



May 21, 2019 | Technical & Cost Proposal
Town of Jamaica

Public Community Water System Source Exploration



May 21, 2019

Town of Jamaica
jamaicatreasurer@svcable.net

Re: Public Community Water System Source Exploration

Dear members of the selection committee:

Water is a fundamental human need, with every person on earth requiring at least 5 to 15 gallons of clean, safe water a day for drinking, cooking, washing, and bathing. Providing the Town of Jamaica with technical assistance in source exploration for the development of a Public Community Water System is critical to the strength, health, and overall resiliency of the community. The Town is seeking qualified and experienced consultants to site and potentially install wells, evaluate geologic conditions, and to test and evaluate water quality and sustained yield for a potential new water supply. VHB has assembled a team to meet the Town's needs. Through our knowledge and experience working on similar projects for municipalities throughout Vermont and New Hampshire, we understand the importance of this project to the Town and the community. We are well positioned to provide the services outlined in this RFP in a cost-effective and inclusive matter, supported by staff in our Vermont offices.

To meet the goals, capacity, and timeframe requirements outlined in the RFP, we have created a project team led by **Senior Hydrogeologist, Meddie Perry, CGWP** and **Professional Geologist, Lydia Lee, PG**. Combined, Lydia and Meddie bring over three decades of extensive experience providing similar services to a variety of public and private clients across New England.

To further enhance our team's full-service capabilities, we are pleased to be teaming with **Green Mountain Well Co. (GMW)** on this effort. GMW is a well-known, highly respected provider of specialty contract drilling services, and since their incorporation in 1969, GMW has garnered a reputation for quality and innovation in the water-well drilling industry.

The VHB Team brings a balanced skill set, local presence, depth of resources, and extensive experience with the services outlined in the Town's Scope of Services. Beyond our commitment to quality and efficiency of services, we make the following pledges to the Town.

The VHB Team brings a balanced skill set, local presence, depth of resources, and extensive experience with the services outlined in the Town's Scope of Services.

Engineers | Scientists | Planners | Designers

40 IDX Drive, Building 100
Suite 200
South Burlington, Vermont 05403
P 802.497.6100
F 802.495.5130



» **We will collaborate:** We will work closely with the Town's Project Manager to deliver a successful project with robust project management to deliver work items on schedule and within budget.

» **We will be innovative:** We will think outside of the box with respect to well siting, design, and access. We will combine our professional experience with cutting edge technology, such as webmapping, to balance cost efficiency and likelihood of obtaining the necessary quantity and quality of water.

Thank you for this opportunity to present our approach and qualifications. Our team is very motivated to work with the Town of Jamaica to investigate the potential of developing a new water supply for a PCWS. Our proposal includes a technical scope of work and supporting appendices, with a separate cost proposal included in Appendix D. We will submit a Certificate of Insurance within three weeks of being selected with the limits outlined in the RFP. Should you need further information or have any questions, please feel free to contact me at any time.

Sincerely

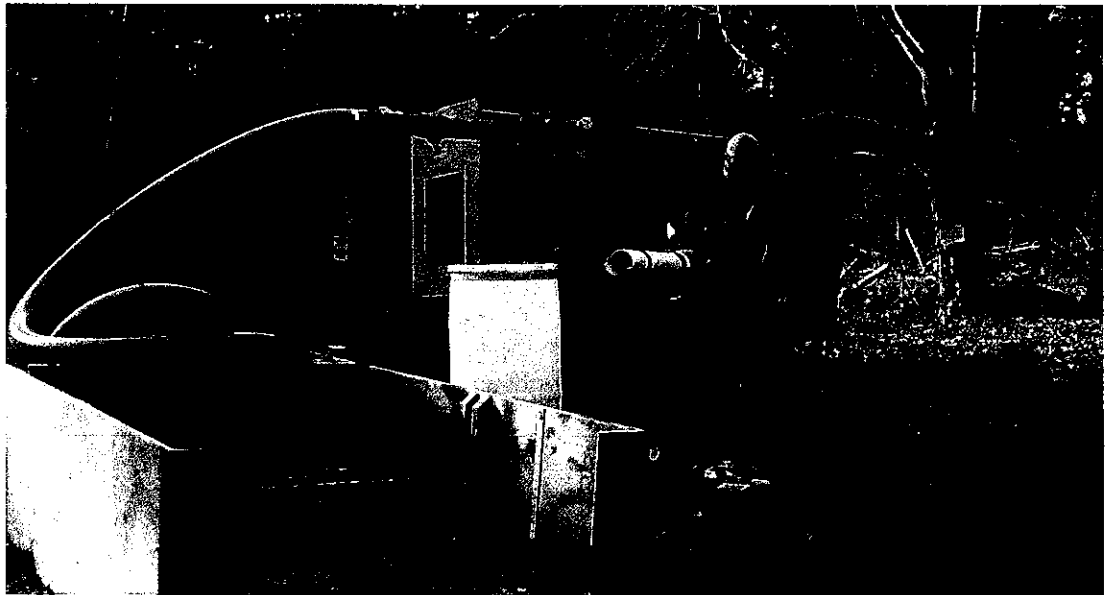
A handwritten signature in black ink, appearing to read 'Meddie J. Perry'.

