EXPRESSION OF INTEREST

CEDAR LAKES DAM RESTORATION/ WAREHOUSE STABILIZATION PROJECT

AGR 1800000001

FEBRUARY 1, 2018

Submitted to:
Department of Administration, Purchasing Division
Buyer: Guy Nisbet
2019 Washington Street East
Charleston, WV 25305-0130

Submitted by:
Michael Baker International, Inc.
400 Washington Street, East, Suite 301
Charleston, WV 25301

Michael Baker
INTERNATIONAL

Michael Baker
INTERNATIONAL

We Make a Difference

February 1, 2018

Mr. Guy Nisbet
Department of Administration, Purchasing Division
2019 Washington Street East
Charleston, WV 25305-0130

RE: Expression of Interest - Cedar Lakes Dam Restoration/Warehouse Stabilization Project AGR1800000001

Dear Mr. Nisbet,

The Charleston office of Michael Baker International, Inc. (Michael Baker) is pleased to present our qualifications for professional design services to support the Cedar Lakes Dam Restoration/Warehouse Stabilization Project.

Michael Baker is very well qualified to assist the West Virginia Department of Agriculture given our recent and ongoing experience with dam rehabilitations and slope stabilization in West Virginia, Ohio, Pennsylvania, and across the country. Michael Baker is currently providing all of the potential required services for the Cedar Lakes Dam Restoration and Warehouse Stabilization on existing projects and has the resources and expertise to ensure the project is a success. We have a proven track record of delivering our dam rehabilitation projects on-time and on-budget, even successfully expediting projects when requested. The success of our team is built around a dedicated dam rehabilitation team who will be committed to the Cedar Lakes Dam and Warehouse Stabilization project, including our proposed project manager, Mr. Patrick Fogarty. This team is well established and has a proven track record on very similar dam safety and slope stabilization contracts.

Michael Baker has already visited the Cedar Lakes Dam and Warehouse sites to better understand the project and develop thoughts on our proposed project approach as detailed in our expression of interest. The project approach will be further developed and refined in coordination with the Department of Agriculture, but our preliminary work along with our extensive experience with dam rehabilitation and the availability of key staff will allow Michael Baker to begin work on the project quickly and efficiently. Michael Baker's previous dam rehabilitation projects have included value engineering and development of innovative solutions to reduce overall project budgets while still meeting project objectives.

Michael Baker is a full-service national engineering firm with expertise in dam rehabilitations, water resources, geotechnical, structural, and environmental engineering. Our Charleston office, where our project manager is based, is located less than 35 miles from the project sites and our Pittsburgh office is less than 3 hours from the site. This allows Michael Baker to provide all of the engineering services that the Department of Agriculture requires in-house and local to the site, which not only helps reduce costs, but also provides faster response, reduced coordination and ultimately, cost savings. These are just a few of the advantages of working with Michael Baker.

If you have any questions regarding our expression of interest, please feel free to contact us and we will be happy to discuss them with you.

Sincerely,
MICHAEL BAKER INTERNATIONAL, INC.

Patrick W. Fogarty, P.E., P.S.
Project Manager
400 Washington Street East, Suite 301
Charleston, WV 25301
(304) 769 0821, pfogarty@mbakerintl.com

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL OTHER CONTRACTS: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Michael Baker International, Inc.

Authorized Signature: _____ Date: February 1, 2018

State of Pennsylvania

County of Allegheny, to-wit:

Taken, subscribed, and sworn to before me this 1st day of February, 2018.

My Commission expires October 21, 2019.

AFFIX SEAL HERE

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Jacque McWilliams, Notary Public
Moon Twp., Allegheny County
My Commission Expires Oct. 21, 2019
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

NOTARY PUBLIC Jacque McWilliams

Purchasing Divison
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Centralized Expression of Interest
02 — Architect/Engr

Proc Folder: 405455

Doc Description: Addendum 01, WV Department of Agriculture

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2018-01-22	2018-02-01 13:30:00	CEOI 1400 AGR1800000001	2

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

Michael Baker International, Inc.
400 Washington Street, East, Suite 301
Charleston, WV 25301
304-769-0821

FOR INFORMATION CONTACT THE BUYER

Guy Nisbet
(304) 558-2596
guy.l.nisbet@wv.gov

Signature X FEIN # 25-1228638 DATE 2/1/2018

All offers subject to all terms and conditions contained in this solicitation

Addendum

Addendum No.01 issued to publish and distribute the attached information to the vendor community.

****

E[illegible]ssion of Interest
([illegible]ar Lakes Dam Restoration/Food Warehouse Slope Stabilization Project)

The West Virginia Purchasing Division is soliciting Expression(s) of Interest for the Agency, West Virginia Department of Agriculture from qualified firms to provide architectural/engineering services for the "Cedar Lakes Dam Restoration and Food Warehouse Slope Stabilization Project" per the Expression of Interest, and the Terms and Conditions as attached hereto.

PROCUREMENT OFFICER 304-558-2221 AGRICULTURE DEPARTMENT OF ADMINISTRATIVE SERVICES 1900 KANAWHA BLVD E CHARLESTON WV25305-0173 US	AUTHORIZED RECEIVER 304-558-3200 AGRICULTURE DEPARTMENT OF EXECUTIVE DIVISION 217 GUS R DOUGLAS LN, BLDG 1 RM 100 CHARLESTON WV 25312 US

Line	Comm Ln Desc	Qty	Unit Issue
1	Engineering Services		

Comm Code	Manufacturer	Specification	Model #
81000000			

Extended Description :
Engineering Services

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Centralized Expression of Interest
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Michael Baker International, Inc.
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Charleston, WV 25301
304-769-0821

FOR INFORMATION CONTACT THE BUYER
Guy Nisbet
(304) 558-2596
guy.l.nisbet@wv.gov

Signature X [signature] **FEIN #** 25-1228638 **DATE** 02/01/2018

All offers subject to all terms and conditions contained in this solicitation

Addendum

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Line	Comm Ln Desc	Qty	Unit Issue
1	Engineering Services		

Comm Code	Manufacturer	Specification	Model #
81000000			

Extended Description :
Engineering Services

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

SOLICITATION NUMBER: CEOI 1400 AGR1800000001
Addendum Number: No.01

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[ ] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[✓] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[ ] Other

Description of Modification to Solicitation:

Addendum issued to publish and distribute the attached documentation to the vendor community.

1. Vendor submitted question and Agency response.

No other Changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A

Addendum # 1 for AGR18*1 CEOI

Question 1 : Are the inspection reports available for Dams No. 1 and No. 2?

Answer: Past copies of inspection and previous engineering assessments will be provided to successful vendor. However, successful vendor will be required to complete immediate initial assessment to determine current state and shortcomings of dam structure.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: CEOI 1400 AGR 1800000001

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[X] Addendum No. 1	[ ] Addendum No. 6
[ ] Addendum No. 2	[ ] Addendum No. 7
[ ] Addendum No. 3	[ ] Addendum No. 8
[ ] Addendum No. 4	[ ] Addendum No. 9
[ ] Addendum No. 5	[ ] Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Michael Baker International, Inc.
Company

Authorized Signature

February 1, 2018
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Patrick W. Fogarty, PROJECT MANAGER

(Name, Title)

Patrick W. Fogarty, Practice Manager

(Printed Name and Title)

400 Washington Street East, Suite 301, Charleston, WV 25301

(Address)

304-769-0821/304-769-0822

(Phone Number) / (Fax Number)

pfogarty@mbakerintl.com

(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Michael Baker International, Inc.

