Description of waste products and assessment of its chemical composition
Waste Management Plan
By-product recovery list including type and quality of by-product

⁷ <https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-302>



C3 Environmental impact [Marks 0-5]

The technology should not have a negative environmental impact. This includes contribution to climate change.

Method of Assessment:

The judging panel will assess and judge the contestants' potential negative impact on the environment by judging the completeness and outcomes of the Environmental Outcome Assessment below. The judging panel will score contestants on a scale of 0-5 points with 5 being the highest and best score. Contestants will receive a 0 if they fail to submit this section.

Additional supporting evidence:

The judging panel will assess the contestants' submitted environmental outcome assessment.

Environmental Outcome Assessment

- Fate of chemicals/materials used
- Toxicity of chemicals and materials used
- List and characterization of discharges at Pilot Stage and estimated Grand Prize scale
- List and characterization of recoverable by-products at Pilot Stage and estimated Grand Prize scale
- Estimated energy consumption and requirements
- Transportation processes and related impact

D. SCALABILITY

Contestants to submit a business plan of no more than 20 pages (US Letter or A4, no less than 10 point type) covering the following points:

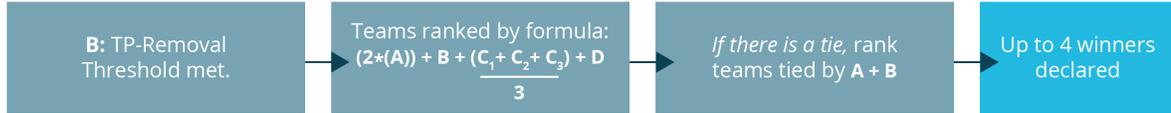
- Financial and business sustainability
- Results of financial audit including Pilot Stage operation and maintenance costs and estimated operation and capital costs for Grand Prize
- Amount of private/public funding received to date
- Scalability of Technology
- Ability of technology to scale to water volumes of Grand Prize Stage
- Ability of technology to handle higher and lower concentrations of total phosphorus
- Ability of technology to generate value-added by-products at Grand Stage scale
- Implementation Plan
- Grand Prize Stage implementation plan
- Key implementation requirements and milestones

D. Scalability [Marks 0-5]

The judging panel will score contestants on a scale of 0-5 points for the scalability of the solution with 5 being the highest and best score. Contestants will receive a 0 if they fail to submit this section.

DECLARING A WINNER





Up to four winners are declared in this round. Teams who meet the minimum standards for TP removal (B) will be scored for all categories.

Scoring will be as follows:

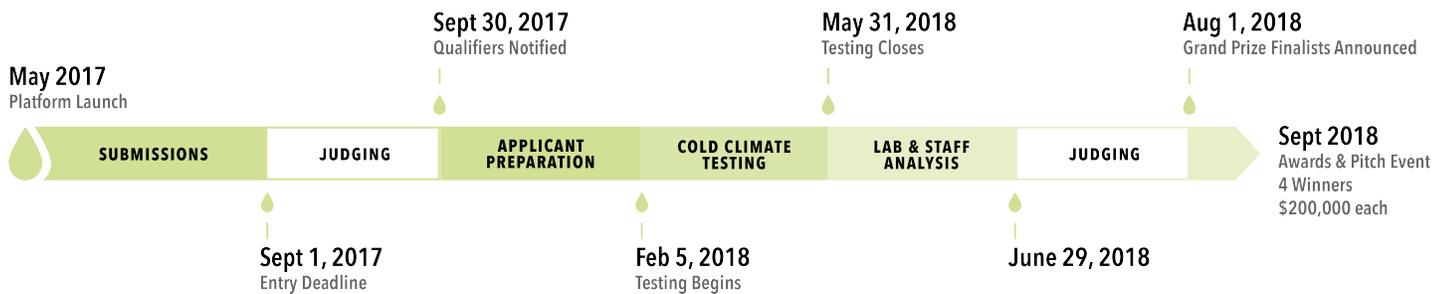
$$2(A)+B+ ((C_1+C_2+C_3)/3)+ D$$

In the event of a tie the contestant with the combined best score for lowest cost and lowest TP concentration will win.