Meddie J. Perry, CGWP
Project Manager
mperry@vhb.com

Y 6154



Town of Jamaica
Public Community Water System Source Exploration



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Executive Summary

VHB is pleased to present this proposal to assist the Town of Jamaica (“Town”) with groundwater source exploration for a new Public Community Water System (“PCWS”). VHB understands that the Town seeks to first evaluate the viability of PCWS well sites within or nearby the Village area of the Town that would meet the required siting criteria, and second, to construct and test up to three wells at suitable locations that would serve the new PCWS system. VHB understands the Town seeks a yield of approximately 60 gallons per minute (“gpm”) which would meet the estimated existing and projected future maximum daily demand of 82,000 gallons per day (Dufresne Group, 2018).

VHB has assembled a team from our South Burlington, VT office ready to provide the Town with all of the services necessary to locate, explore, develop, evaluate, and permit groundwater wells for the PCWS. We are teaming with the drilling firm Green Mountain Well Co., based in Putney, VT. Professional hydrogeologists from our South Burlington, VT office have over 20 years of experience assisting New England clients with water supply needs. Our services include, but are not limited to initial feasibility studies, well siting and design, geophysical surveys, fracture trace analyses, environmental/natural resource assessments, permitting, safe yield and water quality testing, delineation of recharge zones and wellhead protection areas, and engineering design and construction management for water system improvements and new installations. The VHB South Burlington, VT office has obtained permits for over 80 public wells for private and municipal clients.

For this project, VHB has teamed with **Green Mountain Well Co.** (the “VHB Team”) to provide the Town with access to cutting edge drilling technology. Green Mountain Well is a recognized leader in the VT drilling industry and has the equipment and staff required to support this project's timeline and budget.

Founded in
1979

1,500 passionate professionals

including engineers, scientists, planners, and designers

30+ locations

throughout the east coast

69th on ENR

Top US Design Firms List

Introduction to VHB

VHB's passionate professionals include experienced engineers, scientists, planners, and designers who partner with public and private clients in the transportation, real estate, institutional, and energy industries, as well as federal, state, and local governments. Together, we work on a daily basis to improve mobility, enhance communities and economic vitality, and balance development and infrastructure needs with environmental stewardship.

We're a team—1,500 strong—eager to deliver value by embracing our clients' goals, anticipating challenges, building lasting partnerships, and always providing an exceptional experience. We're passionate about making meaningful contributions to the world through the work we do, and we are proud, yet humbled, to have been doing this for over 40 years.

We bring collective knowledge, technical excellence, and a wide network of trusted relationships across our footprint to deliver value. When you have a team with such a broad range of experience, it's only natural to look at projects from every angle, and ask the types of questions that lead to better solutions. That's what we do at VHB—we help our clients make the right decisions to move their projects forward..

Introduction to Green Mountain Well Co.

Green Mountain Well Co. ("GMW") has been providing fresh water and geothermal services to communities in Vermont, New Hampshire and Massachusetts since 1957. GMW are licensed professional well drillers in Vermont and specialize in water well drilling and hydrofracking services, while also providing end to end water system service, including access road construction, well pump sales and service, and water system filtration component installation. Their highly trained and experienced technicians attend ongoing educational programs to keep current with the latest water system equipment and technology. GMW has worked with several Public Community Water Systems in Vermont and New Hampshire to develop sustainable water sources, including the town of Charlestown, NH, Magic Mountain Ski Area, Stratton Mountain Ski Area, Mount Snow Ski Area, Jamaica State Park and several State of Vermont Department of Corrections facilities. In total, GMW has advanced over 4,000 wells for public and private entities in the State of Vermont, including almost 50 in Jamaica.

Capacity to Perform, Commitment to Excel

The VHB Team understands how important the PCWS Source Exploration project is to the community. We share in that excitement and are eager to help the Town realize its goals. To meet our commitment to deliver a successful project within the planned timeframe, each member of our proposed team has been vetted for availability throughout the contract duration. We are determined to provide the Town with responsive, top-quality service, and we are enthusiastic about the prospect of partnering with the community.

Integrated Planning, Design, and Engineering Services

VHB's hydrogeologists are supported by a staff of ecologists, engineers, cartographers, preservation planners, and permitting specialists that will provide additional expertise to help propel the project to completion. Support services that will be integral to the success of the project may include Geographic Information Systems ("GIS"), hydrogeologic analysis and testing, environmental investigations and

permitting, cultural resources assessment, and roadway design. Because VHB offers all of these services through our South Burlington, VT office, we can efficiently coordinate between disciplines to provide extremely responsive, integrated services. In addition, VHB and Green Mountain Well CO. have successfully teamed to successfully site, drill, test, and permit PCWS wells in VT and NH.

Our team has an open-minded approach to projects, and we are committed to listening and truly understanding the Town's needs—we see the whole picture, not just one piece. We integrate the right people and resources from our four core service areas—planning and design, land development, transportation, and environmental science—to help clients initiate and complete intricate, challenging, and significant projects.



Project Understanding and Scope of Work

The VHB team will provide all materials, labor, equipment, fuel, tools, transportation, and services for Phase 1 (Well Siting) and Phase 2 (Source Exploration) as presented in the RFP and further described below. If determined feasible and necessary, the VHB team will complete additional wells at the request of the Town under a revised scope of services. As requested by the RFP, a proposed Project Schedule, including estimated dates of deliverables and public meetings, in addition to a table of staff hours by task, are enclosed.