(Company)

(Authorized Signature) (Representative Name, Title)

Chad Davis, Vice President

(Printed Name and Title of Authorized Representative)

2/1/2018

(Date)

412-375-3077/412-375-3980

(Phone Number) (Fax Number)

1.0 COMPANY OVERVIEW

To assist the West Virginia Department of Agriculture (WVDOA) in providing professional engineering services for the Cedar Lakes Dam Restoration and Warehouse Slope Stabilization Project, Michael Baker is proposing to utilize its already proven team of highly skilled water resources, geotechnical, and structural engineers. Our Team has successfully provided all of the services included within the Expression of Interest, including site investigations and assessments, final design services, and construction administration for dam rehabilitation and slope stabilization projects. Because it is a full-service engineering firm, Michael Baker can provide all the required services, with the exception of geotechnical investigations, in-house. Having a full-service engineering firm helps to reduce costs and provides for a faster response, improved coordination, consistent quality, emergency assistance (if required), and, ultimately, cost savings to WVDOA. As shown throughout our Expression of Interest, our Team has the qualifications, project experience, resources, and dedication to meet WVDOA's goals and objectives for this project and make it a success.

Proven Team with extensive experience. The Michael Baker Team has the qualifications, project experience, and resources to meet aggressive schedules successfully.

Michael Baker INTERNATIONAL

MICHAEL BAKER INTERNATIONAL, INC. (MICHAEL BAKER) was founded 77 years ago (1940) as a civil engineering and surveying firm. Michael Baker is now one of the largest professional services firms, ranked in the top 7 percent of engineering firms by *Engineering-News Record* (ENR). Michael Baker provides professional engineering and consulting services for its clients worldwide. Services span the complete life cycle of infrastructure and managed asset projects, including planning, design, construction services, asset management, and asset renewal. The skills, talents, and knowledge of our people are the real value, as demonstrated by our development of innovative, sustainable solutions for a broad spectrum of clients.

Michael Baker Purpose Statement: Creating value by delivering innovative and sustainable solutions for infrastructure and the environment.

Our local office in Charleston, WV is a "single-stop resource" capable of providing comprehensive professional services. Michael Baker will provide the hands-on services needed for this project, from Client meetings to site analysis, and construction document preparation, from our Charleston office. With over 30 in house professionals locally, Michael Baker can react quickly and efficiently to the needs of your project. Additional staff from our headquarters near Pittsburgh, Pennsylvania will support the project with extensive experience in dam safety, hydrologic and hydraulic modeling, geotechnical analysis, structural analysis, construction administration, and local and federal regulatory permitting that will be critical to the success of this contract. Michael Baker is committed to delivering quality work on time and on budget as demonstrated by our extensive history of dam rehabilitation and geotechnical projects that are ongoing or have been completed recently.

"The Pennsylvania Fish & Boat Commission partnered with the Baker team, and has successfully completed a number of high hazard dam safety improvements projects. The Baker team has been nationally recognized for its competent engineering staff; and, for its innovative and economically viable designs. Their client responsiveness and positive regulatory track-record are also exceptional. They deliver projects on-time and on-budget. I highly recommend the Baker team for future dam/reservoir improvement projects."

Jack Rokavec, P.E., (former) Chief of Engineering

2.0 PROJECT UNDERSTANDING/PROJECT APPROACH

PROJECT GOALS AND OBJECTIVES

WVDOA has divided the overall project into the Cedar Lakes Dam No. 1 and No. 2 Restoration Project (Project A) and the Food Distribution Warehouse Slope Stabilization Project (Project B). For Project A, WVDOA has requested engineering services to perform evaluations of both dams, which will include a site inspection, review of past inspections, hydrologic analysis of the potential failure, and a geotechnical investigation and analysis. The evaluations and analyses will be utilized to identify deficiencies and develop recommended solutions to repair any deficiencies identified during the site inspection and/or the analyses. The recommended solutions for the dams are expected to focus on the channel restoration at Dam No. 2, principal spillway design and replacement, riser and outlet pipe repairs and/or replacements for Dam No. 2, auxiliary spillway modifications for Dam No. 1 and No. 2, and other maintenance needs identified during the site investigation.

Cedar Lakes Dam No. 1

For Project B, Michael Baker will perform site investigation at the location of the existing slip, conduct subsurface explorations, and perform geotechnical analyses to identify the cause of the slip and to develop a permanent solution to reduce potential hazards to the warehouse facility. For Projects A and B, design alternatives will be prepared to address the deficiencies identified during the inspection and analyses. Michael Baker will assist in obtaining the necessary state and federal permits based for the selected alternative. A final bidding package, which will consist of final construction drawings, specifications, and engineering cost estimates will be prepared for the selected alternatives. In addition, Michael Baker will provide construction contract administrative services to ensure that the project is constructed in accordance with the contract documents.

Cedar Lakes Dam No. 2

Slip Location at Food Distribution Warehouse

GENERAL

Michael Baker is uniquely qualified to provide WVDOA with the necessary services to perform all facets of the project from initial site evaluation through construction. Our broad background in dam rehabilitations and design allows us to successfully complete all aspects of this project including, but not limited to; field investigations and assessments, PMF hydrologic studies, geotechnical and structural analysis, analysis of rehabilitation options (preliminary design), completion of construction documents (final design), permitting, planning, cost estimates, and construction support. Michael Baker's understanding of the services that could be required for the project and how the firm is suited to provide those services are detailed below.

SITE VISIT

Michael Baker personnel performed a field view on January 22, 2018 at Cedar Lakes Dam No. 1 and No. 2 and the slip location at the Food Distribution Warehouse. The deficiencies and/or design concerns that have been identified during the site visit for each dam and the location of the slip are presented below:

Auxiliary Spillway at Dam No. 1

Dam No. 1

- Irregularities in the downstream embankment slope near the principal spillway (location of potential embankment instability).
- Vegetation within the lake upstream of the principal spillway which may restrict flow to the spillway.
- Vegetated auxiliary spillway (located along the left abutment) appears to convey flow along the downstream toe (if activated), which can cause excessive erosion and potential embankment failure.

Dam No. 2

- The principal spillway riser and surrounding embankment had significant damage, which if activated, can cause potential dam failure.
- Corrugated metal outlet pipe showed severe deterioration along the invert of the pipe.
- The recently constructed riprap channel showed multiple locations of displaced riprap.

CMP outlet pipe with corrosion along invert at Dam No. 2

Slip at Food Distribution Warehouse

- Location of the slip identified on the slope, apparent scarp near the fence at the top of the slope.
- Slope failure may impact perimeter fence, existing utilities, and the building foundation.

Damaged principal spillway riser and embankment at Dam No. 2

PROJECT APPROACH

The cursory site inspection of the dams revealed an isolated location of potential embankment instability near the principal spillway at Dam No. 1 and damage to the embankment at Dam No. 2 caused by the failure of the principal spillway riser at Dam No. 2.