Scoring for the tiebreak will be as follows:

$$A+B$$

8.5 Timeline: Pilot May 2017 – September 2018



9. ELIGIBILITY CRITERIA

To be eligible to enter and win any Challenge within the Program, Contestants must:

- Not have any team members who are located in Cuba, Iran, North Korea, Sudan or Syria;
- Have a bank account into which payments may be legally deposited from the United States in United States Dollars (USD);
- Hold insurance or other risk management means as required by applicable law and determined by the challenge administrators, in their sole discretion, to be adequate to protect against potential claims, losses, and damages arising from contestant's participation in the Challenge Program.
- Agree to the Terms and Conditions and Challenge Rules.
- Be 18 years of age or older.
- Be eligible to work in the United States during the Grand Prize Stage and in Canada during the Pilot Prize Stage (e.g. has all necessary visas)
- Not be related to any members of the judging panel, advisory board or challenge administrators.
- Not be an employee of any organization affiliated with the prize (sponsors, partners, supporters).



10. INTELLECTUAL PROPERTY AND COMMERCIALIZATION

IP rights will be retained by all contestants across Stage 1, Stage 2, Pilot Prize Stage and Grand Prize Stage. The Grand Prize winner and the Grand Prize Secondary Prize winners retain their IP and are required to commercialize their winning technology. Contestants who participate in the Grand Prize Stage will be required to sign the Contingent License Agreement included as Appendix D as a condition to participating in the Grand Prize Stage. If, after three years, the Grand Prize or Secondary Prize winner has not made the winning technology commercially available, the Everglades Foundation shall automatically receive an unlimited, irrevocable license so that it may further develop and commercialize the technology and/or license it to designated partners for implementation. Designated partners include but are not limited to multiple State of Florida agencies and other commercial partners. The winning contestant will be required to share annual updates with the Everglades Foundation and with an independent financial auditor.

After the competition concludes and for the first three years that the winning technology is on the market, if the price on the open market of the Grand Prize or Secondary Prize winning technology exceeds the Grand Prize audited costs by more than 20%, the Everglades Foundation has an option to purchase the technology at cost and assign it to the State of Florida.

Intellectual property will not be transferred by reason of entry to the challenge program. However, while it is anticipated that professional norms will prevail throughout the challenge program, contestants and their businesses, companies and firms enter the challenge program entirely at their own risk. Opportunities to network effectively, and market one's business ideas to judges, partners and investors, will require that contestants are able to talk relatively freely about their business and the technology it employs.

Contestants are advised not to include proprietary information in their public facing submission. However, proprietary information and financial information will be requested for review by the challenge administrators during the judging rounds. All judges and challenge administrators are committed to maintaining strict confidentiality and must sign a non-disclosure agreement (NDA). The Challenge Program is designed to provide contestants with an opportunity to present their ideas and innovations through the program.

Please refer to the Terms and Conditions for further guidance.



11. JUDGING PANEL

The judging panel is a group of 20-25 highly qualified experts with experience across the varied phosphorus removal technologies. The challenge administrators oversee the judging panel and reserve the right to modify the judging panel as needed through the duration of the competition.



APPENDIX A: COST INPUTS AND THRESHOLD

During the Pilot Prize and Grand Prize Stage, contestants will be required to input costs that detail the total costs for setting up and running their technology for the Pilot Prize and Grand Prize Stage parameters, respectively. These costs are broken into two categories: operation and maintenance costs as well as capital costs.

GRAND CHALLENGE STAGE COSTS

The winning Grand Prize technology must achieve a breakthrough in low-cost removal of total phosphorus (TP) from water. The Grand Prize contestants will compete to provide the cheapest innovation with a cost that meets or falls below the do-not-exceed cost as listed in Appendix A.

The challenge administrators and designated financial auditors will collect cost information beginning in Stage 2 and throughout the Pilot Prize Stage. Should the challenge administrators determine, in their sole discretion, that the Grand Prize do-not-exceed cost target is unachievable, they may increase the do-not-exceed cost target.

Method of Assessment:

Costs will be assessed periodically during the Grand Prize Stage. Costs will be monitored by an independent financial testing auditing partner, to be appointed by the challenge administrators.