Services will include:

1. Project Management

The VHB team will assume end-to-end project responsibility, including oversight of all subcontractors. This will include coordinating schedules, site access, clearing, equipment setup and other site activities with the Town. The team will conduct project meetings including:

- One meeting to introduce the VHB team and kickoff the project with Town representatives of the Project. Although a kickoff meeting is not specifically identified in the RFP, it is VHB's philosophy that an in-person kickoff meeting is critical to the successful completion of Projects.
- One public or Selectboard meeting to present the results of the well siting investigations (Phase I)
- One site visit with Town officials to present the proposed drilling locations and rationale, and to review the level of effort to construct access to the sites
- One public or Selectboard meeting to present the results of the well testing

In addition, the VHB team will comply with all federal, state, and local laws, ordinances or rules and regulations relating to the performance of the work. This includes notifying DigSafe to assure that there are no conflicts with existing utilities at the work sites. As described in the scope of services for Phase I, VHB will identify additional environmental studies and permits required prior to the well drilling. A proposed schedule is provided in Appendix A.

2. Phase 1 - Well Siting

Below we propose the sequence of tasks leading to the selection of at least three preferential well sites based on a combination of site availability, accessibility, hydrogeology, and environmental considerations. In our professional experience in Vermont's relatively short window for environmental permitting assessments, we recommend and propose to complete environmental field assessments as part of Phase 1 in order to have the most thorough information available to assist in decision making for Phase 2. In summary, our proposed sequence of tasks is as follows:

1. Well Site Identification - to identify possible locations,
2. Hydrogeologic Analysis - to narrow in on specific sites, well construction, and to assist in ranking,
3. Summary Report and Town Meeting – to receive Town input and agreement with locations
4. Environmental assessments - to assist in the access road design to avoid protected natural and cultural resources, or to seek appropriate permitting if avoidance is not possible.

Well Site Identification

VHB will work with the Town to identify parcels or tracts of land near the Village that would be available for well development, with the goal of identifying three or more well sites that are likely to produce adequate quantities and quality of water for the planned PCWS. We note that due to the number of homes, buildings, on-site septic systems within the Study Area defined in the 2018 Water Report (Dufresne Group, 2018), and other features, meeting the required setbacks for a PCWS well within the Study Area will be challenging. To obtain a sense of the well siting availability within and nearby the Study Area, VHB prepared a preliminary PCWS Siting map (Appendix B), which with additional information from the Town would be used as the starting point for identifying potential sites for new wells, or for determining if existing wells could be suitable for PCWS use based on siting criteria (pending well owner permission). Based on this preliminary screening, there are a few locations and an existing well that could meet the PCWS siting criteria within the Study Area.

Hydrogeologic Assessments

VHB proposes to use hydrogeologic assessment methods in order to optimize the siting and design of wells in order to seek suitable quantities and quality of water. VHB will conduct a geologic study and environmental evaluation using GIS mapping and on-site reconnaissance to identify up to three appropriate locations for installing new wells intended to meet PCWS permitting standards. Specifically, to improve chances of finding the desired quantities and quality of water, VHB will analyze bedrock and surficial geologic mapping, complete a fracture trace analysis, evaluate potential contaminant sources, review geologic logs for existing wells to evaluate aquifer types and yields, and evaluate watershed size and recharge area. VHB also will use GIS analysis to analyze required setbacks and buffers from ANR mapped features.

VHB will also work with the Town and the Dufresne Group to incorporate previously collected information into the analysis (such as the estimated demand to meet projected growth, well and septic systems locations, and estimated yields of existing wells). Assessment of potential contaminant sources will include a desktop evaluation of groundwater flow rates and directions, and a two-year time of travel from septic systems and leachfields, as required.

Accessibility for a drilling rig and avoiding known protected natural resource features (such as wetlands and streams) will also be considered in the selection of drilling sites, and confirmed by VHB with the on-site reconnaissance. If feasible, wells will be preferentially sited and constructed to avoid the need for Microscopic Particulate Analysis testing (“MPA”).

Depending on the size of available well sites, VHB may recommend the use of geophysical methods to ground-truth the fracture-trace and GIS analysis that has been conducted, to fine-tune specific drilling locations and to improve the likelihood of high well yields. If recommended, this geophysical work would seek geologic features to be targeted for drilling in order to increase the chances of encountering adequate yield from a bedrock well. We have not included geophysical assessments in this scope of work due to the limited sites available within the Study Area, and need to refine additional exploration areas in collaboration with the Town prior to determining its applicability.

At the conclusion of this task, VHB will stake and GPS-locate up to three well drilling sites.

Summary Report and Presentation

VHB will provide the Town with a map and brief report that presents the recommended well locations, ranking, and rationale for ranking. The various well drilling sites will be ranked based on our evaluation of likelihood of obtaining sufficient yield, likelihood of competing with existing wells for water, accessibility (including avoidance of protected natural resource features), compatibility with future development, proximity to planned water system infrastructure, and vulnerability to contamination by septic systems and other potential contaminant sources.