Any available subsurface information for the dam sites and the location of the slip will be evaluated. A subsurface investigation and topographic survey will likely be performed at both sites to further supplement any current information available. A geotechnical analysis will be performed for both dams and for the slope at the warehouse, and remediation alternatives will be prepared to address any deficiencies for both projects.

Depending on the existing information available, a hydrologic and hydraulic analysis will be performed for Dams No. 1 and No. 2 to determine the adequacy of the existing principal and auxiliary spillways. Based on WV Dam Safety Rule (47CSR34), dams that are equipped with an auxiliary spillway must have sufficient capacity to convey the design storm through both spillways without overtopping the embankment. In addition, the principal spillway at Dam No.1 will be analyzed to ensure that it has adequate capacity to convey the 100-year design event without activating the vegetated auxiliary spillway for Dam No. 1 (assuming the auxiliary spillway does not have overtopping erosion protection below the vegetation).

Michael Baker will investigate all design alternatives that will permit the lake levels to remain unchanged and stay within the project budget. In addition, our team has a proven history of providing value added solutions.

As well as evaluating the hydraulic capacity of the auxiliary spillways at Dam No. 1 and No. 2, a scour analysis may be performed on the spillways to ensure that they have adequate erosion protection during activation of the auxiliary spillways. The auxiliary spillway channel

section at Dam No.1 conveys water along the toe of the existing embankment, and therefore a hydraulic analysis should also be performed to ensure that the vegetation provides adequate erosion protection for the expected flow velocities. If necessary, the auxiliary spillway alignment can be modified or erosion protection can be installed to accommodate flows and prevent erosion. The grouted rock lined auxiliary spillway at Dam No. 2 should also be evaluated to ensure that it has adequate erosion resistance.

Dam No.1 and Dam No. 2 have been constructed in series. Due to the proximity of the reservoirs, the height of the embankment, and the impounded volume of Dam No. 2, sudden failure of the upstream reservoir (Dam No. 2) will likely cause failure of Dam No. 1. If required, Michael Baker can evaluate the dams to determine if failure of Dam No. 2 is expected to fail Dam No. 1. Based on the results of the hydraulic and geotechnical analyses, condition of the dams (in particular Dam No. 2), and the costs to the rehabilitate the dams, decommissioning of one or both of the dams may be a viable alternative. Michael Baker has experience with dam decommissioning and site restoration efforts to reclaim the free-flowing stream condition.

The results of the historical review, site investigation, subsurface exploration, geotechnical investigation, and hydrologic and hydraulic analysis will be documented and used to provide viable design alternatives to rehabilitate (or remove) Dam No.1 and No.2 to meet current West Virginia Dam Safety Rules. In addition, design alternatives will also be presented to remedy the slip encountered at the Food Storage Warehouse. The preliminary design alternatives will be submitted to WVDOA for review along with engineering cost estimates. All comments will be addressed and final design will commence on the preferred alternative. Michael Baker will also assist on acquiring the necessary state and federal permits required for construction. The final bid package will include construction drawings, specifications, and bid documents. After the contractor is selected, Michael Baker will supply a qualified and experienced construction administration and inspection team to oversee construction to ensure the project is constructed in accordance with the construction documents. Michael Baker will coordinate closely with WVDOA throughout the design and construction phases to ensure that all concerns are considered throughout the project.

Michael Baker routinely performs value engineering on our own work and cost constructability studies. If there is an opportunity to provide our client with a cost savings alternative we will bring it to the table. On similar projects, cost saving measures have included such measures as sliplining deteriorated conduits and re-facing concrete structures. Michael Baker understands the value in maximizing the return on every construction dollar and committed to providing cost-saving alternatives that comply with current dam safety regulations.

Michael Baker has consistently provided designs and cost estimates that fit within our client's budget. Our value engineering and alternative analysis approach have often provided our clients the ability to spend additional funds on other desired park upgrades.

3.0 CORPORATE/PERSONNEL EXPERIENCE

Details on Michael Baker's corporate and relevant project experience is summarized below. Our information on key personnel qualifications and availability is included in ***Section 5.0*** of this Expression of Interest, and additional information on our overall experience with similar dam rehabilitation services is included in ***Section 10.0***.

Michael Baker prides itself on the quality of our projects, which is evident in the fact that we have built long-term relationships with many of our clients. The following Relevant Project Experience Matrix summarize Michael Baker's extensive experience relevant to the Cedar Lakes Dam Restoration and Warehouse Slope Stabilization Project. We have included in the ***Appendix A***, detailed descriptions for projects that were recently completed, under construction, and/or under design. The project descriptions contain client reference information as well.

RELEVANT PROJECT EXPERIENCE MATRIX

		Example Dam Rehabilitation and Slope Stabilization Projects												
		Millville Dam Inspection and Rehabilitation	Pike Lake Dam Rehabilitation	Mt. Gilead Upper and Lower Dam Improvements	Lake Loramie State Park Dam Rehabilitation	Blue Rock State Park Cutler Dam Rehabilitation	Buckeye Lake Dam Improvements	Chapman Lake Dam Rehabilitation	Dutch Fork Lake Dam Rehabilitation	Canonsburg Lake Dam Rehabilitation	Somerset Lake Dam Rehabilitation	Kyle and Donegal Lake Dam Rehabilitation	Pettit Landslide Remediation	Pitcairn Road Landslide Remediation
	Michael Baker's Relevant Scope													
1	Site Inspections & assessments, including topographic/bathymetric surveys, subsurface investigations, and environmental delineations	X	X	X	X	X	X	X	X	X	X	X	X	X
2	Performance of hydrologic and hydraulic evaluation for existing and proposed dams		X	X	X	X	X	X	X	X	X	X		
3	Performance of geotechnical analyses pertaining to slopes, earthen embankments, and abutments including seepage, stability, and foundation recommendations	X	X	X	X	X	X	X	X	X	X	X	X	X
4	Performance of structural analyses involving the integrity of spillways, retaining walls, and other structures	X	X	X	X	X	X	X	X	X	X	X		
5	Alternative evaluations and associated cost benefits/cost estimates	X	X	X	X	X	X	X	X	X	X	X	X	X
6	Construction drawings, specifications, final cost estimates, bidding services, and permit applications		X	X	X	X	X	X	X	X	X	X	X	X
7	Experience in design of dam, spillway and/or control structure modification, rehabilitation, and upgrades	X	X	X	X	X	X	X	X	X	X	X		
8	Development of control of water plans, SWPPP, E&S control plans, site layout plans, and demolition plans.		X	X	X	X	X	X	X	X	X	X	X	X
9	Experience in construction oversight and construction administration		X	X	X	X	X	X	X	X			X	X
10	Slope Stability Evaluation and Remediation			X	X	X		X	X		X	X	X	X

4.0 PROJECT MANAGEMENT PLAN

Michael Baker has a longstanding history of providing timely engineering services within budget on assigned projects. Michael Baker will endeavor to always keep WVDOA informed of the status of the work, to complete all assignments on time, and to submit deliverables on schedule.