Costs include but are not limited to:

Capital Costs: Contestants' capital costs required to set up the technology to run over a 20-year period. Capital costs will take into account the technology's useful life and incorporate necessary costs to upgrade or replace the technology across the 20-year span. Capital costs must include and appropriately capitalize heavy equipment, research and development, design and engineering costs, construction and other set up costs and decommissioning costs per generally accepted accounting principles.

Operation and Maintenance Costs: Contestants must provide the costs necessary to run the technology both during the Grand Prize Stage and estimates for running annually over 20 years. Costs must at a minimum include labor, energy, fuel, water, chemicals/materials/consumables, treatment/disposal of waste and replacement costs.

Contestants may also submit potential income associated with the sale of value added by-products but this will be broken out separately from the costs and will not factor into the Grand Prize cost calculation winning criteria. Challenge administrators, working with a team of experts, will compare contestants' inputs to a standard value for each of the common by-products that could contribute to income.

Total cost will then be measured against the calculated total phosphorus removed for the period to capture a cost per kilogram of total phosphorus (TP) removed.

The cost assessment procedure is outlined below:

- **COST MODEL** - A cost model will be provided outlining a consistent methodology for contestants to input their costs. This model will include an explanation of **assumptions** that have been made and **standard rates**, where appropriate. The cost model worksheet will be made available to contestants at the commencement of the Pilot Prize Stage. Competitors will be required to use the cost model to determine the cost of their technology



- **ASSUMPTIONS AND STANDARD RATES** – The inputs that will be used for all contestants are listed below and any variable rate will be pegged to the costs as of July 21, 2016. These inputs include:
 - discount rate for calculating amortized costs;
 - not-to-exceed 20-year life for capitalized costs;
 - applicable labor rates as listed in the 2016 Davis Bacon wage rates;
 - cost per KWH for electricity in Florida
 - disposal costs based on standard handling and transportation costs assuming the contestant's by-products and waste do not require special costs
 - chemical costs based on prevailing U.S. market prices

- **CAPITAL COSTS** - Using the cost model, contestants will submit their capital costs to set up and run the technology over a 20-year life. Capital costs will be amortized over a 20-year life using a standard discount rate to be provided as a key assumption.

- **CAPITAL COSTS AUDIT** - The independent financial auditing partner will undertake an audit of the submitted capital costs to ensure that they are accurate. Contestants will be expected to work with the auditors and provide answers and information to determine the capital costs.

- **OPERATION AND MAINTENANCE COSTS** - Every quarter, contestants will submit their operation and maintenance costs into the cost model. All supplier invoices must be submitted by contestants along with the required operation and maintenance costs. .

- **OPERATION AND MAINTENANCE COSTS AUDIT** - On a quarterly basis, the independent financial auditing partner will undertake an audit of the submitted Operation and Maintenance costs to ensure that they are accurate. Contestants will be expected to work with the auditors and provide answers and information to determine the operating costs.

- **JUDGING PANEL** - The independent financial auditing partner will produce a report outlining the total costs, the cost per kilogram of total phosphorus removed and other relevant information relating to cost. This will be submitted to the judging panel for their consideration and scoring.

To receive a passing mark, contestants must demonstrate that their cost, as calculated per the cost model and audited by the independent financial auditor, does not exceed the cost threshold set by the challenge administrators and outlined in Appendix A.

DO-NOT-EXCEED COST

The Grand Prize Do-Not-Exceed Cost is \$120 per kilogram of total phosphorus (TP) removed using the cost calculation approach detailed above and based on the monitored total phosphorus removed during the in-situ testing.

Should the challenge administrators determine, in their sole discretion, that the do-not-exceed cost target is unachievable, they may increase the do-not-exceed-cost target.

PILOT PRIZE COSTS

During the Pilot Prize Stage, contestants will provide information that will be used to calculate the cost of their technology to remove one kilogram of total phosphorus under pilot testing conditions.



Method of Assessment:

Costs will be assessed at the end of the three-month testing period. Operating costs will be actual costs incurred over the testing period. These costs will be evaluated against the amount of total phosphorus each contestant removed to calculate a cost per kilogram of total phosphorus removed.

A cost spreadsheet will be provided to the contestants to calculate their respective costs during the Pilot Prize Stage. Description of these costs is included below in Appendix A. An independent financial auditor will validate costs.