In this report, VHB will also include a discussion of a desktop review of ANR mapped protected natural resources (e.g., wetlands, essential wildlife habitat) to assist in the identification of permits that may be required prior to construction of access roads and drill pads. Following Town approval of the well sites, VHB proposes to complete detailed natural resource field assessments, as described in the next section, to assist in avoidance or permitting, and for addressing Categorical Exclusion criteria if the Town chooses to seek funding from the Drinking Water State Revolving Fund (“DWSRF”) for future water system construction.

A VHB Hydrogeologist will attend one public or Selectboard meeting to present the results of the well siting and hydrogeologic investigation.

Environmental Permitting Assessments

VHB will assess natural resources (e.g., wetlands, threatened or endangered species, protected species habitat, etc.) and address other environmental permitting considerations, such as cultural (archaeological and/or historic) resources consultation, needed for permitting and/or to address Categorical Exclusion criteria, which would be needed if the Town chooses to seek funding from the DWSRF. Ideally these assessments would take place immediately following the Town’s approval of the well sites. However, natural resources permitting assessments need to be completed during the growing season

(approximately June through October), and are therefore a critical path item in our proposed schedule. For these reasons, we may recommend that the field assessments be completed as soon as the Project team narrows in on the well sites if the Selectboard meeting is planned to occur after the growing season. Below we describe in detail what the assessments would include, and how the information will be synthesized into a memorandum for use in permitting, as needed.

Natural Resources Assessments

VHB assumes that at minimum, three separate well sites will need to be assessed for protected natural resources prior to construction of the access roads and wells. Based on the assumptions for road construction provided in the RFP, we assume a natural resources study area of approximately 3 acres, which would include 50-foot buffers on either side of a 1,000-foot-long, 14-foot wide road. We assume the study areas can be assessed in one day by one VHB environmental scientist. The study areas will need to be refined following an agreed upon access route in order to make sure all appropriate areas and buffer distances are assessed.

VHB environmental scientists will perform database and field reviews to address certain natural resources as may be applicable to the Categorical Exclusion and potential permitting associated with wetland/waters impacts. Database reviews will include a mix of public and privileged online databases, including the Vermont Natural Heritage and U.S. Fish and Wildlife Service (USFWS) information regarding rare species, including bat habitat. If necessary, based on database review and initial site screening visits, VHB will conduct a detailed wetland and waters delineation of the study area during the growing season (generally June through October). In accordance with current USACE and ANR guidance, delineations will be conducted using the technical criteria contained in the USACE Northeast Regional Delineation Supplement to the 1987 Corps Wetland Delineation Manual. If applicable, resource boundaries will be flagged, USACE data (vegetation, soils, and hydrology) will be collected, wetland functions and values will be assessed, and wetland resources will be photo-documented. Proposed wetland classifications and functions under the current (2018) Vermont Wetland Rules ("VWR") will be assessed. Stream flow regimes will be determined and data collected to document the determinations. VHB will locate the delineation flagging using sub-meter capable mobile data collection equipment. Also included will be an assessment for vernal pools assuming the delineation occurs within the normal vernal pool survey window (May-early June in the Project area). If the assessments are outside this window, potential vernal pools will be documented which may require follow up survey during the appropriate season. One VHB staff will coordinate and participate in one wetland confirmation review site visit with regulatory personnel, if applicable. VHB assumes any regulatory site review would be a separate day during the same growing season.

Following regulatory review, if needed, VHB will prepare a wetland/waters technical memorandum summarizing the methods and results of the field resource assessments and agency review described above. Also included will be wetland/waters delineation mapping, USACE data forms, wetland/waters summary tables, photographs, etc. This memorandum can also provide necessary documentation for a USACE Section 404 permit or Vermont Wetland Permit ("VWP"), or other applicable environmental permits as may be necessary. We assume that all three well sites will be included in one memorandum.

Cultural Resources Consultation

With respect to cultural resources, VHB anticipates that the wells and access roads would not adversely impact historic sites (i.e. above ground structures). However, we do anticipate the need for consultation with the Division for Historic Preservation (“DHP”) regarding archaeological sensitivity of the selected well sites. This consultation will be necessary for DWSRF monies and USACE Section 404 or other federal permitting, if needed. Our scope of services assumes a VHB Preservation Planner will complete initial consultation with DHP via a brief cover letter and map of the proposed well sites and access routes. If additional coordination or archaeological assessments are determined to be necessary, VHB will coordinate and subcontract a qualified archaeological consultant to perform such assessments at the Town’s request, under a separate scope and fee. As with the natural resources assessments, if archaeological assessments are required, seasonal restrictions would apply and we therefore recommend that initial consultation be completed as soon as the Project team narrows in on the well sites.

3. Phase 2 – Source Exploration

We recognize that a phased approach to well construction and testing is preferred because it would allow for decision making for subsequent well construction. Furthermore, the driller’s estimated yields and observations from the highest ranked well will inform the need for additional wells to meet the Town’s demand. On the other hand, efficiencies may be realized with the consecutive construction and subsequent back to back testing of all three wells. VHB’s hydrogeological experts will continuously work with the Town as a team to determine the most efficient path forward as the project progresses. For the purposes of this proposal, we assume that up to three well sites will be permitted, constructed, and tested within the same general timeframe. In summary, our proposed sequence of tasks is as follows:

1. Site visit and Kickoff meeting
2. Permitting
3. Drilling, Testing, and Evaluating to be phased based on driller’s estimated yield and observations

Site Visit and Phase 2 Kickoff

VHB will kickoff Phase 2 by conducting a site visit with Town officials to present the proposed drilling locations, rationale, and accessibility.

