

U.S. Fish and Wildlife Service

Draft Environmental Assessment

Millbrook Quarry Zebra Mussel and Quagga Mussel Eradication

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TABLE OF CONTENTS

I.	INTRODUCTION	4
II.	PURPOSE AND NEED FOR ACTION.....	5
III.	BACKGROUND AND PRE-PROCUREMENT ACTIONS.....	6
	Millbrook Quarry Zebra Mussel Workgroup.....	6
	Emergency Procurement and Solicitation of Funds.....	7
	Funding	7
	Continuing Geochemical and Hydrologic Investigation.....	8
IV.	THE VIRGINIA PROCUREMENT PROCESS: COMPETITIVE NEGOTIATION	8
	The Competitive Negotiation Process	8
	Millbrook Quarry RFP Evaluation Panel.....	9
	Criteria for Evaluation of Proposals	10
	Stipulation Regarding Compliance with NEPA	10
	The Request for Proposals	10
V.	REVIEW OF THE PROPOSALS	10
VI.	ALTERNATIVES.....	11
	A. (Proposed Action) Aquatic Sciences L.P. (Muriate of Potash).	11
	B. G.E. Betz (Spectrus CT-1300 – Clamtrol).....	12
	C. Amark (Carbon Dioxide).....	13
	D. No Action.....	13
	E. Alternatives Considered But Not Feasible.....	13
VII.	AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	14
	A. Hydrologic and Geochemical Setting	15
	B. Threatened or Endangered Species.....	17
	C. Aquatic Wildlife.....	17
	D. Terrestrial Wildlife, Including Migratory Birds	18
	E. Streams, Lakes, Rivers, and Other Surface Waters	18
	F. Groundwater	18
	G. Wetlands	19
	H. Natural Areas, and Unique or Important Vegetation	19
	I. Cultural or Historic Resources.....	19
	J. Recreational or Socioeconomic Resources.....	20
VIII.	COASTAL ZONE MANAGEMENT ACT CONSISTENCY	20
IX.	AGENCIES, ORGANIZATIONS, AND PARTIES CONSULTED	21
X.	PREPARERS	22
XI.	LITERATURE CITED	22

LIST OF FIGURES

1. Zebra mussels (*Dreissena polymorpha*) in hand24
2. Underwater view of zebra mussels on rock in Millbrook Quarry25
3. Regional location of Millbrook Quarry, Prince William County, Virginia.....26
4. Aerial photograph of Millbrook Quarry and Broad Run27
5. Millbrook Quarry, from berm in northeast quadrant, looking southwest.....28
6. Broad Run adjacent to Millbrook Quarry29
7. Millbrook Quarry bathymetry.....30
8. Groundwater elevation contours and wells in vicinity of Millbrook Quarry.....31
9. Surveyed reaches and freshwater mussels collected in Broad Run32
10. Wetlands in proximity to Millbrook Quarry33

LIST OF APPENDICES

A. Ad-hoc Millbrook Quarry Zebra Mussel Workgroup.....34
B. Millbrook Quarry Zebra Mussel Eradication RFP Evaluation Panel35
C. Request For Proposals RFP 00375-35237
D. Millbrook Quarry RFP Procurement Documentation.....56
E. Virginia Department of Game and Inland Fisheries FWIS Review80
F. Virginia Department of Conservation and Recreation Review82
G. Virginia Department of Historic Resources Review83
H. Potash Material Safety Data Sheet (MSDS)84

I. INTRODUCTION

In August 2002, the Virginia Department of Game and Inland Fisheries (DGIF) received an unconfirmed report that a zebra mussel (*Dreissena polymorpha*) (Figures 1, 2) infestation was present in Millbrook Quarry, Prince William County (Figures 3, 4). While zebra mussels had been discovered and removed from a boat at Smith Mountain Lake in 1993 before it was launched, a population had never before been documented in Virginia. Specimens were collected from the quarry on 31 August 2002 and forwarded to Dr. Richard Neves (Cooperative Fish and Wildlife Research Unit, Virginia Polytechnic Institute and State University) and Mike Pinder (DGIF) for identification. On 3 September 2002, these specimens were confirmed as zebra mussels, thus documenting the first zebra mussel population in the state.

Native to the Caspian, Black and Azov seas of eastern Europe, zebra mussels are believed to have been introduced into U.S. waters in 1986 through ballast water discharge. These mollusks have spread rapidly throughout most of the Great Lakes and Mississippi River Basin states. Currently, reproducing zebra mussel populations occur in waters in or adjacent to 25 states and extend westward into eastern Oklahoma and western Iowa. Unlike native freshwater mussels, zebra mussels produce free-living larvae (veligers) which do not require fish hosts, and zebra mussels can attach to firm substrates with their byssal threads. This facilitates their adherence to objects such as boats, pipelines, pilings, rocks, and other aquatic objects or fauna, greatly accelerating their spread. Additionally, the microscopic zebra mussel veligers are easily transported from infested waters through ballast water discharge and on or in boats, anchors, personal watercraft, dive gear, and bait buckets. Each female zebra mussel has the capability to produce upwards of 1 million eggs per year, further enhancing the spread of this exotic species.

The quagga mussel (*Dreissena bugensis*), native to the Dneiper River drainage of the Ukraine, was first reported from Lake Erie in 1989, though this second *Dreissena* invasion of North America was not identified as *D. bugensis* until 1991. A close relative of zebra mussels, and the only other species of the genus *Dreissena* in North America, quagga mussels are now found in Lake Michigan, Lake Erie, Lake Ontario, Lake Huron, the Erie Canal, the upper St. Lawrence River, and a few other locations in New York, Ohio, Michigan, Pennsylvania, and Missouri. There are morphological, ecological, and genetic differences between zebra mussels and quagga mussels, but the species often co-occur, they overlap greatly in physical appearance and distribution, and they potentially express similar ecological and economic impacts. Quagga mussels have not been documented from Millbrook Quarry or from any other site in Virginia. Because of their co-occurrence with zebra mussels, their similar pathways for introduction, their potential economic and environmental impacts, and similarity in options for their eradication, we include quagga mussels with zebra mussels in this project, and use the term zebra mussel to generically include both species.

Elsewhere in the U.S., zebra mussel populations that colonize open or large water bodies are merely managed to mitigate economic and ecological impacts, usually at great financial cost and accompanied by long-term loss of natural resources. Numerous water treatment and power facilities must regularly treat their systems to keep them clear of zebra mussels, beaches must periodically remove decaying masses of dead zebra mussels, and bottom-dwelling organisms are often covered by this exotic mussel. In the United States, congressional researchers estimated

that zebra mussels cost the power industry alone \$3.1 billion in the 1993-1999 period, with their impact on industries, businesses, and communities exceeding \$5 billion. Additionally, numerous freshwater mussel populations (as well as other aquatic species) have been extirpated from areas that zebra mussels now colonize.

II. PURPOSE AND NEED FOR ACTION

Purpose – To protect Virginia native freshwater mussels and other fauna, and commercial and recreational facilities, from infestation by zebra and quagga mussels.

Need – To evaluate and select a method of eradication and long-term control of zebra and quagga mussels at Millbrook Quarry.

The Millbrook Quarry zebra mussel population could have significant adverse short-term and long-term ecological and economic impacts in Virginia. The quarry (Figure 5) is separated from Broad Run (Figure 6), a perennial tributary of the Occoquan River, by a mere 200-300 foot-wide berm. Lake Manassas, just 5-1/2 miles downstream of the quarry (see Figure 3), serves as the primary water supply for the City of Manassas and a number of municipalities in the area. Just downstream of Lake Manassas is the Occoquan Reservoir, which serves a larger water supply capacity (over 1 million people in northern Virginia), and a number of power supply facilities that could be significantly affected if zebra mussels escape to infest the Occoquan watershed. Fairfax Water (formerly the Fairfax County Water Authority) estimates that they would incur a \$2 - \$4 million capital outlay for chemical feed facilities, and \$500,000 - \$850,000 per year for chemicals and system maintenance. Annualized costs over a 20-year period (capital and O&M) could range from \$670,000 to \$1.16 million. The City of Manassas would likely incur similar expenses to treat zebra mussels at its facility on Lake Manassas. Furthermore, water intake facilities throughout Virginia would be potentially vulnerable, and many rare and declining freshwater species could suffer significant losses. Impacts to the Commonwealth's native freshwater mussel communities could be devastating, since Virginia supports 81 species of mussels, including 44 that are listed as endangered, threatened, or of special concern. Forty-five of the 54 species of freshwater mussels in Virginia reaches of the upper Tennessee River Basin are endemic to that basin: zebra mussels, if they became widely established in the Commonwealth, could threaten their existence.

Millbrook Quarry is extensively used from spring through fall for recreational and instructional diving, and these users likely have benefited in the short-term from enhanced water clarity in the quarry. These recreational and commercial interests, however, also will be adversely impacted if zebra mussels eventually encrust and conceal the bus, dive platforms, boats, airplane, and other "objects" sunk in the quarry for divers' enjoyment and training purposes. Also, diving in the quarry could be prohibited, restricted, or subjected to additional costs or regulation (e.g., quarantine or mandatory decontamination of all equipment) if the current infestation of zebra mussels is not eradicated.

III. BACKGROUND AND PRE-PROCUREMENT ACTIONS

Millbrook Quarry, located in western Prince William County adjacent to Virginia Highway 55 and Interstate 64, was opened in 1947 by Millbrook Quarries, Inc. The quarry initially produced road stone for construction of Virginia Highway 55. Gooch et. al., (1960) reported that in 1958 the quarry was about 400 feet wide, 600 feet long, and 100 feet deep. The current dimensions of the quarry reveal a maximum depth of 93 feet, a surface area of 12.01 acres, and volume of approximately 180 million gallons (Figure 7). Virginia Department of Mines, Minerals, and Energy (DMME) records indicate that the quarry has been inactive since at least February 1963. The Dive Shop (Fairfax, VA) first began using the quarry for scuba diving in the early 1970's, and has leased the quarry as a training and recreational dive site since 1978 (John Wall, pers. comm.). Through The Dive Shop, the site is accessed by more than a dozen dive shops in the northern Virginia / Washington metropolitan region. Diving occurs on weekends only, and primarily from April through mid-November. The quarry has a single gated entrance, and offers limited Saturday-night-only camping. Portable toilets are provided, but there is no running water or electricity on site; no public non-diving recreational use is permitted.

Unfortunately, given the proximity of Millbrook Quarry to Broad Run and its extensive use as a dive location, it is highly unlikely that the zebra mussel population in Millbrook Quarry could simply be forever isolated. Broad Run has historically flooded the bank separating it from Millbrook Quarry (1972, Hurricane Agnes), and unintentional transport by divers from the quarry to other state waters is likely (the microscopic veligers can easily be transported in water-containing pockets of buoyancy compensators, weight belts, or other dive gear, or even on linings of wetsuits). Conversely, while there are suspected groundwater connections between Millbrook Quarry and the adjacent Broad Run, there is no direct surface outflow or inflow, effectively eliminating natural dispersal modes and rendering this population relatively isolated. Also, since the population remains as the only known zebra mussel population in Virginia, eradication of this infestation would completely remove this invasive species from the Commonwealth.

Millbrook Quarry Zebra Mussel Workgroup - Upon confirmation of the infestation, initial assessment of the threat to native wildlife communities posed by zebra mussels, and review of our legal jurisdiction to intervene, DGIF organized a meeting of numerous federal, state, and local agencies and organizations, thereby establishing the ad-hoc Millbrook Quarry Zebra Mussel Workgroup (Appendix A). On October 18, 2002 the Workgroup held its first meeting to review the situation and determine potential courses of action. At that time, all parties agreed that eradication of the population, if possible, should be the ultimate goal, despite recognition that eradication of such a large open-water population of zebra mussels had never before been attempted.

Before an appropriate eradication plan could be developed, the Workgroup concluded that substantial technical information needed to be collected regarding the quarry and degree of infestation. The information needs were grouped into three categories: 1) water chemistry; 2) hydrogeologic characteristics; and 3) physical parameters of the quarry and zebra mussel population. Workgroup agencies (primarily DGIF, DMME, and the Occoquan Watershed Monitoring Laboratory of Virginia Tech [OWML]) initially sought to conduct the necessary

onsite data collection in mid-November 2002. That effort was unsuccessful because of access requirements imposed by the property owner and dive shop owner. The Workgroup thus met again on November 22, 2002 to review seven potential eradication options that had been developed via literature review. These options included application of chlorine, pH shift below 6.0, dewatering of the quarry, increasing the quarry water salinity, application of copper sulphate, application of potassium, and application of Clamtrol, a commercially available molluscicide. Additionally, the group discussed potential avenues to gain access to the property, to complete the necessary fieldwork. Concurrent with the passage and Governor's signing of HB 2752 (Virginia Nonindigenous Aquatic Nuisance Species Act) in mid-March 2003, the landowner and dive shop owner granted DGIF and cooperating agencies access to the property.

In late April 2003, experts from key agencies conducted the fieldwork, and completed their preliminary data analyses in late June 2003 (OWML 2003, VDGIF 2003, VDMME 2003). This effort confirmed widespread occurrence of zebra mussels of several year classes throughout the quarry, from near surface to depths greater than 80 feet; and provided a baseline hydrologic and geochemical characterization of the quarry, groundwater, and Broad Run. The Workgroup met again on 22 July 2003 to review the data and analyses, and to evaluate potential treatments. Based on the preliminary analyses, treatment with chlorine, pH shift, dewatering the quarry, and increasing salinity were considered to be among the least desirable or potentially successful alternatives because of environmental concerns, technical infeasibility, logistics, or expense. Likewise, copper sulphate treatment was disfavored because of potential environmental concerns. Two identified options, Clamtrol and potassium, were considered to potentially offer acceptable solutions to the Millbrook Quarry situation. The Workgroup, however, recognized that selection of a treatment alternative would require formal evaluation via the Virginia procurement process, that DGIF probably would be the purchasing agency in the formal procurement process, and that no funds had been identified to pay for the eradication effort.

Emergency Procurement and Solicitation of Funds - In August, 2003, DGIF increased formal efforts to obtain funding for eradication of the infestation, and sought eradication proposals from potential vendors via Emergency Procurement Solicitation Number 00375-200. Unfortunately, confirmed offers of funding were not forthcoming and, on 30 October 2003, the emergency solicitation was cancelled due to lack of funding to proceed. This action formally ended review and evaluation of the proposals that had been submitted in response to the Emergency Procurement Solicitation. Furthermore, DGIF staff was instructed not to pursue any further solicitation or evaluation of proposals until funding for the eradication was secured.

Funding - Based on preliminary review, the eradication effort was anticipated to cost between \$150,000 and \$800,000. Because such eradication had never been attempted, a wide range of technologies were potentially under consideration, and there were no established methods, treatments, or models by which to accurately forecast project cost. Therefore, we established \$800,000 as the funding target. A wide variety of funding options were explored including numerous federal agencies; state, regional, and local governments likely to be adversely impacted by presence of zebra mussels in Virginia's waters; and prominent Virginia industries that would be similarly impacted. Our goal of securing \$800,000 in funding commitments was reached in September 2004, thereby enabling us to begin formal development of the Request for Proposals.

Continuing Geochemical and Hydrologic Investigation - As was suggested in their initial report, the Occoquan Watershed Monitoring Laboratory and Virginia Department of Mines, Minerals and Energy continued their investigation of the quarry's hydrology and geochemistry, to further support evaluation of the relationships between the quarry, regional groundwater, and Broad Run; and to provide greater understanding of the potential environmental implications of pursuing eradication of the Millbrook Quarry infestation (Lassetter et. al. 2004, 2005; OWML 2004). A summary of our current understanding of the quarry's hydrology and geochemistry is presented in Section VII.

IV. THE VIRGINIA PROCUREMENT PROCESS: COMPETITIVE NEGOTIATION

The Competitive Negotiation Process - Competitive negotiation may be the procurement method used for goods and nonprofessional services when it is not practicable or fiscally advantageous to use competitive sealed bidding (Code of Virginia, §§ 2.2-4301 & 2.2-4303C). Competitive negotiation has the advantage of flexibility for describing in general terms what is being sought and the factors to be used in evaluating responses. It offers the opportunity, through negotiation, to change the content of an offer and pricing after opening. Negotiation is the dialogue that occurs to achieve mutually satisfactory objectives and benefits and to reconcile differences through mediation. This discussion provides the means for both the buyer and seller to reach agreement on a contract's content, terms, and conditions. In the course of negotiation, both parties should be able to reach a mutually acceptable agreement.

This method of procurement requires the issuance of a Request for Proposal (RFP) that describes in general terms the requirement, the factors that will be used to evaluate the proposal, the Commonwealth General Terms and Conditions, plus any special conditions including unique capabilities or qualifications that will be required. In a sealed program, all responses must be held unopened until the date and time specified for their receipt. Public openings are not required by law for proposals submitted under competitive negotiation, but doing so avoids the appearance of impropriety. If a public opening of proposals is conducted, only the names of the firms submitting proposals shall be disclosed. Questions on the proposals of other offerors should not be answered until after evaluation and negotiations are complete and an award decision has been made.

The proposals are evaluated by the buyer, contracting officer, or an evaluation team. As an option, evaluators may request presentations or discussions with offerors, as necessary, to clarify material in the offerors proposals, to help determine those fully qualified and best suited. Proposals are then evaluated on the basis of the criteria set forth in the RFP, using the scoring weights previously determined. All RFP responses are to be evaluated. Proposals not meeting requirements should be scored lower. Only bids in response to an Invitation For Bid may be determined to be nonresponsive. Offerors may be given an opportunity to correct a deficiency in their proposals, within an appropriate period of time, as determined by the purchasing office. Offerors who fail to submit required documentation or meet mandatory requirements, in such time, for evaluation purposes may be eliminated from further consideration. Two or more offerors determined to be fully qualified and best suited are then selected for negotiation. Price is considered, but need not be the sole determining factor.

Pricing constitutes 25% of the evaluation, and the other specified criteria determine 75% of the scoring for each proposal. The lowest-priced proposal thus receives 25 points toward its final score, and each other proposal being considered receives a proportional number of points, relative to the lowest-priced proposal. The total points awarded according to the other criteria (maximum of 75), added to the points awarded for pricing, constitute the final score for each proposal being evaluated. The final score is expressed as points received based on a maximum possible score of 100 points.

During the evaluation phase it may be determined that only one offeror is fully qualified, or that one offeror is CLEARLY more highly qualified than the others under consideration. A written determination shall be prepared and retained in the contract file to document the meaningful and convincing facts supporting the decision for selecting only one offeror and negotiating with that offeror. The determination shall be signed by the agency head or his/her designee.

Negotiations are conducted with each of the offerors so selected. Negotiation allows modification of proposals, including price. Offers and counter-offers may be made as many times with each offeror as is necessary to secure a reasonable contract. After negotiations have been conducted with each of the selected offerors, the Commonwealth selects the offeror which, in its opinion, has made the best proposal; however, if the contract is up to \$100,000, the contract may be awarded to a reasonably ranked minority or woman-owned offeror that is other than the highest ranking offeror. In all cases, written confirmation shall be obtained from the offeror on any modifications of the original proposal. Once Intent to Award notice is posted, no further negotiation shall be conducted.

Agencies are not required to furnish a statement of the reason why a particular proposal was not deemed to be the most advantageous. Offerors may inspect the proposal records after evaluation and negotiations are complete, but prior to award. Agencies may cancel a RFP, or reject proposals at any time prior to making an award. The award documents shall incorporate, by reference, the terms and conditions of the RFP and the contractor's proposal, together with all written modifications thereof.

Records are open to the public in accordance with the Virginia Freedom of Information Act, subject to the following: Any offeror who responds to an RFP, upon request shall be afforded the opportunity to inspect proposal records within a reasonable time after the evaluation and negotiation of proposals are complete but prior to award, except in the event the buying agency decides not to accept any of the proposals and to re-solicit. Bids and proposal records shall be open to the public only after award of the contract. The procurement records must be available for review by any bidder or offeror at the time a Notice of Intent To Award or an Award Notice is posted.

Millbrook Quarry RFP Evaluation Panel - In anticipation of the breadth of expertise required to properly evaluate proposals submitted in response to the RFP, and recognizing the wide range of technical, public health, environmental, and socioeconomic issues to be considered, we assembled an interagency RFP evaluation panel of 8 members representing seven agencies: DGIF; the Virginia Department of Mines, Minerals and Energy; the Virginia Department of Environmental Quality, the Virginia Department of Health; the Cooperative Fish and Wildlife

Research Unit of Virginia Tech, the Occoquan Watershed Water Monitoring Laboratory, and Fairfax Water (formerly Fairfax County Water Authority). The members of the RFP evaluation panel are listed in Appendix B.

Criteria for Evaluation of Proposals - As described above, the RFP evaluation process requires establishment of formal criteria by which each panel member must score each proposal submitted. The technical criteria constitute 75% of the final score, and pricing constitutes the remaining 25% of the final score. The Panel recognized several primary objectives that must be satisfied by any acceptable proposal: (1) the process must achieve 100% mortality of zebra (and quagga) mussels in Millbrook Quarry; (2) the process must not significantly or unacceptably affect non-target wildlife, the environment, or human health; and (3) to the greatest possible extent, the process must not involve any adverse off-site environmental impacts. These provided the focus for establishment of the formal evaluation criteria as they were presented in the RFP (Appendix C).

Stipulation Regarding Compliance with NEPA - Because we could not anticipate which vendors would submit proposals for consideration, or what treatment alternatives would be submitted as formal proposals, and because the procurement process mandates confidentiality throughout the evaluation and selection process, it was not possible for us to develop an environmental assessment for this effort until the proposals were formally submitted and reviewed, and the procurement process concluded. Therefore, we included the following requirement in the RFP to specifically require compliance with all federal environmental review requirements under NEPA and other applicable laws and regulations:

“The contractor shall eradicate Zebra and Quagga Mussels at the Millbrook Quarry, Prince William County, Virginia within the contracted time period and shall provide all goods, services and expertise necessary to complete this task. . . . The treatment process and associated design, construction and monitoring efforts must comply with all NEPA guidelines and with applicable NEPA compliance and reporting requirements. Documentation of such compliance is mandatory as a condition of federal grants providing funds for this effort. All proposals must document how the vendor would comply with this condition.”

The Request for Proposals - The RFP #00375-352 entitled “*Eradication of Zebra and Quagga Mussels at Millbrook Quarry, Prince William County, Virginia*” was posted on the Commonwealth’s procurement site on 29 November 2004, and copies were delivered to 12 potential vendors who had been identified during the pre-procurement actions. The entire RFP is attached as Appendix C. January 10th, 2005 was stipulated as the deadline for submission of proposals.

