# Strategic Initiatives for New Core and Non-Core Revenue Generation

Prepared for

## South Central Connecticut Regional Water Authority

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# The Challenge

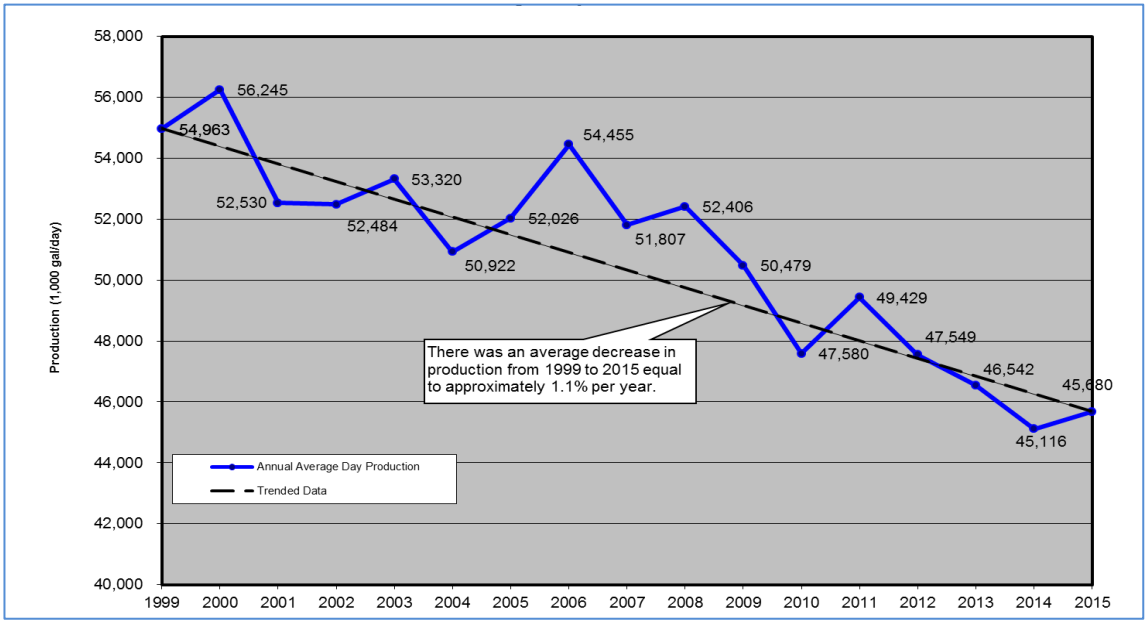
*The South Central Connecticut Regional Water Authority* ("RWA") *is a non-profit, public corporation and political subdivision of the State. Its mission is to provide customers with high quality water at a reasonable cost while promoting the preservation of watershed and aquifers. The RWA provides approximately 46 million gallons of water per day to an estimated 430,000 consumers in our region. The source of this water is a system of watershed and aquifer areas that cover about 120 square miles within 24 municipalities. More than 27,000 acres of these watershed and aquifer areas are protected as open space as a result of the Authority's efforts and with partners.*

Since 1999, on average the customers of the RWA have been using less water as highlighted in the following chart. While the reasons are multi-faceted and include the loss of local manufacturing, ongoing vacancies in housing and business establishments, the aging of the Baby-Boom generation resulting in smaller families, and ongoing water conservation, the primary driver is more efficient water-using appliances and plumbing fixtures mandated in the mind-1990s. Combined, these factors are causing a sustained decline in the amount of water the RWA sells annually (from a high of 56.2 mgd in 2000 to a low of 45.1 mgd in 2014).

This drop in water production translates into lower revenues for RWA. Nevertheless, a significant infrastructure both above and below the ground requires continued maintenance and replacement, with costs rising annually.

The declining consumption trend, forecasted to last another decade, combined with growing maintenance costs for an aging utility infrastructure has lead RWA to search for supplemental means to generate revenues.

One million dollars in new net income = a 1% reduction in the price of water (or at least precludes the need to raise prices by 1%).




*Average Daily Production Trend*

# Cost per Gallon of Water Sold and Marginal Contribution

*Based on the following computations it is recommended that new initiatives should not require a return to the debt market; projects should be fundable out of operating cash flow.*

| | | | | |
|---|---|---|---|---|
| A | Total Operating Revenues 2015 | $ | 109,162,255 | |
| B | Less Non-Water Revenue | $ | 6,276,706 | |
| C | TOTAL Water revenues | $ | 102,885,549 | |
| | (Commercial and residential, industrial, fire, public authority, wholesale and other) | | | |
| | | | | |
| REVENUE PER GALLON | | | | |
| D | Gallons distributed per day | | 46,000,000 | ave. |
| E | Per year | | 16,790,000,000 | |
| F | Average revenue per gallon | **$** | **0.006** | per gallon incl. maintenance fees |
| | | | | |
| AVERAGE COST OF CAPITAL ALREADY INVESTED | | | | |
| G | Depreciation | $ | 18,639,374 | |
| | Interest | $ | 23,701,000 | Cost of borrowing to buy assets |
| H | Payments in lieu of taxes | $ | 7,188,246 | Taxes on land and hard assets |
| J | Total Annual Cost of Capital Invesments in PPE | $ | 49,528,620 | |
| K | As a percentage of Annual Water Revenue | | **48%** | |
| | | | | |
| L | CURRENT CAPITAL COST PER GALLON | **$** | **0.003** | per gallon |
| | | | | |
| WATER RELATED EXPENSES | | | | |
| M | Operating and maintenance expense | $ | 47,984,055 | ** |
| N | Other water expenses | $ | 1,755,763 | |
| P | TOTAL Water Releated Expense | $ | 49,739,818 | |
| Q | As a percentage of Annual Water Revenue | | **48%** | |
| | | | | |
| R | WATER RELATED COST PER GALLON | $ | 0.0030 | |
| S | Less DIRECT COST to PROCESS 1 GALLON | $ | 0.0005 | ave. of .00025 and .00075 |
| T | Equals INDIRECT OPERATION COSTS | $ | 0.0025 | Delivery, marketing, billing, etc. |
| | | | | |
| U | TOTAL COST OF CAPITAL AND OPERATIONS | $ | 0.00541 | per gallon |
| V | Error Factor | $ | 0.00025 | ** |
| W | Low Estimate | $ | 0.00516 | per gallon |
| X | High Estimate | $ | 0.00566 | per gallon |
| | ** variance from mean of production cost estimates (Line S) | | | |
| | | | | |
| INCREMENTAL REVENUE PER GALLON (at 7.48 gallons per cubic foot) | | | | Excluding Maintenance fees |
| | Industrial and Commercial - 8" to 12" mains | | 0.0039 | |
| | Commercial Users - 3" to 6" mains | | 0.0042 | |
| | Residential and Commercial Users - 1" to 2" mains | | 0.0045 | |
| | Residential Users - 5/8" to 3/4"mains | | 0.0049 | |
| | | | | |
| Marginal Contribution if 1 additional gallon consumed | | | | At average cost of .0005 / gal. |
| | Industrial and Commercial - 8" to 12" mains | $ | 0.0034 | |
| | Commercial Users - 3" to 6" mains | $ | 0.0037 | |
| | Residential and Commercial Users - 1" to 2" mains | $ | 0.0040 | |
| | Residential Users - 5/8" to 3/4"mains | $ | 0.0044 | |
| | | | | |

# Strategic Approach to the Challenge

**Less is more.** We have investigated and analyzed more than twenty potential new sources of revenue, and even reconsidered prior suggestions. We then consciously narrowed the field to a manageable number of lower risk, higher NPV and sustainable initiatives, each with the potential to contribute at least one million dollars to net income—to concentrate expertise, achieve a critical size for efficiency, and to focus the finite staff and financial resources of the Authority.

Considering the immediacy of the challenge to generate new revenue, we have not included conservation programs that are low margin and further reduce consumption (e.g. – gray water projects); and non-revenue-generating Conscious Capitalism initiatives (e.g. – education programs or research into low-cost methods of purifying water in third world countries). Mike Roer is available, however, to assist pro bono with conscious capitalism programs.

**Cost of Capital.** As a non-profit, RWA cannot increase equity through the sale of shares; thus it is difficult to generate a debt/equity ratio optimally attractive to investors. The result is a bond rating higher than many for-profit water companies, with the effect of an interest rate approximately .2% higher than some competitors. We have researched recent bond offerings by water utilities and will share those findings in a separate memo.

| In 1000s of Dollars | 2015 | 2013 | 2011 | 2009 |
|---|---|---|---|---|
| Revenue (Total) | 109,162 | 98,394 | 91,300 | 75,225 |
| Contributions to Capital | 2,474 | 2,164 | 2,388 | 4,381 |
| Bonds payable (less current) | 593,896 | 577,947 | 562,872 | 539,537 |
| Credit Rating | | | | |
| Moodys | A+ | A+ | A+ | A+ |
| S&P | Aa3 | Aa3 | Aa3 | Aa3 |
| Interest | 23,701 | 23,811 | 24,081 | 21,454 |
| *As a percentage of revenue* | 21.7% | 24.2% | 26.4% | 28.5% |
| Operating Income | 30,937 | 25,231 | 26,332 | 15,873 |
| Interest Coverage Ratio | 1.31 | 1.06 | 1.09 | 0.74 |

*The Interest Coverage Ratio has improved dramatically in the last half decade, yet perhaps still not high enough to garner a AAA rating and lower interest rates.*

The fiscal challenges facing the RWA advise that new initiatives optimally will be characterized by ...

1. A LEVEL OF REQUIRED CAPITAL THAT CAN BE FINANCED BY OPERATING CASH FLOWS (up to $2,000,000 and ideally no more than $1,000,000). As stated in the RWA Annual Report of 2011, p. 3, “Other initiatives to strengthen the Authority for the long term are to ... reduce debt leverage and fund a portion of the capital program internally.”
2. HIGH MARGINS TO ALLOW POSITIVE CASH FLOW PAYBACK OF CAPITAL within 1 or 2 years – to replenish the capital pool in order to fund additional revenue-generating programs.
3. SUSTAINABLE RUN RATE to stave off price increases and pay down long term debt.

We have herein identified and analyzed a number of initiatives that meet these ambitious criteria.

# Recent New Initiatives That Are Already Successful

RWA has expanded its in-house expertise generating approximately $4.0 million of net revenues annually. New programs include ...

1. **PipeSafe**[SM]. Water and sewer service line protection programs. For an annual fee, RWA will repair or replace that portion of the service line owned by the customer (curb to house) in the event of a break or blockage.

2. **Laboratory Water Testing**. RWA manages a water testing laboratory to monitor contaminants in its water supply for levels greater than those imposed by state and federal regulations. RWA has expanded its water testing program to include testing for businesses along the east coast.

3. **Fleet Maintenance**. RWA has a large fleet of vehicles and equipment necessary to meet its daily operational needs. Its Fleet Garage not only maintains the internal fleet but has also expanded its scope to maintain the fleets of other local businesses.

These three initiatives generate $6.3 million in annual revenue and $3.6 million in profits.

RWA also derives a small streams of revenues from **cell tower rental** and the **sale of wood** for home heating.

# Previously Considered Initiatives

This section categorizes these concepts and prior assessments thereof, and considers whether it might be feasible to develop means to counter the perceived weaknesses.

| INITIATIVE | STRENGTHS | PERCEIVED DEAL BREAKER | POSSIBLE STRATEGY TO COUNTER DETERRENT |
|---|---|---|---|
| **ENVIRONMENT** | | | |
| WASTE WATER TREATMENT | Land available; Expertise | Potential contamination | none |
| | | | |
| **ENERGY** | | | |
| SOLAR POWER | Abundant land | May not now sell surplus | Enabling legislation; lease land to solar developer |
| BIO GAS (anaerobic digestion) | Land available; clean energy | High capital investment; Low margins | Research less capital intensive process |
| CO-GENERATION (fossil fuels) | Energy consumer | Low energy prices; No expertise; Counter to organic image | none |
| WIND ENERGY | Windy ridge on RWA land | Not permitted by charter; May alienate public | none |
| FRACKING | Land available | Customer alienation | none |
| | | | |
| **FOOD PRODUCTION** | | | |
| MALTING | High water use | Not permitted by charter; Adequate demand? | Enabling legislation |
| | | | |
| **CONSULTING SERVICES** | | | |
| UTILITY REVENUE ENHANCEMENT | Expertise | No expertise with other software systems; lean staff structure | none short term |
| CONTRACT OPERATIONS | Expertise | Low profit margins | none short term |
| INTERNAL PLUMBING | Client relations | Perception of unfair competition | Invest in a plumbing contractor with benefit of vertical integration and reserve capacity |
| | | | |
| **OTHER** | | | |
| ANTENNAE RENTAL | Clean use of land | Declining demand | none |
| | | | |

# Evaluation Criteria

## **Scope of Vetting in Phase I** (The scope of current contract)

The process of evaluating new services and products for possible introduction involves multiple screening stages. These stages assume that the organization is developing a large number of new ideas that need to be culled into a smaller group for consideration of investment of resources.

In the initial stage, therefore, new ideas are put through a broad screen designed to eliminate ideas that are unfeasible, inconsistent with the RWA's goals, off strategy, financially unreasonable, or a poor fit with the organization's skills and positioning. Vetting criteria included:

ORGANIZATIONAL FIT

- Strategic fit (does the product/service fit with the strategy of the RWA going forward?)
- Mission fit (is it consistent with the mission, values and image of the RWA?)
- Asset/Skills fit (does the idea build on/leverage existing RWA skills/knowledge/assets?)
- Restrictions/Limitations on Expansion (does the idea violate any established restrictions?)[1]
- Does enabling legislation preclude RWA from investing in industries that it is not permitted to engage in?
- Resources (does the idea leverage existing people and knowledge resources; what investment is required in these things to bring the idea to market?)

MARKET FIT

- Perceived fit (does the RWA have the "right" to be a player in this business?. Will customers/prospects feel like this makes sense?)
- Uniqueness (is the idea new; is there a reasonable assumption of buyer interest?)
- Competition (do other ideas like this exist; are there significant barriers to entry?)
- Competitive Insulation (to what degree would RWA have an unfair competitive advantage and, if so, for how long? What are the implications?)

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[1] The RWA's governing legislation limits expansion to water or environmental related businesses. However, should an excellent opportunity be presented outside of those currently authorized lines of business, RWA could request a change to its enabling legislation.

Governing legislation requires RWA maintain a majority ownership position in any investment. However, a change to the majority ownership stipulation could be requested from the legislature.

## FINANCIAL CHARACTERISTICS

- Profit potential of at least $1 million per annum (equivalent to 1% reduction in water rates)
    - RWA has 118,000 customers
    - Approximately 8%, or 10,000 are commercial clients
- Capital Intensity: Investment required to develop (heavy/normal/low)
- Investment required to market (heavy/medium/low)
- Business sustainability (can the product or service deliver profit indefinitely?)
- Adequate margins. Gross margins meet or exceed defined hurdle rates.
    - The cost of treating 1 gallon of clean water is $.00075.
      This cost is based on a range of production costs (depending on quality of raw water and volume) of from $250 to $750 per 1 million gallons. Data supplied by Rose at 4/28/16 meeting.
    - The cost to deliver 1 gallon of water to a customer is unknown; however, we can deduce an approximation from the financial statements.
        - For existing customers, given that infrastructure and maintenance thereof are sunk costs, we might assume for these purposes that he *incremental* cost of delivering 1 additional gallon of water is minimal. indeed, we might assume that producing 1 *additional gallon* of water in a large batch as being in the magnitude of $.0001 to .00025. The exact marginal cost could be computed from the production and detailed expense reports.
        - For new customers, the cost of new infrastructure could be calculated on a project by project basis and amortized over the expected life of the project or customer.
        - The cost of the marketing campaign would be included as part of the investment for the project, although there would be some ongoing marketing expense.

## PRODUCTION AND DELIVERY CAPABILITY

- Ease of manufacture/creation (Can the idea be made/service provided with a reasonable amount of effort)
- Distribution (can the idea be delivered to the buyer efficiently?)

## MARKETING AND SALES CAPABILITY

- Marketing (are special skills required; can the RWA acquire or buy these skills reasonably)
- Sales (are special selling skills/vehicles required?)

## GENERAL CHARACTERISTICS

- Assumed risk of success (normal/high/low)
- Length of time to develop

## Due Diligence and Business Planning: Phase II

MARKET FIT. Ideas that survive the first (vetting) stage can then be exposed to potential buyers in concept form to determine if there is real interest in the idea. Areas of evaluation at this stage would include:

1. Purchase interest to the buyer (does it really meet an unmet need; is it believable)
2. Perceived uniqueness
3. How much the buyer is willing to pay for the product/service (price/ value)
4. How often it would be purchased/used
5. Who is the buyer/decision maker (target audience definition: primary, secondary)
6. What is the current product/service this would replace
7. Ideas for improving/changing the product/service to increase its appeals

Ideas that are conceptually interesting to prospective buyers then need to undergo a rigorous business analysis prior to actually starting to develop the product or service and investing meaningful financial, human and organizational resources into bringing the idea to life.