Contestants will also be asked to estimate the cost of their technology scaled to function at the Grand Challenge site.

- **OPERATION AND MAINTENANCE COSTS:** Contestants will be asked to input the costs of running their technology for the testing period. This includes but is not limited to labor; energy/fuel; chemicals/ materials/ consumables; treatment/ disposal of waste and by-products; replacement and maintenance costs. An independent financial auditor will audit the costs. Costs do not include the set up costs that are covered by the challenge administrators.
- **REMOVAL COSTS:** decommissioning costs.
- **KILOGRAM OF TOTAL PHOSPHORUS (TP) REMOVED:** Contestants will record the total amount of phosphorus (TP) removed to calculate a cost per kilogram of TP removed.

Contestants will complete the cost worksheet at the end of the Pilot period. Evidence in the form of receipts must be submitted if applicable. An independent financial auditing partner will audit each of the contestants' submissions and an audit report will be sent to the judging panel.

In addition, contestants will provide estimated capital and operating costs to participate in the Grand Prize Stage. This information will be audited but not used in the judging calculation for the Pilot Prize Stage. The information gathered will inform the cost threshold for the Grand Challenge. Applicable standard rates and assumptions as outlined in the Grand Prize Stage Costs in Appendix A will be used.



APPENDIX B: FLORIDA WATER QUALITY PARAMETERS AND HYDROGRAPH

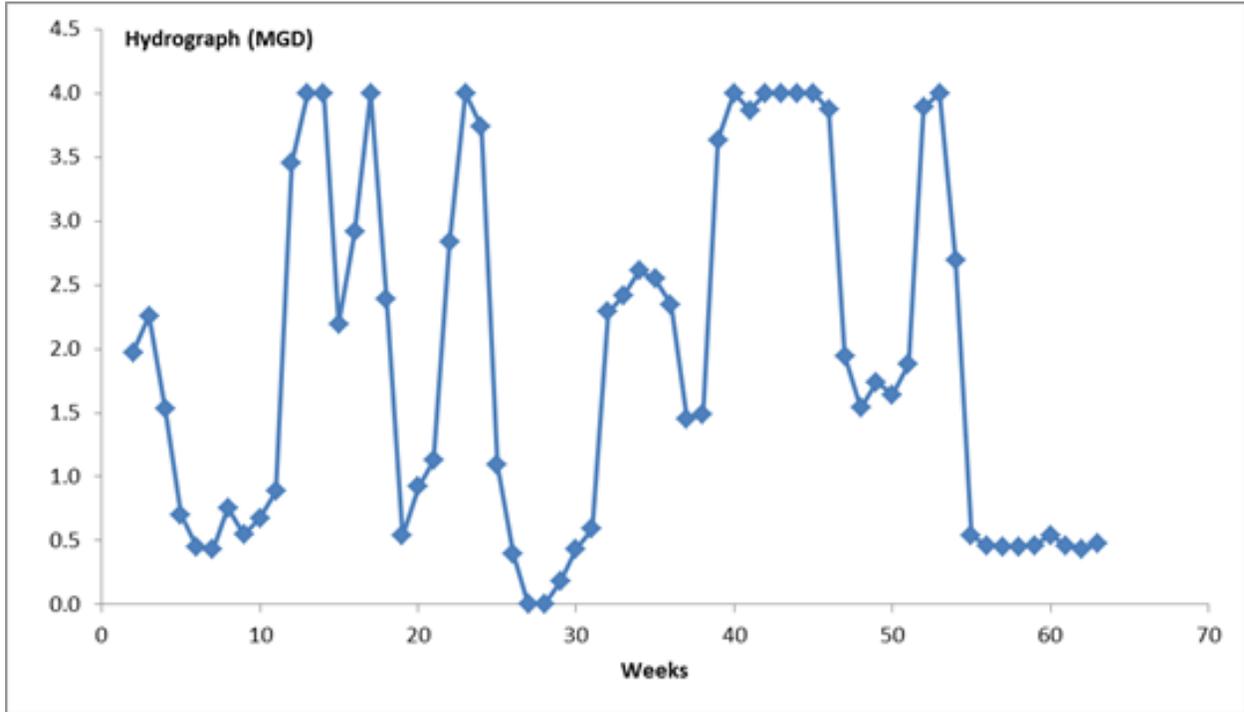
The following table represents the water quality parameters competitors will be facing during the Grand Prize in-situ testing in the Florida Everglades (if the Kissimmee River site is selected by the Challenge administrators.) Should an alternate site be selected, the challenge administrators will update Appendix B. Data were obtained from the South Florida Water Management District online database (DBHYDRO) for the period record from 1973 to 2016. Grab samples were used for this analysis. The frequency of sampling varies from bi-weekly measurements, to monthly or even to every three months for some water quality parameters.