V. REVIEW OF THE PROPOSALS

Three proposals were submitted in response to our solicitation, each offering a different treatment: Aquatic Sciences (muriate of potash – KCl), G.E. Betz (Spectrus CT-1300 – Clamtrol), and Amark (carbon dioxide). Upon receipt of the proposals, the Evaluation Panel

members reviewed each proposal for completeness and clarity, and submitted to the chairman their questions or issues requiring clarification. A list of questions and issues requiring clarification was compiled and sent to each vendor. A teleconference regarding these issues was held with each vendor on 30 March 2005, and upon receipt of written responses from each vendor, each panel member individually scored the proposals according to the established criteria, and forwarded those preliminary scores to the panel chairman. The proposals were then reviewed at a Panel meeting on 27 April 2005, and the initial proposals were formally scored.

By unanimous decision, the Panel recommended that DGIF negotiate with two of the three vendors that submitted proposals (Aquatic Sciences and G.E. Betz). The Panel also unanimously recommended that the third vendor (Amark) be dropped from further consideration because the proposal lacked technical merit, assurances, and reasonable chance of success; and lacked adequate documentation in many areas.

Initial negotiations were conducted with G.E. Betz on 20 May 2005 and with Aquatic Sciences on 24 May 2005. Revised proposals were submitted by Aquatic Sciences on 7 June 2005 and by G.E. Betz on 9 June 2005. The revised proposals were forward to each Panel member for their review. At a series of meetings between 23 June 2005 and 13 July 2005, the Panel formally rescored the revised proposals, and the final scores were submitted to DGIF's Director of Purchasing on 14 July 2005. Based on the criteria established in the RFP, the Aquatic Sciences proposal (muriate of potash) was the Panel's unanimous recommendation.

Upon review of the Panel's recommendation, and consideration of pricing as required under state procurement law, a contract was awarded to Aquatic Sciences L.P. on 24 August 2005.

The detailed chronological procurement documentation is attached as Appendix D.

VI. ALTERNATIVES

A. (Proposed Action) Aquatic Sciences L.P. - The entire water column of Millbrook Quarry will be infused with potassium by pumping 131,000 kg of muriate of potash (potassium chloride – KCl) solution from land-based storage tanks with spill containment through a floating supply line to a 22-ft work boat outfitted with a specially designed diffuser assembly. Treatment will occur within zones determined by depth and by presence of thermoclines within the water column (Aquatic Sciences 2005).

The exact mode of action by potassium on mussels is unknown, but evidence suggests that potassium kills mussels by interfering with the organisms' ability to transfer oxygen across gill tissue, resulting in asphyxia (Aquatic Sciences 1997). To ensure lethal concentrations of potassium throughout the water column, yet minimize likelihood of "hotspots" within the quarry, Aquatic Sciences has established a "target" potassium concentration of 100 ppm throughout the water column: 50 ppm will be used as the minimum concentration to initiate bioassays, though long-term exposure to 30-40 ppm would be sufficient to kill 100% of all zebra mussels of all life stages in the quarry. At these concentrations, potassium will pose no human health risks, nor will it harm any non-molluscan aquatic wildlife, vegetation, or terrestrial wildlife inhabiting the

project site. Potassium, further, will provide long-term (estimated at 33 years) protection of Millbrook Quarry against future infestation by zebra mussels.

Concentrations of potassium will be monitored at various depths along transects established throughout the quarry, both during and after “charging” of the quarry with potash. Mortality of zebra mussels will be confirmed by bioassay of zebra mussels imported into the quarry for this purpose, and by direct and video confirmation of zebra mussel mortality by scuba divers.

Very little if any land disturbance will be required, as the staging area and setup can occur within the historically and currently disturbed uplands surrounding the quarry. No disturbance of substrate or bottom sediments within the quarry will occur. No land disturbing activities in or adjacent to Broad Run will occur, through Broad Run will be monitored throughout the project for groundwater infiltration of potassium from Millbrook Quarry.

The Panel’s initial evaluation of Aquatic Sciences’ zebra mussel eradication proposal yielded a score of 511 out of a possible 600 points (i.e., 75 points per panelist x 8 panelists), without consideration of pricing. The Aquatic Sciences proposal was technically thorough, well written, and addressed most areas completely. Upon review of the revised proposal and negotiated conditions, whereby Aquatic Sciences greatly reduced the period of days required for initial treatment, enhanced their already robust monitoring protocol, and strengthened their warranty and contingency plans, the Panel score for this vendor’s proposal increased to 531 points. The Panel unanimously selected the Aquatic Sciences muriate of potash treatment proposal as the preferred alternative. The Panel is confident that use of potassium as proposed offers the greatest likelihood of successfully eradicating the zebra mussel population in Millbrook Quarry with virtually no significant adverse environmental impacts, and furthermore will provide long-term protection against reinfestation of the quarry with zebra mussels. Upon consideration of the final price negotiated with Aquatic Sciences (\$365,069), the final score for this proposal is 88.264 points.

B. G.E. Betz - The entire quarry would be treated with the molluscicide Spectrus CT1300. The target concentration of 8-10 ppm would require approximately 2,000 gallons of Spectrus CT1300. The chemical would be applied by a boat-based application system consisting of a chemical injection distribution header and hoses. An air diffuser system would be operated in water deeper than 10 feet to facilitate complete mixing (G.E. Betz 2005).

The Panel’s initial evaluation of GE Betz’s zebra mussel eradication proposal yielded a score of 446 out of a possible 600 points, without consideration of pricing. The proposal was well written but lacking technical detail in some areas. Spectrus CT1300 (Clamtrol) is effective at killing zebra mussels, but the committee questioned whether it would be 100% effective in the quarry due to possibly inadequate mixing of the water column and the chemical’s short life span. Likewise, there was concern regarding GE Betz’s monitoring protocols and the stated warranty (i.e., how it would be determined whether living zebra mussels discovered after treatment had survived the treatment, or been subsequently introduced). Upon review of the revised proposal and negotiated conditions, whereby GE Betz substantially enhanced their zebra mussel mortality monitoring and provided further assurances regarding other aspects of their proposal, but was unable to assuage concerns regarding Clamtrol’s short effective lifespan and the resulting lack of

continuing protection against reinfestation of the quarry with zebra mussels, the Panel score for this vendor's proposal was lowered to 407 points. Upon consideration of the final price negotiated with GE Betz (\$319,634), the final score for this proposal is 75.875 points.

C. Amark - The proposal entailed injecting 225,000 to 250,000 lbs. of liquid CO₂ into the quarry water column, to lower the pH to 4.0 or less. A piping system would be constructed to remove the water from the quarry, inject the CO₂, and return the treated water to the bottom of the quarry through a sparging hose (Amark 2005). The proposed cost of this alternative was approximately \$779,000.

The Panel's initial evaluation of Amark's zebra mussel eradication proposal yielded a score of 220 out of a possible 600 points, without consideration of pricing. The Panel is skeptical that the proposed drop in dissolved oxygen concentration to 4 ppm would be sufficient to achieve 100% eradication of the zebra mussel population in Millbrook Quarry, and questioned whether Amark could achieve and maintain a level even that low since the quarry is an open system. The Panel had serious reservations regarding the lack of a warranty to eradicate the zebra mussel population, but only to inject 225,000 to 250,000 lbs of CO₂ into the quarry. Additionally, no monitoring of zebra mussel mortality was to be performed and the dissolved oxygen concentration monitoring was not detailed nor would the results be guaranteed. Overall, the Panel felt the proposal lacked technical merit, assurances, and reasonable chance of success; and lacked adequate documentation in many areas. Therefore, the Panel unanimously recommended that Amark's proposal not be further considered, and that no negotiations with that potential vendor were warranted. Upon completion of negotiations with the other vendors, scoring of Amark's original proposal yielded a final score of 37.758 points.

D. No Action - Under the "no action" alternative, zebra mussels would continue to thrive in Millbrook Quarry, and would continue to pose significant risk of spread throughout the Occoquan Watershed and the Commonwealth. It is highly unlikely that the infestation could be contained forever, especially considering the quarry's significant public use as a recreational and training dive site. Even if diving were prohibited or restricted, mandatory decontamination protocols enforced by the quarry operator, or the quarry purchased by a public institution for "quarantine" purposes, the infestation would pose a threat of spread via human trespass, flooding, movement of contaminated or encrusted wildlife from the quarry to Broad Run, or even groundwater transport of veligers. The long-term impacts anticipated by continued zebra mussel infestation of Millbrook Quarry, and their eventual escape, are environmentally and economically unacceptable.

E. Alternatives Considered But Not Feasible - As described above, the ad-hoc Millbrook Quarry Zebra Mussel Workgroup conducted literature review and interagency consultations to develop a preliminary set of potential alternatives. The following alternatives were considered generally less desirable because of environmental concerns, technical infeasibility, logistics, or expense. No proposals were submitted for any of these potential alternatives.

Chlorine - Chlorine, an oxidizing agent, is the most commonly used compound for zebra mussel control in North America and Europe. Adult zebra mussels close at concentrations of 1 to 2 mg/L, and veligers are sensitive at even lower concentrations. Chlorine kills zebra mussels

through asphyxiation and limited glycolysis over a prolonged period of exposure. Primary concerns with chlorine are its toxicity to non-target organisms and the production of carcinogenic trihalomethanes. Maintaining an adequate chlorine concentration over the required exposure period is problematic: cooler temperatures prevent the “boiling off” of chlorine, but also increase the exposure time required.

pH Shift - Zebra mussels typically inhabit water bodies with pH levels of approximately 6.9 – 9.4. Addition of acid to the water column could significantly lower the pH of Millbrook Quarry and kill the zebra mussels through shock and ionic loss of calcium, sodium, and potassium. There is evidence, however, that after several days at pH 5.5-6.0, adults can adapt, succumbing only at pH levels below 5.2. There are significant concerns or unknowns regarding pH alteration, including pH level required for 100% mortality, exposure period required, effectiveness at varying temperatures, impacts on non-target organisms, and potential for achieving required pH reduction at all depths and locations in the quarry. High buffering capacity of Millbrook Quarry and associated groundwater, and regulations prohibiting acid discharges, are significant considerations.

Increasing Salinity - Elevated salinity kills zebra mussels through ionic tissue imbalance, with significant acute mortality at approximately 15ppt, and chronic toxicity at levels above 5ppt. Increasing salinity is not widely used as a treatment or control agent for zebra mussels. Though it would be effective at all temperatures, this treatment option is relatively expensive, would significantly affect non-target organisms, and poses risk of saltwater encroachment into groundwater and wells.

Dewatering the Quarry - Aerial exposure of adult zebra mussels would result in 100% mortality through asphyxiation. The required exposure time, however, could vary from hours to weeks, depending on air temperature, humidity, and clumping of zebra mussels. This alternative clearly would impact non-target aquatic organisms. Of primary importance, it may not be feasible to dewater the quarry due to groundwater inflow; the quarry likely would simply refill from groundwater as it is being drained. Additionally, the water would have to be pumped away from the quarry without exposing Broad Run to zebra mussel adults or veligers.

Copper Sulphate - Copper, a nonoxidizing agent, is harmful to aquatic organisms including algae, fish, mussels, and clams, and is widely used in antifouling coatings for water intakes. Copper ions, available in a variety of salts, are toxic to zebra mussel adults and veligers alike. Copper sulphate can be an effective molluscicide at concentrations up to 5 mg/L, with exposure time, water temperature, and water hardness all impacting toxicity. Toxicity tests reveal copper ions to be relatively benign to fish at the concentrations needed to kill zebra mussels; however, impacts upon non-target invertebrates would be of concern.

VII. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

For purposes of impact analysis, the project area includes Millbrook Quarry and the surrounding previously disturbed uplands, Broad Run, and the groundwater and private wells to the south of the quarry (Figure 8). Because all of the alternatives considered (apart from the no-action

alternative) would entail construction of a pumping station, storage tanks, and appurtenant facilities, the anticipated construction impacts would be similar, albeit inconsequential, for each action alternative.

A. Hydrologic and Geochemical Setting - Because virtually any alternative to eradicate zebra mussels from Millbrook Quarry would affect, and be affected by, the hydrology and water chemistry of the quarry; because of our commitment to safeguard regional groundwater and wells; and because of concern regarding potential impacts on Broad Run, Lake Manassas, and other downstream surface waters, assessment of the hydrologic and geochemical setting of Millbrook Quarry and Broad Run is of critical importance. The following description of Millbrook Quarry is excerpted from the initial DMME report (VDMME 2003).

“Millbrook Quarry is located near the western margin of the Culpeper Basin, which is an elongate, north-northeast trending, fault-bound province characterized by interbedded sedimentary and igneous rocks of Mesozoic age (Late Triassic and Early Jurassic). The quarry was developed in a conglomerate and sandstone unit identified by Lee and Froelich (1989) as the Millbrook Quarry Member of the Waterfall Formation. This formation is Early Jurassic in age. Lee and Froelich (1989) described the conglomerate of the Millbrook Quarry Member as containing abundant cobble-size clasts of greenstone and minor amounts of quartzite, gneiss, marble, limestone, basalt, and vein quartz in a matrix of sand and silt that is cemented by silica and calcite. The unit includes interbedded lenses of medium- to coarse-grained calcareous sandstone and micaceous siltstone.

“Approximately 500 feet to the west of the quarry, the western margin of the Culpeper Basin is marked by the north-northeast trending, southeast-dipping Western Border Fault (Roberts, 1928). Rocks on the western side of this fault include stratified units of the Blue Ridge Anticlinorium (Rader and Evans, 1993). These strata include quartz pebble conglomerate, quartzite, metasilstone, and phyllite of the Cambrian-age Chilhowee Group.

“In a report on sources of aggregates in Virginia, Gooch, et. al., (1960) noted a major north-northeast trending (N20°E) fault passing through Millbrook Quarry. The bedding of rocks to the southeast of this fault is relatively undisturbed, with a strike of N15°W and dip of 25°W. They also indicated a second sub-parallel fault that strikes N10°E in the southeast area of the quarry. It was noted that this fault dipped at a relatively shallow angle of 38 degrees to the southeast. The strike of both of these fault systems is generally parallel to the Western Border Fault described above, and is a predominant structural orientation noted by Leavy (1984) along the western margin of the Culpeper Basin.”

In their presentation at the 2004 Virginia Water Resources Symposium, Lassetter et al. (2004) provided the following summary statements regarding Millbrook Quarry (see Figure 8).

1. “Geologic studies indicate that calcareous bedrock in Millbrook Quarry has a very high capacity for acid neutralization.
2. “NNE-trending faults and fractures and NNW-striking bedrock strata in the quarry area are very likely pathways for southward-directed ground water flow.
3. “The NNE-trending section of Broad Run just south of the quarry probably reflects the prevailing bedrock fracture pattern, and, depending upon fracture interconnectivity may be conducting water as leakage from the quarry.
4. “Analysis of stream base flow conditions in Broad Run during August 2004 indicate an upper bound for ground water inflow ~ 0.65 cfs.
5. “If a significant hydrologic connection exists, it would likely occur SE and S of the quarry, where the water elevation in Broad Run is ~5-10 feet below that of the quarry.
6. “The present water level in Millbrook Quarry likely reflects equilibrium conditions with the regional, unconfined ground water system, that moves southward through the quarry area.
7. “Water wells to the N, W, and E of the quarry are located up gradient and should not be affected by changes in water quality that may occur in the quarry; wells to the S and SE are potentially exposed to impacts related to pumping and/or changes in water quality in the quarry.
8. “Water balance calculations indicate an annual rate of sub-surface outflow to be ~3.6% of the volume of water in the quarry; ~ 6.5M gal/yr.
9. “The major ion compositions of ground water and surface water in the study area reflect the different geologic characteristics of the Culpeper Basin and Blue Ridge rocks.
10. “The combined geochemical and hydrologic data suggest that leakage from the quarry undergoes mixing with regional ground water before emerging in Broad Run.
11. “Stable isotope compositions of oxygen and hydrogen (analytical results received in Oct 04) may provide the means to confirm and refine the water balance calculations and interactions between ground water and surface waters.”

As postulated in *11* above, DMME review of the October 2004 stable isotope analysis provided further support of the water balance calculations between Millbrook Quarry, regional groundwater, and Broad Run (Lassetter et al. 2005). None of the alternatives considered would alter this hydrologic and geochemical setting. Impacts upon specific resources including groundwater and wells, surface waters, or aquatic biota are addressed in following sections of this assessment.

B. Threatened or Endangered Species - Review of the DGIF Fish and Wildlife Information System databases (Appendix E) indicates that two federally listed species occur within a 2-mile radius of the project location; the bald eagle (*Haliaeetus leucocephalus*) (FTST), and dwarf wedgemussel (*Alasmidonta heterodon*) (FESE). The DGIF bald eagle nest database confirms that no nests are known to occur on the property. Furthermore, as stated above, virtually no long-term alteration of the existing previously disturbed terrestrial habitat will occur. Therefore, none of alternatives would be expected to impact bald eagles. Similarly, we have no record of occurrence of the dwarf wedgemussel in Broad Run. Because the state threatened brook floater (*Alasmidonta varicosa*) is known to occur in Broad Run downstream of Lake Manassas, DGIF experts conducted a mussel survey of Broad Run from just upstream of Millbrook Quarry to within ½ mile of the confluence of Broad Run into Lake Manassas (VDGIF 2005). Only two species of common mussels were found in that survey, *Elliptio complanata* and *Elliptio* spp. lance (Figure 9). Therefore, none of alternatives would be expected to impact dwarf wedgemussels nor any other state or federally listed species. Review by the Virginia Department of Conservation and Recreation – Division of Natural Heritage (Appendix F) confirms this assessment.

C. Aquatic Wildlife - Aquatic life in the quarry includes largemouth bass and other sunfish, catfish, turtles, and crayfish, as observed by DGIF staff during site visits and scuba dives, and as confirmed by the property owner and dive shop owner. Because the quarry is a man-made body of water, all aquatic life in the quarry has been either introduced by humans or wildlife, or has colonized the quarry from Broad Run during flood events. The selected alternative (muriate of potash) is expected to kill only the zebra mussels, since toxicity data indicates that the target concentration is not lethal to non-target organisms other than freshwater mollusks (e.g., the threshold effect concentration (TEC) for potassium is 272.6 ppm for *Ceriodaphnia* and 426.7 ppm for fathead minnows) (Aquatic Sciences 1997).

Regarding the eliminated alternatives, lowering the dissolved oxygen to 3-4 ppm as was proposed by Amark, or introducing Spectrus CT1300 at a concentration of 8-10 ppm as proposed by G.E. Betz were anticipated to kill most or all living aquatic organisms in the quarry that could not at least temporarily relocate to another water body (e.g., turtles).

The primary concern regarding off-site impacts to aquatic life was the potential for potassium to infiltrate via groundwater into Broad Run, and thus offer a potential threat to freshwater mussels in that stream. Below Lake Manassas, DGIF databases indicate that at least six native mussel species inhabit Broad Run, including the state endangered brook floater and state special concern yellow lance. No records, however, were available for the reach upstream of Lake Manassas to the quarry. Therefore, as previously discussed, DGIF staff conducted a mussel survey of Broad Run downstream of Millbrook Quarry in August 2005 (VDGIF 2005). A significant population of the common eastern *Elliptio* was located in the downstream section of the surveyed reach, though mussels significantly decreased in number as you approach the quarry (Figure 9). No brook floaters or yellow lance mussels were observed during the survey.

Toxicity data are not available for the mussel species found in Broad Run, but elevated potassium levels in the range of 10-15 ppm have been reported as lethal to other freshwater mussel species over a few-week period (Richard Neves, Virginia Tech, pers. comm.). Based on

flow and isotope data gathered during the pre-procurement studies, DMME estimates that Millbrook Quarry contributes approximately 25% of the groundwater inflow to Broad Run below the quarry, and groundwater typically constitutes approximately 10% of the surface flow of Broad run (Lassetter et al. 2005). Therefore, under normal flow conditions, if Millbrook Quarry exhibited 100 ppm of potassium, the potassium addition from Millbrook Quarry would be on the order of 2-3 ppm (the background potassium concentration in Broad Run is approximately 1 ppm). Under extreme low flow conditions (i.e., no flow in Broad Run except for groundwater contributions) the highest potassium concentrations that should occur in Broad Run would be approximately 25 ppm if the concentration of potassium in Millbrook Quarry was 100 ppm. Few mussels were documented to occur within the first mile of Broad Run downstream of the quarry, and potassium concentrations will decrease through dilution as you proceed downstream; therefore, minimal to insignificant impacts to native freshwater mussels in Broad Run are anticipated. Available toxicity data indicate that potassium concentrations anticipated in Broad Run will have no adverse impact on other aquatic taxa (e.g., Aquatic Sciences 1997).

D. Terrestrial Wildlife, Including Migratory Birds - Terrestrial wildlife in the vicinity of the quarry includes beaver, raccoons, deer, and migratory or resident birds, with Canada geese being the most frequently observed wildlife on the property, as observed by DGIF staff during site visits, and as confirmed by the property owner and dive shop owner. None of the alternatives considered would involve significant or long-term alteration of the previously disturbed upland property, and none of the water treatment alternatives considered would affect terrestrial wildlife, waterfowl, or other migratory birds. Therefore, none of the alternatives considered are anticipated to adversely impact terrestrial wildlife.

E. Streams, Rivers, Lakes and Other Surface Waters - All of the action alternatives are designed to alter the water chemistry of Millbrook Quarry, and all action alternatives would, if successful, result in the decomposition of the entire organic component of the zebra mussel population. This impact, though unmeasured, is anticipated to be minimal to insignificant when compared to the environmental risks posed by the current infestation.

Via the selected treatment, elevated levels of potassium may remain in the quarry for over 30 years, effectively protecting the quarry from reinfestation with zebra mussels for that period. As discussed above, DMME estimates that Millbrook Quarry contributes approximately 25% of the groundwater inflow to Broad Run below the quarry, and groundwater typically constitutes approximately 10% of the surface flow of Broad run. Therefore, under normal flow conditions, if Millbrook Quarry exhibited 100 ppm of potassium, the potassium addition from Millbrook Quarry would be on the order of 2-3 ppm; and under extreme low-flow conditions, the highest potassium concentrations that should temporarily occur in Broad Run would be approximately 25 ppm. Given the distance from Millbrook Quarry to Lake Manassas, and the size of Lake Manassas, no adverse impacts to Lake Manassas or other downstream waters are anticipated.