Permitting

Although the Project Team may decide to drill wells in a phased approach, VHB recommends applying for the necessary permits for the construction of all three wells concurrently, in order to expedite the permit application review and approval process. For the purposes of this proposal, we assume that the Town will submit Public Source Water Permit Applications for three well sites prior to their construction. After well drilling, VHB will submit a Source Testing Application prior to long-term yield testing of the wells. Based on a preliminary review of the ANR atlas, there are no mapped wetlands or hydric soils in the Village area, so it is likely that direct wetland or wetland buffer impacts and associated permitting can be avoided. Further, construction of one 1,000-foot-long, 12-foot-wide road would result in less than one acre of earth disturbance, and therefore we anticipate the project would not trigger a stormwater

construction permit. If, based on the final well site selection and natural resources assessments described above, additional permits are needed, VHB will provide a scope of work and cost estimate for the Town's review and approval.

Public Source Water Permit Application

VHB will develop a Public Source Water Permit Application and supporting documentation for submittal to DEC, Drinking Water and Groundwater Protection Division ("DWGPD"), seeking approval for installation of three PCWS wells. As required, the application will include the well siting methodology and results, a risk assessment of potential contamination sources, proposed well construction design, and identification of abutting landowners for Public Notification. VHB will attend a site visit with DWGPD personnel as required for the permit process. Note that a public hearing may be held, if requested during the Public Notice period. We assume that the public meeting in Phase 1 will satisfy public interest in the project, and therefore have not included a public hearing in our scope or timeline. However, if one is requested, VHB will attend at the Town's request under a separate scope of work or as time and materials. When the well sites have been agreed upon by the regulators, VHB and Green Mountain Well will coordinate to install wells that meet Vermont well construction requirements.

Drilling

VHB will coordinate with Green Mountain Well Co. to construct access roads and drill up to three wells, starting with the highest ranked well, and moving on to the second and third, depending on estimated yield. Following drilling, the site will be restored with erosion matting and seeding. We assume the road will remain in place for future access to the well.

Road Design

In collaboration with the Town, the VHB team will design and construct up to 1,000 linear feet of access road(s) to the well sites. The roads will consist of 1 foot of gravel and 1 foot of sand and will provide access from nearby public roadways or Town owned parcels. The roads will be designed and sized based on coordination with GMW, and to avoid impacts to natural resource features to the extent possible. GMW based construction material estimates per the assumptions indicated in the RFP. We note that more than 1,000 feet of roadway may be needed based on the final selection of the well sites, avoidance of wetlands and buffers, and discussions with the Town. VHB also understands that the Town may construct the access road. We note that if tree clearing is required, time of year restrictions may apply in order to avoid impacts to habitat for endangered bats, which would be evaluated during the natural resources assessments described above.

The VHB Team will sub-contract with a heavy equipment contractor for the construction of access roads and drilling pads. Steps will be taken as needed to control erosion during the development of the project site and access road, and during drilling operations.

Bedrock Well Installation

Bedrock wells will be installed by GMW, a VT Licensed Well Driller, using air-rotary drilling methods, and in accordance with PCWS standards. For the purposes of this proposal, we assume three wells will be drilled with 50-feet of 8-inch diameter casing and a 6-inch diameter borehole below the casing to a depth of 600 feet below ground surface. The driller will log materials and complete well logs that include descriptions of fracture zones and rock types. GMW will observe the overburden materials in

order to assess the presence of a productive gravel aquifer and the feasibility of installing overburden wells. The driller will provide yield estimates during installation by conducting blow testing at different depths to estimate contributions from substantial water bearing fractures.

As requested by the RFP, we are proposing the construction of 3 bedrock wells. However, based on the surficial geologic mapping of the area, and the presence of a few productive gravel wells (see attached map), we may recommend the installation of an overburden test well to evaluate the feasibility of a gravel production well. Our rationale is that where sufficient gravel deposits are present, gravel wells typically produce significantly higher yields than bedrock wells. If the Project Team decides to explore this, VHB would prepare a separate scope and fee, which would include installation of a test well, logging and sampling overburden material for grain size (sieve) analysis to assist in well design, and an initial yield test.

Yield Testing

After the wells have been successfully drilled, VHB will prepare a Source Testing Application and coordinate with the DWGPD for review and approval. VHB will coordinate with the Town to mail monitoring permission forms with stamped and addressed return envelopes to property owners within the monitoring radius. The permission form will request access to install probe tubes for data loggers/water level measurements and for monitoring throughout the test(s). Once the Source Testing Application has been approved, for each well, VHB will coordinate pumping test set-up, perform pre-test monitoring, conduct step-drawdown testing and analysis, conduct a long-term pumping test, and conduct a recovery test. For this proposal, we are assuming a 72-hour duration pumping test will be required for each well; depending on the well yields, longer-duration tests may be appropriate. During the pumping test, water levels will be monitored at least every 15 minutes in the production well and in all observation wells in the monitoring radius using water level dataloggers and/or manual water level measurements.

Our scope of work is based on the assumption of back to back 72-hour pumping tests, with monitoring of all accessible wells within 2,000 feet (as required for up to a 49 gpm permitted yield) for each well. Costs are based on the assumption that VHB will need to monitor no more than 15 wells in the test radius (2,000 feet), per test.