WATER PARAMETERS	AVERAGE	STANDARD DEVIATION	MINIMUM	MAXIMUM
ALKALINITY, TOT, CaCO ₃ (mg/L)	32.9	10.8	5.0	78.2
CALCIUM (mg/L)	14.9	4.9	5.4	32.6
CARBON, DISSOLVED ORGANIC (mg/L)	18.7	3.9	6.5	33.7
CARBON, TOTAL ORGANIC (mg/L)	18.5	4.3	3.5	43.4
CHLORIDE (mg/L)	22.9	7.2	6.3	78.1
CHLOROPHYLL-A (mg/M ³)	9.8	8.2	1.0	69.3
COLOR (PCU)	122.4	70.0	25.0	467.0
DISSOLVED OXYGEN (mg/L)	5.5	2.1	0.0	11.3
HARDNESS AS CaCO ₃ (mg/L)	53.5	17.5	22.5	143.7
IRON, TOTAL (ug/L)	346.0	173.7	40.0	1,390.0
KJELDAHL NITROGEN, TOTAL (mg/L)	1.2	0.4	0.2	5.7
MAGNESIUM (mg/L)	3.9	1.6	1.9	22.4
NITRATE+NITRITE-N (mg/L)	0.1	0.1	0.0	1.4
pH FIELD	6.9	0.6	4.0	9.1
TOTAL PHOSPHORUS (mg/L)	0.1	0.1	0.0	0.6
POTASSIUM (mg/L)	2.3	0.9	0.1	6.6
SODIUM (mg/L)	13.3	5.0	5.7	52.0
SP CONDUCTIVITY, FIELD (uS/cm)	183.6	77.7	59.0	1,386.0
SULFATE (mg/L)	12.0	5.8	3.8	49.4
WATER TEMP (°C)	24.9	4.6	11.4	37.3
AIR TEMP (°C)	22.0	4.7	2.5	30.3
TOTAL DISSOLVED SOLIDS (mg/L)	136.1	45.6	5.0	292.0
TURBIDITY (NTU)	2.9	2.0	0.1	26.6



Hydrograph:

Below is the hydrograph that will be used during the 14-month competition (averaging approximately 2 MGD with a maximum of approximately 4MGD). The x-axis shows the number of weeks and the y-axis presents the flow. Challenge administrators will set the flow as a constant MGD value for each week.



APPENDIX C: ONTARIO WATER QUALITY PARAMETERS

The following table represents the water quality parameters the competitors will be facing during the Pilot stage in-situ testing in Canada (Ontario site.) Should an alternate site be selected, the challenge administrators will update Appendix C.

WATER PARAMETERS	AVERAGE	STANDARD DEVIATION	MINIMUM	MAXIMUM
WATER TEMPERATURE (°C)	14.19	1.59	12.3	17.4
BOD mg/L	2.92	0.90	1	4
TSS (mg/L)	4.42	1.31	3.00	7
NH3 (as N) (mg/L)	0.79	0.65	0.10	2.35
UNIONIZED AMMONIA (mg/L)	0.00	0.00	0.00	0.017
PHOSPHORUS (mg/L)	0.53	0.07	0.41	0.65
FEBRUARY AIR TEMPERATURE (°C)	-2.4	2.4	-5.9	1.2
MARCH AIR TEMPERATURE (°C)	1.9	1.8	-2.2	6
APRIL AIR TEMPERATURE (°C)	8.5	1.4	3.6	13.5
MAY AIR TEMPERATURE (°C)	14.6	2	9.4	19.9
pH 6.8-7.5				



APPENDIX D: CONTINGENT LICENSE AGREEMENT

Please note this appendix will only be required for the contestants of the Grand Stage.