F. Groundwater - Hydrological studies by DMME show that Millbrook Quarry acts as a sink for groundwater from the north, east, and west, which exits the quarry to the south (Figure 8). Therefore, any chemical treatment would primarily affect groundwater to the south of the quarry, but the impacts are anticipated to be negligible and benign. Migration into wells is not anticipated to be a problem for any of the treatment options because: (1) there are very few

drinking water wells in the vicinity of Millbrook Quarry to the south; and (2) none of the proposed treatment options are known to pose any human health impacts at the anticipated treatment concentrations. The National Secondary (non-mandatory) Drinking Water guideline for chlorides is 250 ppm. The Virginia DEQ has adopted this as a state standard for public water supplies. By comparison, the anticipated final chloride concentration in Millbrook Quarry after treatment will be approximately 90 ppm, well below this EPA/DEQ standard of 250 ppm for potable water. There is no federal or Virginia water quality standard for potassium, but potassium chloride is widely used as the primary alternative to sodium chloride in home water softeners, and many health benefits are attributed to diets rich in potassium. The 2005 Dietary Guidelines for Americans issued by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services recommends a daily potassium intake of at least 4,700 mg.

Regarding the eliminated alternatives, the active ingredient in Spectrus CT1300 is the same chemical used to treat algae and bacteria in swimming pools, and is certified by the National Sanitation Foundation for use in potable water systems at 3 ppm. Given the relatively short life span of Spectrus CT1300 and dilution, it is not anticipated that concentrations in wells, even if detectable, would approach this limit. The other eliminated alternative, injection of carbon dioxide, would pose no known hazards.

G. Wetlands - A review of the Virginia Quadrangle USGS National Wetland Inventory (NWI) map, and staff observations on site revealed no wetlands that would be impacted at Millbrook Quarry. There are wetlands associated with Broad Run (Figure 10), but none of the alternatives considered would involve any physical or hydrological alteration of those wetlands: the potential minimal increase in potassium and chlorides in Broad Run would not adversely affect the associated wetlands.

H. Natural Areas, and Unique or Important Vegetation - Bull Run Mountains State Natural Preserve Area is within 2 miles of the project location. None of the action alternatives considered would have any adverse impacts upon the Preserve Area, as confirmed by the Virginia Department of Conservation and Recreation – Division of Natural Heritage (Appendix F).

The uplands surrounding Millbrook Quarry have been extensively altered: first, to facilitate active quarry operations; and second, to facilitate recreational and instructional diving. The lands to be directly impacted by this project are dominated by fescue and other grasses. The adjacent wooded lands are dominated by sycamore, maples, oaks, and other common species. None of the proposed alternatives are expected to impact any areas of unique or important vegetation. Review by the Virginia Department of Conservation and Recreation – Division of Natural Heritage (Appendix F) confirms this assessment.

I. Cultural or Historic Resources - The property once served as an active quarry and is currently leased for training and recreational diving. No known historic properties would be affected by the proposal, as confirmed by a review conducted by the Virginia Department of Historic Resources (Appendix G).

J. Recreational or Socioeconomic Resources - Millbrook Quarry and the immediately adjacent lands are privately owned and leased to a local dive shop for training and recreational diving. The selected alternative will not adversely affect these dive operations; in contrast, the proposed action may facilitate continued long-term use of the property for this purpose. The treatment operations will be conducted from Monday through Friday, with diving continuing unabated on weekends. Dive operations will be suspended for several weeks during the bioassay period to ensure safety and integrity of this scientific process; current plans are to conduct the bioassay after seasonal termination of dive operations in mid-November. Fishing from boats or from the banks, conducted very rarely and only by the landowner or invited guests, will not be affected.

VIII. COASTAL ZONE MANAGEMENT ACT CONSISTENCY

This document provides the Commonwealth of Virginia with the Department of Game and Inland Fisheries' Consistency Certification and necessary data and information under Coastal Zone Management Act section 307(c)(3)(A) and 15 CFR Part 930, sub-part F for the eradication of zebra mussels and quagga mussels from Millbrook Quarry, Prince William County, Virginia. The DGIF certifies that the proposed activity complies with the enforceable policies of Virginia's Coastal Resources Management Program and will be conducted in a manner consistent with the Virginia Coastal Resources Management Program.

Prince William County is subject to the Chesapeake Bay Preservation Act and to the Chesapeake Bay Preservation Area Designation and Management Regulations (9VAC10-20-10 et. seq.). The County has designated its entirety as a Chesapeake Bay Preservation Area. All areas not within a Resource Protection Area (RPA) are within a Resource Management Area (RMA). While the adjacent Broad Run is a designated RPA (pers. comm., Patty Deitz, Prince William County Watershed Management Section), this project will be conducted outside of that RPA. Millbrook Quarry is an isolated water feature with no connection to Broad Run and has no perennial stream either entering or leaving the feature. The quarry is within the designated RMA and is subject to the general performance criteria stipulated in 9VAC10-20-120 (pers. comm., Alice Baird, Virginia Dept. Conservation and Recreation, Chesapeake Bay Local Assistance). This project (eradication of zebra mussels from Millbrook Quarry) however, does not propose any land disturbance as the existing access road and staging area will provide the necessary working area.

As analyzed and described in Sections I-VII and Appendices D-H of this Environmental Assessment, the proposed action will be conducted within the quarry and on previously disturbed uplands adjacent to the quarry, utilizing the existing access road. The eradication effort will result in no adverse impacts regarding the following enforceable policies of Virginia's Coastal Resources Management Program: Subaqueous Lands Management, Wetlands Management, Dunes Management, Non-point Source Pollution Control, Point Source Pollution Control, Shoreline Sanitation, and Air Pollution Control. The only enforceable policies of Virginia's Coastal Resources Management Program that potentially could be adversely impacted are Fisheries Management, i.e. shellfish (the native freshwater mussels of Broad Run) and Coastal Lands Management (Broad Run as a designated Resource Protection Area). As discussed in Section VII of this Environmental Assessment, there are no surface water connections between the quarry and Broad Run, there will be no work conducted in Broad Run except to collect water

samples for monitoring purposes, and the proposed project is not anticipated to adversely affect these resources under normal or anticipated low-flow conditions. Under extreme low-flow conditions that persisted for several weeks, the anticipated groundwater contribution from Millbrook Quarry to Broad Run could potentially affect the two common species of freshwater mussels occurring in the reach of Broad Run down-gradient from Millbrook Quarry to Lake Manassas by increasing the concentration of potassium. Even under this scenario, however, no federal or state water quality standards applicable to the quarry or Broad Run would be violated. Potential impacts upon the common mussel species in Broad Run would be significantly less than the impacts anticipated if zebra mussels become established in Broad Run or other Virginia waters outside of Millbrook Quarry. Furthermore, eradicating zebra and quagga mussels from the Commonwealth will provide significant immediate and long-term protection of these natural resources.

Similarly, the proposed action will have no impacts regarding the following advisory policies of Virginia's Coastal Resources Management Program: Coastal Natural Hazard Areas, Waterfront Development Areas, and the advisory policies regarding Shorefront Access Planning and Protection. The only advisory policy of Virginia's Coastal Resources Management Program that potentially could be impacted is that regarding Coastal Natural Resource Areas (i.e., spawning, nursery, and feeding grounds of native freshwater mussels). As discussed in Section VII of this Environmental Assessment, the proposed project is not anticipated to adversely affect these resources; conversely, eradicating zebra and quagga mussels from the Commonwealth will provide significant immediate and long-term protection of these natural resources.

The DGIF therefore certifies that the proposed eradication of zebra mussels and quagga mussels from Millbrook Quarry is consistent with the Virginia Coastal Resources Management Program. The State's concurrence, objection, or notification of review status shall be sent to: Mr. Ray Fernald, Virginia Department of Game and Inland Fisheries, P.O. Box 11104, Richmond, VA 23230-1104; and to: Dr. John Organ, U.S. Fish and Wildlife Service, 300 West Gate Center Drive, Hadley, MA 01035-0589.

IX. AGENCIES, ORGANIZATIONS, AND PARTIES CONSULTED

Many individuals and organizations participated in our review of potential zebra mussel eradication alternatives for Millbrook Quarry. Though formal evaluation of alternatives was conducted by the Millbrook Quarry RFP Evaluation Panel (see Appendix B), preliminary consultation, review of potential alternatives, and constructive advice were provided by participants on the ad-hoc Millbrook Quarry Zebra Mussel Workgroup and by others, including:

Chesapeake Bay Regional *Dreissena polymorpha* Working Group
Virginia Invasive Species Council and Advisory Committee
Tom Bonecquisti, Fairfax Water, Fairfax, VA
Roger Chaffe, Office of the Attorney General, Richmond, VA
Charlie Crowder, Fairfax Water, Fairfax, VA
Adil Godrej, Occoquan Watershed Monitoring Laboratory, Manassas, VA
Tom Grizzard, Occoquan Watershed Monitoring Laboratory, Manassas, VA

Tim Hayes, Hunton & Williams, Richmond, VA
Marcus Haynes, Virginia Department of Health, Prince William Health District, Manassas, VA
Ewe Kirste, Prince William County Department of Environmental Services, Prince William, VA
Ron Klauda, Maryland Department of Natural Resources, Annapolis, MD
Bob McMahon, University of Texas, Arlington, TX
Karee Miller, Landowner, Fairfax, VA
Lisa Moss, U.S. Fish and Wildlife Service, Gloucester, VA
John Myers, Natural Resources Conservation Service, USDA, Richmond, VA
Jerrie Nichols, Great Lakes Science Center, Ann Arbor, MI
Chuck O'Neill, NY Sea Grant and National ANS Clearinghouse, Ithaca, NY
Asghar Pariroo, Virginia Department of Health, Culpeper, VA
Stuart Raphael, Hunton & Williams, McLean, VA
Don Schloesser, Great Lakes Science Center, Ann Arbor, MI
Bob Sobeck, Virginia Department of Mines, Minerals and Energy, Charlottesville, VA
Palmer Sweet, Virginia Department of Mines, Minerals and Energy, Charlottesville, VA
Alex Vanegas, Manassas Water Authority, Manassas, VA
Becky Wajda, Virginia Department of Game and Inland Fisheries, Richmond, VA
John Wall, The Dive Shop, Fairfax, VA
David Whitehurst, Virginia Department of Game and Inland Fisheries, Richmond, VA
Gay Zigler, Manassas Water Authority, Manassas, VA

X. PREPARERS

This Draft Environmental Assessment was prepared by Raymond T. Fernald and Brian T. Watson of the Virginia Department of Game and Inland Fisheries (see Appendix B for contact information). The draft was reviewed by staff of the U.S. Fish and Wildlife Service Region 5 Office, Hadley, MA.

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Figure 1. Zebra mussels (*Dreissena polymorpha*) in hand (note byssal threads in upper left-center).



Figure 2. Underwater view of zebra mussels on rock in Millbrook Quarry.

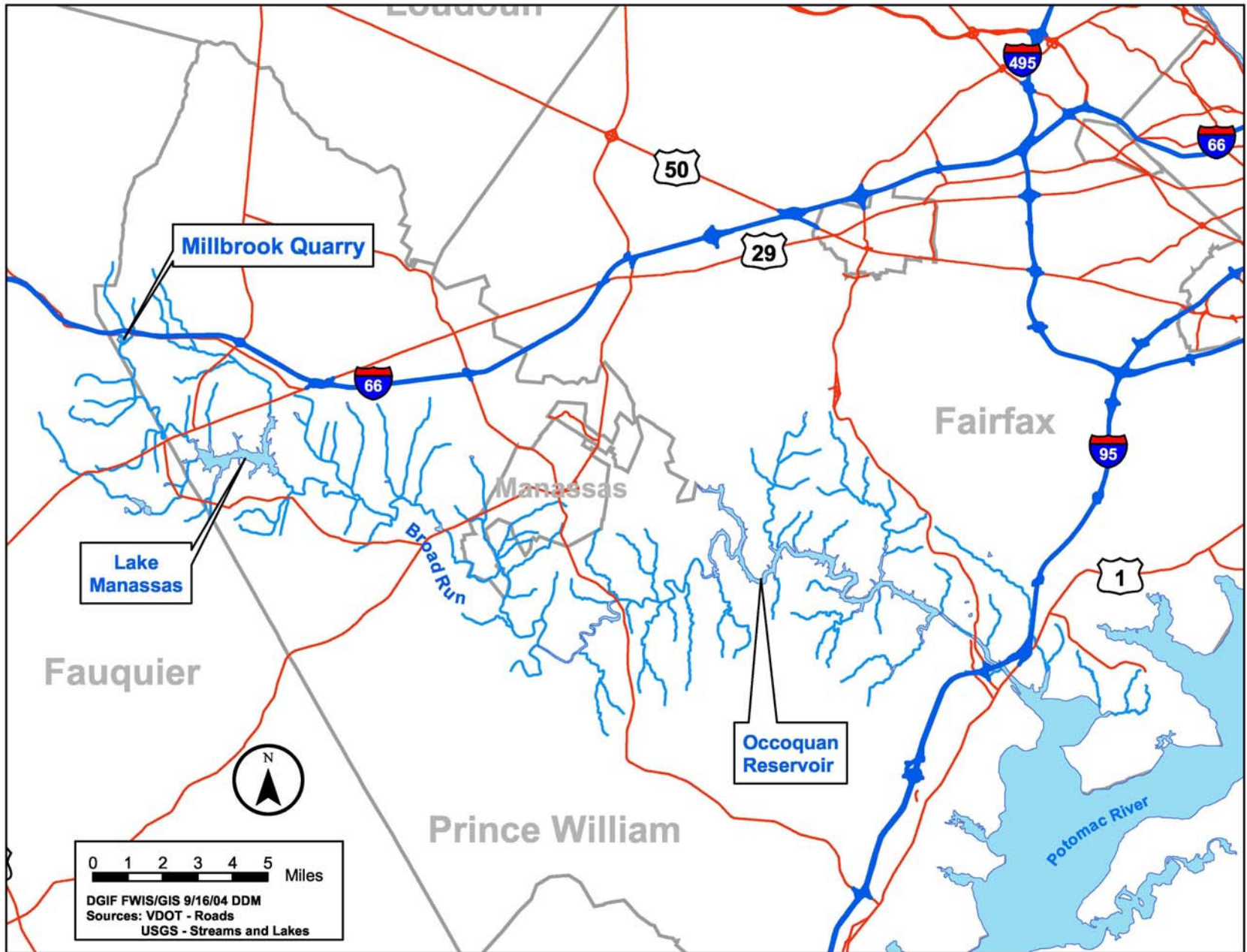


Figure 3. Regional location of Millbrook Quarry, Prince William County, Virginia.

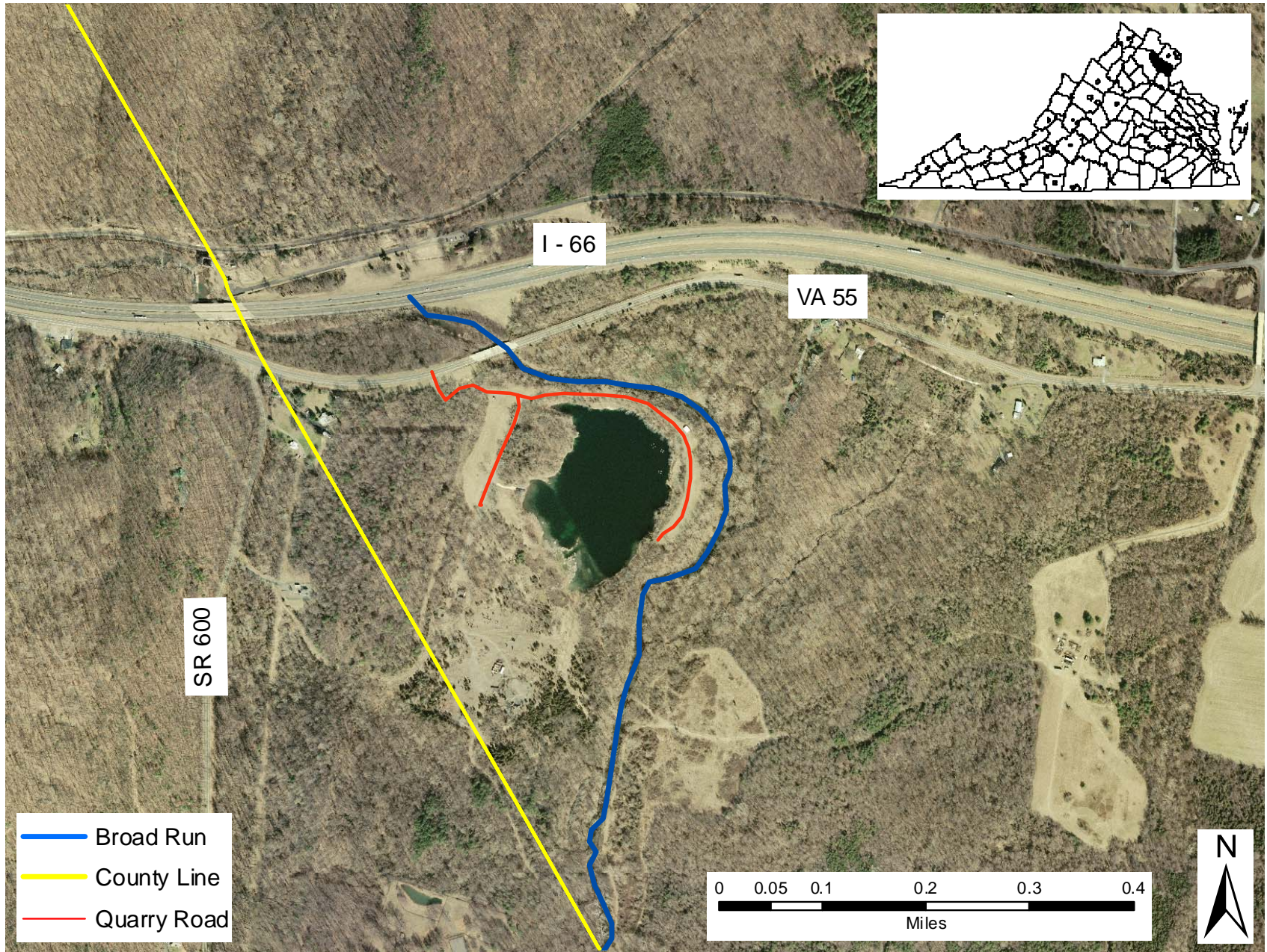


Figure 4. Aerial photograph of Millbrook Quarry indicating its location, access roads and Broad Run.



Figure 5. Millbrook Quarry, from berm in northeast quadrant, looking southwest.



Figure 6. Broad Run adjacent to Millbrook Quarry.

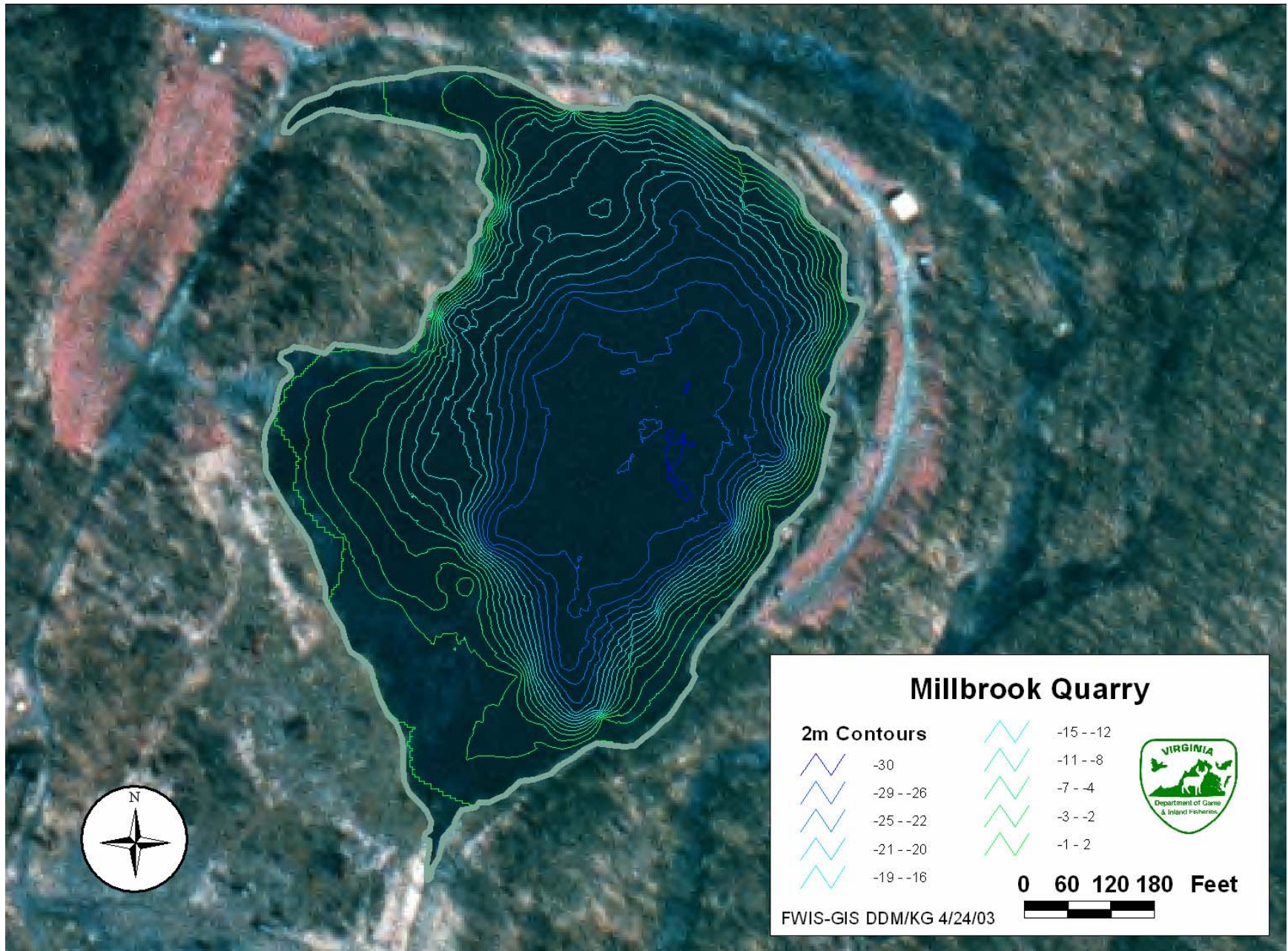


Figure 7. Millbrook Quarry bathymetry.