BUSINESS ANALYSIS.

Ideas that successfully emerge from the Concept Stage must then go into a more detailed screening evaluation than in the Initial Stage. This is primarily a thorough financial evaluation based on detailed plans to produce, market, sell and distribute the product or service.

At this stage, a multi-year business plan for the product would be developed with pro-formal P&Ls that provide a detailed look at the cost to introduce the product and the return that can be expected. A rigorous financial analysis will identify ...

- the investment required,
- the time to break even,
- the marketing and sales costs to achieve the revenue goals,
- the pricing required to meet targets,
- the speed of sales growth,
- anticipated competitive activity, and
- production costs.

The Business Analysis is the final stage before actually developing the product or service. The P&Ls and the specific areas defined above will be evaluated against the criteria established by the RWA to make a “go/no go” decision about introducing the idea into the marketplace.

Once ideas have been analyzed, those that survive can then be considered for possible development and potentially test marketing with the prospective buyer audience before they are introduced on a larger scale.

# Potentially New
# Revenue Generating Initiatives

# 1. Expand the already successful PipeSafe[SM] program

PipeSafe[SM] protection (free repair) is currently offered on water and sewer lines. The service is "highly competitive" with private plumbing companies, typically small, family-owned businesses. Some of the small plumbing concerns argue that RWA, as a non-profit monopoly, represents unfair competition.[2]

**a) Franchising PipeSafe[SM] to other water and sewer utilities.**
Craig Williams, Palm Beach County Water Utilities, serving a population of 532,000 (similar in size to RWA), indicates the utility is "very interested in learning more about the PipeSafe[SM] program." Craig may be reached at ccwilliams@pbcwater.com or 561-493-6051.[3]

**b) Provide protection plan to well owners**
This initiative rated 2nd with a score of 54 on the "Non-Core Revenue Matrix Score Sheet - Internal RWA Evaluation of New Product Ideas," compiled by Jim Hill, Nov 2014; refined March 23, 2015.

**c) Provide protection plan to septic users**
Considered previously, this initiative awaits only the ability to add service to billing system software.

**d) Provide protection plan for sump pumps** [suggested at May 23 ideation session]

**e) Provide and install sensors that detect leaks.** Partner with home security monitoring service that would alert homeowner (if volume suggests only a leaky faucet or toilet, or a lawn sprinkler left on too long); or RWA if a larger volume is detected. Alternatively, link to existing smart meter and/or computer- or app-controlled home management system.

**e) Offer "Protection plan for thawing service lines."**
Of 34 new initiatives considered by RWA staff strategy committee, this initiative rated 6th with a an average score of 42 (out of a possible 70).

**f) Snowbird house preparation and frozen-pipe monitoring service.**

**g) Offer to insulate pipes in homes and business** [suggested at May 23 ideation session]
In addition to reducing the likelihood of freezing, wrapping will keep cold water pipes from sweating and keep hot water hotter as it travels from the hot water heater to faucets.

**h) Offer home and business water audits:** "Aquassessment" by "The Authority"[4]

- Check for leaks and usage against norms (similar to energy audit)
- Test water quality and provide written report

Services "**g**" and "**h**" could be combined as an introductory package, as they will not generate repeat revenue, but could offer opportunities to sell additional services.

PipeSafe℠ EMERGENCY PROTECTION WATEREPAIR

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[2] April 28, 2016 debriefing with consultants at RWA headquarters
[3] Non-Utility Revenues Study, Sept 2012
[4] Marketing terms suggested at May 23, 2016, ideation session.

# 2. Consulting and services for other water utilities

The advantage to consulting is that it is not capital intensive and can be initiated relatively quickly. The downside is that it is labor-intensive, non-scalable, and may pull talent off other projects and programs. Due to staff reductions to reduce the need for borrowing, the Authority is currently running lean.

WATER LIBRARY. In addition to providing advice and solving problems, it was suggested at the May 23, 2016, ideation session that RWA become the repository of all information on water. The revenue stream would be through subscription.

The librarian—the primary cost of the service—could also serve as a reference resource to search and compile data for members and RWA itself. Many large companies, such as GE, maintain a librarian.

POTENTIAL CONSULTING SERVICES

- Accounting for unaccounted for water (slippage in the delivery system). [Suggested at May 23 ideation session.] The industry standard is 10% slippage. RWA is currently at 12% with a goal to reduce that to 10%. By offering the service, the Authority may acquire knowledge that will help reduce its own level of unaccounted for water.
- Capital investment prioritization
- Business Continuity
- Vulnerability assessment
- Maintenance management
- System optimization
- Demand forecasting

OTHER SERVICES

- Expand fleet maintenance
- Billing and admin
- Emergency response
- Valve maintenance
- Inspection
- Call center
- Lab services
- System monitoring



CAPITAL COST: ~ $100,000 for first year cost of librarian and computer with high memory capacity.

# 3. Well products and services

There are 322,578 private residential wells in Connecticut that serve approximately 23% of the state's population of 3,574,097 (2010 census).[5]

Private wells are not currently regulated by the U.S. Environmental Protection Agency (EPA). Private well owners are responsible for testing the quality of their own drinking water and maintaining their wells.

Potential services that RWA could offer include:

- Pipe-Safe℠
- Drilling and installation
- Creation of neighborhood shared systems
- Expansion (fracking to extend supply area)
- Rehab and maintenance
- Geothermal heating and cooling system, using well
- Softening and filtering equipment and chemicals for softening and pH balance).
- WaterSafe℠ comprehensive service package, billed monthly automatically
    - Analysis of water quality with written report and recommended changes in types of additives and/or filters
    - Measurement of water depth and comparison to previous readings
    - Well-replenishment priority and at a discounted rate

In 2014, the RWA staff strategy committee felt that buying Hungerfords would provide immediate access to expertise and a customer base. Providing well services ranked 13th and buying Hungerfords ranked 18th among 35 initiatives considered.

There are also 20 other well- and pump-service companies in the state.

CAPITAL INVESTMENT (To acquire Hungerfords): $10,000,000 est.

**Hungerfords Pump Service (Hungerfords Incorporated)**

303 State St; North Haven, CT 06473
(203) 245-4780 Hungerfordspumpservice.com Brendan Rowley, Manager

DESCRIPTION. A privately held company, categorized under Wholesale Pumps.

| | |
|---|---|
| Year Established | 1922 |
| Annual Revenue | $10 to 20 million (Estimate) |
| Employees | 50 to 99 |

BUSINESS SUB-CATEGORIES. Water Filters and Purification Equipment, Water Treatment and Conditioning, Well Drilling, Pump sales and repairs, Water Softener Services and equipment..

PRODUCTS. Well Filters, Water Softeners, Ultra Violet Lights, Well Pumps and Tanks

SERVICES. Radon Removal, Ultra Violet , Water Conditioning, Water Storage System.

CT LICENSE NUMBERS: E1 102804, P1 200983, W1 50
SERVICE AREA: Fairfield, New Haven, Middlesex counties

[5] http://www.ct.gov/dph/cwp/view.asp?a=3140&q=400544&dphNav_GID=1828&dphPNavCtr=|#48151

# 4. Bottleless water dispensers for home and office

*Bottled water for home or office coolers—the alternative to tap-water dispensers—is not politically correct and may invite public criticism. Nor can the authority compete effectively in the individual-serving size with Pepsi and other Fortune 500 bottlers with immense production, marketing and distribution resources.*

The strategy of this initiative is to introduce a variable pricing system for water. Currently, water companies are expected to provide water at a rate that even the poor can afford, and they do this well. Indeed, the Fitch bond rating agency expects a water utility to offer water for no more than 1% of the median household income. In a region with a wide range in incomes like greater New Haven, there are a significant number of households and companies able and willing to pay more for a premium glass of water. One particularly attractive market is high-end new construction, where RWA could install a comprehensive system that would process water for each intended use: drinking and cooking, shower, pool, laundry, toilets or outdoor – before the walls go up.

MENU OF EMBELLISHMENTS TO TAP WATER:

- Chlorine removal (some people buy bottled water because it does not contain chlorine)
- Final filter to remove sediment from the lines
- Chilling; or heating for tea, coffee, and soup
- Nutrient additives
- Infusion of flavor esters
- Carbonation

FILTRATION VERSUS REVER3SE OSMOSIS. The latter is the most effective, and most expensive means of water purification. The process uses 3 gallons of tap to create 1 gallon of purified water. To reduce environmental impact, the waste water could be captured in a gray-water holding tank for lawn and garden watering.

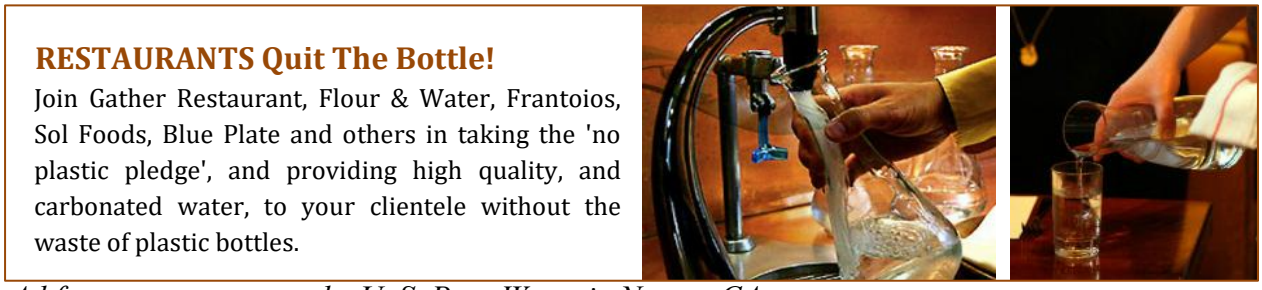
ALTERNATIVE BUSINESS MODELS

1. *Operate as a Franchisee.* RWA might request an exclusive franchise from Onesouce Water, a national firm headquartered in Farmington CT. Each Onesource office serves approximately a 100-mile radius. The advantage of the franchise is to obtain expertise and marketing support. A disadvantage of an arrangement with Onesource is that they do not sell to homes.

2. *Operate Independently*. RWA might purchase any of a number of off-the-shelf units. [*See following pages*.] A good quality dispenser with a 5-step filtration system can be purchased from Drinkpod for approximately $450. According to market rates, the unit can be rented by RWA for $39 per month, allowing a 1-year payback. It is customary to charge $50 to $150 for installation.

   An additional source of income is the annual sale of filters. I would recommend including the filter replacement in the rental price and offer to install them. This would allow the installer to introduce PipeSafe℠ and WaterSafe℠ product and services.

CAPITAL INVESTMENT: Under $100,000 for marketing campaign and initial supply of dispensers and filters. In computing NPV, I would assume a 5-year life of each unit rented out.




*Ad for restaurant water by U. S. Pure Water in Novato CA.*

### a) Competing bottleless water suppliers in Connecticut



ONESOURCE WATER, a national "bottleless" supplier of home and office tap-fed water fountains was founded in 2005 in Farmington Connecticut. The closely-held business received a growth round of venture capital in 2010 that allowed it to expand from a regional to a national company with 25,000 commercial clients.[6] Edgar shows the company has raised $58 million dollars in debt and equity capital in the last 3.5 years.



$H_2O$ EQUIPMENT COMPANY [LEFT] is a family-owned company in East Hampton that sells under-sink RO systems in Connecticut. (860) 267-0110. http://www.h2oequipment.com/products/water-treatment/reverse-osmosis/



CULLIGAN [RIGHT]. The office in Danbury services Fairfield, New Haven, Westchester, and Litchfield counties. http://www.culligan.com/home/water-delivery-and-coolers/bottle-free-water-coolers

Sells for $1200 (although listed at $1600 + $50 to $100 for installation) Rents for $ 25 mo. ($55 month with **reverse osmosis** option)

System uses four filters including reverse osmosis at an average cost of $240 per year. (Three need to be replaced annually; the **reverse osmosis** filter only every third or fourth year.)

[6] www.onesourcewater.net

ENVIRO WATER




Based in Stamford CT.  Serves Westchester, Fairfield and New Haven counties
Sells Wellsys USA bottleless systems made with LG components.
The WS 5000 is lowest priced system and rents for **$45** per month

A description of the Wellsys 9-step process may be viewed here:
http://www.wellsysusa.com/Purification.aspx

Wellsys is based in Arizona and sells though dealers.  I do not know if RWA could obtain a dealerships for its service area since an office in Stamford already covers New Haven County.

**b) Examples of dispensers available to purchase for resale or rental**

DRINKPOD



www.Drinkpodusa.com

Prices range from $339 to $439.

Lowest price unit is 200 Series at $339 with twist filter.
A 5-stage “UF” purification system sells for $428.

Temperature range 32 to 203 degrees F.

UF purification system filtration upgrade:

- Stage 1 – Sediment: Removes cloudiness caused by particles in water.
- Stage 2 – Pre-Carbon: Ensures that chlorine and lead have been removed.
- Stage 3 – UF Purification Membrane: Detoxification, strengthens immune system with minerals
- Stage 4 – TCR Post Carbon: Removes biological contaminants and heavy materials assuring the freshest cleanest healthiest water.
- Stage 5 – TCR Post Carbon: Assures consistent pure taste and no odor.

Set of filters: $89

AQUVERSE® MODEL 5PH



Temperature range 38 to 185 degrees F.

Fill rate (16oz in under 8 seconds) and deep fill area for large sport bottles and containers

Purchase price (including DIY install kit)

- Costco $ 314 picked up from store
- Amazon $ 377 (incl. shipping)
- Home Depot $ 299 on sale (reg. $352) delivered
- Sam’s Club $319

A100 replacement filter 2-pack (sold for anywhere from $32 to $38 each), manufactured by Everpure, removes the following contaminants:

- Lead
- Bad tastes and odors
- Chlorine
- Dirt and cloudiness
- Giardia lamblia cysts
- Entamoeba histilytica cysts
- Cryptosporidium parvum cysts
- Mold and algae
- Oxidized sulfides
- Oxidized iron
- Oxidized manganese
- 99.9% + of all particles 1/2 micron and larger in size

# 5. Water bottle refilling kiosks in public places

In 2014, annual bottled water consumption in the United States reached a peak of 34 gallons a person, said a report from the Beverage Marketing Corporation. However, in 2013, the most recent year for which data is available, only a little over 31 percent of plastic jars and water bottles were recycled, according to government data.[7]

WHY HAS BOTTLED WATER BECOME SO POPULAR? "According to Charles Fishman, a journalist and author of "The Big Thirst: The Secret Life and Turbulent Future of Water." "The reason is, and I think this is often overlooked, people aren't buying water — they're buying convenience. And with the branding, to some degree they're also buying image."[8]

A TREND ENCOURAGING FOR PUBLIC REFILLING STATIONS. Some consumers have switched to reusable water bottles, many of which have become status symbols themselves, like the stainless steel insulated bottles made by S'well, and the glass bottles in colorful silicon sleeves by Bkr.




**Two different sizes of bottles can be served by one kiosk:**

1. PERSONAL-SIZE BOTTLES. The kiosk would be a convenient service for those on the run who need a refill.
2. HOME/OFFICE WATER COOLER 3- and 5-GALLON JUGS. While not as convenient as having water delivered, it is a lot cheaper for consumers to fill their own containers at water filling stations.

   Since many water bottle companies source their water from private wells or competing suppliers, the kiosks may also increase consumption of RWA water.

CAPITAL INVESTMENT: Under $100,000 initially, to create awareness of availability of the service. (The filling stations in high traffic public places or convenience stores advertise themselves.) Other capital costs include staffing the marketing and service operations.

The equipment capital costs would be incremental, with dispensing units purchased as needed. This is something RWA could ease into, with the first unit installed in a public area at 90 Sargent Drive as a pilot project to prove the concept and evaluate market demand and return on investment.

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[7] Gloria Dawson "Selling Bottled Water That's Better for the Planet," *New York Times*, April 30, 2016

[8] Gloria Dawson "Selling Bottled Water That's Better for the Planet," *New York Times*, April 30, 2016

### a) The personal-size kiosk

All currently available coin-op kiosks are designed to accommodate 5-gallon containers, not just personal water bottles.




Free water fountains that will also refill a personal water bottle have become popular on environmentally-conscious campuses.

To justify charging, RWA could offer embellishments in a custom-designed kiosk with a mixer similar to the patented Coca-Cola dispenser.

We recommend accepting only credit cards, to reduce the temptation of vandalism (no one is going to steal water) and to eliminate the labor cost of emptying and counting the contents of coin and currency boxes.

There would still be a risk to mischief vandalism, so we recommend first testing concept at only a handful of public sites.