At Michael Baker, we do not believe that project success just happens, but rather it comes from a well thought out approach to manage and execute the work. All Michael Baker projects have a Project Management Plan (PMP) prior to project initiation. The PMP is a collection of all pertinent information required to successfully manage and execute a project. Features of the PMP include:

- Project Purpose
- Scope-of-Work and Contract
- Project Team and Stakeholders
- Communications Plan
- Documentation of Critical Assumptions and Constraints
- Project Procurement and Subcontracting
- Project Schedule
- Project Budget and Invoicing
- Quality Management Plan
- Risk Management Plan
- Closeout Plan

The point of contact for the project with the WVDOA will be **Pat Fogarty, P.E., P.S.** as shown in the organizational chart in ***Section 5.0***. Pat Fogarty is located in Michael Baker's Charleston office and will coordinate day to day activities with subcontractors, task leads within Michael Baker, and WVDOA. Mr. Fogarty's proven commitment to delivering a project on time and on budget will ensure a successful project for WVDOA.

SCHEDULE AND BUDGET CONTROL

Michael Baker's project control system follows a pre-established format. It is an Internet-based Oracle database system that combines financial monitoring with an assessment of progress, client satisfaction, and technical performance. The control system requires that program managers regularly update, assess, and report on their projects. A baseline of planned costs and schedules is entered into Oracle. Through Oracle, project control is achieved by processing the data to compare expenditures and actual completion with respect to time. Outputs highlight status by trending budget variance, schedule variance, milestone accomplishments, and technical performance over time. By regularly assessing the status of these key indicators, potential problems can be identified at an early stage and their resolution determined before there is a major impact.

CLIENT COORDINATION

Michael Baker works diligently to tailor our project approach to ensure that our client's priorities come first. We do this by listening to what is important to our client and then acting upon those needs. This approach has allowed Michael Baker to serve as an extension of our client's staff through which we have formed great relationships with our clients; who continue to provide us with opportunities to serve them. Over the years, we have found the following key aspects to be essential to Baker's success with dam safety clients and would work closely with WVDOA to incorporate any additional items they have found to be helpful in the past.

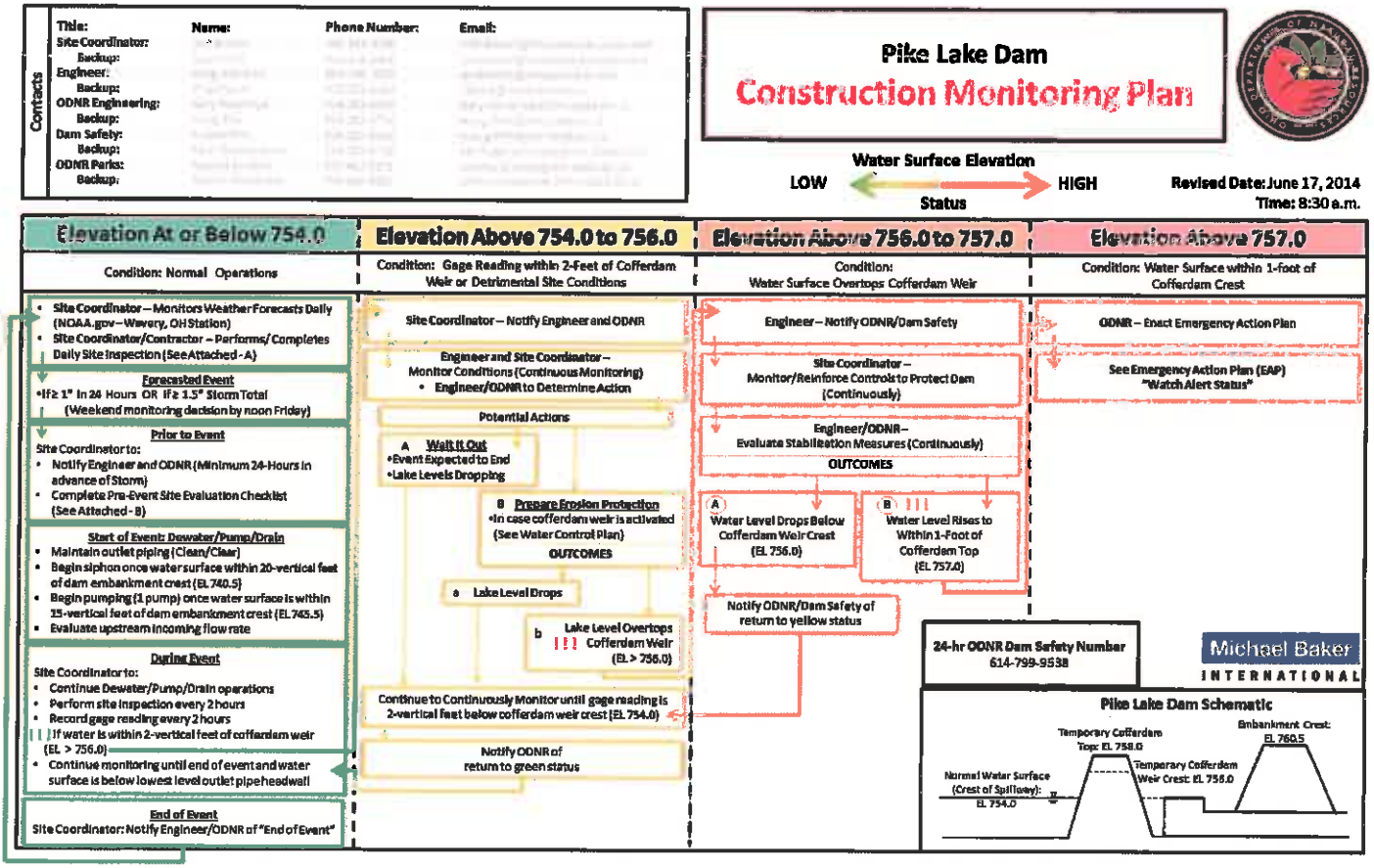
- Partnering: Michael Baker strives to partner with our clients so that we can be a trusted member of the team that shares the values and concerns of our client, which in turn alleviate some of the headache for our clients.
- Effective Communication: This is essential given the number of reviewing agencies, stakeholders, and vested parties that are typically involved in projects that include a dam.
- Responsiveness: Prompt turnaround on items is critical during certain aspects of the project, especially during construction.
- Technically Sound: Given the potential consequences if a dam were to fail, it is essential that technically sound designs are developed that will resolve the issue while giving the owner (and downstream residents) peace of mind.
- Cost Effective: Cost effective solutions are essential for any client and we strive to create value by designing with the intent of lowering the overall construction cost of the project, such as by reutilizing or rehabilitating structures to the extent possible.

Below are some highlights of successful implementation of these key aspects.

PARTNERING. Michael Baker prides itself in our ability to partner effectively with our clients in order to reduce our client's efforts and embrace what is important to them. Partnering results in a more seamless project; given our clients know we have their best interests in mind and we will take care of the issues within our control. Partnering allows us to work as an extension of our client's staff and produce the documents that fully incorporate the client's concerns. We have done this successfully with a number of our clients.