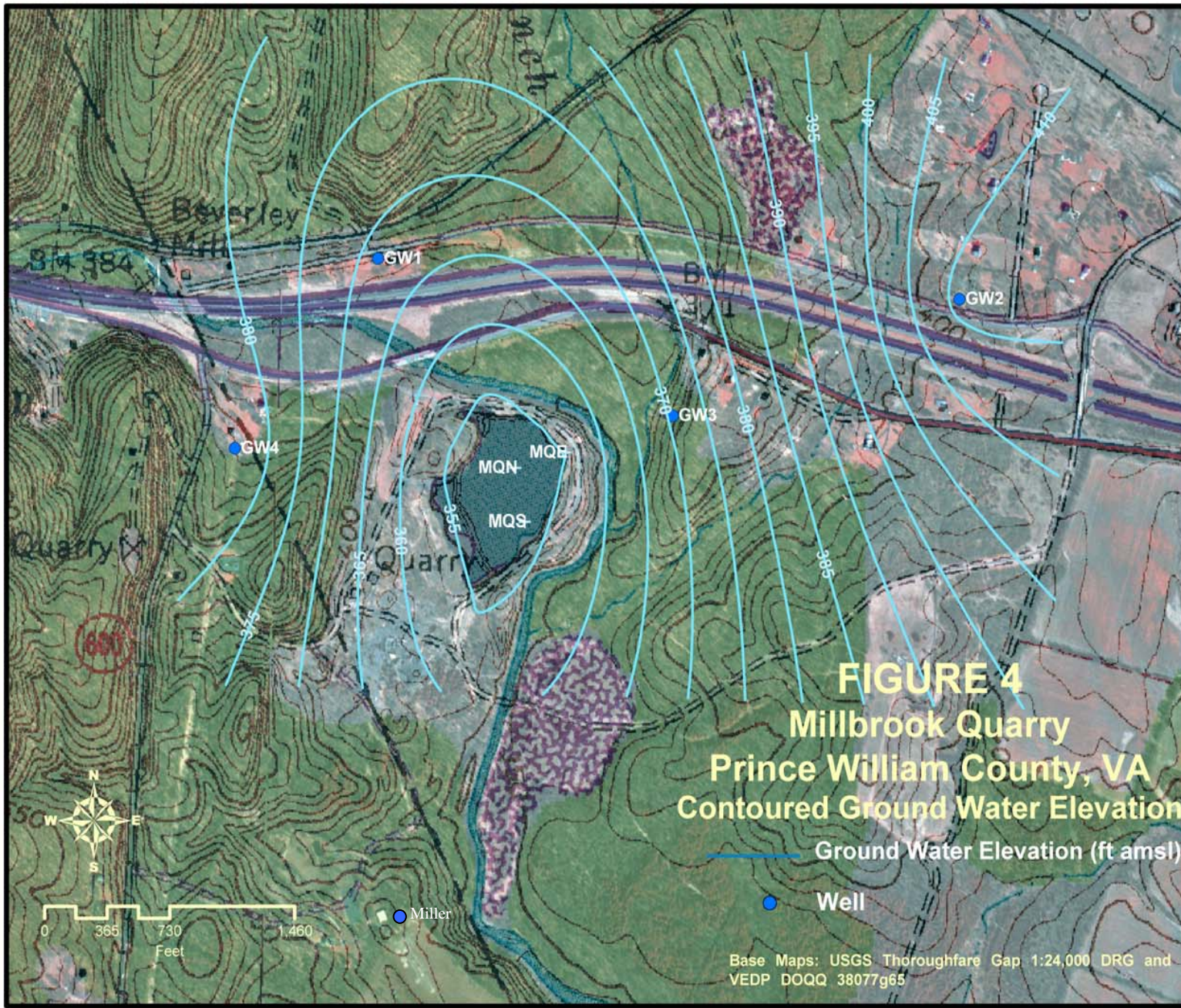


Figure 8. Groundwater elevation contours and wells in vicinity of Millbrook Quarry.

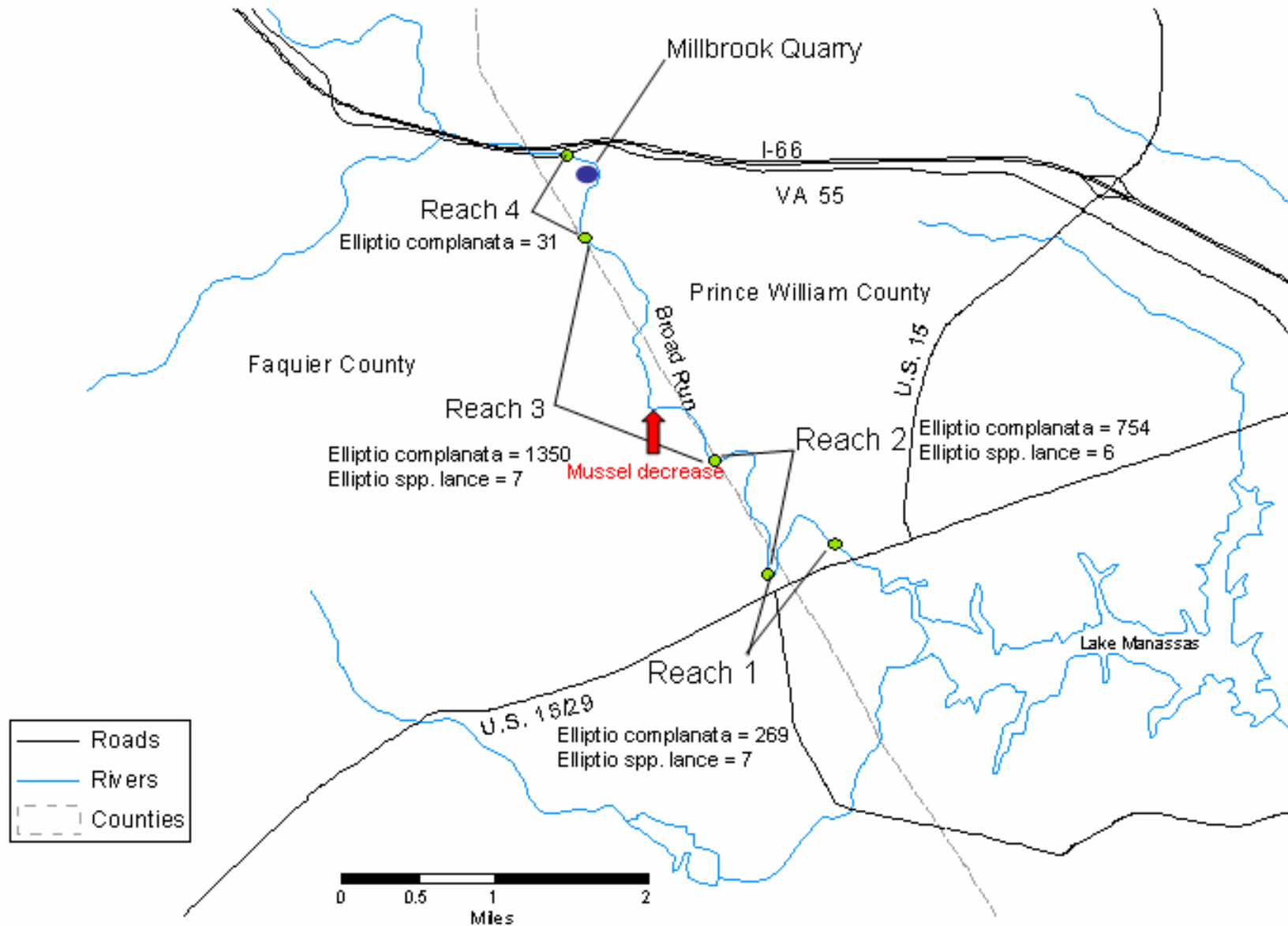


Figure 9. Surveyed reaches and freshwater mussels collected in Broad Run, Prince William and Fauquier counties, Virginia

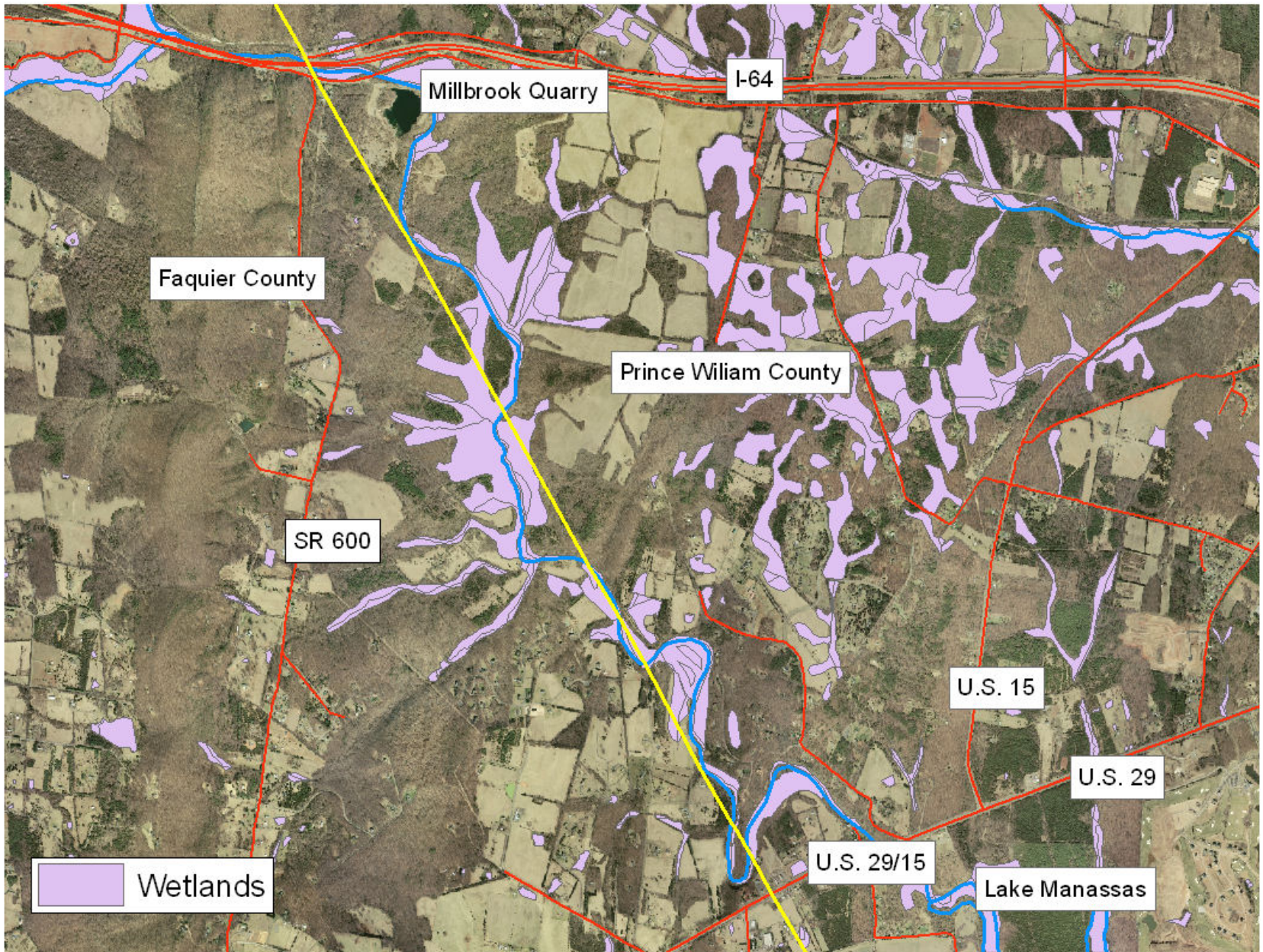


Figure 10. Wetlands in proximity to Millbrook Quarry and Broad Run.

Appendix A. Primary agency participants in the ad-hoc Millbrook Quarry Zebra Mussel Workgroup

Virginia Department of Game and Inland Fisheries

Virginia Department of Mines, Minerals & Energy

Virginia Department of Environmental Quality

Virginia Department of Health

Prince William Health District

Rappahannock-Rapidan Health District

Virginia Tech. Occoquan Watershed Monitoring Laboratory

Virginia Tech. Cooperative Fish and Wildlife Research Unit

Fairfax Water (formerly the Fairfax County Water Authority)

City of Manassas Water Authority

Prince William County Public Works Department

U.S. Fish and Wildlife Service

Appendix B. Millbrook Quarry Zebra Mussel Eradication RFP Evaluation Panel

Raymond T. Fernald, Manager (*Panel Chairman*)

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Appendix C. Request For Proposals RFP 00375-352

REQUEST FOR PROPOSALS

Issue date: 29 November 2004

RFP Number 00375-352

Title: Eradication of Zebra and Quagga Mussels at Millbrook Quarry, Prince William County, Virginia

Issuing Agency: Virginia Department of Game and Inland Fisheries
4010 West Broad Street

Richmond Virginia 23230

Proposals will be received until 4:00 PM , 10 January 2005 for providing the services described herein.

A Pre-proposal Conference will be held at 11:00 AM on 13 December 2004 in the Department of Game and Inland Fisheries Conference Room located at 4010 West Broad Street Richmond, Virginia 23230
Attendance at this Pre-proposal conference is optional.

A Site Visit will be held at 11:00 AM on 14 December 2004 at the Millbrook Quarry, Prince William County, Virginia Attendance at this site visit is optional
Contact for the site visit is Brian Watson Wildlife Diversity Biologist,
Telephone (434) 525-7522, ext. 114 Cell: (434) 941-5990 e mail Brian.Watson@dgif.virginia.gov

All inquiries for information must be directed to: Ed Walsh Phone 804-367-6184 FAX 804-367-6340

PROPOSALS ARE TO BE MAILED OR SENT DIRECTLY TO ISSUING AGENCY SHOWN ABOVE.
This solicitation is subject to the provisions of the Commonwealth of Virginia General Terms and Conditions, the DGS/DPS Vendors Manual and the Special Terms and Conditions as attached.

In compliance with this Request for Proposals and to all the conditions imposed therein and hereby incorporated by reference, The undersigned offers and agrees to furnish the services in accordance with the attached signed proposal or as mutually agreed upon by subsequent negotiation.

_____	Date: _____
Name and Address of Firm:	
_____	By: _____
	Signature)
_____	Name: _____
	(Please Print)
Zip Code	Title: _____
FEI / FIN No. _____	Phone: () FAX: _____

TABLE OF CONTENTS FOR REQUEST FOR PROPOSALS # 00375-352

I. PURPOSE..... 3

II. BACKGROUND..... 3

III. STATEMENT OF NEEDS..... 4

IV. PROPOSAL PREPARATION AND SUBMISSION INFORMATION..... 4 - 6

V. PRICING, DELIVERY 7

VI. OPTIONAL PREPROPOSAL CONFERENCE & SITE VISIT 7

VII. EVALUATION CRITERIA..... 7

VIII. GENERAL TERMS AND CONDITIONS 8-11

IX. SPECIAL TERMS AND CONDITIONS..... 12-14

ATTACHMENT A..... 15

I PURPOSE:

The purpose of this Request for Proposals is to obtain a contractor through competitive negotiation to eradicate Zebra and Quagga Mussels at Millbrook Quarry, Prince William County, Virginia.

II BACKGROUND

*****ADDITIONAL BACKGROUND DATA CAN BE FOUND ON THE DISK THAT HAS BEEN INCLUDED WITH THIS SOLICITATION**

In August 2002, the VA Department of Game and Inland Fisheries (DGIF) received an unconfirmed report that a zebra mussel population was present in Millbrook Quarry, Prince William County. While zebra mussels were discovered and removed from a boat at Smith Mountain Lake in 1993 before it was launched, a population had never before been documented in Virginia. Specimens were collected from Millbrook Quarry on August 31 and forwarded to Dr. Richard Neves (VA Tech) and Mike Pinder (DGIF) for identification. On September 3, these specimens were confirmed as zebra mussels, thus documenting the first zebra mussel population in Virginia. Native to the Caspian, Black and Azov seas of Eastern Europe, zebra mussels are believed to have been introduced into U.S. waters in 1986. These mollusks were first discovered in Lake St. Claire, MI in 1988, and since have spread rapidly throughout most of the Great Lakes and Mississippi River Basin states. With their rapid spread, zebra mussels have caused an enormous amount of economic and biological damage due to their prolific reproduction and ability to attach to any stable surface. Numerous water treatment and power facilities must now treat their systems to keep them clear of zebra mussels, beaches must periodically remove decaying masses of dead zebra mussels, and bottom-dwelling organisms are often covered by the mussels. In the United States congressional researchers estimated the zebra mussel cost the power industry alone 3.1 billion in the 1993-1999 period, with its impact on industries, businesses, and communities over \$5 billion. Additionally, numerous freshwater mussel populations (as well as other aquatic species) have been extirpated from areas that zebra mussels now colonize. Within Virginia, this zebra mussel population has the ability to immediately impact Lake Manassas, which is just 5-1/2 miles downstream of the quarry and serves as the primary water supply for approximately 90,000 people in the jurisdictions of City of Manassas, City of Manassas Park and Prince William County. Just downstream of Lake Manassas is the Occoquan Reservoir, which contributes to the drinking water supply for 1.2 million Northern Virginians, and a number of power supply facilities that could be significantly affected in a relatively short period of time. Furthermore, water intake facilities throughout the Commonwealth would be potentially vulnerable, and many of the federally endangered freshwater mussel species could suffer significant losses.

Understanding the serious impacts this exotic mussel will have in Virginia if it somehow escapes from Millbrook Quarry, a number of federal, state, and local agencies and organizations have been meeting to determine how best to deal with this population. At this time, the consensus is that eradication of the population, if possible, is the best course of action. Given the proximity of Millbrook Quarry to Broad Run and its use as a dive location, it is highly unlikely that the population can simply be isolated; Broad Run has historically flooded the bank separating it from Millbrook Quarry (1972, Hurricane Agnes), and unintentional transport by divers remains a possibility. Data gathered from Millbrook Quarry April 21-23 indicates that the quarry volume is approximately 180 million gallons (12.1 acres, 93 feet max. depth) and that there is no surface inflow or outflow. There is a ground water connection between the quarry, Broad Run, and the water table; however, the amount of water exiting through subsurface channels appears to be relatively low (3.6% of the volume per year). Based on the regional ground water table, the subsurface flow is to the south-southeast and any potential impacts to Broad Run or wells would occur in this area. The zebra mussel population is fairly widespread throughout the quarry with the majority of the mussels found between 30-50 feet in depth; however, individuals can be found within a few feet of the surface and have been found as deep as 80 feet. Densities appear to be fairly low compared to populations from the Great lakes. Typically, zebra mussels are found under rocks or along crevasses in small clusters or individually. Hard structures, such as the underside of the dive platforms and the cabin cruiser appear to have the highest densities, with numbers estimated between 10,000 and 20,000/m².

III. STATEMENT OF NEEDS

The contractor shall eradicate Zebra and Quagga Mussels at the Millbrook Quarry, Prince William County, Virginia within the contracted time period and shall provide all goods, services and expertise necessary to complete this task

The treatment process and associated design, construction and monitoring efforts must comply with all NEPA guidelines and with applicable NEPA compliance and reporting requirements. Documentation of such compliance is mandatory as a condition of federal grants providing funds for this effort. All proposals must document how the vendor would comply with this condition.

Personnel from DGIF and / or other pertinent agencies may be present to observe and review the work. Decontamination shall be conducted in compliance with the Department of Game and Inland Fisheries procedures identified in Attachment A of this Solicitation.

IV. RFP PREPARATION AND SUBMISSION INSTRUCTIONS:

A. General Instructions:

1. Proposal Response:

a. In order to be considered for selection, offerors must submit a complete response to this Request for Proposals. One (1) original and eight (8) copies of each proposal must be submitted to the issuing agency. No other distribution of the proposal shall be made by the offeror.

2. Proposal Preparation:

a. Proposals shall be signed by an authorized representative of the offeror. All information requested should be submitted. Failure to submit all information requested may result in DGIF requiring prompt submission of missing information. Proposals, which are substantially incomplete or lack key information, may be rejected by the DGIF. Mandatory requirements are those required by law or regulated or are such that they cannot be waived and are not subject to negotiation.

b. Proposals should be prepared simply and economically, providing straightforward, concise description of capabilities to satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of content.

c. Proposals should be organized in the order in which the requirements are presented. All pages of the proposal should be numbered. Each paragraph in the proposal should reference the paragraph number of the corresponding section of the Request for Proposal. It is also helpful to cite the paragraph number, subletter, and repeat the text of the requirement as it appears in the solicitation. If a response covers more than one page, the paragraph number and subletter should be repeated at the top of the next page. The proposal should contain a table of contents, which cross-references the solicitation requirements. Information which the offeror desires to present that does not fall within any of the requirements of the solicitation should be inserted at an appropriate place or be attached at the end of the proposal and designated as additional material. Proposals that are not organized in this manner risk elimination from consideration if the evaluators are unable to find where the requirements are specifically addressed.

d. Each copy of the proposal should be bound or contained in a single volume where practical. All documentation submitted with the proposal should be contained in that single volume

3. Oral Presentations:

a. Offerors who submit a proposal in response to this RFP may be required to give an oral presentation of their proposal to DGIF. This provides an opportunity for the offeror to clarify or elaborate on the proposal. This is a fact finding and explanation session only and does not include negotiation. DGIF will schedule the time and location of these presentations. **Oral presentations are at the sole option of DGIF and may or may not be conducted with all offerors**

B. Specific Proposal Instructions:

1. Proposals should be as thorough and detailed as possible so that DGIF may properly evaluate your capabilities to provide the required service. Offerors are required to submit the following items as a complete proposal.
2. Return the RFP cover sheet and all addenda acknowledgements, if any, signed and filled out as required.
3. Identify the specific plans for providing the proposed service including:

METHODOLOGY

Process

- The process to be used to ensure the eradication of zebra mussels and quagga mussels*, to include any chemicals and / or equipment that may be used, the quantities of each, the treatment period, and the effect or end result expected, including discussion of the duration of treatment effectiveness. Describe any protection against future infestation, and/or against continued reproduction or recruitment of the infestation in the quarry, in the event that 100% mortality is not initially achieved. Identify the susceptibility if any to adverse weather events, floods, power outages, or other likely yet unpredictable circumstances and events.
- Documentation outlining that the process to be used is feasible and effective (e.g., scientific publications, evaluations and reports on current or completed projects undertaken, toxicity data, etc.). Identify the earliest starting date, schedule of operations, and estimated completion date of the project.

Measures of Effectiveness

- Protocol and justification thereof for monitoring and documentation of pertinent chemical concentrations, water chemistry (e.g., Dissolved Oxygen or pH), exposure times, or other treatment parameters that would be utilized as indicators of treatment efficiency and effectiveness at specific locations and depths within the quarry, or to determine compliance with contract standards of performance.
- Identify the Quality Assurance policy and procedures that you have in place or would implement specifically for this project.

*Throughout this document, the term zebra mussel is intended to include both the zebra mussel and quagga mussel.