Water Quality Sampling

VHB will collect water quality samples for laboratory analysis for all parameters required for a new PCWS source, at the conclusion of each 72-hour pumping test.

MPA Testing

Although we highly recommend siting and constructing a well to avoid the need for MPA testing due to the additional requirements that are triggered if the MPA results are not favorable, we have included the following scope of work and associated costs per the RFP. If necessary, VHB will complete MPA testing in accordance with the methodology described in the US Environmental Protection Agency document "Consensus Method for determining groundwaters under the direct influence of surface water using microscopic particulate analysis" (EPA document # 910/9-92-029). In general, this methodology involves installing equipment on the discharge pipe of the well to regulate and meter flow and pressure, and to house a 1-micron filter, with samples collected after the recommended

collection time (16.5 hours). Following the collection time, the filter and water from the filter housing will be collected as instructed by the laboratory, stored in a cooler, and delivered to the lab within the designated hold time. VHB will review the results with the Town to determine next steps.

Source Evaluation Report

VHB will analyze results of the yield testing and prepare a report that meets all applicable requirements of the Vermont Water Supply Rule, section A-3.3, documenting safe yield, interference to other wells, water quality, and delineating a proposed Source Protection Area ("SPA"). VHB will attend one public or Selectboard meeting to present the results of the well testing prior to submittal of the report to the DWGPD.

Appendix A - Proposed Schedule

**Town of Jamaica PCWS Source Evaluation -
Proposed Schedule**



ACTIVITY	PLAN START	TASK DURATION (days)	FINISH	Notes
Phase I - Well Siting	6/1/2019	113	9/24/2019	
Authorization to Proceed	6/1/2019	1	6/1/2019	TBD by Town
Coordination and Project Management	6/1/2019	175	11/23/2019	Meetings and site visits are included in subsequent tasks
Well Site Identification	6/1/2019	45	7/16/2019	Includes (1) VHB site visit (mileage)
Desktop Hydrogeologic Analysis	7/17/2019	15	8/1/2019	Includes (1) VHB site visit (mileage)
Draft Report	8/2/2019	30	9/1/2019	
Town Review	9/1/2019	22	9/23/2019	
Public/Selectboard Meeting	9/23/2019	1	9/24/2019	Date TBD with Town input. Timing as proposed aligns with Town Selectboard meeting
Natural Resources field assessments and regulatory site visit ¹	9/25/2019	14	10/9/2019	Both the NR assessment and regulatory site visit need to be completed during the growing season (generally June through October), following Town's approval of proposed well sites/parcels.
Natural Resources Tech Memo; DHP Coordination	10/9/2019	45	11/23/2019	
Phase II - Source Exploration	10/9/2019	317	8/22/2020	
Town Site Visit	10/9/2019	1	10/9/2019	Includes (1) VHB site visit
Permitting				
Prepare & Submit Source Permit Application - 3 wells	10/10/2019	45	11/24/2019	
Prepare & Submit any necessary collateral permits (i.e. VWP, 404, etc.) ²	TBD	TBD	TBD	Need for permits to be determined based on results of NR Assessments. Based on a preliminary review of ANR mapped wetlands and hydric soils in the area, we assume wetlands/waters impacts and permitting can be avoided.
DEC site visit, application review and notice draft permit(s)	11/24/2019	30	12/24/2019	Includes (1) VHB site visit (mileage)
Public Comment Period	12/24/2019	30	1/23/2020	
Public Meeting (if necessary)	1/23/2020	14	2/6/2020	Assumed none will be requested
Appeal Period (if applicable)	1/23/2020	30	2/22/2020	
Anticipated date of Permit Receipt			2/22/2020	
Drilling and Testing				
Drill and construct 3 Wells (weather & ground conditions dependent)	3/8/2020	30	4/7/2020	Includes oversight of installation of three bedrock wells. Driller costs included on separate table.
Analyze Results, submit Source Testing Review Application	4/7/2020	10	4/17/2020	
DEC review source testing application	4/17/2020	10	4/27/2020	
Request Monitoring Permission	4/27/2020	15	5/12/2020	Assumes town to mail and manage monitoring notification
Well Site #1 Pumping Test	5/12/2020	14	5/26/2020	Testing Includes: 5-hour step test, 48 hour background monitoring, 72-hour pumping test and 48-hour recovery monitoring for each well site at <50 gpm yield. Assumes 15 observation wells will be monitored, including probe tube installation. Includes per diem, time for Water Quality Sampling and MPA sampling, if needed (8 hours per well).
Well Site #2 Pumping Test	5/26/2020	14	6/9/2020	
Well Site #3 Pumping Test	6/9/2020	14	6/23/2020	
Source Evaluation Reporting	6/23/2020	60	8/22/2020	
Source Permit	8/22/2020	60	10/21/2020	

Appendix B - Site Map

MAP DEVELOPED FOR PROPOSAL PURPOSES ONLY

vhb May 14, 2019



Jamaica, VT

Town of Jamaica - PCWS

PCWS Siting Map

Sources: Background Hillside (VCGI 2015)
 ANR - VT Agency of Natural Resources (Various Years)
 DC - Duffene Group (2018)
 FEMA - Federal Emergency Management Agency (Various Years)
 VCGI - VT Center for Geographic Information (Various Years)
 VHS - Digitized Setback Buffer (2019)