POTENTIAL ADDITIVES THAT COULD BE SOLD A LA CARTE AT PERSONAL FILLING STATIONS (The RWA ultra-pure® water is free):

- Ice
- Carbonation
- Heated to 183 degrees
- Flavors
- Vitamins
- Fluoride

SUGGESTED LOCATIONS FOR PERSONAL-SIZE KIOSKS

- Urban or suburban hiking trails (near water and electrical connections)
- Schools (to replace sugar-based beverage dispensers)
- Hospitals
- Transportation waiting stations
- Sporting stadia and arenas

### b) The 3- and 5-gallon refill kiosk

There are a number of manufactures of these units, especially overseas, where it has been a common practice to purchase drinking water in large containers. We recommend a comparison of the most popular models and interviews with current owners.

SUGGESTED LOCATIONS FOR 5-GALLON JUG REFILL STATIONS

- Outside the RWA building at 90 Sargent Drive
- Convenience stores (the store would receive a commission on sales)
- Gasoline Service stations (fill up you jugs while you fill up your car)




*A bank of kiosks that accommodate 5-gallon containers*

# 6. Water store "Whatever your water needs"

Water stores are common in California and the southwest where the quality of tap is not up to New England standards. In addition to water, most stores also sell water jugs in 3- and 5-gallon sizes (retailing for between $11 and $17), filters, softening agents, and water test kits.

A water store in the RWA lobby would also allow customers to learn about RWA services, like ...

- PipeSafe[SM] and WaterSafe[SM] programs
- Home and business water testing



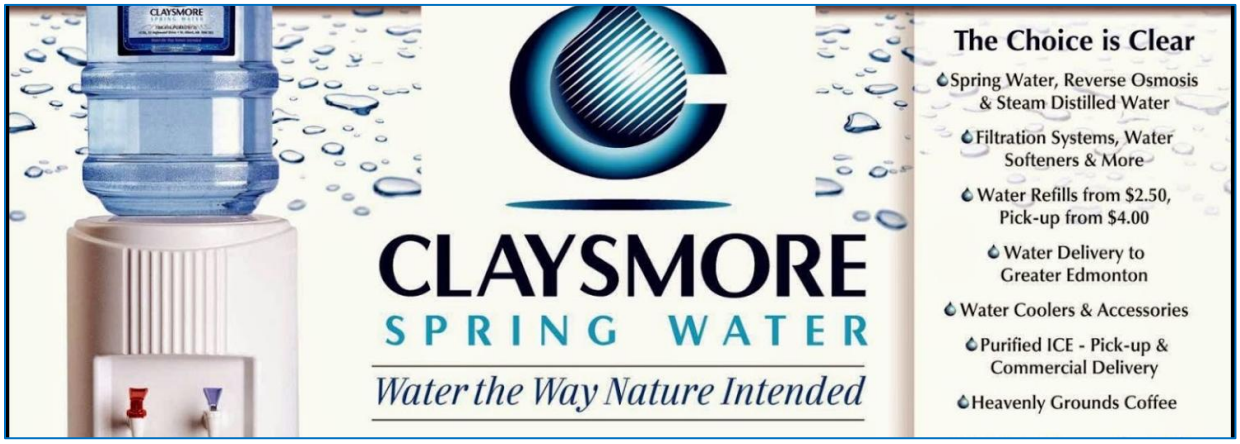



*[LEFT] After hours filling station in the outer lobby of a water store in California*

*[RIGHT] Low-tech DIY filling station at The Water Store in Greenbrae, CA. Note grated counter top to capture drain spillage.*



*The Water Store in Santa Barbara CA sells reverse osmosis water for $.50 per gallon (100 times the RWA rate for tap) and distilled water for 70% more. The store offers discounts for patrons who buy pre-paid water cards for 50 (10%), 100 (20%), or200 gallons (32.5%).*




*Claysmore Spring Water Company near Edmonton, Canada will deliver water (for $4 per container), but will allow customers to fill bottles themselves at the store for $2.50 from the unit shown flush-mounted in the store entranceway.*

For the pilot store project we would recommend starting very small, with only one filling station and a few small products like filters. To reduce the initial labor expense the bill payment clerk in the RWA lobby could also serve as the store cashier.

As a convenience to customers, so they don't have to lug water bottles any distance, would be to provide a drive up service area with a tail-gate high wheeled courtesy cart where bottles could be filled and then rolled over to a van or pick-up. The sales clerk in the lobby could turn on a water valve to the filling station with a 5-minute timer. If successful, the simple spigot could be replaced by a 24-hour credit-card automated kiosk (s).

SUPPLEMENTAL PRODUCTS THAT COULD BE SOLD IN AN "ALL THINGS WATER" STORE

- Bottles for bottled-water dispensers (making sure bottle is compatible with most systems)

- Home bottleless water dispensers
- Filters (*Linda Discepolo reports that RWA got out of the retail filter business because of the low price of filters available through Home Depot. June 10, 2016).*
- Flavor and vitamin concentrate bottles for home water dispensers
- Water softening agents
- The SWON shower-water saver and other conservation devices
- Kiddy pools and slip-n'-slides
- Specially formulated aquarium water
- Distilled water for irons, humidifiers at $1 per gallon ($.92 at Target; $1 at Kmart)
- Pool chemicals
- Lawn sprinklers
- Fountains
- High-tech personal water bottles
- Home water test kits [shown at right]. As an alternative to the customer-service-intensive lab testing, it may be more cost-effective to sell DIY test kits with instructions, offering phone consultation free only to RWA service area residents, and charging a fee of $39 for up to 20 minutes of phone consultation to all others. There are a number of kits already on the market.




CAPITAL INVESTMENT: **~$50,000** to install filling station under eave outside lobby of RWA offices, plus one shelving system and initial inventory in lobby for water-related products.

# 7. Bulk transport of processed water – Inside Connecticut

### a) By pipeline to neighboring authorities with shortages

RWA is already working on two interconnections to provide reciprocal capacity protection of up to 1 mgd with Wallingford and Southbury, both of which are heavily reliant on ground water (wells). New DEEP regulations will limit withdrawals from wells because the process limits stream flows. RWA has wells along route 10 that supply about 15% of the water to that area.

Currently, RWA generates $1.1 million in revenue (and net profit, since the cost of the water is negligible) through wholesaling 421 million gallons of water annually at ~.0026 per gallon.

Ted Norris would like to run a pipeline along route 1 to supply New London with water. [See Transportation of water by underwater flexible pipeline for a potentially less expensive and faster method of connection.]

### b) By truck (Swimming pool filling, construction site supply, ice rinks, and well replenishment)

One advantages of having pool water delivered is obviously convenience (not having to babysit a garden hose for hours) and the home owner gets to use the pool sooner. The water can also be pre-chlorinated.[9] RWA provides bulk filling stations for tankers, but does not currently deliver water by truck. According to 2012 minutes of the town of Woodbridge, the fire marshal is permitting pool water haulers to fill their tank trucks from fire hydrants.[10]

As an indication of labor and operating costs, Henshaw Farms in Massachusetts offers to fill most pools for $135 per hour.[11]

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[9] http://www.poolpricer.com/

[10] http://www.woodbridgect.org/filestorage/6587/6651/6828/6902/8532/05-21-2012_BOFC_Minutes_Approved.pdf

[11] http://henshawfarms.com/p/38/Bulk-Pool-Water-Delivery

1. VEHICLES. The average pool holds 19,000 gallons.[12] Tanker trucks are available in 2000 gallon (single axle), 4000 (double axel), 6000 (tractor trailer), and 9000 gallon capacity. RCL Trucking, Inc. in Franklin MA has a fleet of 9 6000-gallon tankers. Most pool filling companies use 6000 gallon trailers; a few supplement with smaller trucks.



*6000 Gallon tractor trailer, the most common delivery system among pool filling companies. Similar rigs sell for $160,000.*



*4000 Gallon water truck*

[12] Google

RWA BULK FILL STATIONS

- Branford (E Industrial Road),
- Cheshire (East Johnson Avenue, MacCausland Court),
- East Haven (Panagrossi Circle),
- Hamden (Crestway), and
- North Haven (Leonardo Drive).

With the exception of the Branford and Hamden stations, which are open all year, Bulk Fill stations are operated seasonally from April 1 through October 31.

2. SPRING WATER. RWA owns a spring in Prospect, Connecticut.

3. ADDITIVES. Bulk delivery by truck allows water to be prepared for intended use – at premium pricing. Unlike water delivered by mains, trucked water can have additives such as chlorine and chemicals to balance pH.

4. ULTRAPURE. As Ted Norris pointed out at the ideation session on May 23, 2016, many firms require absolute purity. And some homeowners may opt for a premium grade of water for swimming pools, hot tubs, aquariums or well replenishment. To guarantee that impurities are not introduced in the loading or off-loading process, we may want to add a "final filter" to the truck hose, as do gasoline filling stations.

   Potential customers for ultra-pure water include the following industries:

   - pharmaceutical,
   - cosmetics
   - semiconductor,
   - chemical,
   - medical research,
   - aquaponics and hydroponics.




*As evidence of need, the Meco company sells water purifying equipment to pharmas. While most large labs already have this equipment, small and university laboratories may find it more economical and reliable to procure "Guaranteed UltraPure®" water from RWA. And even large labs may feel safer starting the process with UltraPure® as opposed to standard.*

## 5. PRICING POOL WATER AND DELIVERY

L&J Pools in Bethel CT provides water delivery to surrounding towns. Their tankers hold 6000 gallons and all prices are on a per load basis.

POOL SIZES & CAPACITIES - ABOVE GROUND (APPROXIMATE)

| ROUND POOL | | OVAL POOL | |
|---|---|---|---|
| SIZE | CAPACITY | SIZE | CAPACITY |
| 12ft X 48 in – | 3,400 gal | 18ft X 12ft X 48in | 5,525 gal |
| 15ft X 48 in – | 5,300 gal | 24ft X 12ft X 48in | 7,688 gal |
| 18ft X 48 in – | 7,700 gal | 24ft X 15ft X 48in | 10,000 gal |
| 21ft X 48 in – | 10,400 gal | 30ft X 15ft X 48in | 12,000 gal |
| 24ft X 48 in – | 13,600 gal | 33ft X 15ft X 48in | 16,000 gal |
| 27ft X 48 in – | 17,200 gal | | |

ABOVE GROUND (APPROXIMATE)

| 3′ x 8′ deep | |
|---|---|
| 16 x 32 | 15,500 to 17,500 – 2-3 loads |
| 18 x 36 | 20,000 to 22,500 – 3-4 loads |
| 20 x 40 | 26,000 to 28,000 – 4-5 loads |

L&J PRICES (6,000 gallon minimum delivery charge regardless of how much customer takes)

| | | | | | |
|---|---|---|---|---|---|
| BETHEL, CT | – | $255.00 | NEW MILFORD, CT | – | $330.00 |
| BRIDGEWATER, CT | – | $340.00 | NEWTOWN, CT | – | $265.00 |
| BROOKFIELD, CT | – | $275.00 | REDDING, CT | – | $265.00 |
| DANBURY, CT | – | $265.00 | RIDGEFIELD, CT | – | $285.00 |
| EASTON, CT | – | $310.00 | SHERMAN, CT | – | $340.00 |
| MONROE, CT | – | $335.00 | SOUTHBURY, CT | – | $310.00 |
| NEW FAIRFIELD, CT | – | $285.00 | WESTON, CT | – | $330.00 |

Bridgewater is 17 miles and 39 minutes driving time (one way) from the L&J office in Bethel. The premium to deliver to Bridgewater is $85, to account for additional driving time and gas. The surcharge for adjacent towns to Bethel is only $10.

RTS Pool and Hot Tub Water in Hebron charges $250 for 5000 gallons (the capacity of their tanker), with no distance surcharges. (www.rynotransport.com)

L&J TERMS AND CONDITIONS:

- The tanker is over 60ft in length and will only park at road curb and then use up to 200 ft. of hose
- If additional hose is needed the charge is $25.00 + tax for each additional 50′ length
- The cannot deliver where steep hill exist
- Waiting time is $1.45 per minute or $85 per hour + tax
- If water is unable to be delivered because of site access, customer is responsible for delivery cost
- To split load with next door neighbor $100 + tax additional
- If an inline pump is needed it is $125 + tax additional

## 6. ESTIMATED REVENUE POTENTIAL

There are approximately 25 suppliers of pool water in Connecticut, ranging from one-truck operations working out of a house to multi-truck companies. There are also over 100 pool building contractors and almost as many pool supply companies. Both would make excellent referral partners for a bulk water supply business. With RWA's water quality reputation and analysis expertise, this would make for an formidable competitive advantage.

### POTENTIAL CUSTOMERS

- swimming pool filling after installation, repairs, or cleaning
- pool filling for well owners (filling a pool will deplete most private wells)
- tank cleaning and paint stripping (See Initiative Water tank cleaning)
- dust control at construction sites
- wells that need replenishing. (Due to regulation of well-charging, it was recommended at the Ideation follow-up session, that we work through an agent such and Hungerford for wells.)
- homes that rely on water tanks

Leslies has the largest chain of pool supply stores. I checked with one store and found that...

a) They do not offer a pool-filling service
b) They do not recommend anyone or even have a list of suppliers. This suggests that perhaps some pool supply stores and service companies could act as marketing partners.

### NET INCOME CALCULATION

Assuming 15 minutes to load and 30 minutes to unload each water shipment and
1 hour round trip average time to customer (anything over would be billed to client)
= maximum of 4 loads per day. The bulk fill stations vary in terms of pressure , although they all have a 2 ½ inch outlet and are all capable of flowing at least 600 gpm. (Email from Jim Hill)

At a year-round average efficiency of 3 loads per day x $300 per load average @ $.05 per gallon = $900 per day x 5 days per week = $4500 per week = **$225,000 per truck per year in revenue ( 75% efficiency)**.

Each truck would require a driver @ $70,000 per year (est. all in), $10,000 for gas and maintenance at $.50 per mile x 120 miles per day average, plus amortization of $160,000 vehicle over 10 years for an additional $16,000 = total annual cost per unit of $96,000, or a net contribution, after expense, of **$129,000 per unit**. A fleet of 8 tractor trailers would add **$1,032,000** to the bottom line at 75% efficiency.

As additional income, the fleet could also deliver ultra-pure water reverse osmosis water or distilled water at $1 per gallon. Chemworld.com ships distilled water for from $3.63 per gallon in 275-gallon containers to $7.00 a gallon in 55-gallon drums, including delivery.

Water consumption would equal 90,000 gallons per day.

During fall and winter months, the drivers could deliver fire wood or pellets for home heating (already produced by RWA) and malted barley to Connecticut breweries in conventional box trailers. (See initiatives Wood Fuel Pellets and Malting .)

## 7. CAPITAL INVESTMENT: **$150,000** for a 6000-gallon water trailer ($100,000) and marketing ($50,000) to test demand and operating profitability. RWA already a tractor to pull the trailer. To ramp up by adding 7 tractor-trailers each with a 6000-gallon capacity would require an additional investment of $1,120,000.

# 8. Bulk transport of processed water – Outside Connecticut

## EXCESS RWA CAPACITY

The total Safe Yield (the yield which can be reasonably expected in 99 out of 100 years) of all active sources is 79.3 million gallons per day ("MGD"). The total Available Water for all Authority supplies, which is defined by the Connecticut Department of Public Health ("DPH") as the amount of water that the Authority can dependably supply, taking into account limitations on Safe Yield, is 76.7 MGD.

The Authority's Available Water is approximately 15.8 MGD greater than the highest historical annual average daily draft in the Authority's service area of 60.9 MGD in 1988.

## LEGISLATIVE RESTRICTIONS.

Pending legislation at the state level would require permission to export more than 500,000 gallons outside Connecticut.

To export water outside Connecticut or the U.S., there would be a need to educate the general public and state legislators on the value of selling surplus water. This may be an uphill battle, and even if winnable, may not be worth the potential negative publicity. Even Canada is considering legislation to prohibit sales of its waters to foreign countries, and they own 20% of the world's water reserves.

## AREAS ALONG ATLANTIC COAST WITH CURRENT OR PREDICTED WATER SHORTAGES

- LONG ISLAND. Long Island (where 5000-year-old aquifers are being depleted). It is 12.5 miles as the dolphin swims from Hammonhasset State Park in Connecticut to Lighthouse Road in LI.
- WESTCHESTER COUNTY (the region has 96 water systems)
- WASHINGTON D.C.
- ATLANTA
- FLORIDA
- THE BAHAMAS is the only country in the western hemisphere importing water.