- Monitoring protocol, and justification thereof, to document complete mortality of zebra mussels and quagga mussels during and after treatment, and to ensure that mortality is universal and consistent at all locations and depths within the quarry, as may be utilized as indicators of treatment efficiency and effectiveness, or to determine compliance with contract standards of performance (to include contingency or follow-up treatment options if post-project monitoring reveals that the treatment was not successful in achieving 100% eradication of the infestation).
- Identify all warranties and exclusions of warranty associated with the performance of this contract; describe what certification would be provided at the completion of the project to indicate that the work has been successfully completed; and, describe any post-project testing / follow-up services that would be implemented or advisable.

Impacts

- Analysis of the potential short-term and long-term impacts to non-target organisms, wells and groundwater, Broad Run, and Lake Manassas; to existing or potential surface water withdrawals downstream of Millbrook Quarry, and to recreational diving operations within Millbrook Quarry.
- Protocol and justification thereof for monitoring and documentation of water quality and chemistry within the quarry, groundwater, wells, and adjacent surface waters before, during, and post-treatment.

Operational and Materials Safety

- For proposed treatments, supporting documentation must be provided detailing the potential hazards of the biological agents, chemicals (e.g., MSDS) or mechanical equipment and the necessary certifications/registrations allowing for use of all such biological or chemical agents or equipment in Virginia for the intended purpose.
- The operational safety precautions that would be necessary during the treatment process, including discussion of their compliance with OSHA and other applicable guidelines and regulations.

Site Security, Logistics, Alteration, and Restoration

- Need and justification, and protocol and plans for maintaining site security throughout treatment and monitoring activities, including discussion of impact of project implementation on current recreational diving activities at the quarry.
- Plans for provision of electric, water, and sanitary facilities on site as needed throughout the treatment process.
- Alterations and construction impacts to property and plans for site restoration after project completion. Identify any local, state, or federal environmental or construction permits that would be required to accomplish the project.

OFFEROR'S ORGANIZATION AND EXPERIENCE

- Description and history of the offeror's corporate experience in providing this type of service.
- A list of clients for which this service or a comparable service has been or is being provided.
- Identify and discuss the staffing levels and expertise within your organization.
- Identify the individuals from your company that will be responsible for completing this project, fully documenting their background and experience, and their proposed role in this project.

V. PRICING AND DELIVERY

- Identify the individual costs associated with providing the required service. (Goods, Services)
- Identify the total costs for completion of the project.

VI. OPTIONAL SITE VISIT and OPTIONAL PREPROPOSAL CONFERENCE

OPTIONAL PREPROPOSAL CONFERENCE

An optional pre-proposal conference will be held at 11:00 AM on 13 December 2004 in the Department of Game and Inland Fisheries 4010 West Broad Street, Richmond, Virginia 23230. The purpose of this conference is to allow potential offerors an opportunity to present questions and obtain clarification relative to any facet of this solicitation.

While attendance at this conference will not be a prerequisite to submitting a proposal, offerors who intend to submit proposal are encouraged to attend. Bring a copy of the solicitation with you. Any changes resulting from this conference will be issued in a written addendum to the solicitation

An optional site visit will be held at 11:00 AM on 14 December 2004 at the Millbrook Quarry, Prince William County, Virginia Attendance at this Site Visit is optional. The purpose of this site visit is to allow companies an opportunity to see the work site.

While attendance at this site visit will not be a prerequisite to submitting a proposal, offerors who intend to submit proposals are encouraged to attend.

Contact for the site visit is Brian Watson -Telephone _____ Email _____

VII. EVALUATION AND AWARD CRITERIA:

- A. Proposals shall be evaluated by the Department of Game and Inland Fisheries using the following criteria:

	VALUE
1. Specific plans to eradicate Zebra and Quagga Mussels	<u>64</u>
2. Offeror’s organization and experience	<u>11</u>
3. Pricing	<u>25</u>

VIII. GENERAL TERMS AND CONDITIONS:

- A. **VENDORS MANUAL:** This solicitation is subject to the provisions of the Commonwealth of Virginia *Vendors Manual* and any changes or revisions thereto, which are hereby incorporated into this contract in their entirety. The procedure for filing contractual claims is in section 7.19 of the *Vendors Manual*. A copy of the manual is normally available for review at the purchasing office and is accessible on the Internet at www.dgs.state.va.us/dps under “Manuals.”
- B. **APPLICABLE LAWS AND COURTS:** This solicitation and any resulting contract shall be governed in all respects by the laws of the Commonwealth of Virginia and any litigation with respect thereto shall be brought in the courts of the Commonwealth. The agency and the contractor are encouraged to resolve any issues in controversy arising from the award of the contract or any contractual dispute using Alternative Dispute Resolution (ADR) procedures (*Code of Virginia*, § 2.2-4366). ADR procedures are described in Chapter 9 of the *Vendors Manual*. The contractor shall comply with all applicable federal, state and local laws, rules and regulations.
- C. **ANTI-DISCRIMINATION:** By submitting their proposals, offerors certify to the Commonwealth that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and §11-51 of the *Virginia Public Procurement Act*. If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the contract on the basis of the recipient's religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender or national origin and shall be subject to the same rules as other organizations that contract with public bodies to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the public body. (*Code of Virginia*, § 11-35.1E).

In every contract over \$10,000 the provisions in 1 and 2 (below) apply:

1. During the performance of this contract, the contractor agrees as follows:

- a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
 - b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.
 - c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting these requirements.
2. The contractor will include the provisions of 1 above in every subcontract or purchase order over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.
- D. **ETHICS IN PUBLIC CONTRACTING:** By submitting their proposals, offerors certify that their proposals are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other offeror, supplier, manufacturer or subcontractor in connection with their proposal, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.
- E. **IMMIGRATION REFORM AND CONTROL ACT OF 1986:** By submitting their proposals, offerors certify that they do not and will not during the performance of this contract employ illegal alien workers or otherwise violate the provisions of the federal Immigration Reform and Control Act of 1986.
- F. **DEBARMENT STATUS:** By submitting their proposals, offerors certify that they are not currently debarred by the Commonwealth of Virginia from submitting bids or proposals on contracts for the type of goods and/or services covered by this solicitation, nor are they an agent of any person or entity that is currently so debarred.
- G. **ANTITRUST:** By entering into a contract, the contractor conveys, sells, assigns, and transfers to the Commonwealth of Virginia all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the Commonwealth of Virginia under said contract.
- H. **MANDATORY OF STATE TERMS AND CONDITIONS**
Modification of or additions to the General Terms and Conditions of this solicitation may be cause for rejection of the proposal. However, the Commonwealth reserves the right to decide, on a case by case basis, in its sole discretion, whether to reject such a proposal.

I. **CLARIFICATION OF TERMS:** If any prospective offeror has questions about the specifications or other solicitation documents, the prospective offeror should contact the buyer whose name appears on the face of the solicitation no later than five working days before the due date. Any revisions to the solicitation will be made only by addendum issued by the buyer.

J. **PAYMENT:**

1. **To Prime Contractor:**

- a. Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the payment address shown on the purchase order/contract. All invoices shall show the state contract number and/or purchase order number; social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations).
- b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however.
- c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the contractor at the contract price, regardless of which public agency is being billed.
- d. The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail, or the date of offset when offset proceedings have been instituted as authorized under the Virginia Debt Collection Act.
- e. **Unreasonable Charges.** Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges, which appear to be unreasonable, will be researched and challenged, and that portion of the invoice held in abeyance until a settlement can be reached. Upon determining that invoiced charges are not reasonable, the Commonwealth shall promptly notify the contractor, in writing, as to those charges which it considers unreasonable and the basis for the determination. A contractor may not institute legal action unless a settlement cannot be reached within thirty (30) days of notification. The provisions of this section do not relieve an agency of its prompt payment obligations with respect to those charges, which are not in dispute (*Code of Virginia*, § 11-69).

2. **To Subcontractors:**

- a. A contractor awarded a contract under this solicitation is hereby obligated:

- (1) To pay the subcontractor(s) within seven (7) days of the contractor's receipt of payment from the Commonwealth for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or
 - (2) To notify the agency and the subcontractor(s), in writing, of the contractor's intention to withhold payment and the reason.
- b. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the Commonwealth, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the Commonwealth.
3. Each prime contractor who wins an award in which provision of a SWAM procurement plan is a condition to the award, shall deliver to the contracting agency or institution, on or before request for final payment, evidence and certification of compliance (subject only to insubstantial shortfalls and to shortfalls arising from subcontractor default) with the SWAM procurement plan. Final payment under the contract in question may be withheld until such certification is delivered and, if necessary, confirmed by the agency or institution, or other appropriate penalties may be assessed in lieu of withholding such payment.
- K. **PRECEDENCE OF TERMS:** The following General Terms and Conditions *VENDORS MANUAL*, APPLICABLE LAWS AND COURTS, ANTI-DISCRIMINATION, ETHICS IN PUBLIC CONTRACTING, IMMIGRATION REFORM AND CONTROL ACT OF 1986, DEBARMENT STATUS, ANTITRUST, MANDATORY USE OF STATE FORM AND TERMS AND CONDITIONS, CLARIFICATION OF TERMS, PAYMENT shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.
- L. **QUALIFICATIONS OF (BIDDERS/OFFERORS):** The Commonwealth may make such reasonable investigations as deemed proper and necessary to determine the ability of the offeror to perform the services/furnish the goods and the offeror shall furnish to the Commonwealth all such information and data for this purpose as may be requested. The Commonwealth reserves the right to inspect offeror's physical facilities prior to award to satisfy questions regarding the offeror's capabilities. The Commonwealth further reserves the right to reject any (proposal) if the evidence submitted by, or investigations of, such offeror fails to satisfy the Commonwealth that such offeror is properly qualified to carry out the obligations of the contract and to provide the services and/or furnish the goods contemplated therein.
- M. **TESTING AND INSPECTION:** The Commonwealth reserves the right to conduct any test / inspection it may deem advisable to assure goods and services conform to the specifications.

- N. **ASSIGNMENT OF CONTRACT:** A contract shall not be assignable by the contractor in whole or in part without the written consent of the Commonwealth.
- O. **CHANGES TO THE CONTRACT:** Changes can be made to the contract in any of the following ways:
1. The parties may agree in writing to modify the scope of the contract. An increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract.
 2. The Purchasing Agency may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt. The contractor shall be compensated for any additional costs incurred as the result of such order and shall give the Purchasing Agency a credit for any savings. Said compensation shall be determined by one of the following methods:
 - a. By mutual agreement between the parties in writing; or
 - b. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the contractor accounts for the number of units of work performed, subject to the Purchasing Agency's right to audit the contractor's records and/or to determine the correct number of units independently; or
 - c. By ordering the contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The contractor shall present the Purchasing Agency with all vouchers and records of expenses incurred and savings realized. The Purchasing Agency shall have the right to audit the records of the contractor, as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the Purchasing Agency within thirty (30) days from the date of receipt of the written order from the Purchasing Agency. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the Commonwealth of Virginia *Vendors Manual*. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the contractor from promptly complying with the changes ordered by the Purchasing Agency or with the performance of the contract generally.
- P. **DEFAULT:** In case of failure to deliver goods or services in accordance with the contract terms and conditions, the Commonwealth, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies, which the Commonwealth may have.

Q. **INSURANCE:** By signing and submitting a proposal under this solicitation, the offeror certifies that if awarded the contract, it will have the following insurance coverage's at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with §§ 11-46.3 and 65.2-800 et seq. of the *Code of Virginia*. The offeror further certifies that the contractor and any subcontractors will maintain these insurance coverage's during the entire term of the contract and that all insurance coverage's will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission.

INSURANCE COVERAGES AND LIMITS REQUIRED:

1 Workers' Compensation - Statutory requirements and benefits. Coverage is compulsory for employers of three or more employees, to include the employer. Contractors who fail to notify the Commonwealth of increases in the number of employees that change their workers' compensation requirements under the *Code of Virginia* during the course of the contract shall be in noncompliance with the contract

2. Employer's Liability - \$100,000.

3. Commercial General Liability - \$1,000,000 per occurrence. Commercial General Liability is to include bodily injury and property damage, personal injury and advertising injury, products and completed operations coverage. The Commonwealth of Virginia must be named as an additional insured and so endorsed on the policy.

4. Automobile Liability - \$1,000,000 per occurrence. (Only used if motor vehicle is to be used in the contract.)

R. **ANNOUNCEMENT OF AWARD:** Upon the award or the announcement of the decision to award a contract over \$50,000, as a result of this solicitation, the purchasing agency will publicly post such notice on the DGS/DPS eVA web site (www.eva.state.va.us) for a minimum of 10 days.

S. **DRUG-FREE WORKPLACE:** During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, “*drug-free workplace*” means a site for the performance of work done in connection with a specific contract awarded to a contractor, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

- T. **NONDISCRIMINATION OF CONTRACTORS:** A bidder, offeror, or contractor shall not be discriminated against in the solicitation or award of this contract because of race, religion, color, sex, national origin, age, disability, faith-based organizational status, any other basis prohibited by state law relating to discrimination in employment or because the bidder or offeror employs ex-offenders unless the state agency, department or institution has made a written determination that employing ex-offenders on the specific contract is not in its best interest. If the award of this contract is made to a faith-based organization and an individual, who applies for or receives goods, services, or disbursements provided pursuant to this contract objects to the religious character of the faith-based organization from which the individual receives or would receive the goods, services, or disbursements, the public body shall offer the individual, within a reasonable period of time after the date of his objection, access to equivalent goods, services, or disbursements from an alternative provider.
- U. **eVA BUSINESS-TO-GOVERNMENT VENDOR REGISTRATION:** The eVA Internet electronic procurement solution, web site portal www.eva.state.va.us, streamlines and automates government purchasing activities in the Commonwealth. The portal is the gateway for vendors to conduct business with state agencies and public bodies. All vendors desiring to provide goods and/or services to the Commonwealth shall participate in the eVA Internet e-procurement solution either through the eVA Basic Vendor Registration Service or eVA Premium Vendor Registration Service. All bidders or offerors must register in eVA; failure to register will result in the bid/proposal being rejected.
- a. eVA Basic Vendor Registration Service: \$25 Annual Fee plus a Transaction Fee of 1% per order received. The maximum transaction fee is \$500 per order. eVA Basic Vendor Registration Service includes electronic order receipt, vendor catalog posting, on-line registration, and electronic bidding.
 - b. eVA Premium Vendor Registration Service: \$200 Annual Fee plus a Transaction Fee of 1% per order received. The maximum transaction fee is \$500 per order. eVA Premium Vendor Registration Service includes all benefits of the eVA Basic Vendor Registration Service plus automatic email or fax notification of solicitations and amendments, and ability to research historical procurement data, as they become available.

IX. **SPECIAL TERMS AND CONDITIONS**

1. **ADVERTISING:** In the event a contract is awarded for supplies, equipment, or services resulting from this solicitation, no indication of such sales or services to the Department of Game and Inland Fisheries will be used in product literature or advertising. The contractor shall not state in any of its advertising or product literature that the Commonwealth of Virginia or any agency or institution of the Commonwealth has purchased or uses its products or services.
2. **AUDIT:** The contractor shall retain all books, records, and other documents relative to this contract for five (5) years after final payment, or until audited by the Commonwealth of Virginia, whichever is sooner. The agency, its authorized agents, and/or state auditors shall have full access to and the right to examine any of said materials during said period.

The envelope should be addressed as directed on Page 1 of the solicitation.

If a proposal not contained in the special envelope is mailed, the bidder or offeror takes the risk that the envelope, even if marked as described above, may be inadvertently opened and the information compromised which may cause the proposal to be disqualified. Proposals may be hand delivered to the designated location in the office issuing the solicitation. No other correspondence or other proposals should be placed in the envelope.

8. **MINORITY/WOMEN OWNED BUSINESSES SUBCONTRACTING AND REPORTING:** Where it is practicable for any portion of the awarded contract to be subcontracted to other suppliers, the contractor is encouraged to offer such business to minority and/or women-owned businesses. Names of firms may be available from the buyer and/or from the Division of Purchases and Supply. When such business has been subcontracted to these firms and upon completion of the contract, the contractor agrees to furnish the purchasing office the following information: name of firm, phone number, total dollar amount subcontracted and type of product/service provided.
9. **PRIME CONTRACTOR RESPONSIBILITIES:** The contractor shall be responsible for completely supervising and directing the work under this contract and all subcontractors that he may utilize, using his best skill and attention. Subcontractors who perform work under this contract shall be responsible to the prime contractor. The contractor agrees that he is as fully responsible for the acts and omissions of his subcontractors and of persons employed by them as he is for the acts and omissions of his own employees.
10. **SUBCONTRACTS:** No portion of the work shall be subcontracted without prior written consent of the purchasing agency. In the event that the contractor desires to subcontract some part of the work specified herein, the contractor shall furnish the purchasing agency the names, qualifications and experience of their proposed subcontractors. The contractor shall, however, remain fully liable and responsible for the work to be done by its subcontractor(s) and shall assure compliance with all requirements of the contract.
11. **OWNERSHIP OF DATA AND MATERIALS:** All materials and documentation originated and prepared for the State pursuant to the contract shall belong exclusively to the State and be subject to public inspection in accordance with the Virginia Freedom on Information Act. Trade secrets or proprietary information submitted by an contractor shall be subject to public disclosure under the Virginia Freedom of Information Act; however, the contractor must invoke the protection of 11-52D of the Code of Virginia, in writing, either before or at the time the data or other materials is submitted. The written notice must specifically identify the data or materials to be protected and state the reason why protection is necessary. The proprietary or trade secret material submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific word, figures, or paragraph that constitute trade secret or proprietary information.. The classification of an entire proposal document, line item prices and/or total proposal prices as proprietary or trade secret is not acceptable.
12. **CERTIFIED TEST REPORT:** Each offeror shall provide a copy of a certified test report with their proposal. The certified test report shall be from a recognized independent testing laboratory or manufacturer's quality control laboratory showing all test results and full compliance with the

appropriate specifications indicated herein. However, the Commonwealth reserves the right to perform any tests or inspections when and as deemed necessary to verify the certified test report.

13. **FINAL INSPECTION:** At the conclusion of the work, the contractor shall demonstrate to the authorized owners' representative that the work has been completed and is in compliance with contract specifications and codes. Any deficiencies shall be promptly and permanently corrected by the contractor at the contractor's sole expense prior to final acceptance of the work.
14. **INDEMNIFICATION:** Contractor agrees to indemnify, defend and hold harmless the Commonwealth of Virginia, its officers, agents, and employees from any claims, damages and actions of any kind or nature, whether at law or in equity, arising from or caused by the use of any materials, goods, or equipment of any kind or nature furnished by the contractor/any services of any kind or nature furnished by the contractor, provided that such liability is not attributable to the sole negligence of the using agency or to failure of the using agency to use the materials, goods, or equipment in the manner already and permanently described by the contractor on the materials, goods or equipment delivered.
15. **INSPECTION OF JOB SITE:** My signature on this solicitation constitutes certification that I have inspected the job site and am aware of the conditions under which the work must be accomplished. Claims, as a result of failure to inspect the job site, will not be considered by the Commonwealth.
16. **LABELING OF HAZARDOUS SUBSTANCES:** If the items or products requested by this solicitation are "Hazardous Substances" as defined by § 1261 of Title 15 of the United States Code (U.S.C.) or "Pesticides" as defined in § 136 of Title 7 of the United States Code, then the bidder/offeror, by submitting his bid/proposal, certifies and warrants that the items or products to be delivered under this contract shall be properly labeled as required by the foregoing sections and that by delivering the items or products the bidder/offeror does not violate any of the prohibitions of Title 15 U.S.C. § 1263 or Title 7 U.S.C. § 136.
17. **MATERIAL SAFETY DATA SHEETS:** Material Safety Data Sheets and descriptive literature shall be provided with the proposal for each chemical and/or compound offered. Failure on the part of the offeror to submit such data sheets may be cause for declaring the proposal as non-responsive.
18. **PRIME CONTRACTOR RESPONSIBILITIES:** The contractor shall be responsible for completely supervising and directing the work under this contract and all subcontractors that he may utilize, using his best skill and attention. Subcontractors who perform work under this contract shall be responsible to the prime contractor. The contractor agrees that he is as fully responsible for the acts and omissions of his subcontractors and of persons employed by them as he is for the acts and omissions of his own employees.
19. **WORK SITE DAMAGES:** Any damage to existing utilities, equipment or property resulting from the performance of this contract shall be repaired to the Commonwealth's satisfaction at the contractor's expense.

20. **PROTECTION OF PERSONS AND PROPERTY:**

- a. The contractor expressly undertakes both directly and through its subcontractor(s), to take every precaution at all times for the protection of persons and property which may come on the building site or be affected by the contractor's operation in connection with the work.
- b. The contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work.
- c. The provisions of all rules and regulations governing safety as adopted by the Safety Codes Commission of the Commonwealth of Virginia, issued by the Department of Labor and Industry under Title 40.1 of the *Code of Virginia* shall apply to all work under this contract.
- d. The contractor shall continuously maintain adequate protection of all his work from damage and shall protect the owner's property from injury or loss arising in connection with this contract. He shall make good any such damage, injury, or loss, except such as may be directly due to errors in the contract documents or caused by agents or employees of the owner. He shall adequately protect adjacent property to prevent any damage to it or loss of use and enjoyment by its owners. He shall provide and maintain all passageways, guard fences, lights, and other facilities for protection required by public authority, local conditions, any of the contract documents or erected for the fulfillment of his obligations for the protection of persons and property.
- e. In an emergency affecting the safety or life of persons or of the work, or of the adjoining property, the contractor, without special instruction or authorization from the owner, shall act, at his discretion, to prevent such threatened loss or injury. Also, should he, to prevent threatened loss or injury, be instructed or authorized to act by the owner, he shall so act immediately, without appeal. Any additional compensation or extension of time claimed by the contractor on account of any emergency work shall be determined as provided by paragraph O, of the General Terms and Conditions.

The contractor expressly undertakes, either directly or through his subcontractor(s), to clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly, and workmanlike appearance. No such refuse, rubbish, scrap material, and debris shall be left within the completed work nor buried on the building site, but shall be removed from the site and properly disposed of in a licensed landfill or otherwise as required by law.

ATTACHMENT A

DGIF DECONTAMINATION PROCEDURE FOR MILLBROOK QUARRY

1) All equipment used in zebra mussel infested waters will be inspected for the presence of zebra mussels. If detected, zebra mussels will be removed and disposed of in a manner that prevents introduction into non-infested waters.