CONTINGENT LICENSE AGREEMENT

THIS AGREEMENT is made as of this [REDACTED] day of August 2018 by and between [REDACTED], a [REDACTED], with offices at [REDACTED] ("LICENSOR"), and The Everglades Foundation, Inc., a Florida nonprofit corporation, with offices at [REDACTED] ("LICENSEE") (collectively the "PARTIES").

WITNESSETH:

WHEREAS, LICENSOR is the sole and exclusive owner of United States Letters Patents identified more fully in the attached Schedule A (collectively, the "Patents"), as well as any and all inventions, original works of authorship, developments, concepts, improvements, designs, discoveries, ideas, trademarks or trade secrets identified more fully in the attached Schedule A (the "Other IP," and together with the Patents, the "IP"); and

WHEREAS, LICENSEE desires to acquire a license under the IP for use in the development and sale of the types of products listed in the attached Schedule A (the "Licensed Products");

WHEREAS, LICENSOR has the power and authority to grant to LICENSEE such license.

NOW, THEREFORE, in consideration of the mutual promises and covenants herein contained, the parties hereto agrees as follows:

1. LICENSE

A. LICENSOR hereby grants to LICENSEE, upon and subject to all the terms and conditions of this Agreement, a worldwide and irrevocable license under the Patents to make, use, and sell the systems and methods embodying the invention(s) described in the Patents, for the life of such Patents, as set forth in the attached Schedule A, as well as to make, use, and sell the Other IP, perpetually.

B. As used in the Agreement, the Patents shall mean and include the United States Letters Patents identified more fully in the attached Schedule A, along with any patents on improvements thereof. In addition, the Patents shall mean and include the following:

1. Any divisional, continuation, or substitute U.S. patent application that shall be based on the U.S. Patent Numbers identified in the attached Schedule A; and

2. Any patents that shall issue on any of the above-described patent applications or on any improvements thereof, and any reissues and extensions thereof.

C. The license granted herein is contingent upon:

1. LICENSOR winning the Grand Prize or the Secondary Prize (in each case, the "Prize") in the George Barley Water Prize Challenge (the "Challenge"); and

2. LICENSOR failing to make winning technology as described in the Patents available for commercial use within three years of winning the Prize.

D. The license granted herein is subject to a reserved, nonexclusive, nonassignable license in LICENSOR to make, use, and sell the Other IP and the systems and methods embodying the invention(s) of the Patents.

E. LICENSEE may grant sublicenses under this agreement with the prior express written approval of LICENSOR, which approval shall not be unreasonably withheld, conditioned or delayed.



2. TERM

LICENSEE shall have a paid-up, royalty-free, worldwide, irrevocable and perpetual license under the IP, provided that in relation to the Patents, the license hereunder shall expire simultaneously with the expiration of the longest-lived Patent or the rejection or abandonment beyond further appeal of the last-remaining patent application comprised within the Patents, whichever occurs later, unless sooner terminated by the Parties pursuant to the terms of this Agreement (the Term).

3. COMPENSATION

A. In recognition of the public benefit LICENSEE is creating through the Challenge and in consideration of LICENSOR'S admission to the Grand Prize stage of the Challenge, the opportunity to further develop LICENSOR'S technology, and ten dollars paid to LICENSOR and other valuable consideration, LICENSOR hereby grants to LICENSEE a paid-up, royalty-free, worldwide, irrevocable and perpetual license to make, have made, use, and sell the Licensed Products.

B. Should LICENSEE grant any sublicenses, the terms and conditions of such sublicenses and the identity of sublicensees shall rest in LICENSEE's discretion, provided that they shall be co-terminated with this Agreement and in accordance with Paragraph 2, above.

4. INTELLECTUAL PROPERTY PROTECTION

A. In the event that LICENSEE wishes that a corresponding patent application or other intellectual property protection of any other country, territory, or possession be filed, it shall notify LICENSOR of that wish, and LICENSOR shall thereupon promptly notify LICENSEE whether it will file such other patent application or other intellectual property protection. Failing such agreement, LICENSOR shall at LICENSEE'S notification, permit LICENSEE to file such patent application or other intellectual property protection and prosecute it to issuance or final rejection; all cost and expense incurred by LICENSEE, however, shall be deductible from royalties. Such patent application or other intellectual property protection, any patent, trademark, copyright or corresponding intellectual property protection issuing thereon, and any renewals and extensions thereof shall be added to the aforesaid Patents or Other IP, and LICENSOR shall have the title thereto.