A great example of partnering success is through our work with Ohio Department of Natural Resources (ODNR). We have worked collectively with ODNR to establish a Construction Monitoring Plan that is implemented statewide for all dam construction projects. The Construction Monitoring Plan concept was developed in response to elevated concerns that occurred when one of the dams that ODNR had in construction experienced nearly 4 inches of rain within 48 hours. While the dam performed as designed in terms of water control, the event heightened the awareness that a formal plan was needed to help clarify the roles, responsibilities, and decision points needed during construction of dams (based on forecasted rain events and resulting water levels). The Construction Monitoring Plan clearly defines contact information, elevation thresholds, actions, and a schematic visual rendering of the dams in order for it to be used with ease in the field. Michael Baker also developed a checklist that accompanies the Construction Monitoring Plan that allows the contractor to review the equipment and controls needed to have in place for each of the water level thresholds. Overall, this is a great example of a successful implementation of partnering with our client to develop a tool that benefits our client as well as those working with them. An example of the Construction Monitoring Plan is presented below.

Michael Baker partnered with ODNR to develop a "Construction Monitoring Plan" which was the first in the state and will be used on ALL Ohio dams moving forward.



Michael Baker partnered with ODNR to develop the Construction Monitoring Plan which is being implemented for all state owned dams in construction.

EFFECTIVE COMMUNICATION Michael Baker firmly believes that effective communication is critical to every project. Effective communication ensures that everyone is on the same page in terms of understanding where the project is heading and what roadblocks need to be addressed. An example of effective communication can be shown through Michael Baker's and ODNR's milestone review meetings. During final design for ODNR dam rehabilitations, Michael Baker and ODNR held milestone review meetings before the start of the design and at the 50%, 90%, and 100% milestones. Michael Baker coordinated the meetings and invited all stake holders, including ODNR project managers, park managers, dam safety representatives, and ODNR environmental staff to each of the meetings to make sure all needs were being addressed. This approach has proven to be very effective in streamlining project

Michael Baker routinely coordinates final design milestone meetings with all project stakeholders. This ensures that all projects need are being met and helps to streamline the project review process.

review comments and has since been implemented successfully with several other clients. We have found that by inviting the regulators to the meetings, they become more involved with the project and as a result, several comments/concerns are addressed before submitting the 100% final design submission for regulatory review. This effective communication technique has provided the Michael Baker team to meet aggressive and expedited design schedules.

In addition to milestone review meetings, Michael Baker has also organized and presented at public meetings throughout the design phases to communicate and inform the public on the direction of the project. Through partnership with our clients, these meetings allow the design team to discuss the technical design, inform of any impacts, and field any questions from the public. These meetings help to inform the public while reducing the number of questions that the client must field.

Effective communication is also critical for construction given that engineers need to clearly define, through their plans and specifications, what the intent of the design is and what is needed to be accomplish during construction. Michael Baker has a rigorous QA/QC approach that has proved to be very effective in producing bid documents that have effectively conveyed our design intent and have not been challenged in terms of contractor issues.

RESPONSIVENESS Michael Baker prides itself for our ability to be responsive to our clients and our ability to provide a variety of services on short notice or emergency basis. Our Charleston office is less thirty miles from the project location and we are available to provide immediate assistance whenever WVDOA should require it. Michael Baker is also responsive in terms of completing aggressive schedules. In support of ODNR's Dam Safety Initiative, Michael Baker agreed to a very aggressive schedule that included full designs of three dams from the conceptual stages to final design stages within four months, which included permitting. Baker established a core team to tackle the project and coordinated working progress meetings once a month with ODNR Division of Engineering, ODNR Division of Parks (owner of the dams), and ODNR Division of Water Resources (dam safety regulatory branch of ODNR) in order to discuss the projects and ensure that our questions, as well as theirs, were addressed. Because Michael Baker was able to complete the design and obtain all necessary permits within the aggressive timeline, ODNR was able to advertise and award the projects before the end of the year, which allowed for a full construction season to complete each dam. Meeting this aggressive schedule made it possible to complete construction and establish vegetation before winter sets in, resulting in a true win for everyone involved.

In support of ODNR's Dam Safety Initiative, Michael Baker agreed to a very aggressive schedule that included full design of three dams from Concept to Construction Documents within four months, which included permitting.

TECHNICALLY SOUND Michael Baker prides itself on the technical abilities of our team. We constantly strive to develop innovative approaches to common problems that are founded on sound technical principles. Michael Baker is particularly proud of our work at Canonsburg Dam (A Pennsylvania Fish and Boat Commission facility located in Washington County, Pennsylvania), which at the time was the only post-tension anchor work occurring at the time. We developed a design criterion that was presented to the client for review and they concurred with every step of our approach. The project also included a number of innovative designs that allowed for quicker construction and reduced risk while in construction. Michael Baker had the privilege to present these ideas at the ASDSO National Dam Safety conference in 2012. The project was a true representation of the technical ability that Michael Baker brings to a client and the value of our technical expertise.

Michael Baker also approaches projects knowing that sometimes others at the table may have an idea that is better suited for the issue at hand and the combination of ideas might result in a better overall solution than the initial solution. As such, we promote regular brainstorming meetings amongst our technical peers on projects to ensure we have a solid approach to an issue.

PROVEN TRACK RECORD

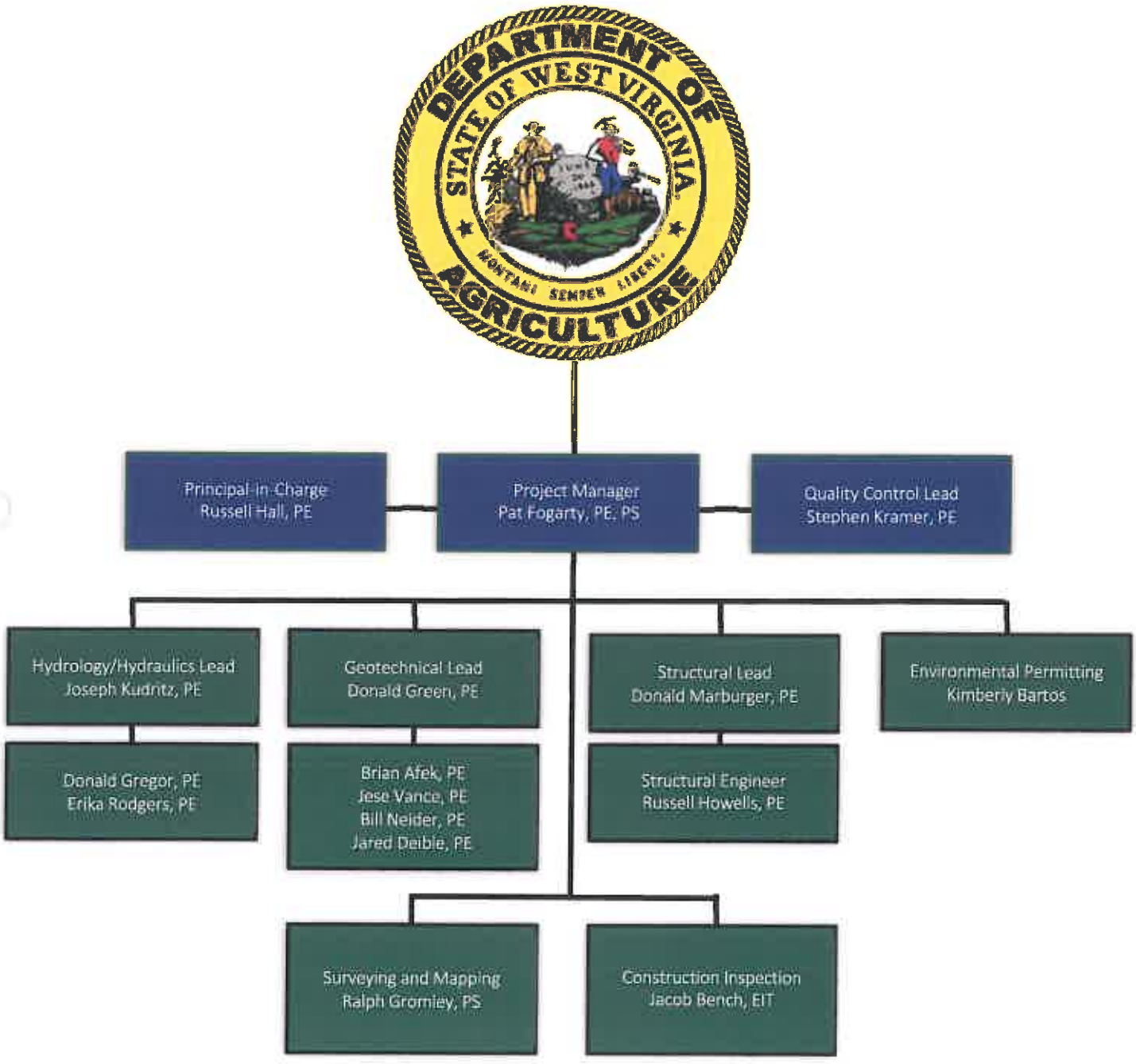
Our track record for meeting demanding schedules and responding to urgent requests is well documented. Michael Baker has proven our ability to be cost effective, responsive to aggressive schedules, and able to tackle any challenge through this contract. Michael Baker is committed to developing and adhering to a mutually agreeable schedule for completing your projects. One of Michael Baker's core values is customer commitment, and we are committed to understanding the importance of, and meeting, your project schedules. Michael Baker also has a track record of successfully performing projects of all sizes. We work on projects for our municipal clients that are less than $5,000, as well as complex program projects with numerous concurrent task orders that combine for a total contract value of nearly $500 million. Regardless of the project size, Michael Baker has the ability to deliver for our clients.