## FOUR METHODS OF TRANSPORTING EXCESS WATER LONG DISTANCES:

- By underwater flexible pipeline
- By tanker ship
- By rail
- By water bags towed by ships

## a) Transportation of water by underwater flexible pipeline

A French company, Via Marina, has developed a proprietary system called submariver® that they describe as follows.[13]

*"Available water at river mouths can be transported by underwater pipes parallel to the coast (or across the sea to islands). This patented system is structured around a special and very flexible pipe that adapts to the seabed profile without preparation of the ground. It is laid on the sea bottom (typically at 200m depth) and ballasted."*

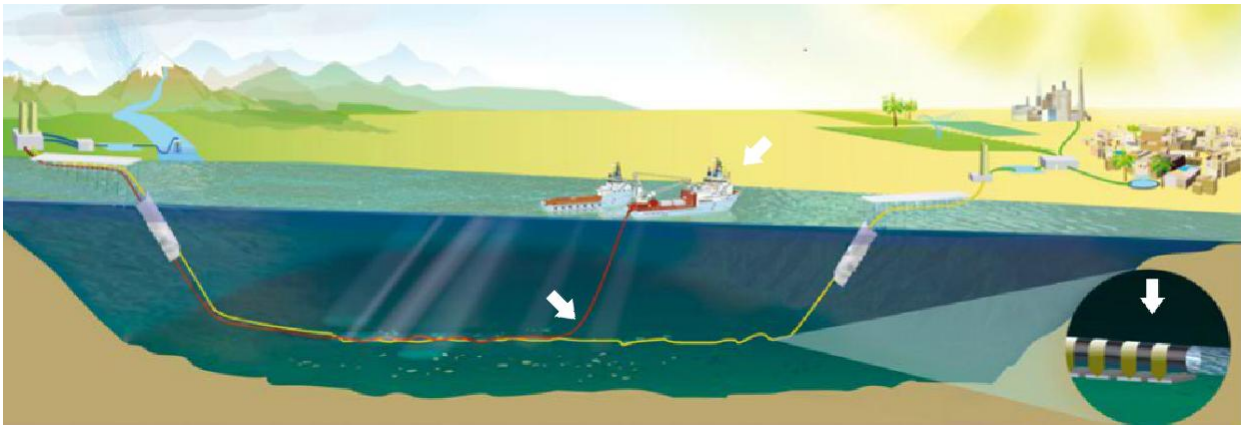
The cost is *"(0.1 – 0.3€/m3 in most cases."* This is cheaper than desalination or transport by tanker ship.

*"Its energy consumption is less than 0.2kWh/m3 in most cases, which is about 5% of the energy necessary for seawater desalination. The low energy consumption makes the process more environmentally friendly and less sensitive to energy price.*

The pipe is made of existing thermoplastics: e.g. fibers of high tenacity polyester and coating of low density polyethylene. A filtering and a light chlorination is required at the departure point to prevent harm to the system and pipe.[14]

Engineering and installation will require approximately 5 years, primarily for the connections at each end and pumping stations. The actual pipeline can be laid at the rate of 3 miles per day. There are currently no installations.

A consideration in Long Island Sound is the danger of an underwater pipe being hooked by a ship anchor. For this reason, Via Marina recommends redundant pipelines.



CAPITAL INVESTMENT: $20,000,000 for underwater system to Long Island; $30,000,000 to New London (est.)

ESTIMATED COST TO TRANSPORT WATER VIA SUBMERGED PIPELINE (Per Via Marina). From $.0004 to $.0012 per gallon.

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[13] Felix Bogliolo, writing IWA Water Wiki, Jan 1, 2010, on behalf of Via Marina http://www.iwawaterwiki.org/xwiki/bin/view/Articles/Transportationoffreshwaterinlargequantitiesandoverlongdistancesbyunderwaterflexiblepipeline

[14] Email June 3, 2016, from Felix Bogliolo, to M. Roer.

## b) Transportation of water by tankers

Shipping water vast distances is uneconomical due to the cost of fuel. However, water shipments do occur on small geographic scales. In 1997, Greece began shipping water to the island of Aegina, 13 miles off its coast. Singapore currently imports freshwater from Malaysia.

Moreover, desalination plants, which are very popular in the Middle East, are much less costly. Saudi Arabia and Kuwait are almost completely dependent on desalinated water. Water from desalination plants costs about $1/cubic meter (this price includes the cost of building and running the plant).[15]

ESTIMATED COST TO TRANSPORT WATER VIA TANKER. Via Marina, who sells a competing system, avers that shipment by sea is > 2 Euro per cubic meter, or approx. **$.01 per gallon**.

The transportation cost can be reduced if oil tankers brining hydrocarbons from the oil-rich, water-starved middle east to Connecticut can be loaded with water for the return trip.

A typical supertanker has a capacity of 2 million barrels, or 84 million gallons, at 42 gallons per barrel. While in theory oil and water do not mix, the water would need to be reprocessed after delivery.

LNG TANKERS, on the other hand, may be more compatible since the tanks evaporate all residual gas after pumping. The largest LNG tankers hold 33 million gallons, There are four ports in the U.S. that accept liquefied natural gas. One arrives in Boston "every few days." Considering RWA's 15 mgd surplus, this might be a good fit.




*An LNG tanker in Boston Harbor.*

A Washington-based company has begun shipping city tap water from Alaska on barges to be bottled in Kent, Washington.

The main logistical hurdles are on the receiving end, where there is usually a lack of infrastructure to take water from vessels into tanks or storage facilities. For a temporary solution, Alaska Bulk Water is considering a new twist on the bladder idea of loading water in shipping containers with special bags. Most ports know how to handle containers.

CAPITAL INVESTMENT: $1,000,000.[16]

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[15] Peter Gleick, President of the Pacific Institute for Studies in Development, Environment, and Security; quoted in the Guardian http://www.theguardian.com/environment/2010/sep/06/ship-fresh-water-alaska-india

[16] http://www.aguanomics.com/2009/02/persistance-and-baggs.html

## c) Transportation of water by rail (WBR)

ESTIMATED COST TO TRANSPORT WATER BY RAIL. The going rate for moving crude from North Dakota to California sits near $14 per barrel, which translates to roughly $**.32 per gallon**. This does not include the costs to procure, load and unload the water.[17]

Can federal or state funding help offset the transportation costs?

ASSEMBLING A WATER CAR FLEET. With most of North America's 371,000 tank cars already dedicated to crude, chemicals and other commodities, and orders for new cars running a year or more behind schedule, is it even possible to field an effective number of unit trains for water? *Railway Age* Editor-in-Chief William Vantuono suggests:

> *"The 165,00-plus DOT-111 tank cars that do not meet the latest voluntary AAR safety standards (CPC-1232) for hazmat and that could be forced out of service by a pending PHMSA rulemaking could be purchased by the feds and re-purposed into water cars (i.e. clean them up, install new linings, new fittings, etc.). That would help solve the rail industry problem of what to do with all these suddenly obsolete but serviceable tank cars that the feds say we can't use for the purpose for which they were originally built."*[18]

Vantuono ran the idea past Robert Pickel, Senior Vice President-Marketing and Sales at National Steel Car. "Blasting a car can cost $1,500 to $2,000 per car," Pickel said. "Lining, depending on the material, would likely cost around $5,000 to $6,000 per car." That's compared to the $20,000 to $40,000 estimated cost of refitting a DOT-111 tank car for continued crude service.[19]

Among those DOT-111s currently moving hazmat, Pickel says there are 80,000 "legacy" cars built before 2011, which will be obsolete for crude service by 2017.

DOT-111s and other tank cars used in CBR service are mostly in the 30,000 to 32,000-gallon-capacity range. But with water being heavier than crude, tank cars used in WBR service could only be filled to around 20,000 to 22,000 gallons so as not to exceed gross axle load limits. Ideally, this would mean using tank cars in that medium size range for WBR.




But filled to only two-thirds of their capacity with water, sloshing could be problematic. Baffles might work as they are used in other transport modes.

Another is whether sub-freezing temperatures present challenges during loading or shipment.

Keith Getter | Getty Images

CAPITAL INVESTMENT: $2,500,000 for a fleet of 50 refurbished cars. A number of used 20,000 gallon cars (the right size) are available for $18,000 to $40,000.[20] Cars should be insulated for carrying

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[17] Bruce E. Kelly "Drought relief, by rail." *Railway Age*. *August 03, 2015* http://www.railwayage.com/index.php/freight/class-i/drought-relief-by-rail.html

[18] Bruce E. Kelly *ibid.*

[19] Bruce E. Kelly *ibid.*

[20] http://www.sterlingrail.com/classifieds/Listings.php?type=Tank%20Car&fsw=FS

water.  According to the Association of American Railroads (AAR)Rail cars built after 1974 and more than 50 years old can only transfer between railroads by mutual agreement.[21]

### d) Transportation by water bag towed behind ships

During the Gulf War, Operation Desert Storm used water bags to supply water to the troops.

Several companies around the world are developing technologies whereby large quantities of fresh water can be loaded into huge sealed bags and towed across the ocean for sale.

The Nordic Water Supply Company in Oslo, Norway, has signed a contract to deliver 7 million cubic meters of water per year in bags to northern Cyprus.

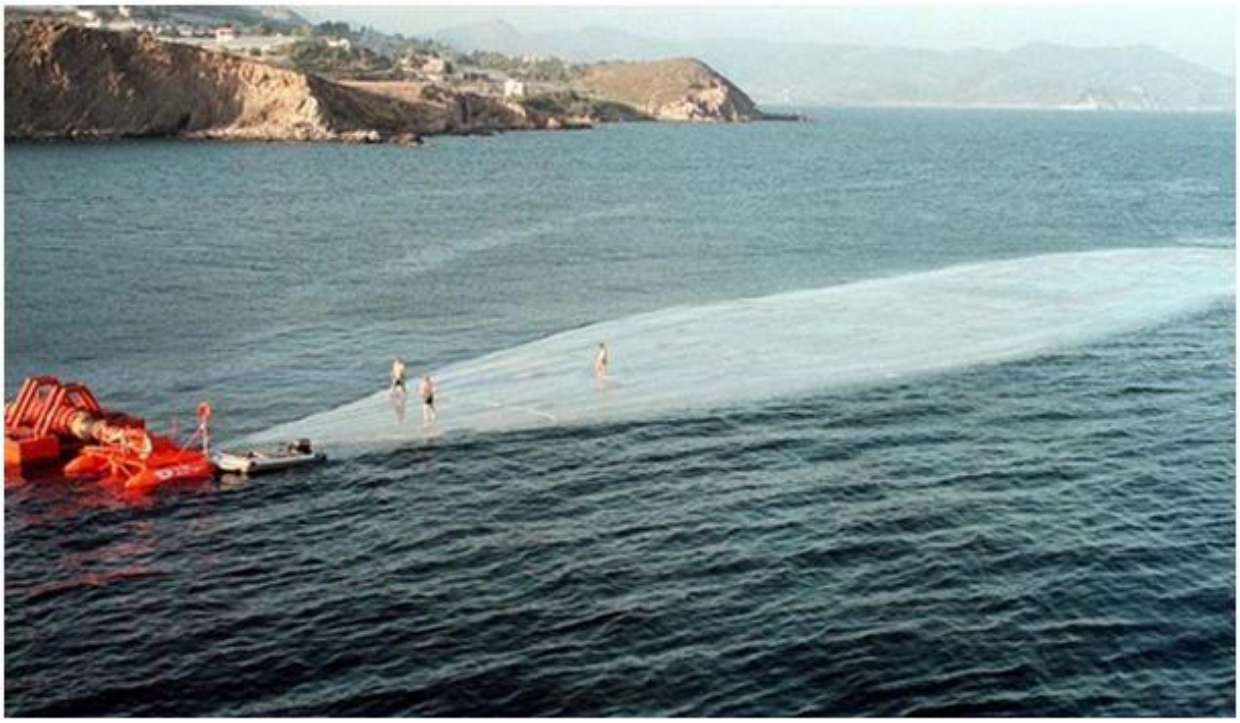
Aquarius Water Trading and Transportation Ltd. of England and Greece has begun the first commercial deliveries of fresh water by polyurethane bags, towed like barges through waterways. The company, whose corporate investors include Suez Lyonnaise des Eaux, delivers water to the Greek Islands where a piping system links the bag to the main water supply on the island. Aquarius predicts that the market will soon exceed 200 million metric tons per year. The company's bag fleet consists of eight 720-ton bags and two 2,000-ton versions.

See http://www.hidropolitikakademi.org/en/international-water-transfer-projects-of-turkey.html

For more on the history and alternative water bag technologies see
https://en.wikipedia.org/wiki/Flexible_barge

http://www.mdpi.com/2079-9276/3/4/703/htm

[21] https://www.up.com/customers/all/equipment/over-age/index.htm#6



CAPITAL INVESTMENT: $2,500,000 for a fleet of 50 refurbished cars. A number of used 20,000

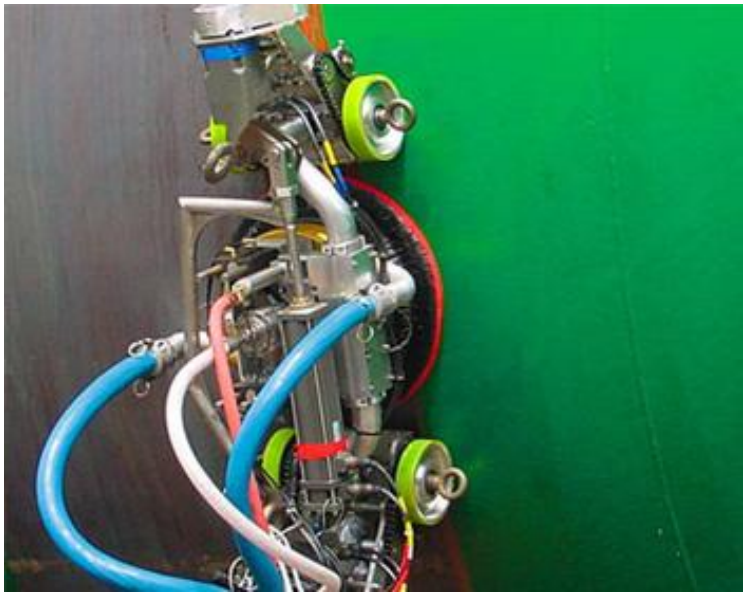
# 9. Storage tank stripping and repainting

RWA operates 39 water storage tanks, 24 of which are steel while the remainder are concrete. All steel tanks require periodic re-painting of the exterior with frequency dependent on location and climatic conditions. All painting is performed by outside contractors.

Painting – RWA steel tanks range in size from 16,000 square feet to 93,000 square feet. Exterior painting is required more frequently versus interior due to climatic conditions in the Northeast and is much more expensive than interior stripping and painting due to shrouding of the exterior to contain debris during sand blasting.

MANUAL PAINT REMOVAL. Sand blasting is expensive and not environmentally friendly. Costs for the small 18,000 square foot NW Cheshire tank were $160,000 or $8.89/square foot PLUS $70,000 for the exterior shroud for a total of $230,000 or $12.78/s.f. At this writing other comparative costs have not been received, but one can only imagine the cost for the larger 81,000 s.f. tanks.

ROBOTIC PAINT REMOVAL. An alternate means of stripping paint from the surface is robots equipped with high pressure water jets, which magnetically adhere to metal surfaces to strip the paint and, simultaneously, vacuum debris into a container which filters the water for recirculation.



THE ECONOMICS. Early estimates for Waterjet Robotics project to $7.38 s.f. with no need for an external shroud., This translates to a 42% savings versus current methods. Incremental cost savings are expected from lower mobilization and de-mobilization expenses, clean-up costs and liability insurance.

See chart on next page for a detailed cost comparison between the current all-manual process and the alternative method of a robot performing the stripping on the flat surfaces, which are typically 80% to 85% of the tank area.

SUMMARY OF BENEFITS OF THE ROBOTIC PROCESS:

1. Enhanced safety as the operator guides the robot via joystick from the ground, debris is instantly captured upon removal and sent to an enclosed container, preventing air and ground pollution.
2. Environmentally Friendly as ALL debris is instantly contained upon removal.
3. Less expensive as the process is faster versus all-manual methods.
4. Reduced down time due to the speedier process, tanks can be returned to service quicker.
5. Lower insurance premiums as the process reduces labor in number and in hazardous exposure to falls and inhalation of paint particles.

## Cost Analysis – NW Cheshire Storage Tank

| Paint Removal | Tank Size (sf) | Cost/ s.f. | Cost $ | Debris Shroud | Insurance | Total Cost | Savings with Robot |
|---|---|---|---|---|---|---|---|
| **EXTERIOR** | 8,000 | | | | | | |
| All Manual (current system) | | $10.00 | $80,000 | $70,000 | TBD | $150,000 | |
| Using robot on flat surfaces | | | | | | | |
| 80% by robot | | $ 6.71 | $42.950 | -0- | | | |
| 20% manual | | $10.00 | $16,000 | | | | |
| Total with robot | | *$ 7.37 average* | $58,950 | -0- | TBD | $58,950 | ($91,050) |
| | | | | | | | |
| **INTERIOR** | 10,000 | | | | | | |
| All Manual (current system) | | $10.00 | $80,000 | -0- | TBD | $80,000 | |
| Using robot | | | | | | | |
| 80% by robot | | $ 6.71 | $53,700 | -0- | | | |
| 20% manual | | $10.00 | $20,000 | | | | |
| Total with robot | | *$ 7.40 average* | $73,950 | | | $73,950 | ($6,050) |
| | | | | | | | |
| **Total Cost** | | | | | | | |
| Manual | | | | | | $230,000 ($12.77/sf) | |
| Robot | | | | | | $132,900 ($7.38/s.f.) | ($97,100) (42%) |

*Notes: 1) Waterjet Robotics amounts include profit.*

*2) Savings do not reflect reduced insurance costs and mobilization costs which have yet to be determined.*

Translating the above savings to RWA's average size tank of 38,700 square feet results in a savings of $283,800 per tank, and for the large 93,000 tank in Saltonstall Ridge, a $502,000 savings for the paint removal phase.