B. With the exception of patent applications or other intellectual property protection measures filed by LICENSEE, all patent applications comprised within the Patents and other intellectual property protection measures comprised within the Other IP shall be prosecuted to issuance or final rejection by LICENSOR at its own cost and expense as applicable. Any taxes, annuities, working fees, maintenance fees, and/or renewal and extension charges with respect to each application for patent or other intellectual property protection and to each Patent or Other IP subject to this Agreement shall be punctually paid by LICENSOR.

5. WARRANTIES AND OBLIGATIONS

A. LICENSOR represents and warrants that it is the owner of the entire right, title, and interest in and to the IP; that it has the right and power to grant the licenses granted herein; that there are no other agreements with any other party in conflict with such grant; and that it knows of no prior art that would invalidate the Patents or any other applicable intellectual property protection.

B. LICENSOR further represents and warrants that LICENSEE's contemplated use of the IP as represented to LICENSOR does not infringe any valid rights of any third party, and that there are no actions for infringement against LICENSOR with respect to items it manufactures and sells embodying the invention of the Patents or Other IP anywhere in the world.

C. LICENSEE shall be solely responsible for the manufacture, production, sale, and distribution of the Licensed Products and will bear all costs associated therewith.

D. In the event that LICENSOR develops any improvement to the apparatus claimed in the Patents or ideas embodied in the Other IP, and later incorporated in an improved or modified product by LICENSEE, such improved product shall be subject to the license granted herein. All improvements



made by the LICENSEE shall be promptly disclosed to LICENSOR but shall remain the property of LICENSEE. LICENSOR is hereby given a non-exclusive, royalty-free, non-transferrable license to make, use or sell the improvements made by LICENSEE. LICENSEE hereby agrees to execute any and all documents necessary to perfect LICENSOR's rights in such improvements.

6. MARKING

LICENSEE shall, and agrees to require its sublicensees to, fully comply with the patent, trademark and other intellectual property marking provisions of the intellectual property laws of the countries where the IP is being commercialized.

7. TERMINATION

The following termination rights are in addition to the termination rights that may be provided elsewhere in the Agreement:

A. *Immediate Right of Termination.* LICENSOR shall have the right to immediately terminate this Agreement by giving written notice to LICENSEE in the event that LICENSEE files a petition in bankruptcy or is adjudicated bankrupt or insolvent, or makes an assignment for the benefit of creditors or an arrangement pursuant to any bankruptcy law, or if the LICENSEE discontinues or dissolves its business or if a receiver is appointed for LICENSEE or for LICENSEE's business and such receiver is not discharged within 30 days.

B. *Right to Terminate Upon Notice.* Either party may terminate this Agreement upon 60 days' written notice to the other party in the event of a material breach of this Agreement by the other party, provided that, during the 60-day period, the breaching party fails to cure such breach.

C. *LICENSEE Right to Terminate.* LICENSEE shall have the right to terminate this Agreement at any time upon written notice to LICENSOR, such termination to become effective immediately upon LICENSOR's receipt of such written notice.

8. POST-TERMINATION RIGHTS

Upon expiration or termination of this Agreement, LICENSEE shall thereafter immediately, except for reason of termination because of expiration or a declaration of patent invalidity, cease all further use of the Patents and all rights granted to LICENSEE or its sublicensees under this Agreement shall forthwith terminate and immediately revert to LICENSOR.

9. INFRINGEMENTS

A. LICENSOR agrees to defend the IP against infringement by third parties upon notification by LICENSEE to LICENSOR with the request that LICENSOR proceed to take such steps to end such infringement. If LICENSOR does not institute an infringement suit within 30 days after LICENSEE's written request that it do so, or should LICENSOR thereafter fail to press such action vigorously, LICENSEE may institute and prosecute such lawsuit in the name of LICENSOR.

B. Any lawsuit shall be prosecuted solely at the expense of the party bringing suit and all sums recovered shall be divided equally between LICENSOR and LICENSEE after deduction of all reasonable expenses and attorney fees.