	Setback Buffer (VHS)		Public Well (ANR)		Bedrock Water Table (ANR)
	Building Footprint (VHS/DC)		Alluvium		0-99 gpm
	Study Area (VHS/DC)		Isolated Kame		10-99 gpm
	DEM Footprints (FEMA)		Outwash		20-49 gpm
	SWW Wetland (ANR)		WVD Stream (VCGI)		50-99 gpm
			VADW Wetlands (VCGI)		100-1200 gpm
			Elevation Contour - 20 ft (VCGI)		
			Parcel Boundary (VCGI)		
			Road Boundary (VHS/DC)		

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Appendix D - Cost Proposal



Town of Jamaica PCWS Source Exploration Cost Proposal

Enclosed please find VHB's Cost Proposal, which includes the following:

Table 1 – Summary of Not-to-Exceed Fees for Each Phase.

Includes a breakdown by Project Team member and total costs for each phase.

Table 2 – Schedule and Estimated Costs.

This table presents a detailed task spreadsheet, which includes the approximate schedule and timeline of the project, assumptions, staff hours, and billing rates. We have also included estimated expenses, such as mileage, equipment rentals, pump test set up, and laboratory fees. This table provides the information requested for Section 2a, 2e, 2f, and 2g of the Cost Proposal Section of the RFP.

Table 3 – Bedrock Installation Unit Costs.

This table presents the unit rates for drilling, casing, grouting, driller's yield test, and sub-total cost for each well drilled with 50-feet of 8-inch diameter casing and 6-inch diameter borehole to a depth of 600 feet below ground surface. This table provides the information requested for Section 2b of the Cost Proposal Section of the RFP.

Table 4 – Access Road Unit Costs.

This table presents unit costs per 100 linear feet for work needed to get access to drilling locations, and extension of those costs to the assumed 1,000 linear feet, per Section 2d. of the Cost Proposal Section of the RFP.



Town of Jamaica, Vermont
Public Community Water System Source Exploration
Prepared on May 21, 2019

Table 1: Summary of Not to Exceed Costs				
	VHB	Endyne Inc.	GMW	Total
	<i>Hydrogeology and Permitting</i>	<i>Water Quality Lab Analysis</i>	<i>Access Road and Drilling/Well Construction</i>	
Phase 1	\$21,110	--	--	\$21,110
Phase 2	\$119,295	\$7,500	\$56,090	\$182,885
*Project Total Cost:				\$203,995

Notes:

*Per RFP Cost Proposal requirements, Total Cost assumes three wells with 1,000 feet of access road total
Detailed breakdown of VHB and sub-consultant costs included in Tables 2 through 4

Table 2: Town of Jamaica PCWS Source Evaluation - Schedule and Estimated Costs

ACTIVITY	TASK DURATION (days)	FINISH	Labor Types		Ecologist	Environmental Ecologist	Environmental Scientist	GIS Specialist	Environmental Scientist III/ Historic Pres. Planner	Geologist	Senior Hydrogeologist	Expenses	Total Cost	Notes	
			Hourly Billing Rate	Estimated Hours to Complete Scope of Work (EHW)											
Phase I - Well Siting	6/7/2019	9/24/2019													
Authorization to Proceed	6/7/2019	6/7/2019													
Coordination and Project Management	6/7/2019	11/23/2019							10	5	5		\$2,150	Meetings and site visits are included in subsequent tasks	
Well Site Identification	6/7/2019	7/16/2019			8				10	8	1	\$55	\$3,385	Includes (1) VMB site visit (mileage)	
Detailed Hydrogeologic Analysis	7/17/2019	8/7/2019							8	10	2	\$500	\$4,180	Includes (1) VMB site visit (mileage)	
Drill Report	8/2/2019	9/1/2019							16	4	2		\$4,080		
Town Review	9/1/2019	9/23/2019													
Public/Stevedore Meeting	9/23/2019	9/24/2019								4	10		\$1,850	Includes travel time, preparation, and 3 hour meeting	
Natural Resources Field Assessments and regulatory file info	9/25/2019	10/9/2019			10					4		\$55	\$2,335	Assumes (1) day for assessments and half day for regulatory file info. See Footnote 1	
Natural Resources Field Memo, DRP Coordination	10/9/2019	11/23/2019			8	24			5	5	20	\$630	\$3,250	Includes (1) VMB site visit (mileage)	
Phase II - Source Evaluation	10/9/2019	8/23/2020													
Town Site Visit	10/9/2019	10/9/2019	1	10/9/2019					10			\$55	\$55	Includes (1) VMB site visit (mileage)	
Permitting															
Prepare & Submit Source Permit Application - 3 wells	10/10/2019	11/24/2019	45						30	4	2	\$55	\$4,945	See footnote 2.	
Prepare & Submit any necessary additional permits (i.e. VMP, DRP, etc.)	11/24/2019	12/24/2019	30						10			\$90	\$90	Includes (1) VMB site visit (mileage)	
DRP site visit, application review and receive state permits	12/24/2019	1/23/2020	30											Assumes none will be requested	
Public Comment Period	1/23/2020	2/6/2020	14												
Public Meeting (if necessary)	1/23/2020	2/22/2020	30												
Appeal Period (if applicable)	1/23/2020	2/22/2020													
Anticipated date of Permit Receipt		2/22/2020													
Drilling and Testing															
Drill and construct 3 wells (mainwell & around conditions dependent)	3/8/2020	4/7/2020	30						40			\$195	\$1,995	Includes overnight of installation of three distinct wells. Other costs included on separate table.	
Analyze Results, submit Source Testing Request Application	4/7/2020	4/17/2020	10						32	4	2		\$4,720		
DRP review, source testing application	4/17/2020	4/27/2020	10												
Request Monitoring Permission	4/27/2020	5/12/2020	15						12				\$90	Assumes town to mail and manage monitoring notification	
Well Site #1 Pumping Test	5/12/2020	5/26/2020	14						16	4	2	\$1730	\$17,660	Testing includes: 5-hour stop test, 20-hour background monitoring, 72-hour pumping test and 24-hour recovery monitoring for each well site at 500 gpm test. Assumes 10 observation wells will be installed at 500 gpm test. Assumes 10 observation wells will be installed at 500 gpm test. Includes cost for temporary sampling pump, time for Water Quality Sampling and MRA sampling. Includes 8 hours per well.	
Well Site #2 Pumping Test	5/26/2020	6/9/2020	14						16	4	2	\$1730	\$17,660		
Well Site #3 Pumping Test	6/9/2020	6/23/2020	14						16	4	2	\$1730	\$17,660		
Laboratory Fees (Gdym, Inc. at Wilkison - PCWS package, 3 WMS)												\$3,900	\$3,900	Lab fees include full PCWS package (\$1,300/well) for 3 wells	
MRA Testing, VMB Labor and Laboratory Fees (Gdym, Inc. at Wilkison - 3 Wells)									24			\$5,790	\$5,790	300k Testing requires a spring and well test. Assumes first test can be done concurrently with pump test. Lab fee is \$150/well per test. Includes cost for temporary sampling pump.	
Source Evaluation Reporting	6/23/2020	9/22/2020	60						40	4	4		\$5,280		
Source Permit	8/22/2020	10/21/2020	60						12	4	4				
PHASE II TOTAL HOURS AND ESTIMATED COST					0	24	610	4	112	24	14		\$61,315	\$126,795	Does Not Include Public's Cost for access road or well construction. See Summary Table for Total Not to Exceed Costs