"ODNR, Division of Engineering really appreciates Michael Bakers design efforts on Blue Rock Dam. Baker's 50% phase submission presentation on July 12, 2016 was very well received by the design team, complete, and the best I've seen to date. Furthermore, procurement of the USACE Section 404 permit on July 14, 2016 at this stage of construction document preparation is just outstanding. Keep up the good work as the project moves toward construction ahead of schedule!

Gary Harsanye, P.E., Project Manager – ODNR Division of Engineering

5.0 KEY PERSONNEL AND AVAILABILITY

The Michael Baker team commits the personnel below to successfully execute all aspects of the work for the Cedar Lakes Dam Restoration and Warehouse Stabilization Project. All of the key members included in the project team are either located in Charleston, WV or are less than three hours from the project site. The project team below will also be supported by a large pool of resources of over 6,000 employees including 396 licensed civil and environmental engineers, 34 licensed geotechnical engineers and geologists and 129 licensed structural engineers. An organizational chart is presented below and selected resumes are provided in *Appendix B*.



6.0 PROPOSED SUB FIRMS

Our Team has successfully provided all of the services included within the Expression of Interest, including site investigations and assessments, final design services, and construction administration for dam rehabilitation and slope stabilization projects. Because it is a full-service engineering firm, Michael Baker can provide all the required services, with the exception of geotechnical investigations, in-house. This helps to reduce costs and provides for a faster response, improved coordination, consistent quality, emergency assistance (if required), and, ultimately, cost savings to WVDOA.

Michael Baker's extensive experience in the region will allow us to leverage our in-house expertise and established relationships with known geotechnical investigation subconsultants to provide geotechnical investigation. We expect to solicit proposals from a minimum of three firms, likely including NGE Environmental & Geotechnical Engineering Solutions, EnviroProbe Service, Inc., and Terracon Consultants, Inc. to perform subsurface investigation and laboratory testing. The three firms listed have been utilized successfully on past project teams. The subcontractor for this work will be selected based on the most responsive, qualified, and reasonable provider.

A Michael Baker geologist will be on site during all geotechnical investigations to log borings and/or test pits and assist with selection of samples for laboratory testing. The results of the drilling and laboratory testing will be utilized to perform analyses, prepare engineering reports, and make recommendations regarding foundation and construction techniques.

7.0 PRODUCT QUALITY CONTROL

The quality of our projects is evident in the fact that we have built long-term relationships with many of our clients. In fact, over 80% of Michael Baker's workload is repeat business, which is directly attributable to our commitment to delivering quality projects. In addition, our clients have the peace of mind that comes from knowing that their projects will be completed on time without cost overruns.

Quality Planning is done up front. Quality assurance and quality control are continuous over the life of the project. Michael Baker utilizes three elements in our quality process:

- **Quality Planning.** In the planning stage, we identify clients' program requirements, determine which quality standards apply, and determine what will be done to satisfy these program requirements.
- **Quality Assurance.** Throughout the various phases of the project, we make sure that quality control efforts are taking place; we verify that efforts are producing the desired results, and we make adjustments to the processes as necessary.
- **Quality Control.** We perform extensive review of each deliverable to determine if it meets the requirements developed in the quality planning stage. We also identify ways to eliminate causes of unsatisfactory results such as change orders created by errors and omissions.

To ensure the quality of our work, our senior technical personnel provide guidance and oversight throughout the design of all projects. As detailed in ***Section 5.0***, our proposed Quality Control lead for this project is **Stephen Kramer, P.E.** Mr. Kramer has over 30 years of engineering experience directly relevant to the Cedar Lakes Dam Restoration and Warehouse Slope Stabilization Project.

We make certain that senior staff are available to assist when needed, and ensure that all products meet our high level of quality. In addition to the oversight that is provided throughout the design, all of our work receives a thorough technical and peer review by a senior staff member. In most cases a minimum of two reviews are performed by senior staff prior to the final submission of the design. These reviews by senior staff verify that the design meets all applicable requirements and we are providing a technically sound design. No final product leaves our office until it has been reviewed by senior staff, which assures that it meets the level of quality expected by our clients.

8.0 PROJECT COST CONTROL

In today's economy, we understand that engineering and construction is expensive and as a consultant it is our duty to do everything we can to reduce the overall costs of projects. Michael Baker develops a Project Management Plan that is used to develop engineering budgets and control engineering costs throughout the lifespan of the project (see ***Section 4.0***).

CONSTRUCTION COST ESTIMATING

Cost estimates will be developed based on Michael Baker's extensive and ongoing experience with dam rehabilitation and slope stabilization projects. Michael Baker understands the importance of accurate cost estimates throughout the project, particularly during the planning and preliminary design phases since these estimates are routinely used to determine final design and construction budgets. The following table provides Michael Baker's engineer's cost estimate and the average contractor bid price for the five recently completed dam rehabilitation projects. As shown, Michael Baker has successfully estimated project costs within 4% of the average contractor bid price.

The Engineering Cost Estimates determined by the Michael Baker Dam Rehabilitation Team have been within 4% of the Average Contractor Cost Estimates for the dam rehabilitation projects. The Selected Contractor's Bid Price has been less than the Engineer's Estimate for all of the projects.