2) After visual and tactile inspection of all dive gear to remove zebra mussels, sediments, and all other foreign materials, all dive gear will be thoroughly washed in a solution containing 1/2-cup salt per 1-gallon water. Commercial dive gear cleaners may be used in conjunction with the saltwater solution. Buoyancy compensators must be flushed internally and dried according to manufacturers' recommendations. Wastewater from this washing process must be discharged immediately back into Millbrook Quarry or into a source for wastewater treatment and must not discharge into open waters.

3) All dive gear used at Millbrook Quarry must be completely dried for a period of at least seven (7) days before use in non-infested waters. Extra caution should be taken to ensure that wetsuit seams, buoyancy compensators, braided lines or ropes, and other such porous or permeable materials are thoroughly dry.

4) All hard-surfaced and non-temperature-sensitive equipment (boats, outboard motors, trailers, etc.) will be exposed to a high-pressure wash with water heated to at least 140 degrees Fahrenheit, and allowed to dry for 24 hours before use in non-infested waters. The cooling system of outboard motors will be thoroughly flushed with chlorinated tapwater before the motor is used in non-infested waters.

Appendix D – Millbrook Quarry RFP Procurement Documentation

Issue date: 29 November 2004

RFP Number 00375-352

October 4, 2004

The Zebra Mussel Eradication Proposal Review Panel met for the first time. Ed Walsh (EW) conducted a review of the RFP process. Panel members began developing evaluation criteria for the RFP, and all committee members signed non-disclosure statements.

November 9, 2004

RFP evaluation criteria recommendations were finalized, and forwarded by Ray Fernald (RTF) to EW.

November 22, 2004

Determination made to use Competitive Negotiation in lieu of Competitive Sealed Bidding.

November 29, 2004

Request for Proposal #00375-352, *Eradication of Zebra and Quagga Mussels at Millbrook Quarry, Prince William County, Virginia*, was issued. Proposals were solicited from 12 potential vendors.

December 13, 2004

Optional pre-proposal conference was held at DGIF headquarters in Richmond. Potential vendors attending included Amark Corp., Aquatic Sciences L. P., and GE Betz Inc.

December 14, 2004

Optional on-site visit was held at Millbrook Quarry, Prince William County, hosted by Brian Watson (BTW). Potential vendors attending included Amark Corp., Aquatic Sciences L. P., and GE Betz Inc.

January 10, 2005

Proposals were closed. Three proposals were received from Amark Corp., Aquatic Sciences L.P., and GE Betz Inc.

January 26, 2005

All members of the Zebra Mussel Eradication Proposal Review Panel, except Richard Neves (RN), met in Richmond with EW to receive eradication proposals and instructions for reviewing proposals. Panel members were assigned to review proposals and to identify the areas requiring clarification to Committee Chairman Ray Fernald by 18 February.

January 27, 2005

BTW delivered eradication proposals to RN and e-mailed instructions pertaining to proposal review and clarification questions.

February 18, 2005

Clarification questions and comments submitted by all panel members to RTF. RTF and BTW began compiling the clarification questions and comments for each proposal.

February 23, 2005

Tables of clarification issues and questions for each proposal were sent to EW by RTF.

March 8, 2005

Clarification issues and questions for each proposal discussed between EW and RTF. RTF would formalize and reformat clarification issues and questions with BTW, and then represent to EW in tabular format for presentation to potential vendors.

March 22, 2005

EW received clarification issues and questions from RF and discussed process. EW will contact Vendors and FAX questions to them on 22 and 23 March. A telephone conference will be held with each vendor on the 30th of March to discuss their responses to the proposal questions. Vendors will then be asked to provide a written response by Friday, 1 April 2005.

Questions were Faxed to:

Neil Marshall, Amark

Dan Butts, Aquatic Sciences

Doug Frassa advised that Mike Brown would come to DGIF HQ at 1:00 PM and pick up a copy of the questions for GE Betz

Appointments for telephone conferences on 30 March were scheduled as follows:

Neil Marshall, Amark	9:00 AM
Dan Butts, Aquatic Sciences	11:00 AM
Doug Frassa, GE Betz	1:30 PM

29 March 2005

EW received a call from Amark asking to move their conference to 3 PM on the 30th of March. Change was agreed to.

March 30, 2005

Held conference calls with 3 potential zebra mussel eradication contractors to discuss clarification questions generated by the Mussel Eradication Proposal Review Panel. Questions were faxed to each contractor for official written responses.

April 1, 2005

DGIF received responses to questions from:

Neil Marshall, Amark

Dan Butts, Aquatic Sciences

Doug Frassa, GE Betz

April 6, 2005

All members of the Zebra Mussel Eradication Proposal Review Panel, except Billy Lassetter (WLL), met in Richmond with EW to receive official instructions on scoring the eradication proposals and to receive answers to clarification questions; information was delivered that day to WLL. Eradication proposal reviews and preliminary scoring should be completed and submitted to RTF by April 18.

April 27, 2005

All members of the Zebra Mussel Eradication Proposal Review Panel met to review the scoring for each of the 3 proposals. Below follows the reasoning for scoring of each criterion and any subsequent changes based on panel discussion.

Amark

1. Describe the process to be used...

Scores ranged from 1-3. Overall, the panel was highly doubtful that addition of CO² to the quarry would lower dissolved oxygen to the level required to kill 100% of the zebra mussels. Additionally, from review of scientific literature, the target concentration of 4 ppm O² is not low enough to ensure 100% mortality. The panel felt that the description of the process lacked detail, and the process would provide no long-term protection against future infestations. Khizar Wasti (KW) lowered score by 2 points as result of discussion, stating that he initially scored higher based on the description of the process rather than the technical merit of the process.

2. Provide documentation outlining that the process is effective...

Scores ranged from 1-5 and no scores were changed. Panel members stated that the documentation provided was not applicable to the quarry (open system) and scientific evidence exists that documents zebra mussels can survive dissolved oxygen concentrations as low as 2 ppm; also the process is untested in any system. The schedule of operation also was vague and the contractor reserved the right to delay start up for 180 days after contract award.

3. Protocol and justification for monitoring chemical concentrations...

Scores ranged from 0-3. The panel felt the monitoring plan was vague at best as no specified plan including dissolved oxygen monitoring locations and frequency of monitoring was included in the proposal (just mentions a probe will be lowered to various depths and various locations). Additionally, Amark did not guarantee the results of their monitoring and recommended that DGIF do their own monitoring. A number of the panel members were highly concerned that Amark could not and would not guarantee their monitoring results as that was the indicator they were using to determine if the process was successful or not in killing the zebra mussels. Harold Post (HP) and KW lowered their scores by 1 point each in light of these concerns.

4. Identify the QA/QC policy...

Scores ranged from 0-2. The majority of the panel felt that little to no QA/QC documentation was provided in the proposal. The only QA/QC that was provided pertained to dissolved oxygen monitoring but Amark then stated they would not guarantee those results. RN, the only panelist to award 2 points for this criterion, felt this was adequate. No scores were modified based on panel discussion.

5. Monitoring protocol to document complete mortality of zebra mussels...

Scores ranged from 0-10, reflecting the greatest variance among panel member's scores within a criterion. The majority of the panel felt that the failure to directly monitor zebra mussel mortality was a major flaw of the proposal, and unacceptable for determining success of the project. Some panel members felt this flaw was more significant than others, leading to the large range in scoring. KW reduced his score for this criterion from 10 to 2, based on his reevaluation of this aspect of the vendor's proposal.

6. Identify all warranties and exclusions...

Scores ranged from 0-2. The only warranty provided by Amark was that they would inject 225,000 to 250,000 lbs of CO² into the quarry; there is no warranty to kill zebra mussels. Some panel members awarded minimal points based on the warranty provided. WLL score decreased 1 point based on a lack of guarantee for zebra mussel mortality and BTW score increased 1 point based on the CO² warranty. There was no net change in the score for this criterion.

7. Analysis of potential short-term and long-term impacts...

Scores ranged from 1-4 with most in the 2-3 range. A majority of the panel felt that identification and discussion of potential or anticipated impacts was lacking. While off-site impacts should not be a problem, mortality of many organisms within the quarry would be expected. There was little discussion of this, and no plan to dispose of the dead biota. No scores were modified based on the panel discussion.

8. Protocol and justification for monitoring water quality and chemistry...

Scores ranged from 0-3. While impacts to diving and off-site impacts are not anticipated, Amark did not address the need to monitor water chemistry prior to deoxygenation, nor after the process to determine any lasting effects. RN corrected this score; stating that his original submission of a 5 for this criterion was a transcription error on his part.

9. For proposed treatments, provide documentation detailing hazards...

Scores ranged from 1 to 2. Some panel members assumed this information was not pertinent to the treatment process, while others felt any omission should have been addressed by Amark. Based on panel discussion, Jamie Hedges (JBH) raised score from 0 to 1.

10. The operational safety precautions...

Scores ranged from 1-2. Most of the panel felt the information provided regarding safety precautions was minimal. No specific OSHA standards were mentioned, just that an OSHA certified employee would be on site. No scores were modified based on panel discussion.

11. Need and justification for site security...

Scores were either 1 or 3. The majority of the panel felt the proposal was ambiguous and lacked meaningful discussion of on-site security to the degree that the site would likely not be secured in any way; increasing potential for vandalism. Any security measures would not impact the diving operation. KW lowered score from 3 to 1 based on panel discussion regarding lack of vendor security information. WLL and RN scored higher on this criterion, essentially accepting vendor's statements at face value, without further evaluation.

12. Plans for provision of electric, water...

Scores ranged from 1-2. Generators and portable restrooms were the only on-site provisions mentioned in the proposal. Some panel members felt additional needs, such as water, weren't addressed and scored 1 out of 2. No scores were modified based on panel discussion.

13. Alterations and construction impacts...

Scores ranged from 1-2. The proposal mentions that impacts should be minimal but does not specifically address what the impacts may be. Half the panel felt this explanation was adequate and awarded 2 points; half did not and awarded 1 point. No scores were modified based on panel discussion.

14. Description and history...

Scores ranged from 0-1. Amark does not have any experience in treating water systems for zebra mussels other than the system developed for ballast water, and has never utilized the proposed process to eradicate a zebra mussel population. In light of this, WLL lowered score from 3 to 1.

15. A list of clients...

Scores ranged from 0-1. Since Amark does not have any experience treating systems for zebra mussels, most of the panel felt that 0 or 1 point were warranted at most. The services cited for clients listed were not the services being sought in this instance. Most of the other entities cited in the proposal are research sponsors or partners, or unaffiliated researchers. Based on panel discussion, WLL lowered score from 2 to 1, and KW from 2 to 0.

16. Identify and discuss the staffing levels and expertise...

Scores ranged from 1-2. A majority of the panel felt that Amark provided little information regarding the company's staffing levels and expertise, and those listed had little to no experience with zebra mussels. RTF and BTW raised their scores from 0 to 1 since some information was provided in the proposal.

17. Identify the individuals from your company responsible....

Scores ranged from 1 to 3. The only information provided in the proposal regarded Wilson Browning, Jr.; with no significant information provided regarding other primary individuals. Six of 8 panel members scored this criterion at 1, with JBH raising score from 0 to 1, and KW lowering score from 3 to 1. Rick Browder (RGB) and RN felt the information provided was adequate or that additional information could be readily obtained.

Based on the panel's review and discussion of Amark's zebra mussel eradication proposal, Amark's score was 220 out of a possible 600, a reduction of 19 points from the preliminary score of 239 points (not including the score for pricing). The panel was highly doubtful that the anticipated drop in dissolved oxygen concentration to 4 ppm was sufficient to achieve 100% eradication of the zebra mussel population in Millbrook Quarry, and questioned whether Amark could achieve and maintain a level even that low since the quarry is an open system. The panel also had serious reservations regarding the lack of a warranty to eradicate the zebra mussel population, but only to inject 225,000 to 250,000 lbs of CO² into the quarry. Additionally, no monitoring of zebra mussels was to be performed and the dissolved oxygen concentration monitoring was not detailed nor would the results be guaranteed. Overall, the panel felt the proposal lacked technical merit, assurances, and reasonable chance of success; lacked adequate documentation in many areas; and was poorly prepared. Therefore, the panel unanimously recommended that Amark's proposal not be further considered.

Aquatic Sciences

1. Describe the process to be used...

Scores ranged from 5 to 7. Overall, the panel felt the proposal was detailed, thorough, and easy to understand. Based on the information provided, the panel also was confident that the use of potassium at the target concentration would be effective at killing the zebra mussel population in Millbrook quarry. The use of potassium also provides long-term protection against future infestations (potentially 33 years), which the panel considered to be a significant benefit of the process. Several panel members acknowledged downgrading the proposal because of the high cost and relatively weak warranty, issues which are considered in other criteria and should not be evaluated under this criterion. No scores, however, were altered based on panel discussion of this issue.

2. Provide documentation outlining that the process is effective...

Scores ranged from 6-9. While no process has been used in an open water system such as Millbrook Quarry, Aquatic Sciences has used potassium effectively in other systems. Based on these results and the toxicity data provided, the panel felt the process would be relatively effective. Aquatic Sciences also would recharge the quarry at no cost if target concentrations were not obtained. The fact that the potassium will remain in the quarry for years at concentrations at lethal levels was considered a significant benefit. RTF, RN, HP, and BTW lowered their scores due to uncertainty regarding treatment effectiveness in a large open-water system, and potential for rapid reduction of potassium concentrations due to uptake by aquatic plants or sediment.

3. Protocol and justification for monitoring chemical concentrations...

Scores ranged from 3-5. Overall, the panel felt the chemical monitoring plan was very thorough, with some panel members believing it was a bit overblown, and others feeling that more information regarding the transect layout should have been provided. No scores were modified based on panel discussion.

4. Identify the QA/QC policy...

Scores ranged from 1-2. Most panel members felt this information was provided in detail with only one member (JBH) giving a score lower than the maximum of 2. No scores were modified based on panel discussion.

5. Monitoring protocol to document complete mortality of zebra mussels...

Scores ranged from 12-13. Overall, the panel felt the monitoring protocol for zebra mussels was thorough and adequate but likely too involved. Additionally, there was no mention of any contingency plan or follow up monitoring if 100% eradication was not achieved. Based on panel discussion, RTF and WLL lowered their scores because of concern regarding difficulty of documenting 100% mortality throughout quarry.

6. Identify all warranties and exclusions...

Scores ranged from 2-4. Aquatic sciences never made a direct warranty statement other than that 100% of zebra mussels should die if the appropriate concentrations could be achieved. Rather, their warranty was based more on the fact that if 100% mortality did not occur, the long-term persistence of potassium would kill any remaining zebra mussels over time. Based on lack of a clearly stated warranty, RTF, JBH, and HP reduced their scores for this criterion.

7. Analysis of potential short-term and long-term impacts...

Scores ranged from 2-4. While the potential impacts in the quarry are expected to be low at the target potassium concentration levels based on toxicity data and there are no known human health concerns, there was concern over potential long-term impacts to Broad Run since the endangered brook floater may be present. Impacts to dive operations would be minimal, only during the bioassay treatment period. Six panel members lowered their score based on discussion of this issue.

8. Protocol and justification for monitoring water quality and chemistry...

Scores ranged from 4-5. The water quality monitoring plan including testing of Broad Run and Millbrook Quarry 6 months and 18 months after treatment. However, no monitoring of local wells was included, which some panel members perceived as a problem due to potential public concern over any chemical treatment. No scores were changed based on panel discussion.

9. For proposed treatments, provide documentation detailing hazards...

All panel member scores were the maximum 2 with no changes. The panel felt complete information was provided, which simply included the MSDS for potassium.

10. The operational safety precautions...

All panel member scores were the maximum 2 with no changes. The panel felt complete information was provided.

11. Need and justification for site security...

All panel member scores were the maximum of 3 with no changes. Aquatic Science provided detailed information regarding all aspects of site security during the treatment process.

12. Plans for provision of electric, water...

All panel member scores were the maximum 2 with no changes. The panel felt complete information was provided including water, electric needs, and portable restrooms.

13. Alterations and construction impacts...

All panel member scores were the maximum 2 with no changes. The panel felt complete information was provided and no impacts would occur as a result of the treatment process.

14. Description and history...

Scores ranged from 2-3. Some panel members felt Aquatic Sciences was too general with the information they provided. No scores changed based on panel discussion.

15. A list of clients...

Scores ranged from 1-2. BTW gave a score of 1 since specific contact information was not provided for some of the clients. No scores were changed based on panel discussion.

16. Identify and discuss the staffing levels and expertise...

All panel member scores were the maximum of 3 with no changes. The panel felt complete information was provided. No scores were changed based on panel discussion.

17. Identify the individuals from your company responsible....

All panel member scores were the maximum of 3 with no changes. The panel felt complete information was provided. No scores were changed based on panel discussion.

Based on the panel's review and discussion of Aquatic Sciences' zebra mussel eradication proposal, their score was 511 out of a possible 600, a reduction of 21 points from the preliminary score of 532, not including the score for pricing. The proposal submitted by Aquatic Sciences was very thorough, well written, and addressed most areas completely. Based on the information provided, potassium is effective at killing zebra mussels and Aquatic Sciences' treatment and monitoring protocols would maximize the possibility of 100% eradication and minimize impacts. Overall, the panel felt confident that use of potassium would be successful at eradicating the zebra mussel population in Millbrook Quarry. The panel recommended that Aquatic Sciences' proposal be considered further and that negotiations be initiated.

GE Betz

1. Describe the process to be used...

Scores ranged from 3-7. Most of the panel felt that Spectrus CT1300 is effective at killing zebra mussels but it has primarily been used in closed systems and in repetitive treatment processes. Likewise, the panel questioned whether 100% eradication could be achieved in the quarry due to the short life span of the chemical and the problems with achieving a complete mixing in the quarry. Additionally, there is no long-term protection against future infestations. No scores were changed based on panel discussion.

2. Provide documentation outlining that the process is effective...

Scores ranged from 7-9. Documentation provided clearly shows that Spectrus CT1300 is effective at killing zebra mussels, but does not establish that it would be fully effective in a large and complex open system like Millbrook Quarry. There was some doubt whether 100% eradication could be achieved if mixing was not 100% effective. No scores changed based on panel discussion.

3. Protocol and justification for monitoring chemical concentrations...

Scores ranged from 3-5. A specific monitoring plan for Spectrus CT1300 concentrations was not provided. While Broad Run would be tested, no plans were included to test local wells despite anticipated public concern due to potential well contamination. No scores changed due to panel discussion.

4. Identify the QA/QC policy...

Scores ranged from 1 to 2. Most panel members felt GE Betz provided full and complete information regarding their QA/QC policy. No scores changed based on panel discussion.

5. Monitoring protocol to document complete mortality of zebra mussels...

Scores ranged from 8-14 and represented the largest scoring disparity within the panel. Overall, GE Betz only planned to use 4 bags with zebra mussels for their bioassay tests but did indicate they would increase that number; however, they did not provide a specific number of additional bioassays they would provide and the additional cost, if any. Likewise, GE Betz did not provide a specific plan for distribution of the bioassay bags nor did they include a control. JBH raised score 3 points, primarily in

recognition of the vendor's offer to retreat or refund fee if zebra mussels were not eradicated, though concern remained regarding limited monitoring of mortality proposed.

6. Identify all warranties and exclusions...

Scores ranged from 2 to 4. GE Betz did provide a direct warranty that 100% of the zebra mussels would be killed, or the quarry would be retreated at no cost or all payments would be refunded: a number of panel members based their score directly on this statement. However, other panel members were concerned with language tying this warranty to proof that the zebra mussels had survived treatment, rather than having been reintroduced after treatment. RTF reduced score by 1 point, in recognition of limited duration of warranty, difficulty in distinguishing new introduction from survivors, and lack of post-project monitoring.

7. Analysis of potential short-term and long-term impacts...

Scores ranged from 1 to 4. It was clearly stated that all aquatic fauna within the quarry would be killed as part of the treatment process. However, it appears that there should be no off-site impacts or long-term impacts, and little impact to diving operations. Some panel members were concerned with potential long-term impacts due to uptake in and release from sediments and no plan to remove dead animals from the quarry. JBH reduced score by 2 points in recognition of anticipated short-term impacts in quarry, and potentially in Broad Run, and concerns shared w/WLL regarding fate of chemical bound to sediment.

8. Protocol and justification for monitoring water quality and chemistry...

Scores ranged from 1 to 4. Overall, GE Betz provided very a very limited plan for monitoring water chemistry during the treatment process. Additionally, there was no plan for testing local wells, though Broad Run would be tested. No pre- or post-treatment was planned. No scores changed based on panel discussion.

9. For proposed treatments, provide documentation detailing hazards...

All panel member scores were the maximum 2 with no changes. The panel felt complete information was provided, which simply included the MSDS for Spectrus CT1300 and the anti-foaming agent.

10. The operational safety precautions...

Scores ranged from 1 to 2. JBH and BTW felt GE Betz did not provide complete information regarding OSHA documentation. No scores changed based on panel discussion.

11. Need and justification for site security...

Scores ranged from 1 to 3. JBH, RGB, and BTW did not feel that GE Betz provided thorough information regarding site security and left open the possibility for vandalism. No scores changed based on panel discussion.

12. Plans for provision of electric, water...

Scores ranged from 1 to 2. JBH felt GE Betz's information was not complete. No scores changed based on panel discussion.

13. Alterations and construction impacts...Scores ranged from 1 to 2. JBH felt GE Betz did not provide thorough information and questioned site impacts and alterations. No scores were modified based on panel discussion.

14. Description and history...

Scores ranged from 1 to 3. The majority of panel members felt that GE Betz provided minimal information for this criterion. RTF reduced score by 1 point in recognition that vendor's considerable experience is in closed systems and continuing, schedule treatments, not in open water situations.

15. A list of clients...

All panel member scores were the maximum 2 with no changes. The panel felt complete and thorough information was provided with regards to the client list.

16. Identify and discuss the staffing levels and expertise...

Scores ranged from 1 to 3. Most panel members felt GE Betz did not provide a complete staffing level list and explain their organizational expertise. HP and KW lowered their scores based on panel discussion.

17. Identify the individuals from your company responsible....

Scores ranged from 1 to 3. Most panel members felt the information provided was relatively general and did not necessarily pertain to the eradication project. RTF, HP, and KW lowered their scores based on panel discussion.

Based on the panel's review and discussion of GE Betz's zebra mussel eradication proposal, their score was 446 out of a possible 600, a reduction of 6 points from the preliminary score of 452, not including the score for pricing. The proposal submitted by GE Betz was relatively well written but lacking in a number of areas. Based on the information provided, Spectrus CT1300 is effective at killing zebra mussels but the panel questioned whether it could be effective in the quarry due to mixing concerns and the chemical's short life span. Likewise, there were questions regarding GE Betz's monitoring protocols and the stated warranty (i.e., how it would be determined whether living zebra mussels discovered after treatment had survived the treatment, or been subsequently introduced). Overall, the panel felt confident that the use of Spectrus CT1300 could be successful at eradicating the zebra mussel population in Millbrook Quarry. The panel recommended that GE Betz's proposal be considered further and that negotiations be initiated.