Notes:
 1. Based on MRA assessment and regulatory file will need to be completed during the opening season (generally June through October). Following Town's approval of proposed well locations, need for permits to be determined based on results of the Assessment. Based on a preliminary review of ARI2 mapped wetlands and hydro data in the area, we assume wetlands/streams impacts and permitting can be avoided.

56,090
 203,995
 6 MW

Town of Jamaica PCWS Source Evaluation
 Green Mountain Well Estimate of Costs
 Prepared by VHB and GMW on May 24, 2019



Table 3: Bedrock Well Installation Unit Costs

Assumptions: ¹									
38.0 feet of sand, gravel, and clay above bedrock									
10.0 feet of casing into bedrock									
50.0 total casing length, including 2 feet above grade									
600.0 feet of total well depth									
(Unit)	Drilling 12-inch diameter hole for casing ²	Casing materials (8-inch diameter, 29 pound-per-foot steel) and installation	Grouting	Subtotal for installed 8-inch casing	Drilling 6-inch diameter hole in bedrock	3-hour air-lift yield test	Miscellaneous parts (drive shoe, cap, well completion report and tag, etc.) \$ per lump sum	Subtotal for 6-inch bedrock borehole	Total Estimated Cost (per well)
Estimated Quantity:	\$ per foot	\$ per foot	\$ per foot		\$ per foot	\$ per hour	\$ per lump sum		
Unit Price	\$19.83	\$2.0	\$23.61	--	\$11.00	\$200.00	\$270.40	--	--
Subtotal	\$992	\$35.94	\$944	\$3,805	\$6,050	\$600	\$270	\$6,920	\$10,725
Total Cost for three bedrock wells:									\$32,180

¹per single bedrock well

²Unit cost includes drill mud "Quick Gell" (10 - \$75 bags)

Table 4: Access Road Unit Costs

Assumptions:							
1000.0 total length of road (feet)							
5% maximum grade							
12.0 road width (feet)							
100.0 cubic yards of gravel per 100 linear feet							
640.0 area of drill rig pad (square feet)							
(Unit)	Access Road Excavation	Access Road Gravel	Subtotal for Gravel Access Road (per 100 feet)	Drill Pad Excavation	Drill Rig Gravel Pad	Subtotal for Drill Rig Pad	
Estimated Quantity:	\$ per cubic yard	\$ per cubic yard	\$ per 100 feet	\$ each	\$ per cubic yard	\$ each	
Unit Price	\$12.25	\$8.63	--	\$735.00	\$8.63	--	
Subtotal	\$1,225	\$863	\$2,088	\$2,205	\$828	\$3,033	
						Total: 1,000 foot Access Road and 3 Drill Rig Pads	\$23,910

Notes:

Estimate does not include tree removal

Site Restoration not included at this time, but is estimated at a rate of \$0.09/SF for seed and mulch and \$0.62/SF for seed and matting. Seed/mulch would be recommended for slopes flatter than 3:1, and seed/matting on 3:1 or greater.