C. The parties agree to fully cooperate with the other party in the prosecution of any such suit. The party bringing suit shall reimburse the other party for the expenses incurred as a result of such cooperation.

10. INDEMNITY

LICENSOR agrees to defend, indemnify and hold LICENSEE and its officers, directors, agents, sublicensees, employees, and customers, harmless against all costs, expenses, and losses (including reasonable attorney fees and costs) incurred through claims of third parties against LICENSEE based on a breach by LICENSOR of any representation and warranty made in this Agreement, including but not



limited to claims by a third party of infringement based on the manufacture, use, or sale of items embodying the invention of the Patents or the Other IP.

11. FORCE MAJEURE

Neither party will be liable for, or will be considered to be in breach of or default under this Agreement on account of, any delay or failure to perform as required by this Agreement as a result of any causes or conditions that are beyond such Party's reasonable control and that such Party is unable to overcome through the exercise of commercially reasonable diligence. If any force majeure event occurs, the affected Party will give prompt written notice to the other Party and will use commercially reasonable efforts to minimize the impact of the event.

12. NOTICE AND PAYMENT

A. Any notice required to be given under this Agreement shall be in writing and delivered personally to the other designated party at the above stated address or mailed by certified, registered or Express mail, return receipt requested or by Federal Express.

B. Either party may change the address to which notice is to be sent by written notice to the other under any provision of this paragraph.

13. JURISDICTION/DISPUTES

This Agreement shall be governed in accordance with the laws of the State of Florida. All disputes under this Agreement shall be resolved by litigation in the courts of Miami-Dade County, Florida including the federal courts therein and the Parties all consent to the exclusive jurisdiction of such courts, agree to accept service of process by mail, and hereby waive any jurisdictional or venue defenses otherwise available to it.

14. AGREEMENT BINDING ON SUCCESSORS

The provisions of the Agreement shall be binding upon and shall inure to the benefit of the Parties hereto, their heirs, administrators, successors and assigns.

15. ASSIGNABILITY

Neither party may assign this Agreement or the rights and obligations thereunder to any third party without the prior express written approval of the other party which shall not be unreasonably withheld, conditioned or delayed.

16. WAIVER

No waiver by either party of any default shall be deemed as a waiver of prior or subsequent default of the same of other provisions of this Agreement.

17. SEVERABILITY

If any term, clause or provision hereof is held invalid or unenforceable by a court of competent jurisdiction, such invalidity shall not affect the validity or operation of any other term, clause or provision and such invalid term, clause or provision shall be deemed to be severed from the Agreement.

18. INTEGRATION

This Agreement and the Terms & Conditions of the Challenge constitute the entire understanding of the Parties, and revokes and supersedes all other prior agreements between the Parties and is intended as a final expression of their Agreement. It shall not be modified or amended except in writing signed by the Parties hereto and specifically referring to this Agreement. This Agreement shall take precedence over any other documents that may conflict with this Agreement.

[Signature page follows]



IN WITNESS WHEREOF, the Parties hereto, intending to be legally bound hereby, have each caused to be affixed hereto its or his/her hand and seal the day indicated.

LICENSEE

LICENSOR

The Everglades Foundation, Inc.

By: _____

By: _____

Name:

Name:

Title:

Title:



**SCHEDULE A
TO
LICENSE AGREEMENT
BETWEEN
[name of LICENSOR] AND
The Everglades Foundation, Inc.
DATED August [redacted], 2018**

1. Licensed Patents

The licensed Patents are as follows:

[Specify licensed products, including country, patent number and issue date]

2. Other Licensed IP

The Other IP licensed hereunder are as follows:

[Specify other intellectual property]

3. Licensed Products

The Licensed Products are as follows:

[Specify licensed products .]



ACKNOWLEDGEMENTS

The Everglades Foundation gratefully acknowledges the in-kind services provided by the Ontario Ministry of the Environment and Climate Change in the development of the George Barley Water Prize.

The Everglades Foundation also recognizes the work of our partners at Verb, Inc., Nesta Centre for Challenge Prizes and Covington Civil & Environmental in developing the final prize design, structure, and judging criteria.

Thank you for your participation.