May 20, 2005

Held negotiations with GE Betz. Recommended modifications to proposal were discussed with potential contractor. EW, RTF, and BTW attended for DGIF; Michael Brown, Doug Frassa, and Raymond Post attended for G.E. Betz.

May 24, 2005

Held negotiations with Aquatic Sciences. Recommended modifications to proposal were discussed with potential contractor. EW, RTF, and BTW attended for DGIF; Carmen Sferrazza, Dan Butts, Clint Johnson, and John Levie attended for Aquatic Sciences.

June 7, 2005

Revised proposal dated June 7, 2005 was received from Aquatic Sciences L.P.

June 9, 2005

Revised proposal dated June 9, 2005 was received from GE Betz.

June 20, 2005

Revised proposals from Aquatic Sciences L.P. and GE Betz were overnight-shipped to all RFP Evaluation Panel members by RTF.

June 23, 2005

RTF and BTW met with RN (RN would not be able to attend Panel meeting scheduled for June 28) to discuss rescoring of proposals based on revisions submitted by GE Betz and Aquatic Sciences following initial negotiations. Prior to scoring each of the proposals, the three panel members discussed changes to the proposals to determine if there were any outstanding questions that needed to be addressed by each potential contractor. The following four questions/issues were identified for GE Betz:

- 1) That the warranty includes 100% mortality in the bioassay and diver assessments.
- 2) Confirmation that additional bioassays over 40 in total would cost \$1,400 each.
- 3) Clarification of project cost since two different prices were noted in the revision.
- 4) Confirmation that a control would be used in the bioassays.

A message was left with Doug Frassa but he did not return the call until after the day's rescoring was completed. BTW spoke with Doug regarding the questions and the final questions were faxed to GE Betz on June 24.

The following six questions/issues were identified for Aquatic Sciences:

- 1) Effects of biological processes on potassium concentration in the quarry.
- 2) Since equipment will be removed from the site prior to concentration monitoring, what target concentration is considered acceptable and what will be done if areas within the quarry do not reach these concentrations.
- 3) Potential effects upon mussels in Broad Run due to long-term leakage from Millbrook Quarry.
- 4) Statement of warranty regarding 100% mortality during bioassays and diver visual inspections, and any contingency plan.
- 5) Confirmation of additional costs for 80 bioassays as opposed to 40.
- 6) Any additional information regarding potassium impacts on freshwater mussels.

A message was left with Dan Butts and he did return the call prior to the completion of the day's rescoring. However, no answers could be provided prior to the completion of rescoring. RN was again concerned that Aquatic Sciences would not provide a specific warranty and had changed the language in their current proposal to eliminate any no-cost recharge of the quarry if potassium concentrations did not reach the target concentration. RN also questioned the longevity of potassium in the quarry and was concerned about impacts to mussels in Broad Run. Based on 7Q10 flow data obtained from the Occoquan Watershed Monitoring Laboratory, RN estimated that the concentrations in Broad Run could reach levels as high as 60 ppm during low flows if the maximum groundwater discharge from Millbrook

Quarry to Broad Run occurred. After much discussion, both proposals were tentatively rescored by the three panel members, pending final rescored upon submission of the additional information requested, and conducting of a mussel survey of Broad Run between Millbrook Quarry and Lake Manassas.

Aquatic Sciences

1. Describe the process to be used...

Scores ranged from 6 to 7, with RN raising his score from 5 to 6. This was mainly due to the charging process being reduced from 3 months to 4 weeks, which was more realistic in his opinion. RN still had reservations regarding the longevity of the potassium and obtaining 100% mixing in the quarry.

2. Provide documentation outlining that the process is effective...

All scores were 8, with RN raising his score from 7 to 8. Based on previous information provided by Aquatic Sciences and his opinion that the process was likely to eradicate zebra mussels, RN felt that his initial score for this criterion was too low.

3. Protocol and justification for monitoring chemical concentrations...

All ranged from 4-5, with BTW raising his score from 4 to 5 since he felt Aquatic Sciences was providing a complete monitoring plan to determine chemical concentrations within the quarry and his initial score was too low.

4. Identify the QA/QC policy...

No scoring changes were made based on discussion between the three panel members.

5. Monitoring protocol to document complete mortality of zebra mussels...

Scores ranged from 13 to 14 with RN raising his score from 12 to 14 and BTW raising his score from 12 to 13. Both panel members felt they had considered cost in the initial scoring and that the current monitoring protocol was necessary to determine success of the treatment.

6. Identify all warranties and exclusions...

Scores ranged from 2 to 3, with RN lowering his score from 3 to 2 and BTW raising his score from 2 to 3. RN again was concerned that Aquatic Sciences failed to provide a warranty given a second opportunity to do so, and questioned Aquatic Sciences' target potassium concentration since it was not specifically stated in the modified proposal. BTW felt that even though a specific warranty providing for 100% eradication was not given, the statement of longevity and attaining potassium concentrations at levels sufficient to kill zebra mussels provided a defacto warranty and raised his score from 2 to 3.

7. Analysis of potential short-term and long-term impacts...

Scores ranged from 1 to 4, with RN tentatively lowering his score from 2 to 1 and BTW raising his score from 3 to 4. RN was concerned over the potential impact to native freshwater mussels in Broad Run due to long-term leakage from the quarry. Based on 7Q10 data that he obtained from the Occoquan Watershed Monitoring Laboratory, he calculated that potassium concentrations in Broad Run could reach as high as 60 ppm during low flow conditions. He left his score as tentative, pending DGIF conducting a mussel survey of Broad Run above Lake Manassas to the quarry. BTW felt the impacts to mussels were a relatively minor issue given the impacts the zebra mussels would have if they escape.

8. Protocol and justification for monitoring water quality and chemistry...

Scores ranged from 4 to 5, with BTW changing his score from 4 to 5. This change was based on Aquatic Sciences' agreement to monitor local wells during and after treatment of the quarry.

9. For proposed treatments, provide documentation detailing hazards...

No scores changed.

10. The operational safety precautions...

No scores changed.

11. Need and justification for site security...

No scores changed.

12. Plans for provision of electric, water...

No scores changed.

13. Alterations and construction impacts...

No scores changed.

14. Description and history...

No scores changed.

15. A list of clients...

All score were the maximum of 2, with BTW raising his score from 1 to 2. BTW felt that the information Aquatic Sciences provided was complete and adjusted his score accordingly.

16. Identify and discuss the staffing levels and expertise...

No scores changed.

17. Identify the individuals from your company responsible....

No scores changed.

Based on the three panel member's rescoring of Aquatic Sciences' proposal, their score increased 8 points to 519 out of 600. The significant proposal alteration was the reduction in potassium charge time, which the three panel members viewed as very beneficial and more appropriate.

GE Betz

1. Describe the process to be used...

Scores ranged from 4 to 5, with BTW lowering his score from 5 to 4 due to concerns over mixing the chemical throughout the quarry and no long-term protection against future infestations.

2. Provide documentation outlining that the process is effective...

Scores ranged from 7 to 9, with RTF and BTW lowering their scores from 8 to 7. Scores were lowered due to the fact that this process is designed primarily for repetitive treatment protocols.

3. Protocol and justification for monitoring chemical concentrations...

Scores ranged from 2 to 4, with RTF lowering his score from 4 to 2 due to a lack of detail in their chemical concentration monitoring plan.

4. Identify the QA/QC policy...

No scores changed.

5. Monitoring protocol to document complete mortality of zebra mussels...

Scores ranged from 10 to 14, with RN raising his score from 13 to 14 and BTW raised his score from 8 to 10 since additional bioassays were added to the monitoring protocol.

6. Identify all warranties and exclusions...

Scores ranged from 2 to 4. RN raised his score from 3 to 4 since GE Betz did provide a written warranty. RTF lowered his score from 3 to 2 since the warranty is only good until GE Betz walks off the site because of difficulty proving origin of any zebra mussels detected after treatment.

7. Analysis of potential short-term and long-term impacts...

Scores ranged from 3 to 4, with RTF lowering his score from 4 to 3 due to impacts to organisms in the quarry and potential long-term impacts from release in sediments.

8. Protocol and justification for monitoring water quality and chemistry...

No scores changed.

9. For proposed treatments, provide documentation detailing hazards...

No scores changed.

10. The operational safety precautions...

No scores changed.

11. Need and justification for site security...

No scores changed.

12. Plans for provision of electric, water...

No scores changed.

13. Alterations and construction impacts...

No scores changed.

14. Description and history...

No scores changed.

15. A list of clients...

No scores changed.

16. Identify and discuss the staffing levels and expertise...

No scores changed.

17. Identify the individuals from your company responsible....

No scores changed.

Based on the three panel member's rescoring of GE Betz's proposal, their overall score decreased 3 points to 443 out of 600. The significant proposal alteration was the increase in bioassays from 4 to 20, which the three panel members viewed as very beneficial and more appropriate.

After review of the proposals and pending further clarification from both vendors, BTW and RTF favored the Aquatic Sciences proposal due to the long-term protection potassium provides and questions regarding the ability to achieve 100% mixing with Spectrus CT1300 given its short life span. RN felt both processes would work and favored Aquatic Sciences pending the results of the Broad Run mussel survey.

June 24, 2005

Answers to DGIF questions dated June 24, 2005 were received from GE Betz.

June 27, 2005

Answers to DGIF questions dated June 24, 2005 were received from Aquatic Sciences L.P.

June 28, 2005

The Evaluation Panel (minus RN and RGB) met to rescore the two proposals under consideration, based on evaluation of the proposal revisions and clarifications submitted by each vendor in response to the initial negotiations with DGIF. Prior to rescoring, the panel reviewed and discussed the new information from each vendor, an updated review of the groundwater relationships between Broad Run and Millbrook Quarry by WLL, and results of the mussel survey of Broad Run conducted by DGIF staff (BTW and Stephanie Huffer)

Aquatic Sciences

1. Describe the process to be used...

Scores ranged from 5 to 7. Most panel members had scored this criterion relatively high during the initial scoring and felt no changes were necessary. KW raised his score from 5 to 7 based on the reduction in the charging period and his opinion that the modified proposal reflected a more realistic process for the problem.

2. Provide documentation outlining that the process is effective...

Scores ranged from 7 to 9. Most panel members had scored this criterion relatively high during the initial scoring and felt no changes were necessary. KW raised his score from 6 to 7 feeling that he had scored the proposal too low during initial scoring, relative to his score for the other proposals.

3. Protocol and justification for monitoring chemical concentrations...

Scores ranged from 4 to 5. Most panel members had scored this criterion relatively high during the initial scoring and felt no changes were necessary. KW raised his score from 3 to 4 feeling that he had scored the proposal too low during initial scoring, relative to his score for the other proposals.

4. Identify the QA/QC policy...

No scores changed.

5. Monitoring protocol to document complete mortality of zebra mussels...

Scores ranged from 12 to 14. Most panel members had scored this criterion relatively high during the initial scoring and felt no changes were necessary, particularly since modifications were made to the bioassay testing. KW raised his score from 12 to 14 based on the bioassay modifications and the overall thoroughness of the zebra mussel monitoring plan.

6. Identify all warranties and exclusions...

Scores ranged from 2 to 3. Most panel members felt the modified proposal provided no new information to alter their score. Aquatic Sciences still did not provide a direct warranty or guarantee of 100% zebra mussel eradication. WLL lowered his score from 4 to 3 based on concerns over achieving the target potassium concentration sufficiently throughout the quarry prior to equipment breakdown and bioassay testing.

7. Analysis of potential short-term and long-term impacts...

Scores ranged from 1 to 4 with no changes. The panel members present felt that any impacts to native freshwater mussels in Broad Run due to potassium leakage from Millbrook Quarry was an acceptable risk given the known impacts of zebra mussels, and their initial score reflected this accordingly. Regarding potential potassium concentrations in Broad Run based on ground water outflow from Millbrook Quarry, WLL (DMME) clarified that use of the 0.65 cfs figure as the maximum outflow from Millbrook Quarry to Broad Run was inappropriate. Rather, this figure is the total estimated groundwater contribution to Broad Run below Millbrook Quarry, based on measured flow increases of 10%, only part of which comes from the Quarry. Based on some new isotope data, WLL estimates that about 25% of the increased flow in Broad Run comes from Millbrook Quarry. Therefore, the total contribution from Millbrook Quarry would be in the neighborhood of 2.5% at the flow levels when they sampled. If this is correct and flow conditions were such that all flow was coming from this groundwater input, then the K levels in Broad Run would be a maximum of about 25 ppm if the concentrations in the quarry were 100 ppm. This figure will decrease dependent on what percent of total flow the groundwater constitutes. At the low flows they measured in 2004, the concentration would have been 2.5 ppm based on these estimates. These levels are significantly lower than the concentrations calculated by RN. The background level of potassium in Broad Run is about 1.25 ppm.

8. Protocol and justification for monitoring water quality and chemistry...

Scores ranged from 4 to 5. Most panel members had scored this criterion relatively high during the initial scoring and felt no changes were necessary.

9. For proposed treatments, provide documentation detailing hazards...

No scores changed.

10. The operational safety precautions...

No scores changed.

11. Need and justification for site security...

No scores changed.

12. Plans for provision of electric, water...

No scores changed.

13. Alterations and construction impacts...

No scores changed.

14. Description and history...

No scores changed.

15. A list of clients...

No scores changed.

16. Identify and discuss the staffing levels and expertise...

No scores changed.

17. Identify the individuals from your company responsible....

No scores changed.

The total score for Aquatic Sciences proposal increased 5 points, raising the proposal score from 519 to 524.

GE Betz

1. Describe the process to be used...

Scores ranged from 3 to 5. Based on continued discussion regarding the potential to achieve 100% mixing in the quarry in light of the short life span of Spectrus CT1300, and when compared to the potassium proposal, most panel members felt the modified proposal provided no new information to alter their score. HP and KW lower their scores from 5 to 4, and from 7 to 5, respectively, based on the unlikelihood of achieving 100% mixing in the quarry.

2. Provide documentation outlining that the process is effective...

Scores ranged from 7 to 9. Most panel members had scored this criterion relatively high during their initial scoring and felt no changes were necessary based on the new information provided by GE Betz. HP lowered his score from 8 to 7 over concern regarding potential for incomplete mixing, and primary use of product in repeated treatment cycles.

3. Protocol and justification for monitoring chemical concentrations...

Scores ranged from 2 to 4. WLL, HP, and KW lowered their scores by a single point due to the continued lack of any type of detailed chemical monitoring plan.

4. Identify the QA/QC policy...

Score ranged from 1 to 2. During initial rescoring with RN on June 23, no scoring changes were made. However, during this meeting the concern was raised regarding the use of subcontractors and the fact that we had no information for one identified subcontractor and one was yet to be identified. Based on this discussion 4 panel members lowered their scores from 2 to 1, with the other 3 remaining at 1. This issue will be conveyed to RN for possible rescoring when his scores are discussed for a final time.

5. Monitoring protocol to document complete mortality of zebra mussels...

Scores ranged from 8 to 14. This criterion again served as the most significant difference between the panel members but after discussion, only two members remained with a high score; all others were

between 8 and 10. A primary concern regarded GE Betz's determination that a closed mussel would be considered dead in the bioassays. A number of panel members were uncomfortable with this bioassay standard since a closed mussel may not be dead, and jostling of bioassay containers during collection may induce zebra mussels to close. Likewise, no recovery time was allowed for any bioassay mussels, as is provided in the Aquatic Sciences proposal, and no control was initially planned until suggested by DGIF. Accordingly, JBH raised her score from an 8 to a 9; while RTF, WLL, and HP lowered their scores to 9, 8, and 9, respectively.

6. Identify all warranties and exclusions...

Scores ranged from 2 to 4 with no net change in the overall score for this criterion. Most panel members felt that the new information provided did not alleviate any concerns they had regarding the limited nature of GE Betz's warranty. WLL lowered his score to 3, to reflect this concern, while HP raised his score to 3 because GE Betz was providing a stated warranty.

7. Analysis of potential short-term and long-term impacts...

Scores ranged from 1 to 4. Most panel members felt that the new information provided did not alleviate any concerns they had regarding impacts; only HP lowered his score by a single point. This was due to concern regarding potential for long-term impacts due to release of chemicals bound in sediments.

8. Protocol and justification for monitoring water quality and chemistry...

Scores ranged from 2 to 4. Most panel members felt their initial scores were satisfactory regardless of the new information provided. HP and KW lowered their scores by a single point since no pre- or post-monitoring was to occur. JBH panel member raised her score a single point feeling the initial score was too low, particularly since GE Betz would now monitor Broad Run and local wells.

9. For proposed treatments, provide documentation detailing hazards...

No scores changed.

10. The operational safety precautions...

Score ranged from 1 to 2. During initial rescoring with RN on June 23, no scoring changes were made. However, during this meeting the concern was raised regarding the use of subcontractors and the fact that information for one identified subcontractor stipulated that the proposed diving was research oriented and not OSHA applicable, and one subcontractor was yet to be identified. Based on this discussion, RTF, WLL, HP, and KW lowered their scores from 2 to 1. This issue will be conveyed to RN for possible rescoring when his scores are discussed for a final time.

11. Need and justification for site security...

Scores ranged from 1 to 3. RTF and WLL lowered their score a single point since when compared to Aquatic Sciences, GE Betz did not provide complete information regarding site security.

12. Plans for provision of electric, water...

All scores were 2. JBH raised her score from 1 to 2 after panel discussion showing complete information was provided.

13. Alterations and construction impacts...

No scores changed.

14. Description and history...

Scores ranged from 1 to 3. WLL lowered his score from 3 to 2 since this information was lacking for the subcontractors.

15. A list of clients...

Scores ranged from 1 to 2. RTF and BTW lowered their scores from 2 to 1 since this information was lacking for the one identified subcontractor and one subcontractor had yet to be identified.

16. Identify and discuss the staffing levels and expertise...

Scores ranged from 1 to 2. RTF, WLL, and HP lowered their scores a single point since this information was lacking for the one identified subcontractor and one subcontractor had yet to be identified.

17. Identify the individuals from your company responsible....

Scores ranged from 1 to 3. WLL lowered his score a single point since this information was lacking for the one identified subcontractor and one subcontractor had yet to be identified.

The total score for GE Betz's proposal decreased 32 points, lowering the proposal score from 443 to 411.

July 1, 2005

RTF and BTW met with RGB to rescore the modified proposals under consideration. Prior to rescoring, they reviewed and discussed the new information from each vendor, the updated review of the groundwater relationships between Broad Run and Millbrook Quarry by WLL, and results of the mussel survey of Broad Run conducted by DGIF staff (BTW and Stephanie Huffer)

Aquatic Sciences

1. Describe the process to be used...

RGB raised his score from 5 to 6 based on the reduced period of time needed to charge the quarry.

2. Provide documentation outlining that the process is effective...

No scores changed.

3. Protocol and justification for monitoring chemical concentrations...

No scores changed.

4. Identify the QA/QC policy...

RGB raised his score from 1 to 2 since he felt all necessary information was provided and that he had initially scored the proposal too low on this criterion.

5. Monitoring protocol to document complete mortality of zebra mussels...

No scores changed.

6. Identify all warranties and exclusions...

No scores changed.

7. Analysis of potential short-term and long-term impacts...

No scores changed.

8. Protocol and justification for monitoring water quality and chemistry...

No scores changed.

9. For proposed treatments, provide documentation detailing hazards...

No scores changed.

10. The operational safety precautions...

No scores changed.

11. Need and justification for site security...

No scores changed.

12. Plans for provision of electric, water...

No scores changed.

13. Alterations and construction impacts...

No scores changed.

14. Description and history...

No scores changed.

15. A list of clients...

No scores changed.

16. Identify and discuss the staffing levels and expertise...

No scores changed.

17. Identify the individuals from your company responsible....

No scores changed.

Total score increased by 2 points, raising the proposal score from 524 to 526.

GE Betz

1. Describe the process to be used...

No scores changed.

2. Provide documentation outlining that the process is effective...

No scores changed.

3. Protocol and justification for monitoring chemical concentrations...

No scores changed.

4. Identify the QA/QC policy...

No scores changed.

5. Monitoring protocol to document complete mortality of zebra mussels...

No scores changed.

6. Identify all warranties and exclusions...

RGB lowered score from 4 to 3 due to concern over proving the origin of any remaining zebra mussels (introduced vs. missed during treatment process).

7. Analysis of potential short-term and long-term impacts...

No scores changed.

8. Protocol and justification for monitoring water quality and chemistry...

No scores changed.

9. For proposed treatments, provide documentation detailing hazards...

No scores changed.

10. The operational safety precautions...

RGB lowered score from 2 to 1 due to lack of information for subcontractors.

11. Need and justification for site security...

No scores changed.

12. Plans for provision of electric, water...

No scores changed.

13. Alterations and construction impacts...

No scores changed.

14. Description and history...

No scores changed.

15. A list of clients...

No scores changed.

16. Identify and discuss the staffing levels and expertise...

No scores changed.

17. Identify the individuals from your company responsible....

No scores changed.

Total score was lowered by 2 points, reducing the proposal score from 411 to 409.

July 13, 2005

RTF and BTW held a conference call with RN to review any outstanding scoring issues based on final clarification provided by each vendor as discussed at the June 28 panel meeting, the updated review of the groundwater relationships between Broad Run and Millbrook Quarry by WLL, and results of the mussel survey of Broad Run conducted by DGIF staff (BTW and Stephanie Huffer) on June 29.

Aquatic Sciences

1. Describe the process to be used...

RN raised score from 6 to 7 based on clarification of target concentrations in the quarry.

2. Provide documentation outlining that the process is effective...

RN raised score from 8 to 9 based on clarification of target concentrations in the quarry.

3. Protocol and justification for monitoring chemical concentrations...

RN raised score from 4 to 5 since the Aquatic Sciences monitoring protocol was more detailed than GE Betz's monitoring protocol.

7. Analysis of potential short-term and long-term impacts...

RN raised score from 1 to 3 since no rare mussels were found in the survey of Broad Run, and due to clarification of potential maximum ground water outflow to Broad Run from Millbrook Quarry and lowered potential maximum potassium concentrations.

Total Aquatic Sciences' proposal score increased 5 points for a final score of 531.

GE Betz

4. Identify the QA/QC policy...

RN lowered score from 2 to 1 due to lack of information from subcontractors regarding their QA/QC protocols.