BUSINESS OPPORTUNITY. RWA may have the opportunity to become the exclusive licensee for the Waterjet Robotics system within Connecticut or a portion of the State, thereby enabling it to offer tank paint removal services to tank owners for incremental sales and profits. Once the paint stripping technology has been perfected within RWA it can contract out to others for paint preparation services or seek a Joint-Venture with an established tank painting company. A pricing model could be crafted for marketing purposes which would cite the cumulative benefits of safety, environmentally friendly and lower labor and insurance expense.

POTENTIAL ADDITIONAL ROBOTIC ADAPTATIONS. In the future, the magnetic adhering robots might be adapted to clean and inspect the inside of mains as well as tanks.

CAPITAL INVESTMENT: the opportunity exists for RWA to enter into a License Agreement with Waterjet Robotics LLC within Connecticut. Capital investment will be contingent on the territory and number of tanks within it. For example, an investment of $400,000-$450,000 for one mid-sized robot with handheld controller and compressor could complete at least two tanks per month. Assuming an average size of 45,000 sq. ft., 80% accessible to the robot, ongoing volume of two/month, gross revenues for paint removal is estimated at $332,100/tank or $8,000,000 for twenty-four tanks. Painting could be handled by an established paint company as a Joint-Venture partner if RWA elected to avoid that phase. The License Agreement would offer equipment purchase/lease terms as well as exclusivity and royalty obligations.

Full disclosure: BDR is the License Agent for the Waterjet Robotics company.

# 10. Billing services

The advantage of billing services is that this is a function RWA already performs, so the ramp-up learning curve is minimal, and there is very little risk or capital investment required.

The strongest competitive advantage would be billing for products or services sold to current RWA customers.

As an example of a precedent, Erie Water Works provides sewer and refuse billing services for the City of Erie and 2 other surrounding communities. In 2012 the authority earned "approximately" $39,000 on revenue of $390,000.[22] As EWW explains ...

> *"As a Municipal Authority, EWW uses Cost of Service principals [sic] to establish fair and equitable charges for services rendered. EWW builds in approximately 10% for administrative overhead in addition to the actual projected costs to provide the service. EWW is also very sensitive to its tax exempt status, and as a result does not seek other activities or look to make additional income on services provided."*
>
> *Perhaps EWW is applying favorable cost accounting principles, as the only additional expense it incurred was to hire "one additional customer service representative." If, however, EWW did actually pay the customer service rep $351,000 I'm moving to Erie.*

RANKING BY RWA STAFF. Interestingly, of 35 initiatives rated by RWA staff (in 2014), "Billing services for other water utilities" was ranked among the top 6 by 3 respondents and among the bottom 6 concepts by 3 others, with 2 giving it an average rating.[23] This concept received the most divergent opinions. It may be worthwhile for the pros and cons to compare notes.

This is an example of the risk of voting on the most promising concepts. Beware the tyranny of democracy.

AN EXAMPLE OF A POTENTIAL CLIENT. The Greater New Haven Water Pollution Control Authority (GNHWPCA) was created in July, 2005 as a Regional Sewer Authority that provides sewer service to the communities of New Haven, Hamden, East Haven, and Woodbridge.[24]

*RELATED CONSIDERATION. The current billing system is based on a legacy SAP platform that, like old pipes with patches over patches, is increasingly expensive to maintain and lacks the agility of newer software platforms. The time and expense needed to add new features or even change the name or price of existing products is a deterrent to growing billing services as a profit center.*

*The promise of a new system might be easier to justify financially if it not only would streamline current operations but would also enable a variety of new revenue streams (all of which would require a billing component).*

CAPITAL INVESTMENT: $100,000 estimate of cost of modifications to billing software, or incremental expense of adding non-customer billing services to a totally new billing system.

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[22] Non-Utility Revenues Study, Sept 2012

[23] Non-Core Revenue Matrix Score Sheet - Internal RWA Evaluation of New Product Ideas, compiled by Jim Hill, Nov 2014; refined March 23, 2015

[24] http://gnhwpca.com/

# 11. Alternative pricing structures

### a) Economic development rate

To encourage new commercial and industrial customers, the Regional Water Authority provides the following economic development rate:

- 80% of the applicable water rates for the first five years.
- After the first five years the Authority will assess the customer its full applicable water rates.
- Rates are subject to periodic effects of a general rate increase and/or surcharges.

To qualify for this economic development rate, the customer must be new to the Authority's service area and consume at least 500,000 gallons per year.

The cost per cubic foot ranges on a sliding scale from ...

- $2.901 per 100 cubic feet (for customers with 8" to 12" diameter water mains), to
- $3.15 per ccf (for 3" to 6" mains), to
- $3.683 per ccf (for mains .75 inch or narrower).

This equates to approximately $.0039 to $.0042 per gallon (at 7.48 gallons per cubic foot) for industrial users (mains of 3" or larger).

The 20% discount on these rates amounts to an annual savings of approximately $400 at a usage level of 500,000 gallons per year.

This is not an incentive to start a new business, so if might be worth considering eliminating this discount and retaining these funds within RWA. ($400 times x users might be substantial for RWA even if not an affective incentive to each company.)

Electric and gas rates represent a larger share of utility costs for more businesses, and that these energy utilities offer economic development rates as a matter of course. Of course a water authority may come under pressure to "do their fair share" to attract outside businesses. Still, the argument might be made that a new development or enterprise would need to consume a significant amount of water on a daily basis for a water rate discount to have any meaningful effect; and unless that were the case the erstwhile RWA profits—that could otherwise help hold down water costs for everyone—are being wasted.

Now, if the region is courting a company that would use a substantial amount of water, say 100,000,000 gallons (with a value to RWA of $388,000 per year @ .00388 per gallon [ $2.901 per ccf]), then a 20% discount would equal $77,600. That sum might weigh on a location decision and result in significant new income for RWA.

CAPITAL INVESTMENT: none.

## b) Water futures

By selling futures, the Authority would thereby allow customers to ...

- lock in rates for a year or more, and/or
- be guaranteed a specific minimum supply.

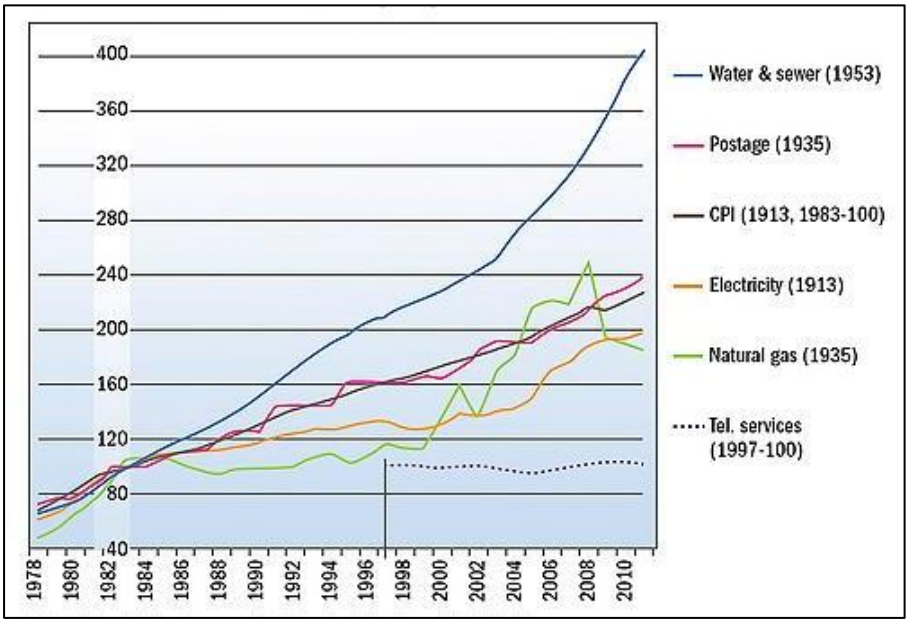
The following is an analysis of the economics of each of these two types of guarantee:

AVAILABILITY GUARANTEE. There may not be a demand for these futures from RWA customers since there is currently an overabundance of water in the service area, except for customers relying on well water (either their own or municipal wells). Conversely, in a 100-year drought scenario, the Authority might find itself in a position where it would be contractually obligated to deliver on more futures contracts than the available amount of water would allow.

However, there are scenarios that are localized to a particular well complex (not caused by a general drought or region-wide drop in the water table) or to a particular customer due to a natural (e.g. tornado) or man-made disaster (e.g. water main break). RWA could ensure an adequate water supply to these customers as theses sporadic and localized water "outages" would likely not exceed RWA capacity to produce or deliver the required water.

Of course, to offer this future guarantee of delivery, RWA would have to implement the Bulk Water Delivery by Tanker Truck initiative to supply swimming pools, construction sites, and well replenishment).

PRICE GUARANTEE. Regarding price protection, water rates have been relatively stable compared to other commodities like energy. We do not see evidence of adequate demand for price-based futures. And the concept may not be in the financial interest of RWA since operating costs continue to rise and for the foreseeable future RWA will most likely need to include price increases in its revenue mix. That is, the revenue from the sale of futures might be more than offset by the lower future water revenue.




***Relative Price Stability of Consumer Commodities 1979-2011***. *Note that lines are erratic, showing seasonal as well as annual variability, except for water (and sewer costs, as they are typically tied to water usage). Index set in 1983 at 100. The blue "Water" line shows a steady progression.*

Beecher J., Trends in Consumer Prices (CPI) for Utilities Through 2011 and Consumer Expenditures on Utilities in 2010, Institute of Public Utilities, Michigan State University. March 2012. Available at ipu.msu.edu.

CAPITAL INVESTMENT: none.

# 12. Lab Testing

This has been a successful auxiliary venture for RWA. As the Authority enjoys a superior reputation nationally, it was suggested at the April 28, 2016, staff meeting with consultants that the current contribution to net income of $250,000 could be increased to more than $1,000,000.

The service would probably grow gradually organically on its own, but it was suggested by staff that another lab might be acquired to accelerate growth in this sector.

Example market rates for testing include:

- Home testing - $30. (This has proved to be unprofitable due to the demand for up to two hours spent on the phone answering questions of consumers, especially for homes changing ownership, as the buyer, seller, and realtor may all have questions.)
- Lead testing - $50 to $175
- Fluorides - $125
- Odors - $100

CAPITAL INVESTMENT: Additional lab equipment to accommodate growth.



# 13. Remote monitoring of water quality

Testing could be performed on the customer's premises, remotely though on-site sensors as an internet of things service. The data would be sent to the RWA labs where out-of-range indices would be automatically flagged. The client would receive the same electronic report.

Potential clients include:

- Water-dependent industries
    - Pharma
    - Breweries and distilleries
- Aquaponics farms
- Schools
- Hotels
- Hospitals
- Apartment buildings
- Homes

The ultimate "Complete Water Solution" would be an automated and continuous on-site monitoring system that would insert additives into mixing tanks and divert water through appropriate filters. The computer-controlled system would also send reports back to the RWA lab of any anomalies and daily reports to the client showing usage and water quality.

CAPITAL INVESTMENT: $100,000 for automated test equipment, or leased for terms of contracts.

# 14. Wood fuel pellets



Forestry as wood for home heating already contributes $300,000 per year in revenue to RWA. A $500,000 bridge would provide access to an additional 800 acres suitable for forestry.

Wood pellets are compressed by-products from the forest products industry, often woodchips and sawdust. They are a cost-effective heating fuel with several advantages over other types of biomass.

Wood pellets are uniformly sized, making them easier to store and use than many other biomass fuels. Pellet heating technology is increasing in popularity and is quite simple, minimizing operation and maintenance requirements. These heating systems can be easy to plan for and install and can save a building owner thousands of dollars in energy costs over time while providing significant local economic and environmental benefits.[25]

ADVANTAGES TO HEATING WITH BIOMASS
Using biomass fuels helps mitigate such environmental issues as acid rain and global climate change. Perhaps the greatest advantage of biomass fuels, however, is that they cost on average 25-50 percent less than fossil heating fuels and are more stable in pricing.[26]

In addition, wood pellets:

- have a high energy content, and the technology is highly efficient compared to other biomass fuels
- are a clean-burning renewable fuel source
- are produced from forestry waste materials

Pellets are sold in 40 lb. bags for customer pick-up at prices ranging from $4 to $6 per bag at locations like Lowes, Walmart and Home Depot. Lowes sells bags for $4. An order for 50 bags (1 ton) costs $199 and Lowes will deliver for a flat fee of $65 additional.




*Drivers that deliver pool water in the summer can deliver pellets in the winter.*

(See Pool Filling)

CAPITAL INVESTMENT: $76,800 for Lawson Mills LMXXT 40 HP pelletizer, $130,800 for grinder (each with a capacity of 1500 pounds per hour);[27] and $60,000 for truck with lift-gate. Adding a provision for delivery and supplies, the total estimate equals **$275,000**.

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25 http://www.biomasscenter.org/pdfs/DOER_Pellet_Guidebook.pdf
26 http://www.biomasscenter.org/pdfs/DOER_Pellet_Guidebook.pdf
27 http://www.lawsonmills.com/pricing-lease-options

# 15. Algae into fertilizer

Traditionally, copper sulfate is applied to water supply reservoirs to control nuisance levels of algae. While copper sulfate applications can have short-term benefits to drinking water supplies, particularly when the treatment process is inefficient at treating high levels of algae, longer-term water quality effects are usually negative, as a result of increased oxygen demand, accelerated recycling of algal nutrients and toxicity to algae grazers. It is the Authority's plan not to use copper sulfate in Lake Whitney, as the advanced treatment process at the new filtration plant will be capable of removing high levels of algae and associated taste and odor causing compounds.[28] The Whitney water treatment plant has the highest concentration of algae.

| Date | Depth (meters) | Temp °C | Dissolved Oxygen (% saturation) | Dissolved Oxygen (mg/L) | Turbidity (NTUs) | pH | Conductivity (µS/cm) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 6/29/2009 | 0.1 | 21.6 | 99.8 | 8.9 | 4.1 | 7.4 | 239 |
| 6/29/2009 | 1.0 | 20.5 | 90.0 | 8.0 | | 7.4 | 248 |
| 6/29/2009 | 2.0 | 19.4 | 75.3 | 7.0 | | 7.3 | 259 |
| 6/29/2009 | 3.0 | 19.1 | 69.3 | 6.0 | | 7.2 | 258 |
| 6/29/2009 | 3.4 | 17.8 | 28.7 | 4.1 | | 7.1 | 241 |

*Lake Whitney water quality as measured on June 29, 2009 using digital meters and water grab test kits, are presented below.*[29]

Algae is an example of phytoplankton. Phytoplankton cell counts at Lake Whitney are provided in Table 2 on a following page. Golden algae (Chrysophyta) were the major component of the phytoplankton at the time of sampling in 2009, with smaller amounts of algae from three other divisions. The blue-green Anabaena (more properly cyanobacteria), several diatoms, and the chlorophyte Sphaerocystis were present in the plankton sample, but not at abundant levels.

## CONVERTING ALGAE INTO A CASH CROP.

A recent Connecticut startup, Sea Green Organics (SGO), processes macro algae that are sustainably harvested from oceans into organic liquid fertilizers that are used in food crop production and turf applications; benefits include 30% or more, reduction of required irrigation water when applied to food crops/turf and increased salable yields. The algae that RWA filters out as part during water processing may be convertible into an effective dry fertilizer.

Currently, SGO harvests salt-water algae. To determine whether the species of fresh-water algae in the RWA waste stream are suitable as a basis for fertilizer, samples will need to be collected and test. SGO has agreed to perform the tests.

One obstacle already identified is that RWA uses flocculants to help filter out solids for the water. These chemicals are generally toxic and not suitable for fertilizers. The algae will probably need to be extracted

[28] http://www.rwater.com/stewardship/whitney-environmental-management-plan/

[29] http://www.rwater.com/media/19111/2010_BioAssess.pdf

from the raw water prior to the flocculants being added. If this is not practical, perhaps the algae could be harvested from the lakes and reservoirs.

Purity of the feed stock is also of importance; elements such as silt, sand, sticks et al need to be eliminated from the Phytoplankton prior to processing. Differing technologies may be used such as filter presses or industrial centrifuges.