DAM NAME	ENGINEER COST ESTIMATE	SELECTED CONTRACTOR BID	AVERAGE CONTRACTOR BID	% DIFFERENCE
Pike Lake Dam	$3,685,000	$3,146,917	$3,642,570	1.2%
Roosevelt Lake Dam and Pond Lick Dam	$7,581,675	$6,416,279	$7,292,262	3.8%
Mt Gilead Dam	$6,870,995	$6,029,380	$6,763,379	1.8%
Lake Loramie Dam	$4,588,500	$4,167,470	$4,669,427	1.6%
Blue Rock Dam	$4,320,000	$3,869,070	$4,299,312	0.5%

VALUE ENGINEERING

We pride ourselves on our ability to value engineer solutions for our own designs as well as others. For example, Michael Baker was able to identify significant savings while conducting a review of a fellow consultants design for the Huntsman Dam project. The project included lining of the emergency spillway, drainage improvements to the embankment, and replacement of the intake structure to meet current earthquake design criteria. Michael Baker conducted a separate inspection of the dam and reviewed all the preliminary design drawings and specifications. As a result of the evaluation, Michael Baker recommended conversion of the proposed ACB spillway lining system to an RCC spillway lining system, which allowed for a shorter spillway through the use of a steeper slope. Michael Baker also recommended modifications to the intake design to help reduce costs by simplifying the structure. Overall, these design alterations resulted in $500,000 in construction cost savings on a $2.5 million project.

Baker's value engineering on Lake Huntsman identified $500,000 in savings on a $2.5 million project.

More often, Michael Baker is conducting value engineering reviews of our own designs; verifying that our solutions are the most cost-effective approach for our clients. A great example of this is at Roosevelt Dam, where the client wished to flatten the slope of the dam from 2:1 to 3:1, which would result in significant height adjustments to the downstream training walls. Given that the spillway was an ogee spillway that was incorporated into the training walls, it was preferable not to demolish the training walls but to rather salvage them if possible. Instead of fully replacing the training walls and spillway weir, Baker developed a solution which used the existing walls as a foundation (given the walls were bearing on bedrock), but then supported the additional increased height of wall from rotation by providing anchor blocks within the fill behind the wall. Michael Baker was able to design anchor blocks that would work in conjunction with the RCC overtopping protection and resulted in over $1 million in construction savings. A lining was added to the inside face of the existing wall as well as the spillway weir to extend the life of the structures. The wall was also architecturally stamped to provide the visual look of dry stacked stone which was used in the former retaining wall downstream.

From Rodger Adams, Chief of PA Dam Safety, *"...your dam designs have had an economic benefit to your clients."*

9.0 SURVEYING

TOPOGRAPHIC SURVEY

ichael Baker has state-of-the-art survey equipment and software, professional surveyors and engineers to perform topographic surveying and manage surveying services. The Survey Team performs detailed land surveys for determining and documenting existing site features of topography, locations of buildings, utilities and structures, property corners, boundaries, right of way and easements. Additionally, survey crews perform site control and construction layout work for establishing vertical and horizontal alignments and control prior to and during construction of dams and other infrastructure.

BATHYMETRIC SURVEY

Michael Baker has the capability to supplement the design survey with a bathymetric survey utilizing dual-frequency echoes to detect and map layering within the beds of ponds, lakes, streams, rivers, and estuaries. The harder the target or strata, the harder and more resolute the sonar's echo is to the transducer. The technology can be used to three-dimensionally locate, map, and compute the depth of the water body and lake bed sediment. This technology is suggested when performing modifications within the lake or when preparing a dredging plan.

Michael Baker has the equipment necessary to perform dual frequency bathymetric surveys; a technology that is critical for developing accurate dredging plans.

10.0 EXPERIENCE WITH SIMILAR DAM REHABILITATION SERVICES

Michael Baker has been conducting site assessments of dams since the mid1970s. We pride ourselves in being one of the firms that assisted the U.S. Army Corps of Engineers (USACE) during the implementation of the USACE's Phase I inspection program. Michael Baker has continued to provide this service to clients and has conducted well over 200 inspections over the years. These assessments are critical to make informed decisions regarding the potential alternatives and ensure the right cision is made upfront to reduce costs and save time. Assessments of dams would include a review of past inspection reports, field inspection to determine the issues firsthand and document facility condition, condition assessments of embankment, lake drain, spillway and other apertures as required, and final recommendations with cost estimates and applicable calculations, as needed. The following is a sampling of the items that we consider and evaluate while performing a site assessment:

Seepage at a Toe of a Dam

SEEPAGE – Seepage occurs in all dams, and engineered dams are designed to minimize and control the harmful effects of seepage. Seepage can appear at or above the toe of the earth embankment and signifies high internal water pressure where there is less embankment weight to counteract the uplift. Michael Baker would recommend the required amount of lake drawdown to relieve seepage pressure and quickly provide the design for emergency relief structures like enlarged toe drains or gravel berms and design permanent drainage control in the form of enlarge reconstructed toe drains and relief wells. If the lake can be drained, an upstream clay blanket would be an option. Seepage and boils beyond the toe would be handled similarly with the added measure of sandbagging the boils. Installation of piezometers may be needed to quantify seepage pressure.

Leakage through Pipe Joints

Seepage through the dam's natural earth or rock abutments or along the embankment-abutment interface is a common problem. Michael Baker would recommend underdrains to control minor seepage and lined groin channels to control surface erosion. In extreme cases, grouting of the foundation soil or rock may be required. Another common issue is seepage paths along the outlet conduit. Michael Baker might recommend the placement of a sand diaphragm or grouting around the perimeter of the conduit to reduce soil or backfill permeability or, in the case of a smaller embankment like Lake Alma, conduit removal and replacement.

Seepage below the emergency spillway slab may not be a concern if the seep quantity is low, clear, and is flowing through the granular base. However, large turbid flows through voids would need to be corrected by grouting, cutoffs, or slab removal and replacement. Seepages with suspended solids, "muddy discharges," are a major issue that Michael Baker can help to resolve immediately through quick and immediate corrective actions such as emergency drawdown of the lake, filters and riprap at exit points, and sandbagging of entrance points.

SLOPE STABILITY – Any slope movement on a dam embankment or abutment would be an immediate cause for concern. The severity of the slope failure depends on the size and depth of movement and whether or not it is accompanied with seepage. Michael Baker has designed repairs for slides on dams by removal and replacement with compacted fill or rock fill with inverted filters. We have also used berms if the slide occurred in the lower part of the embankment.

Embankment Slope Stability Issues

DEFICIENT LAKE DRAINS – Leaking and inoperable valves and sluice gates seem to be as common as household plumbing leaks. These valves and gates are needed for adequate maintenance and dewatering capacity, yet always seem to be an inoperable at the most inopportune times. Michael Baker has designed replacement gates, stop log systems, grates, trash racks, and new valves for dam rehabilitations.

Deteriorated Spillway and Chute

CONDUITS – When an outlet conduit, lake drain pipe, or underdrain cannot be simply patched, tightened, or flushed, replacement piping will extend the integrity of the dam. Michael Baker has designed hundreds of culverts and pressure pipe systems, including slip lining replacements for these types of situations. In certain cases, grouting the old pipe and directionally drilled installation of a new pipe may be appropriate.