5. Monitoring protocol to document complete mortality of zebra mussels...

On review of the "closed mussel is a dead mussel" issue discussed at length by the panel on June 28, RN lowered his score back down to 13 for this criterion, unless further negotiations resulted in an appropriate modification of the monitoring protocol to ensure that closed mussels were, in fact, dead.

GE Betz's total score was reduced 2 points, for a final score of 407.

Based on the final scoring and review of information provided, RN recommended the potassium treatment option due to the potential for long-term protection against future infestations and the safety net it provides in the event of incomplete mixing of chemicals introduced into the quarry

July 14, 2005

Final panel scores for revised proposals by Aquatic Sciences and GE Betz were tabulated by RTF and submitted to EW for review.

15 August 2005

Final scores indicated that the proposal with the negotiated changes from Aquatic Sciences was the best proposal. A final document was requested from Aquatic Sciences clarifying their warranty and pricing.

19 August 2005

Document from Aquatic Sciences, dated 18 August 2005 and clarifying their warranty and pricing, was received.

24 August 2005

A Notice of Award and Contract were sent to Aquatic Sciences. A Notice of Award was posted and was sent to both GE Betz and Amark.

Summary of Zebra Mussel RFP Evaluation

Aquatic Sciences: The Panel's initial evaluation of Aquatic Sciences' zebra mussel eradication proposal yielded a score of 511 out of a possible 600 points, without consideration of pricing. The proposal was very thorough, well written, and addressed most areas completely. Upon review of the revised proposal and negotiated conditions, whereby Aquatic Sciences greatly reduced the period of days required for initial treatment, enhanced their already robust monitoring protocol, and strengthened their warranty and contingency plans, the Panel score for this vendor's proposal increased to 531 points. The Panel unanimously selected the Aquatic Sciences muriate of potash treatment proposal as the preferred alternative. The Panel is confident that use of potassium as proposed offers the greatest likelihood of successfully eradicating the zebra mussel population in Millbrook Quarry with virtually no significant adverse environmental impacts, and furthermore will provide long-term protection against reinfestation of the quarry with zebra mussels. Upon consideration of the final price negotiated with Aquatic Sciences, the final score for this proposal is 88.264 points.

GE Betz: The Panel's initial evaluation of GE Betz's zebra mussel eradication proposal yielded a score of 446 out of a possible 600 points, without consideration of pricing. The proposal was well written but lacking detail in some areas. Spectrus CT1300 (Clamtrol) is effective at killing zebra mussels, but the committee questioned whether it would be 100% effective in the quarry due to possibly inadequate mixing of the water column and the chemical's short life span. Likewise, there was concern regarding GE Betz's monitoring protocols and the stated warranty (i.e., how it would be determined whether living zebra mussels discovered after treatment had survived the treatment, or been subsequently introduced). Upon review of the revised proposal and negotiated conditions, whereby GE Betz substantially enhanced their zebra mussel mortality monitoring and provided further assurances regarding other aspects of their proposal, but was unable to assuage concerns regarding Clamtrol's short effective lifespan and the resulting lack of continuing protection against reinfestation of the quarry with zebra mussels, the Panel score for this vendor's proposal was lowered to 407 points. Upon consideration of the final price negotiated with GE Betz, the final score for this proposal is 75.875 points.

Amark: The Panel's initial evaluation of Amark's zebra mussel eradication proposal yielded a score of 220 out of a possible 600 points, without consideration of pricing. The Panel is highly doubtful that the proposed drop in dissolved oxygen concentration to 4 ppm would be sufficient to achieve 100% eradication of the zebra mussel population in Millbrook Quarry, and questioned whether Amark could

achieve and maintain a level even that low since the quarry is an open system. The committee had serious reservations regarding the lack of a warranty to eradicate the zebra mussel population, but only to inject 225,000 to 250,000 lbs of CO₂ into the quarry. Additionally, no monitoring of zebra mussel mortality was to be performed and the dissolved oxygen concentration monitoring was not detailed nor would the results be guaranteed. Overall, the committee felt the proposal lacked technical merit, assurances, and reasonable chance of success; and lacked adequate documentation in many areas. Therefore, the committee unanimously recommended that Amark's proposal not be further considered, and that no negotiations with that potential vendor were warranted. Upon completion of negotiations with the other vendors, scoring of Amark's original proposal yielded a final score of 37.758 points.

Appendix E. Virginia Department of Game and Inland fisheries FWIS Review

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 Compiled 8/16/2005 Biologist 60452

<http://www.dgif.virginia.gov/http://www.dgif.virginia.gov/>

Project Review Report

List of threatened and endangered species and wildlife resources known or likely to occur within a **2 mile radius of (point 38,49,16 -77,42,12)** in **061 Fauquier, 153 Prince William, VA**. This report is compiled on 8/16/2005,11:14:02 PM

Threatened and Endangered Species Occurrences.

*FE=Federal Endangered; FT=Federal Threatened; FC=Federal Candidate; FS=Federal Species of Concern (not a legal status; list maintained by USFWS Virginia Field Office); SE=State Endangered; ST=State Threatened; SS=State Special Concern (not a legal status).

Bova Code	Status *	Common Name	Scientific Name	Confirmed	Database(s)
060003	FESE	Wedgemussel, dwarf	Alasmidonta heterodon	No	BOVA
040093	FTST	Eagle, bald	Haliaeetus leucocephalus	No	BOVA
040379	FSST	Sparrow, Henslows	Ammodramus henslowii	No	BOVA
040320	FS	Warbler, cerulean	Dendroica cerulea	No	BOVA
060006	FSSE	Floater, brook	Alasmidonta varicosa	No	BOVA
060029	FSSS	Lance, yellow	Elliptio lanceolata	No	BOVA
100248	FS	Fritillary, regal	Speyeria idalia idalia	No	BOVA
010032	FSSS	Sturgeon, Atlantic	Acipenser oxyrhynchus	No	BOVA
010363	FS	Darter, Appalachia	Percina gymnocephala	No	BOVA
040292	FSST	Shrike, migrant loggerhead	Lanius ludovicianus migrans	No	BOVA
040293	ST	Shrike, loggerhead	Lanius ludovicianus	No	BOVA
040129	ST	Sandpiper, upland	Bartramia longicauda	No	BOVA
040180	SS	Tern, Forsters	Sterna forsteri	No	BOVA
040189	SS	Tern, Caspian	Sterna caspia	No	BOVA
040204	SS	Owl, barn	Tyto alba pratincola	No	BOVA
040210	SS	Owl, long-eared	Asio otus	No	BOVA
040213	SS	Owl, northern saw- whet	Aegolius acadicus	No	BOVA
040262	SS	Nuthatch, red-breasted	Sitta canadensis	No	BOVA
040264	SS	Creeper, brown	Certhia americana	No	BOVA
040266	SS	Wren, winter	Troglodytes troglodytes	No	BOVA
040270	SS	Wren, sedge	Cistothorus platensis	No	BOVA
040278	SS	Thrush, hermit	Catharus guttatus	No	BOVA
040285	SS	Kinglet, golden- crowned	Regulus satrapa	No	BOVA
040306	SS	Warbler, golden- winged	Vermivora chrysoptera	No	BOVA
040314	SS	Warbler, magnolia	Dendroica magnolia	No	BOVA
040032	SS	Egret, great	Ardea alba egretta	No	BOVA

040036	SS	Night-heron, yellow-crowned	Nyctanassa violacea violacea	No	BOVA
040364	SS	Dickcissel	Spiza americana	No	BOVA
040366	SS	Finch, purple	Carpodacus purpureus	No	BOVA
040372	SS	Crossbill, red	Loxia curvirostra	No	BOVA
050045	SS	Otter, northern river	Lontra canadensis lataxina	No	BOVA
040094	SS	Harrier, northern	Circus cyaneus	No	BOVA
040112	SS	Moorhen, common	Gallinula chloropus cachinnans	No	BOVA

Anadromous Fish Use Reaches Records - No Records found.

Colonial WaterBird (CWB) Survey Records - No Records found.

Threatened and Endangered Species Waters - No Records found.

Cold Water Stream Survey (CWSS) Reaches - No Records found.

Commonwealth of Virginia Land Holdings

ID	Name
175	Bull Run Mountains State Natural Area Preserve

Appendix F. Virginia Department of Conservation and Recreation Review

W. Tayloe Murphy, Jr.
Secretary of Natural
Resources



Joseph H. Maroon
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

217 Governor Street
Richmond, Virginia 23219-2010
Telephone (804) 786-7951 FAX (804) 371-2674 TDD (804) 786-2121

MEMORANDUM

DATE: September 15, 2005
TO: Ray Fernald, Virginia Department of Game and Inland Fisheries
FROM: S. Rene' Hypes, Department of Conservation & Recreation
SUBJECT: Zebra Mussel Eradication Project-Millbrook Quarry in Prince William County

The Department of Conservation and Recreation (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Biotics documents the presence of natural heritage resources in the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

Under a Memorandum of Agreement, DCR represents the Virginia Department of Agriculture and Consumer Services (VDACS) in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

In addition, our files do not indicate the presence of any State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Any absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. New and updated information is continually added to Biotics. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters, which may contain information not documented in this letter. Their database may be accessed from www.dgif.virginia.gov/wildlife/info_map/index.html, or contact Shirl Dressler at (804) 367-6913.

Thank you for the opportunity to comment on this project.

*State Parks • Soil and Water Conservation • Natural Heritage • Outdoor Recreation Planning
Chesapeake Bay Local Assistance • Dam Safety and Floodplain Management • Land Conservation*

Appendix G. Virginia Department of Historic Resources Review



COMMONWEALTH of VIRGINIA

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

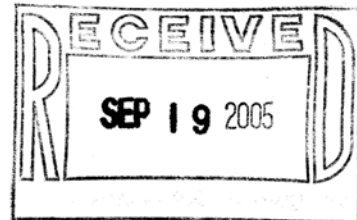
Department of Historic Resources
2801 Kensington Avenue, Richmond, Virginia 23221

Kathleen S. Kilpatrick
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
TDD: (804) 367-2386
www.dhr.virginia.gov

September 15, 2005

Mr. Ray Fernald
Nongame & Environmental Services
VA Dept. of Game & Inland Fisheries
4010 W. Broad St.
Richmond, Virginia 23230



Re: Eradication of Zebra Mussels in Millbrook Quarry
Prince William County, Virginia
DHR File No. 2005-1260

Dear Mr. Fernald:

We have received information regarding the above-referenced project for our review and comment. The proposed project involves the chemical infusion of Millbrook Quarry pond to eradicate an invasive species of mussel. Ground disturbance related to the necessary staging area will be confined to previously disturbed uplands adjacent to the quarry. Existing roads will be used for site access. Our archives show no historic properties in the Area of Potential Effect; however, the project is located within a quarter mile of the mapped boundaries of the National Register-listed Thoroughfare Gap Battlefield (DHR ID #030-1016).

Based on the information provided, a determination of *no historic properties affected* is appropriate for this undertaking. Should the scope of the undertaking change or additional monitoring activities involving ground disturbance be deemed necessary, please provide this information to our office for consideration and comment. Thank you for requesting comment from our office on the potential impacts of this project on historic resources. If you have any questions about our review process or comments, please do not hesitate to call me at (804) 367-2323, Ext. 153 or email roger.kirchen@dhr.virginia.gov.

Sincerely,

Roger W. Kirchen, Archaeologist
Office of Review and Compliance

Cc: Mr. John Wilson, U.S. Fish & Wildlife Service, Region Five

Administrative Services
10 Courthouse Avenue
Petersburg, VA 23803
Tel: (804) 863-1624
Fax: (804) 862-6196

Capital Region Office
2801 Kensington Ave.
Richmond, VA 23221
Tel: (804) 367-2323
Fax: (804) 367-2391

Tidewater Region Office
14415 Old Courthouse Way, 2nd Floor
Newport News, VA 23608
Tel: (757) 886-2807
Fax: (757) 886-2808

Roanoke Region Office
1030 Penmar Ave., SE
Roanoke, VA 24013
Tel: (540) 857-7585
Fax: (540) 857-7588

Winchester Region Office
107 N. Kent Street, Suite 203
Winchester, VA 22601
Tel: (540) 722-3427
Fax: (540) 722-7535

Appendix H. Potash Material Safety Data Sheet

Material Safety Data Sheet

Revision Issued: July 10, 2003 Supersedes: May 31, 2001 First Issued:

Section I - Product and Company Identification

Product Name: **Potash**

PotashCorp MSDS No.: 1
ERG No.: n/a



1101 Skokie Blvd., Northbrook, IL 60062
Phone (800) 241-6908 * (847) 849-4200

Suite 500, 122 - 1st Avenue South
Saskatoon, Saskatchewan Canada S7K 7G3
Phone (800) 667-0403 from Canada *
(800) 667-3930 from USA

Emergencies (800) 424-93000 (CHEMTREC)
Web Site www.potashcorp.com
Health Emergencies, Contact Your Local Poison Center



Common Name: Potash Formula: KCl Synonym: Muriate of Potash Uses: Fertilizer, Industrial Chemical

Section II - Composition/Information On Ingredients

CHEMICAL NAME	CAS No.	Exposure Limits								
		OSHA PEL		TLV - TWA		STEL		CEIL	% by	
		mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	Weight
Potassium Chloride	7447-40-7									95-99.8
Sodium Chloride	7647-14-5			10*						0.1-4

May contain up to 0.25% base lubrication oil and/or 0.03% neutralized primary aliphatic amines

* Based on ACGIH nuisance dust limits

Section III - Hazard Identification

Potential Acute Health Effects: May cause irritation

Eyes and Skin: Mild irritation, especially in open wounds.

Inhalation: Exposure to high dust concentrations may cause irritation of mucous membranes.

Ingestion: A large body load may cause vomiting, diarrhea, cramps, tingling in hands and feet, weak pulse, and circulatory disturbances.

Potential Chronic Health Effects: Lung symptoms

CARCINOGENICITY LISTS: IARC Monograph: No NTP: No OSHA: No

Section IV - First Aid Measures

Eyes: Flush eyes with water, including under upper and lower lids, for at least 15 minutes. Get medical attention if pain and irritation persists.

Skin: Wash thoroughly with water. Obtain medical advice if rash develops.

Ingestion: Administer water if patient is conscious. Ingesting potash will usually cause purging of the stomach by vomiting. Obtain medical attention.

Inhalation: Remove to fresh air. Obtain medical attention if discomfort persists.

Section V - Fire Fighting Measures.

Flash Point: Not Applicable **Autoignition Temperature:** Not Applicable

Lower Explosive Limit: Not Applicable **Upper Explosive Limit:** Not Applicable

Unusual Fire and Explosion Hazards: When subjected to extremely high temperatures, it may release small quantities of chlorine gas.

Extinguishing Media: As required for surrounding fire. Potash is non-flammable and does not support combustion.

Special Firefighting Procedures and Equipment: Wear full protective clothing and self-contained breathing apparatus.

Section VI - Accidental Release Measures

Small Spill:	Sweep up and use as fertilizer if non-contaminated.
Large Spill:	Collect with appropriate equipment. If on a hard surface, sweep up residue with brooms. If on soil, remove and collect the top 5cm of soil.
Release Notes:	Non-toxic to aquatic organisms as defined by USEPA. If in the U.S., contact the US COAST GUARD NATIONAL RESPONSE CENTER toll free number 800-424-8802. In case of accident or road spill notify: CHEMTREC IN USA at 800-424-9300; CANUTEC in Canada at 613-996-6666 CHEMTREC in other countries at (International code)+1-703-527-3887.
Comments:	See Section XIII for disposal information and Section XV for regulatory requirements. Large and small spills may have a broad definition depending on the user's handling system. Therefore, the spill category must be defined at the point of release by technically qualified personnel.

Section VII - Handling and Storage

Ventilation:	Local exhaust to reduce dust concentrations below recommended levels.
Handling:	Avoid generating dust by excessive or unnecessary movement.
Storage:	Store in a dry location. Avoid contact with aluminum or carbon steel to minimize corrosion.

Section VIII - Exposure Controls/Personal Protection

Engineering Controls: May be necessary to minimize dust levels.

PERSONAL PROTECTION:

Eye Protection:	Use tight-fitting safety goggles in areas of high dust concentration.
Protective Clothing:	Gloves, long sleeve shirts and long pants. Launder work clothing regularly.
Respiratory Protection:	NIOSH approved dust respirators until engineering controls are implemented.
Other Protective Clothing or Equipment:	Optional.

Section IX - Physical and Chemical Properties

Appearance/Color/Odor:	White to red solid, fine to 4mm size, granules which may have a slight oily odour.	
Melting Point/Range:	771-773°C	Boiling Point: 1500°C (sublimates)
Solubility in Water:	347 g/L @ 20°C	Boiling Point/Range: 1420-1500°C
Specific Gravity (H₂O=1):	2	Vapor Pressure(mmHg): Not Applicable (no data available)
Vapor Density:	Not Applicable	Molecular Weight: 74
Bulk Density:	1.98 g/ml	% Volatiles: <0.5
pH:	about 7	Evaporation Rate: Not Applicable
Viscosity:	Not Applicable	

Section X - Stability and Reactivity

Stability:	Stable
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	None
Materials to Avoid (Incompatibles):	Contact with strong acid may produce hydrogen chlorine gas; contact with hot nitric acid may product toxic nitrosyl chloride.
Hazardous Decomposition Products:	None

Section XI - Toxicological Information

Significant Routes of Exposure:	Skin, eyes, ingestion, inhalation
Toxicity to Animals:	Acute Oral Toxicity: (mouse, rat) LD ₅₀ = 1500 - 2600 mg/kg bw. Skin Irritation/Corrosion: No data available. Eye Irritation/Corrosion: No data available
Special Remarks on Toxicity to Animals:	Based on toxicity data for another salt compound (i.e. potassium nitrate). Not expected to be toxic by dermal exposure as defined by OSHA. Genetic Toxicity <i>in vitro</i> – Gene mutation – (<i>Saccaromyces cerevisiae</i>) - Mitotic recombination: NOAEL = 300 mM.
Other Effects on Humans:	Large doses by mouth can cause gastrointestinal irritation, purging, weakness and circulatory disturbances. Potassium chloride used as a dietary supplement in food for human consumption is generally recognized as safe (GRAS).
Special Remarks on Chronic Effects on Humans:	Not reported to be carcinogenic mutagenic, teratogenic or allergenic
Special Remarks on Other Effects on Humans:	None.

Section XII - Ecological Information

Ecotoxicity:	Acute toxicity to Fish: (<i>Lepomis macrochirus</i>) (blue gill) – 96 hour - LC ₅₀ = 2010 KCl/L; Acute Toxicity to Aquatic Invertebrates: (<i>Daphnia magna</i>) - 48 hours - EC ₅₀ = 337 – 825 mg/L; (<i>Physa heterostropha</i>) - 96 hrs - LC ₅₀ = 940 mg/L. Acute Toxicity to Aquatic Plants (Algae) (<i>Nitzschia linearis</i>) diatom - 5 days- 120 hour TL _m = 1,337 ppm KCl; (<i>Scenedesmus subspicatus</i>) 72 hour - EC ₅₀ = 2,500 mg/L. (<i>Chlorella vulgaris</i>) - 3 – 4 months - NOEC = 600 KCl/L, LOEL = 700 KCl/L. Chronic Toxicity to Fish: No data available. Chronic Toxicity to Aquatic Invertebrates: No data available.
Environmental Fate:	Will remain in solution until solubility product (350 g/L) reached. Ions may be absorbed by plants or by animals ingesting water containing potash. Stability in water: Ions can persist, dissociates in water. Stability in soil: Binds to clay particles. Distribution: 1.51 x 10 ⁻⁸ % to air; 45.2 % to water; 54.7% to soil; 0.0755% to sediment.
Toxicity:	Not toxic to aquatic organisms defined by USEPA.
Degradation Products:	Chloride and potassium ions. No data available for biodegradability, photodegradation or bioaccumulation.

Section XIII - Disposal Considerations

Product Disposal:	Uncontaminated product may be used as fertilizer. Otherwise, dispose according to Federal State or Provincial regulations in a landfill approved to receive potash.
General Comments:	Because of its solubility, potash should not be disposed of in a location where run-off will escape.

Section XIV - Transportation Information

	USDOT	TDG - Canada
Proper Shipping Name:	Not Regulated	Not Regulated
Hazard Class:		
Identification Number:		
Packing Group (Technical Name):		
Labeling / Placarding:		
Authorized Packaging:		
Notes:		
European Transportation:		

Section XV - Regulatory Information**UNITED STATES:****SARA Hazard****Category:**

This product has been reviewed according to the EPA Hazard Categories promulgated under Section 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Fire: No Pressure Generating: No Reactivity: No Acute: No Chronic: No

40 CFR Part 355-Extremely Hazardous Substances:

40 CFR Part 370-Hazardous Chemical Reporting:

All intentional ingredients listed on the TSCA inventory.

SARA Title III**Information:**

This product contains the following substances subject to the reporting requirements of Title III (EPCRA) of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

Chemical	CAS No.	Percent by Weight	CERCLA RQ (lbs)*	SARA (1986) Reporting		
				311	312	313
Potassium Chloride	7447-40-7	95-99.8	NA	No	No	No
Sodium Chloride	7647-14-5	0.1-4	Na	No	No	No

CERCLA/Superfund, 40 CFR Parts 117,302: If this product contains components subject to substances designated as **CERCLA Reportable Quantity (RQ) Substances**, it will be designated in the above table with the RQ value in pounds. If there is a release of RQ Substance to the environment, notification to the National Response Center, Washington D.C. (1-800-424-8802) is required.

CANADA:

WHMIS Hazard Symbol and Classification: Not Controlled

Ingredient Disclosure List: This product does contain ingredient(s) on this list.

Environmental Protection: All intentional ingredients are listed on the DSL (Domestic Substance List).

EINECS#: (Potassium Chloride) 231-211-8

(Sodium Chloride) 231-554-3

California: Prop 65: This is not a chemical known to cause cancer, nor is it listed.

Section XVI - Other Information

NFPA Hazard Ratings: Health: 1 Fire: 0 Reactivity: 0 Special Hazards: _____
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

COMMENTS:

Section(s) changed since last revision: V, IX, XI, XII, XV

Although the information contained is offered in good faith, SUCH INFORMATION IS EXPRESSLY GIVEN WITHOUT ANY WARRANTY (EXPRESS OR IMPLIED) OR ANY GUARANTEE OF ITS ACCURACY OR SUFFICIENCY and is taken at the user's sole risk. User is solely responsible for determining the suitability of use in each particular situation. PCS Sales specifically DISCLAIMS ANY LIABILITY WHATSOEVER FOR THE USE OF SUCH INFORMATION, including without limitation any recommendation which user may construe and attempt to apply which may infringe or violate valid patents, licenses, and/or copyright.