Per Jim Hill at ideation follow-up session on June 10, only 10-20% of the waste is organic; and the organic component is available only 3 months of the year.

The following steps would be followed to determine whether the available algae is suitable as a base for fertilizer:

1. Fertilizer would be produced from the algae samples using SGO's proprietary process and evaluated using lab analysis protocols including, but not limited to HPLC and NMR spectra analysis.
2. Should samples show adequate levels of bio-active compounds suitable for crop production, volumes of product able to be produced would be determined based on concentrations used in testing.
3. Should samples show sub-par levels of bio-active compounds, alternative processing techniques would need to be explored/developed; and economics of the alternatives evaluated.

Assuming the RWA algae are appropriate to produce a product with maximum efficacy and market acceptance, the following economic assumptions can be made.

THE ECONOMICS

| | | |
|---|---|---|
| Capital Investment | $ 500,000 | 5yr loan at 4% |
| Estimated annual Revenue | $ 2,500,000 | Feed stock dependent |
| OPEX and overhead | $ 600,000 | |
| Net Profit | $ 1,900,000 | |

Depending on volume of Phytoplankton supplied by RWA, total space requirement is estimated at 6,500 – 8,000 s.f.

Full disclosure: Mike Roer has a $5000 loan outstanding to Sea Green Organics LLC.

*Sea Green Organics liquid seaweed extract fertilizer is available in sizes from 1 gallon (below) to 275 gallon containers (left).*






Table 2. Phytoplankton density (cells/mL) and biomass (µg/L) for the sample collected in upper Lake Whitney in June 29, 2009.

| | Density (cells/mL) LW-1 06/29/09 | | Biomass (µg/L) LW-1 06/29/09 |
|---|---|---|---|
| **TAXON** | | **TAXON** | |
| **BACILLARIOPHYTA** | | **BACILLARIOPHYTA** | |
| **Centric Diatoms** | | **Centric Diatoms** | |
| *Aulacoseira* | 90 | *Aulacoseira* | 27 |
| **Araphid Pennate Diatoms** | | **Araphid Pennate Diatoms** | |
| *Asterionella* | 45 | *Asterionella* | 9 |
| *Synedra* | 30 | *Synedra* | 24 |
| *Tabellaria* | 30 | *Tabellaria* | 24 |
| **CHLOROPHYTA** | | **CHLOROPHYTA** | |
| **Coccoid/Colonial Chlorophytes** | | **Coccoid/Colonial Chlorophytes** | |
| *Sphaerocystis* | 120 | *Sphaerocystis* | 24 |
| **CHRYSOPHYTA** | | **CHRYSOPHYTA** | |
| **Flagellated Classic Chrysophytes** | | **Flagellated Classic Chrysophytes** | |
| *Dinobryon* | 120 | *Dinobryon* | 360 |
| **CYANOPHYTA** | | **CYANOPHYTA** | |
| **Filamentous Nitrogen Fixers** | | **Filamentous Nitrogen Fixers** | |
| *Anabaena* | 210 | *Anabaena* | 42 |
| **DENSITY (CELLS/ML) SUMMARY** | | **BIOMASS (UG/L) SUMMARY** | |
| **BACILLARIOPHYTA** | **195** | **BACILLARIOPHYTA** | **84** |
| **CHLOROPHYTA** | **120** | **CHLOROPHYTA** | **24** |
| **CHRYSOPHYTA** | **120** | **CHRYSOPHYTA** | **360** |
| **CRYPTOPHYTA** | **0** | **CRYPTOPHYTA** | **0** |
| **CYANOPHYTA** | **210** | **CYANOPHYTA** | **42** |
| **EUGLENOPHYTA** | **0** | **EUGLENOPHYTA** | **0** |
| **PYRRHOPHYTA** | **0** | **PYRRHOPHYTA** | **0** |
| **TOTAL** | **645** | **TOTAL** | **510** |
| **CELL DIVERSITY** | **0.75** | **BIOMASS DIVERSITY** | **0.48** |
| **CELL EVENNESS** | **0.89** | **BIOMASS EVENNESS** | **0.57** |
| **NUMBER OF TAXA** | | | |
| **BACILLARIOPHYTA** | **4** | | |
| **CHLOROPHYTA** | **1** | | |
| **CHRYSOPHYTA** | **1** | | |
| **CRYPTOPHYTA** | **0** | | |
| **CYANOPHYTA** | **1** | | |
| **EUGLENOPHYTA** | **0** | | |
| **PYRRHOPHYTA** | **0** | | |
| **TOTAL** | **7** | | |

*Phytoplankton were assessed from a whole water sample collected as a near-surface grab sample once on June 29, 2009. Samples were preserved in gluteraldehyde, concentrated by settling, and examined under phase contrast optics at 400X. Cell counts were converted to biomass estimates on a volumetric basis based on cell measurements. [http://www.rwater.com/media/19111/2010_BioAssess.pdf, p. 8]*

# 16. Energy generation

Methods of energy generation already employed by RWA—currently restricted to its own consumption—include:

- Photovoltaic
- Bioreactors
- Hydroelectric (1 installation on line with plans for a second)

### a) Photovoltaic

According to Jim Hill, two unique opportunities exist because additional licensing/right of ways aren't a roadblock:

a) The substation next to 72 Hosley Avenue was RWA land at one point. There is no class III land near there but there is a high voltage power line that runs through RWA property near the substation and a right of way from the substation to the power line. Solar panels could be ground-mounted on one edge of the clear-cut below the power line, potentially for miles, although not all on RWA property.

b) Floating Solar panels on the Saltonstall reservoir. Although land-based panels are still less expensive than water-based installations, RWA is blessed with an abundance of calm waters of more than adequate size for a floating array.



*RWA existing land-based 1-megawatt solar system, which is expected to produce 1.4 million kWh of energy each year, resulting in a savings of over $2 million during its lifetime.*[30]

The Source Group has discussed the feasibility of building energy parks on class 3 land with Connecticut Energy Parks, LLC, a firm that has developed similar projects in Vermont and is in the planning stage for projects in Connecticut.

One of the largest electrical junctions in the country is located at the PSEG power plant in New Haven harbor, connecting a trunk line running under the Sound from Long Island to New England. A solar/battery energy complex connected to this junction could sell electricity over a broad network to meet peak energy (and price) demands.

Recently, the developer has been asked to bid on a solar proposal for the Milford CT school district.

[30] http://www.solarcity.com/commercial/water-district-solar-projects/south-central-connecticut



***Europe's biggest floating solar power system on a reservoir near Manchester in the U.K.*** *The array is being installed by water authority United Utilities to cut energy costs. The 12,000 panel, £3.5m development will be only the second of its kind in Britain, dwarfing an 800-panel pilot last year. The new installation will provide a third of the power for a water treatment works. The technology was introduced to the country by entrepreneur Mark Bennett who built the test site on a farm he owns in Berkshire.*[31]

### b) Hydroelectric

RWA already employs hydroelectric power generation, yet there are additional untapped opportunities on RWA property. A physicist invited by the Source Group to the May 23, 2016, ideation session, Janos Lobb, suggested the use of "curtain turbines" at spillways.

Beyond the greater New Haven region there are 1000 dams in the state that do not generate power, although they may not all be suitable for power generation; and it may not be within the RWA charter, however, to generate energy on lands it does not own.

The San Diego County Water Authority, serving a population of 3,100,000, earns $5.35 million annually (in savings or revenue) from hydro-electric generation. The SDC Water Authority has also contracted for the construction of 3 solar facilities. The combined solar savings is approximately $51,000 per year or $2.1 Million dollars over the life of the 20 year contract.[32]

In-line generators can also be employed in pipes where water is flowing from gravity.

### c) Battery storage

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[31] "United Utilities installs Europe's largest floating solar power project on reservoir," Emily Gosden, The Telegraph, October 26, 2105.

[32] Non-Core Revenue Matrix Score Sheet - Internal RWA Evaluation of New Product Ideas, compiled by Jim Hill, Nov 2014; refined March 23, 2015. *For more information, contact Gary A. Eaton at geaton@sdcwa.org or 760-233-3237.*

The newest wave in energy is to store excess capacity during slow-demand for sale (at a higher price) during peak demand. This concept works well with solar and hydro since the source of energy cannot be turned down during low-demand times as with gas-fueled generators.



Earlier this month (May 5, 2016) Connecticut Municipal Electric Energy Cooperative (CMEEC), SolarCity, and Brightfields Development announced the development of 13 megawatts (AC) of solar power systems and at least 1.5 megawatts (6.0 megawatt hours) of energy storage systems to be located in southern Connecticut.

SolarCity and its development partner Brightfields have begun work on seven solar project sites which will comprise nearly 57,000 panels supplying clean, local solar energy when CMEEC needs it most. The sites are located in Bozrah (off of Brush Hill Road), in Norwich (on a portion of the Mountain Ash Farm and also on the city's former landfills located at Rogers Road), and in Groton (on open land provided by Northeast Housing LLC, which is managed by Balfour Beatty Communities, adjacent to the Navy Submarine Base). The energy storage solution installed at Mountain Ash Farm represents SolarCity's first capacity services project, whereby the company will provide engineering, installation, and maintenance of a battery storage system that CMEEC can control using SolarCity's proprietary GridLogic control platform. Through GridLogic, CMEEC will be able to remotely and instantaneously dispatch stored solar energy to manage load spikes and optimize the operational performance of the distribution system.

Under the terms of the 20-year solar power purchase agreements, SolarCity and its financing partners will build, own and operate the solar power systems while CMEEC will take advantage of locally produced, clean solar energy without the burden of a more traditional asset ownership structure.

CMEEC will provide the renewable power from these systems to all its customers throughout its portfolio of member utilities in the cities of Groton and Norwich, the Borough of Jewett City, the Second (South Norwalk) and Third (East Norwalk) Taxing Districts of the City of Norwalk, Connecticut, and Bozrah Light and Power Company. Additionally, the storage solutions will be financed by SolarCity, allowing CMEEC to pay a fixed rate to utilize the battery storage system that will lower operating costs and provide savings for its customers.[33]

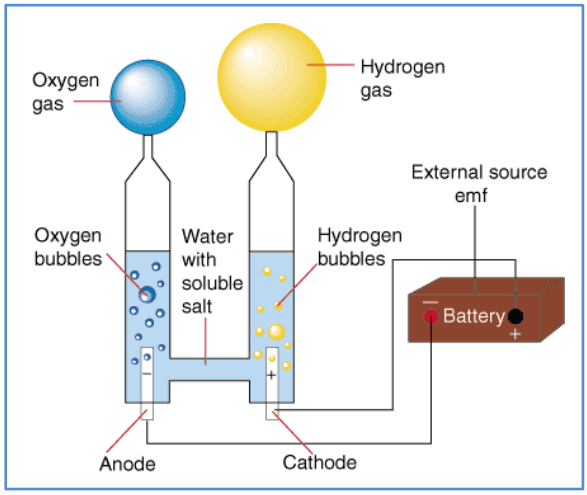
[33] http://www.solarcity.com/newsroom/press/cmeec-and-solarcity-install-solar-and-energy-storage

# 17. Converting water into hydrogen for fuel cells and vehicles

Periodic surpluses of solar and hydro energy can be used to convert surplus water to elements of greater value: hydrogen and oxygen for sale as gases. Hydrogen is used in fuel cells and hydrogen-powered vehicles.

RWA might want to gradually convert its own fleet to environmentally friendly hydrogen vehicles.






[ABOVE] *Jingli DQ 500 Water Electrolysis Hydrogen Generator with capacity of 500 $M^3$/hour.*



[RIGHT] *Air Liquide hydrogen fuel station, similar to four planned for the northeastern U.S. to open in 2017, including at least one in Connecticut.*[34]

CAPITAL INVESTMENT: The National Renewable Energy Laboratory estimates $3,000,000 for a unit that will produce 450 kilograms (5400 $M^3$) per day; excluding space, storage tanks and cost of solar panels to produce energy.[35] (1 kg of hydrogen = ~ 12 $M^3$ at 70 degrees F and 1 atmospheric pressure.)

Suzhou Jingli Hydrogen Production Equipment Co., Ltd. ("Jingli"),in Suzhou, China, sells generators that produce up to 1000 cubic meters per hour. A 250 cubic-meters-per-hour system (2000 $M^3$ / 167 kg per day) is $550,000 FOB Shanghai; 500 $M^3$ per hour system (4000 $M^3$ / 333 kg per day) for $950,000; and a 1000 $M^3$ per hour (8000 $M^3$ / 667 kg per day) system [PHOTO IN UPPER LEFT] for $1,450,000.

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34 "Northeast to Get First Hydrogen Stations," http://www.greenfleetmagazine.com/, April 12, 2016

35 http://www.nrel.gov/docs/fy13osti/56412.pdf

THE ECONOMICS. A kg of hydrogen for a vehicle sells for approximately $10.[36] One kg of hydrogen is equal to 2 to 3 gallons of gasoline on a miles per gallon basis.[37]

## 18. Aquaponics

Aquaponics, by its very name is a water-related activity and therefore I would think is permitted by the RWA charter. If not, the matter might be appealed in January of 2017 when requested revisions to the enabling legislation will be submitted to the state.

DEFINITIONS. Practitioners in the industry define ...

- Hydroponics as growing vegetables in water
- Aquaculture as raising fish in a controlled environment in tanks or ponds
- Aquaponics as the combination of the two whereby the plants clean the water for the fish and the fish provide fertilizer for the plants

Critics of vertical farming have complained that taste can suffer when food is cultivated without soil or sun, while proponents say vertical farms are extremely efficient and have a small environmental impact. They take up minimal space, grow round the clock in all season and are near the markets that sell their crops, reducing the need for long truck trips. Vertical farms are also far less susceptible to the vagaries of unpredictable weather like droughts or floods.[38]

COMPETITION. There are no major players in the industry in Connecticut and RWA would command a competitive advantage with low-cost water and a world-class testing facility to insure the proper balance of nutrients and lack of contaminants in the closed eco-system.

WATER CONSUMPTION. In spite of its name, Aquaponics will not increase water consumption significantly; the system cleans and recycles the water, reducing the water needed to grow a pound of vegetables by 90%. However the initiative could add significantly to RWA's bottom line.

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[36] http://www.edmunds.com/fuel-economy/8-things-you-need-to-know-about-hydrogen-fuel-cell-cars.html May 8, 2015.

[37] http://www.npc.org/reports/FTF-report-080112/Chapter_15-Hydrogen.pdf

[38] http://www.nytimes.com/2015/04/08/realestate/commercial/in-newark-a-vertical-indoor-farm-helps-anchor-an-areas-revival.html?_r=0



*An AeroFarms tiered growing system under LED lighting*

## THE INDUSTRY

Still finding its proper niche in the food supply chain, the largest high-density aquaponics project (vegetables and fish) [8] is only 93,000 square feet. And of that, only 47,000 square feet is dedicated to growing. To put that in perspective, it's about 1 acre under cultivation. The urban farm is a project of FarmedHere in Chicago, that leases space in a former factory and use a five-tiered system developed by AeroFarms. The project is expected to eventually employ 200 people. This was the company's third indoor farm, following pilot projects of 4,000 and 10,000 square feet.[39]

FarmedHere currently sells produce and tilapia to 50 Whole Foods, plus other grocery stores. The company believes it could eventually provide Chicago with 6 to 8 per cent of its premium green and culinary herbs.

To raise the capital for the project, FamilyFarmed .org helped the company raise $1,000,000 in private equity and $700,000 in loans at the Good Foods Financing Conference.

The largest hydroponics operation (vegetables only) is being developed in Newark in purpose-built buildings. The 69,000 square foot indoor farm is being built by AeroFams with $48 million in equity and debt financing from Goldman Sachs, Prudential Financial, and the State of New Jersey ($9 million is from the state).[40] The complex , with labs, offices and a cafe and is expected to be finished in 2016.

Because the farming is completely indoors, it relies on LED bulbs, with crops growing in cloth and fed with a nutrient mist.

About two-thirds of the complex, or 46,000 square feet, will be dedicated to crops in rooms with lofty 30-foot ceilings.

AeroFarms projects it will reap up to 30 harvests a year, or two million pounds of greens, including kale, arugula and romaine lettuce. At 46,000 square feet under cultivation, that translates to 42 pounds of produce per square foot.

The company eventually plans to expand to 70 employees.



*AeroFarms grows vegetables and herbs in stacked beds indoors.*

*Note the care not to introduce pathogens into the eco-system. This would suggest a need for certified "UltraPure" water.*

*Bryan Anselm for The New York Times*

[39] http://www.huffingtonpost.com/2013/03/22/farmedhere-nations-largest-vertical-farm_n_2933739.html
[40] http://www.nytimes.com/2015/04/08/realestate/commercial/in-newark-a-vertical-indoor-farm-helps-anchor-an-areas-revival.html?_r=0

## THE ROAD AHEAD

FarmedHere plans to expand to 20 additional locations around the country, each serving a 200-mile radius.[41] Perhaps RWA could partner with the pioneering grower, thereby leveraging its expertise. RWA might offer its superior capability in water preparation and monitoring as part of a joint venture.

We have also spoken with two growers in Connecticut interested in working with RWA. The first company discussed below, Fresh Farm Aquaponics of South Glastonbury, will provide guidance on establishing a successful operation wholly-owned by RWA.

The second option is with Freedom Fish LLC, a Stamford company planning to raise vegetables and tilapia. The opportunity for RWA is to provide Freedom Fish with land and water as an in-kind investment.

### Fresh Farm Aquaponics

The following pro-forma financial model is based on plans by Fresh Farm Aquaponics for an 11,500 s.f. system (with 750 s.f. devoted to plants and 4000 to fish).[42] If successful, the operation would be expanded to 50,000 square feet, with a projected profit margin in excess of $1 million. In terms of ultimate potential, FFA advises that the maximum size for an Aquaponics industry is 1 million square feet. Beyond that it may provide more fish and produce than can be delivered fresh within a service radius.

The following is the pro forma for the 11,500 s.f. farm:

| | | |
|---|---|---|
| Projected annual revenue | $1,000,000 | At 2500 pounds of production per week (demand validated by interviews with buyers and local stores) |
| Operating costs and overhead | $ 800,000 | Includes rent at $7 s.f. plus electric for artificial lighting |
| Net Profit | $ 200,000 | |

Fresh Farm Aquaponics will manage a similar RWA operation for 25% of the net profit.

CAPITAL INVESTMENT: $1,000,000. To minimize the financial risk, we suggest that RWA replicate FFA's model and plans, following their implementation by 6 months in order to take advantage of their learning curve. Fresh Farm Aquaponics will provide expertise during the planning process for $75 per hour, and anticipate 250-500 hours will be required ($18,750 to $37,500).

LOCATION. Vertical farming in repurposed former multi-story brick factories has a bring-nature-back-to-the-cities romanticism, but has not been successful on an industrial scale. According to Stephen Bowling of Freedom Fish, diseconomies include:

- Having to pump water to upper floors
- Need to install artificial sunlight lamps on all floors except roof, thereby defeating some of the green appeal of a symbiotic eco-system. FFA, who plans to build their next system indoors, estimates that twice as much square footage is required under electric light to achieve the same profit levels as systems under natural light.

Nevertheless, Fresh Farm Aquaponics is planning their $1 million artificial farm in an old two-story factory building in Hartford. They have experience managing a 3500 s.f. system and are confident that their 11,500 s.f. planned factory endeavor will meet the financial projections outlined above.

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[41] http://farmedhere.com/chicagos-farmedhere-plans-to-expand-vertical-indoor-farming-to-20-new-locations-across-the-country/

[42] Interview with co-founder Kieran Foran

## Freedom Fish LLC in Stamford

The Freedom Fish vision is ambitious, covering 50 acres.

The Freedom Fish operation plan consists of three environmentally friendly and sustainable systems that work synergistically: Fish Production with Processing (Aquaculture), Produce Production (Hydroponics), and a waste reuse management system.

The fish are grown in a series of tanks in a recirculating aquaculture system. A small percentage of water is discharged with the fish waste and uneaten feed. This water is nutrient rich and is sent directly to a hydroponic system for high intensity greenhouse production. This system greatly conserves water and produces high quality vegetables and herbs.

Solid waste and fish offal are turned into high quality fertilizers and bio-gas.

The entire process is completely sustainable and environmentally friendly.

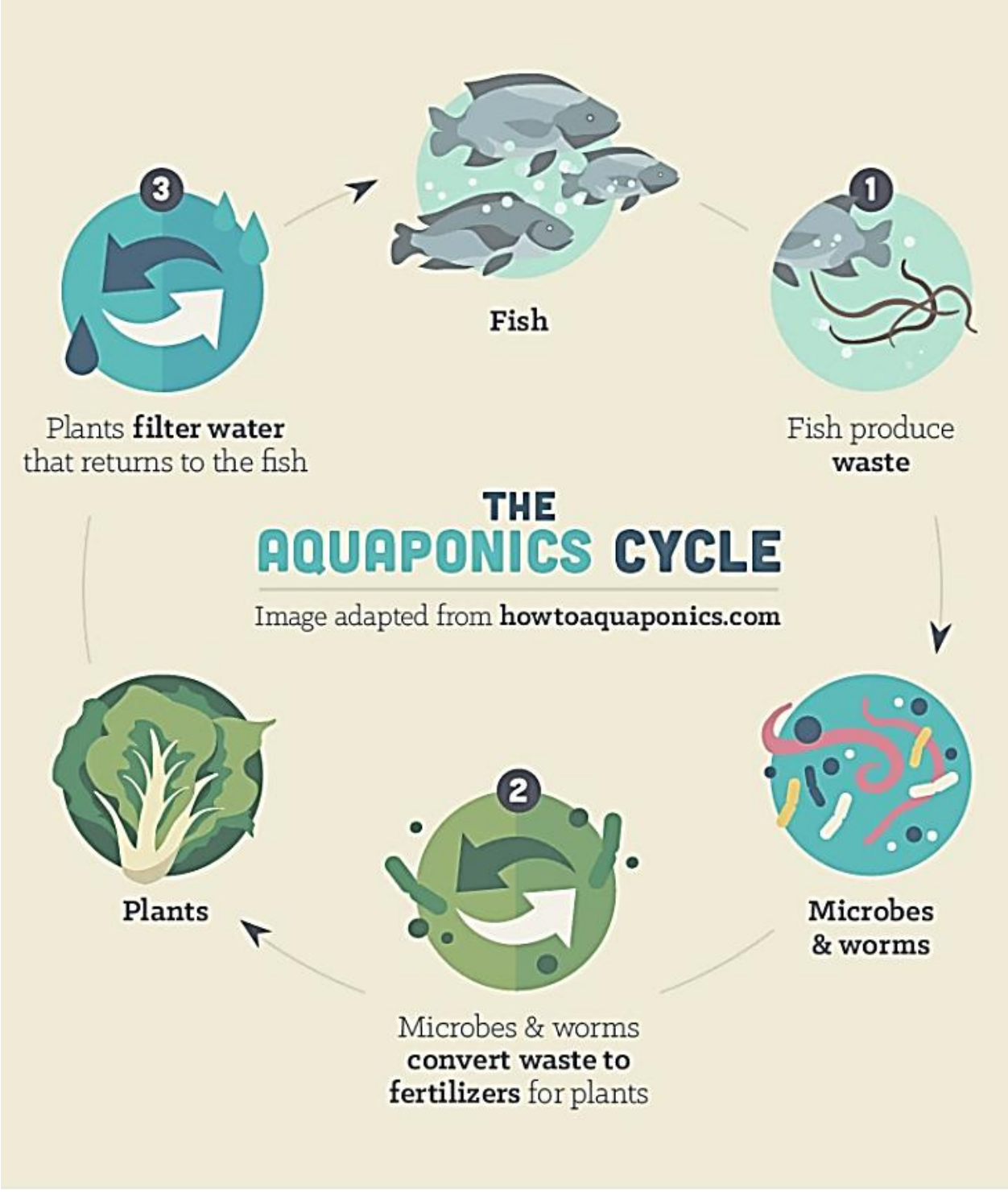
We even create “new” jobs, as virtually all of the tilapia currently sold in the US is imported, and farmed outside the country in conditions that are not friendly to the environment. All the jobs created will be brought back to the US from foreign countries.

RAISING TILAPIA IN CONNECTICUT. DEEP is concerned that Tilapia, an invasive species, may escape into the natural eco-system. However, even if some fish do escape from the tanks in a once-in-a-century storm, tilapia will still not survive in a cold climate. Freedom Fish will keep the fish water temperature in its closed system at 86 degrees. All other aquaponics farms in Connecticut are raising tilapia.



*Aquaponics farm under natural light, resulting in significant savings in energy costs.*

*The aquaponics cycle*



# 19. Malting

The malting of barley and other grains consumes a significant amount of water, as the grains need to be immersed in water, then drained, then immersed again, several times.



## DEFINITIONS

*Base malts* make up the majority of the grist in all-grain beer. This group includes pale malt, Pilsner malt, Vienna malt, Munich malt, mild ale malt, and more; there are also non-barley base malts like wheat and rye.[43]

Base barley malts are named based on the formation of corns on the stalk (e.g. *2-row, 6-row)*, or the variety (e.g., Maris Otter, Golden Promise, etc.), or the region in which the barley was grown or malted (America, England, Moravia, etc.).[44]

## SUPPLY SOURCES FOR MALTS (A SHIFTING PARADIGM)

For the most part, the majority of the malt produced for the beer industry comes from a relatively small number of large businesses: Briess, Cargill and Country Malt in North America, or Bairds, Castle and Weyermann in Europe. In the United States however, recent trends in craft brewing are showing signs of gradually changing the norm, allowing craft malt houses to break into the industry.[45]

There's no standard definition for a craft- or micro-malt house, though Brent Manning, co-owner of Riverbend Malt House in Asheville, N.C., says the micros he's familiar with produce less than 100,000 tons of malt annually. Micros also tend to specialize in regionally grown, specialty and artisan grains. A large part of their business consists of providing custom orders for breweries that want to create local "grain to glass" beers.[46]

The drive behind craft malt comes from the desire to have local-to-regional agriculture supply local-to-regional brewers/distillers, and to do so in a transparent fashion. It is a natural extension of the local foods movement, and in many ways an evolution of the craft beer and distilled spirits movement itself.[47]

## GRAINY TERROIR

Another part of the appeal of micro-malt houses is that they can produce unique and distinctive-flavored malts that are identifiable to the region in which the grains are grown. Like grapes and hops, grains have *terroir*. The term refers to the effect the geography of a region, including climate, soil and water has on a particular crop. As grapes from different wineries are distinct to those soils, it is similar with grains. Different soils and climates produce different flavors.[48]

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[43] http://www.northernbrewer.com/

[44] http://www.northernbrewer.com/

[45] Ben Keene, "Rise Of The Micro-Malters" *All About Beer* Magazine, July 1, 2013

[46] Anne-Fitten Glenn, "The Return of the Micro-Malters" www.craftbeer.com. December 2011

[47] http://www.craftmalting.com/

[48] Anne-Fitten Glenn, "The Return of the Micro-Malters" www.craftbeer.com. December 2011

### a) The malting process

Malt is often called the "Heart of Beer" for good reason. Malted barley, or malt, is the basic ingredient used in the production of beer, providing complex carbohydrates and sugars necessary for fermentation, as well as contributing flavors and colors. Those same benefits are equally effective in the production of yeast-fermented dough systems, baked goods, bars, cereal, granola, prepared foods, snack foods and other finished food products. Malt vinegar is made by malting barley, brewing it into ale, and then turning the ale into vinegar.[49] Malt liquor is beer with a high alcohol content.

And because malt is made from whole grain and minimally processed, it is an all-natural ingredient that helps achieve product claims like natural, healthy, Kosher and non-GMO. Making malt requires only a cereal grain, usually barley, and water and a three-step process: steeping, germinating and drying.[50]

1. STEEPING. The basic malting process, although more of an exact science today than when man first dipped baskets of grain into open wells in Mesopotamia 5,000 years ago, remains a three-step process: steeping, germination and drying.

During steeping, water is absorbed by the raw barley kernel and germination begins. Steeping starts with raw barley that has been sorted and cleaned, then transferred into steep tanks and covered with water. For the next 40-48 hours, the raw barley alternates between submerged and drained until it increases in moisture content from about 12% to about 44%. The absorbed water activates naturally existing enzymes and stimulates the embryo to develop new enzymes. The enzymes break down the protein and carbohydrate matrix that encloses starch granules in the endosperm, opening up the seed's starch reserves, and newly developed hormones initiate growth of the acrospire (sprout).

Steeping is complete when the barley has reached a sufficient moisture level to allow uniform breakdown of the starches and proteins. One visual indicator that the malter uses to determine the completion of steeping is to count the percentage of kernels that show "chit". Raw barley that has been properly steeped is referred to as "chitted" barley", the "chit" being the start of the rootlets that are now visibly emerging from the embryo of the kernel.

2. GERMINATION. In a process called "steep out," the chitted barley is transferred from the steep tank to the germination compartment. Germination, which began in the steep tank, continues in the compartment where the barley kernel undergoes *modification*. Modification refers to the breakdown of the protein and carbohydrates, and the resulting opening up of the seeds' starch reserves. Good modification requires the barley to remain in the compartment for 4-5 days. Germination is controlled by drawing temperature-adjusted, humidified air through the bed. Turners keep the bed from compacting and rootlets from growing together, or felting.

3. DRYING. Germination is halted by drying. If germination continued, the kernel would continue to grow and all of the starch reserves needed by the brewer would be used by the growing plant. Base or standard malts are kiln dried, typically with a finish heat of 180-190° F for 2-4 hours. This develops flavors ranging from very light malty to subtle malty. Specialty malts are dried in a kiln at higher temperatures for

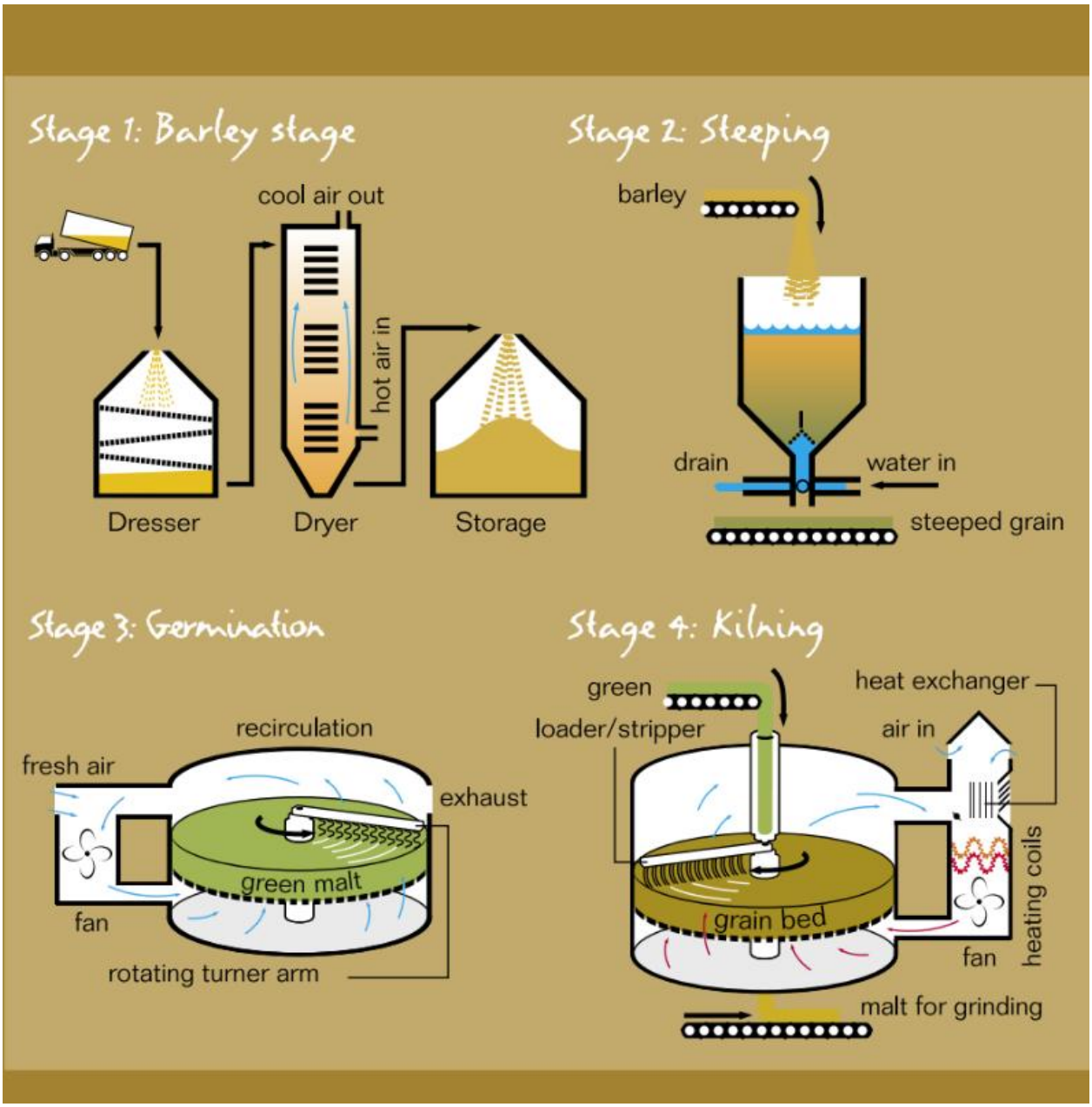
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[49] http://www.thekitchn.com/not-just-for-fish-and-chips-malt-vinegaringredient-spotlight-175742

[50] http://www.briess.com/food/Processes/malttmp.php

longer periods of time, roasted, or both. Varying the moisture level and time and temperature of drying develops the flavor and color characteristics of each specialty malt.

In most large malt-production businesses (located primarily in the Western U.S., Canada and the U.K.), this process is mostly automated. At the other end of the spectrum are places like Riverbend and Valley Malt that use the traditional 250-year-old Scottish method of floor malting. Riverbend is currently using this method exclusively. Valley Malt recently added floor malting to their repertoire after the owner/malters received a fellowship to study the process in the U.K.[51]




[51] Anne-Fitten Glenn, "The Return of the Micro-Malters" www.craftbeer.com. December 2011

## FLOOR MALTING (A MICRO-MALTING PROCESS)[52]

Once the grain has gone through a few wet/dry steep cycles in holding tanks to jumpstart germination, it's spread on the clean concrete floor of a temperature-controlled room. Then the grains must be raked apart as they germinate so they don't grow together into an unusable mat. The hand-raking must take place about every four hours for three days—until the grains are ready for kilning.

Next, the grains go into the kiln for drying and roasting. Different grains take different times and temperatures to develop, but kilning typically takes 30 to 36 hours. Then the malt runs through a de-bearder to remove the roots and polish them. Finally, the grains are cleaned (again) in a seed cleaner and bagged in 50-pound or one-ton bags for distribution to breweries; or five- and 10-pound bags for home brewers.



*Brian Simpson of Riverbend Malt House in Asheville, N.C., uses an old-fashioned rake to sift through malt at Riverbend Malthouse in Ashville NC. They malt their barley, wheat and rye from area farmers, and are currently selling to 12 commercial breweries and local homebrewers*

Photo by Riverbend Malthouse




*Malting system sold by Kaspar Schulz of Germany[53]*

[52] Anne-Fitten Glenn, "The Return of the Micro-Malters" www.craftbeer.com. December 2011

[53] *http://www.kaspar-schulz.de/en/innovations/malt-production/malting-systems/malting-systems.html*

## b) Demand potential

Malt Manufacturing between 2009 and 2014 has grown at an 8.7% annual rate.[54]

Each ton of malted grain typically supplies one run of beer through a 30-barrel brewing system. Thus, a brewery with a 50-barrel system uses six to eight tons of grain weekly.[55]

Rebel Malting, a micro-malter in Reno founded in 2004, has a current capacity of 27 tons a year, with most of this going to homebrewers and three local commercial breweries.[56] For now they see alternative grains (primarily rye and corn but also millet and emmer wheat) as a niche that will keep them sufficiently busy. They've also begun to work on sprouted grains to be milled into flour for baking.[57]

## c) Optimal size for a micro-malt operation

Rahr, one of the country's biggest malthouses produces 15.6 million pounds per week.[58]

CAPACITY OF CURRENT MICRO-MALTERS

- Colorado Malting Company, Alamosa, Colorado produces 13,500 pounds of malt a week (350 tons annually).59
- Rebel Malting, a micro-malter in Reno, founded in 2004, had a capacity of 30 tons a year (as of 2014), with most of this going to homebrewers and three local commercial breweries. Several area two-row barley farms with close to 2,000 acres also make expansion a real possibility. [60]




[54] Applied Marketing, "RWA Target Industry Analysis", December, 2014
[55] Anne-Fitten Glenn, "The Return of the Micro-Malters" www.craftbeer.com. December 2011
[56] Ben Keene, "Rise Of The Micro-Malters" *All About Beer* Magazine, July 1, 2013
[57] Ben Keene, "Rise Of The Micro-Malters" *All About Beer* Magazine, July 1, 2013
[58] Lessley Anderson, "Rise Of The Micro-Malters," April 9, 2013. http://modernfarmer.com/2013/04/meet-the-micro-malts/
[59] Lessley Anderson, "Rise Of The Micro-Malters," April 9, 2013. http://modernfarmer.com/2013/04/meet-the-micro-malts/
[60] Ben Keene, "Rise Of The Micro-Malters" *All About Beer* Magazine, July 1, 2013

## d) Economics of malting

### COST OF RAW GRAIN

Prices for barley vary widely, and of course quantity, species, and delivery costs vary too; but for budget estimates, $300 to $400 per ton ($.20 per pound at high end) may be a reasonable estimate.

East coast availability, actual cost and delivery charges should be verified by RWA.

According to German malting equipment supplier Schulz, about 1 ton of barley produces .8 tons of malt. Therefore, the finished barley will have a cost of **$.25 per pound** for the ingredients (at $400 per ton for raw barley).

CAPITAL INVESTMENT: Equipment (as quoted by Schulz for a 10 ton system) is 807,000 Euros ($923,000 at exchange rate on May 12, 2016). This does not include packing, loading, transportation, installation, electrical installation, engineering or commissioning. A rough estimate for a turn-key operation, excluding the cost of the factory space, would be $1.5 million.

### PRICING

The serious competition is from the mega-malters whose economy of scale allow them to wholesale for anywhere from $.05 to $.30 per pound less than local malters. Major brewers purchase from mega-malters in the U.S. and Europe, and cost and reliability of supply are their only objectives.

However, many craft brewers prefer to buy locally and obtain types of grains that are not offered by the huge one-species-fits-all suppliers.

According to Lance Jergensen of Rebel Malting, “Because the brewers don’t pay for shipping, my malt’s really not that much more expensive than what the big malters charge—maybe 4 or 5 cents per pound more.” Rebel plans to malt 30 tons of grain in the next year.[61]

- Valley Malting in Hadley MA sells malted barley to home brewers for **$1.04 lb**. in 50 bags. Malted wheat sells for $1.10 lb., rye at $1.15 lb. and corn at $1.18 lb. Shipping is a flat $85 to $105, plus a surcharge of $50 to NYC. They also sell wholesale to commercial craft breweries with a minimum purchase of 500 pounds.[62]
- Northern Brewer (http://www.northernbrewer.com/) in Minneapolis sells two-row malt by the pound for **$1.49 lb**. plus $8 flat fee for shipping. Specialty malts sell for as much as $1.79 to $21.49 per pound.

  Full 50-lb. bags can be purchased for $35 (**$.70 lb**.), produced by Briess or mega-malter Rahr.
- Williams Brewing Co in San Leandro, CA retails two row malt to home brewers for $36 per 50 lb. bag (**$.72 lb**.), plus shipping.
- Amazon sells a 10 lb. bag of 2-row malt for $12.18 (**$1.22 lb**.) + $9.70 shipping.

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[61] Per Lance Jergensen. Anne-Fitten Glenn, “The Return of the Micro-Malters” www.craftbeer.com. December 2011

[62] Valley Malting in Hadley MA

### e) RWA competitive advantage

While RWA is not restricted to selling malted grains only within its current service area, the relatively low cost to deliver the commodity gives it a pricing advantage in the region versus other micro-malters.

In addition, the trusted RWA brand and guaranteed purity of water may also provide a competitive edge.

### f) Reliability of grain supply to malters

There have to be nearby farms growing the right kind of grains demanded by the brewing industry.

While malters now can make malt year-round, the grains still can only be grown during the warm months. The micro-malters in the U.S. are working with regional farmers now on grain varieties and amounts of acreage dedicated to next summer's crops[63].

### g) Potential customers

TWO ROADS BREWERY, a thriving operation in Stratford CT does not malt its own grain, but buys from outside malters. It is the largest brewery in Connecticut. Two Roads also produces for other brands, including Hartford's City Steam."[64] Two Roads output was 16,000 barrels in 2014, 32,000 barrels in 2015 (against a capacity of 40,000 barrels. Of this volume, 75% was contract brewing for 12 other brands.[65] In 2015 the company increased capacity to 176,000 barrels (5.5 million gallons at 31 gallons per barrel of beer), or 60 million 12 oz. bottles.[66]

The company currently buys 250,000 tons of "base" malt (not specialty malts) sourced "from all over the world" but primarily from Canada, Germany and Holland. Market rates for base malt range from $.35-$.50 depending on volume.[67]

Two Roads currently obtains its malt 50 lb. bags.[68] Brands include Briess and Weyermann® CARABOHEMIAN®, a drum-roasted caramel malt made from two-row; and German barley malt which, according to Weyerman "delivers intensified caramel aromas, with notes of bred [sic], caramel and toffee flavors."



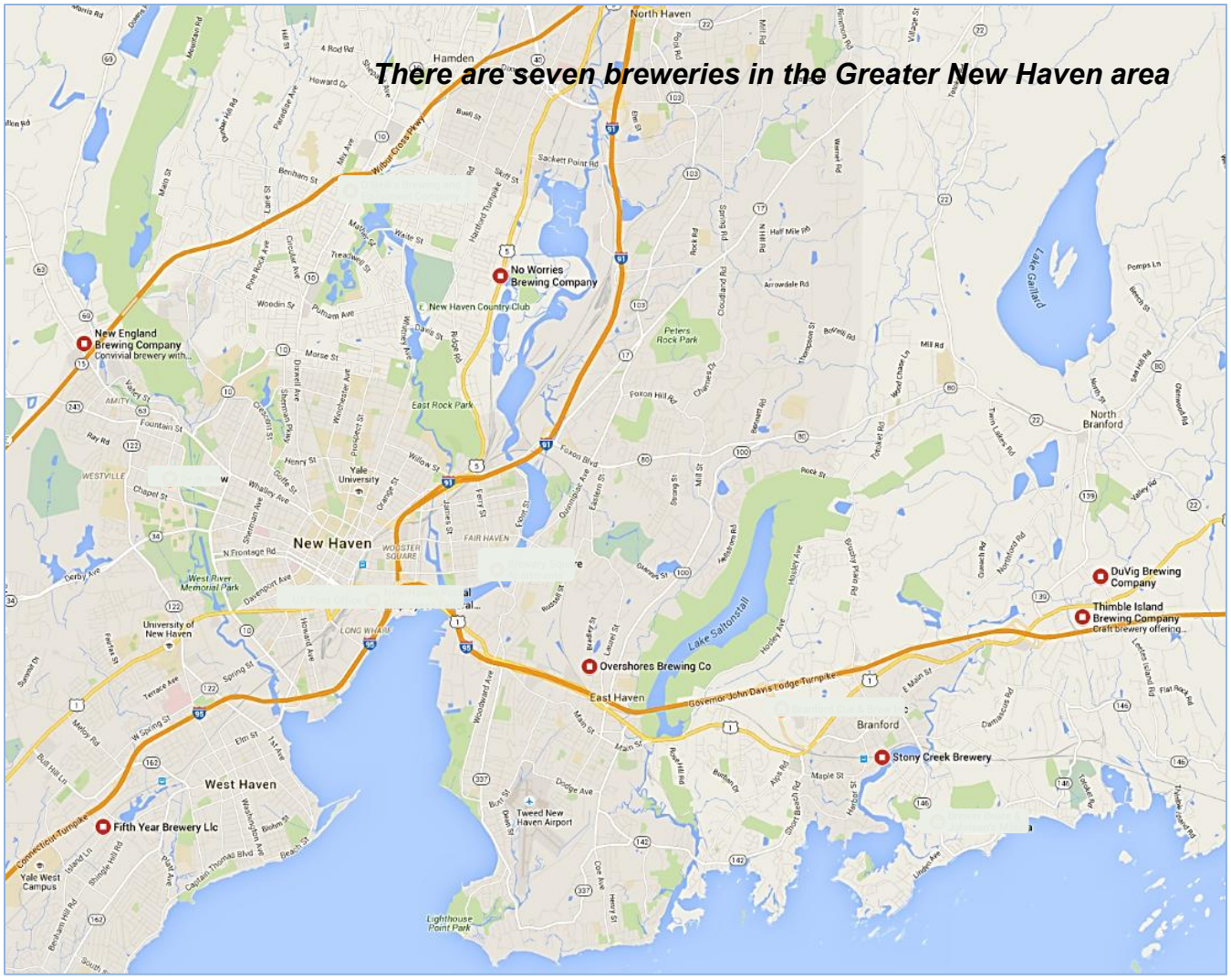
*Two Roads brewery in Stratford CT*

[63] Anne-Fitten Glenn, "The Return of the Micro-Malters" www.craftbeer.com. December 2011
[64] http://craftbrewguy.blogspot.com/2012/12/cbg-visits-two-roads-brewing.html
[65] David Eisenberg. Brewbound.com, May. 20, 2014
[66] Jon Urch, http://www.thedrinkingclasses.com, January 14, 2016; Stratford Patch
[67] Response to email query to company founder Brad Hittle, May 18, 2016
[68] Visit to plant

STONY CREEK BREWERY has a new $20 Million 30,000 square foot facility, making it the second largest brewer in Connecticut, trailing only Two Roads. According to BrewBound.com, the Stony Creek Brewery has produced more than 10,000 barrels during its first 12 months. Stony Creek could eventually produce 60,000 barrels in its current footprint.




*Overshores of East Haven, only active brewery in Greater New Haven.*



# Recommended Initiatives for

# Further Due Diligence and Planning

| Initiative | Rationale | Next Steps | Source |
|---|---|---|---|
| **GROUP A – Already up and running; low risk and cost; relatively easy to implement** | | | |
| 1. **Expand PipeSafe**SM | Already successful | - Franchise to other water utilities.<br>- Offer for wells, septic, sprinklers | *RWA* |
| **GROUP B – Short term, capital needed < $1 million, $1 million potential contribution to net income** | | | |
| 4. **Bottleless Value-Added Water Dispenser** for home/office.<br>Eventually expand to credit card automated refill kiosks in public places | - Increased RWA tap water consumption<br>- Strategy to compete with branded water<br>- Lower cost than bottled (truck delivered) purified water<br>- Optional value-adds include carbonated, hot or cold, flavor infusions, vitamins | - Test various models in store<br>- Select a brand and model, negotiate wholesale discount and white-label branding<br>- Develop marketing campaign<br>- Market test with 25-50 units | *Source Group*<br>*$ 25-35k* |
| 6. **Water Store**<br>• Bottleless dispensers<br>• Filters<br>• 3- and 5-gallon jugs<br>• Bottle refill station<br>• Softeners, etc. | - Easy to do<br>- Very low capital investment<br>- Provides showcase for all other products and services and forum to obtain first-hand customer reactions. | - Draft floor plan for store<br>- Meet with RWA staff to plan payment processing and location of 5-gallon refill station<br>- Purchase display shelving unit and initial inventory | *Source Group*<br>*$ 15k* |
| 7. **Bulk Water via Truck**<br>Prepared water for pools, wells; and UltraPure for pharma, cosmetics, semiconductor, chemical industries | - RWA already selling water in bulk, that pool fillers now mark up more than 10 fold.<br>- Over 20 companies selling water by tanker truck now, most with multiple trucks<br>- Allows RWA to deliver higher-value specialized waters (UltraPureSM, distilled, pre-chlorinated for pools, etc. | - Source 4000-gallon, dual axle truck for test<br>- Launch test market campaign among well owners with pools<br>- Negotiate partner arrangement to pay commissions to pool stores and contractors for sales | *Source Group*<br>*$ 25-30k* |
| 9. **Storage tank stripping**<br>Waterjet Robot license for tank stripping and potentially for painting | - Environmentally friendly; “GREEN”<br>- Significant savings on RWA tanks<br>- Safer<br>- Less tank downtime due to faster process<br>- Major business building potential and ROI | - Contract to have 1 tank painted. Projected to save $100,000<br>- Assess potential within state<br>- Craft business plan<br>- Negotiate licensing agreement | *Source Group*<br>*TBD* |
| **GROUP C – Long term, Capital intensive, JV to minimize burden on RWA staff and financial resources** | | | |
| 8. **Bulk Water via Ship or Underwater Pipeline** | - Only concept that will consume millions of gallons per day<br>- Underwater pipeline potentially cheaper method of moving water to New London<br>- Real shortages along eastern seaboard | - Further assess successful bulk water shipping operations to identify success factors<br>- Summarize findings for go/ no go decision to next step | *Source Group*<br>*$ 30-40k* |
| 16. **Energy Park**<br>Land lease for solar park with battery storage | - RWA energy needs accommodated by Lessee<br>- Stored energy sold to external parties at premium prices during peak demand<br>- Battery storage a “catch-a-wave” opportunity within energy business | - Determine whether such a program conflicts with an existing initiative<br>- If not, reach out to potential partners such as Connecticut Energy Parks for assessment | *Source Group*<br>*$ 35-45k* |
| **GROUP D – Need research, mid-term, JV for minimal burden on staff and financial** | | | |
| 15. **Algae into fertilizer** | - Low investment / High profit potential | - Test RWA algae for efficacy as fertilizer base | *Source Group* |
| 18. **Aquaponics** | - Very popular with RWA staff; trendy<br>- Environmentally friendly | - Prepare business plan and cap table | *Source Group* |