DETERIORATED STRUCTURES – Old dams look like old bridges with respect to deterioration of concrete and steel. Salt-caused corrosion may not be involved but the constant exposure to water and ice takes its toll. Concrete poured for dams during the Depression can be amazingly functional for decades but at some point the deterioration threatens the safety of the dam. Michael Baker has extensive concrete inspection and assessment experience for dams and will rely on this experience to determine if repair or replacement is required. Michael Baker has prepared plans and specs for concrete repairs of spillway walls, slabs, weirs, pipe joints, and pipe end sections. Michael Baker has designed replacement structures for spillway and conduits that cannot be repaired.

UNDERMINING OF STRUCTURES – The undermining of structures is a typical issue with dams. Sections of the spillway, energy dissipation basin, training walls, and cutoff walls can be undermined by the constant erosive forces water flowing through the spillway system. Inspections and monitoring would be required to establish and track the progression of any undermining. Potential solutions for undermined structures range from the placement of a new cutoff that would extend under the existing undermined endwall, pressurized grouting of undermined slabs, to replacement of the structure, depending on the severity and location of the undermining.

Failure of Stone Training Wall

DAM ASSESSMENT AND DESIGN CAPABILITIES

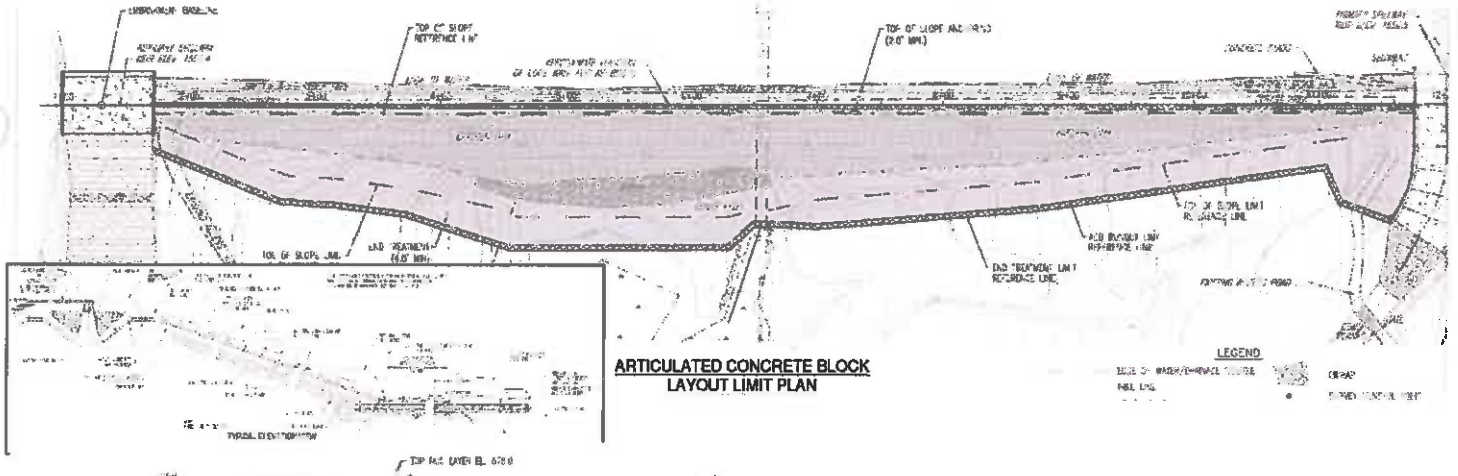
Michael Baker has vast experience in preparing design solutions for all aspects of dam rehabilitation. This range of experience ensures that Michael Baker can undertake any of the problems present at our client's dams and develop a suitable design to correct issues. We also strive to be innovative and address potential problems that may occur during construction to develop a "Plan B" that will help save WVDOA on potential change orders or unforeseen conditions. Michael Baker has developed construction documents for 10 major dam rehabilitation projects in the past five years. As alluded to above, these designs have encompassed all aspects of dam rehabilitation as well as new dam construction. Overall, we have used this range of design opportunities to develop a set of standard details that assist us in efficiently developing design plans. These details are updated as needed based on "lessons learned" or as modifications to the details result in a better overall approach. Leveraging this library and past experience enables Michael Baker to deliver a higher level of quality and proven construction documents at a cost savings for the client. The types of rehabilitation designs that we routinely develop are highlighted below.

Michael Baker has developed construction documents for 10 major dam rehabilitations in the last 5 years

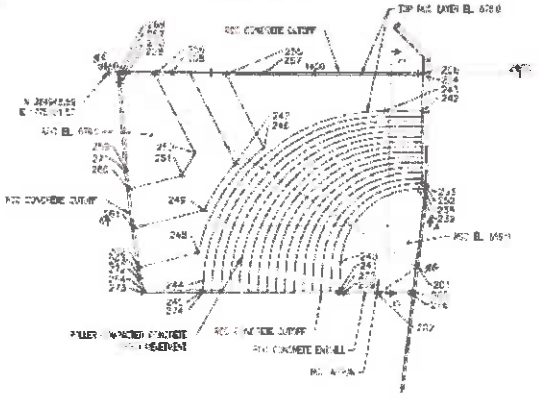
OVERTOPPING PROTECTION - Our Team is well versed in providing and designing Roller Compacted Concrete (RCC) and Articulated Concrete Block (ACB) overtopping protection systems. Our designs include all aspects, from the layout and detailing of the overtopping protection systems, to the incorporation of cutoff walls and endsills, and the development of job-specific specifications. Typical plans and details are included on the following page.

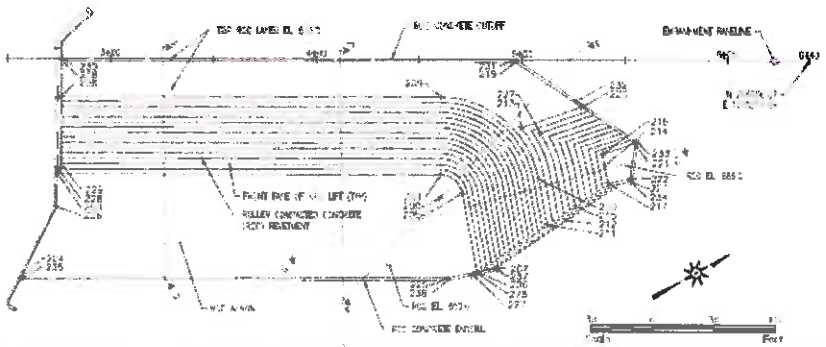
RCC Placement

ACB Placement

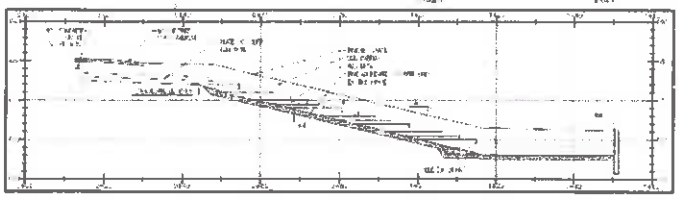


ARTICULATED CONCRETE BLOCK
LAYOUT LIMIT PLAN

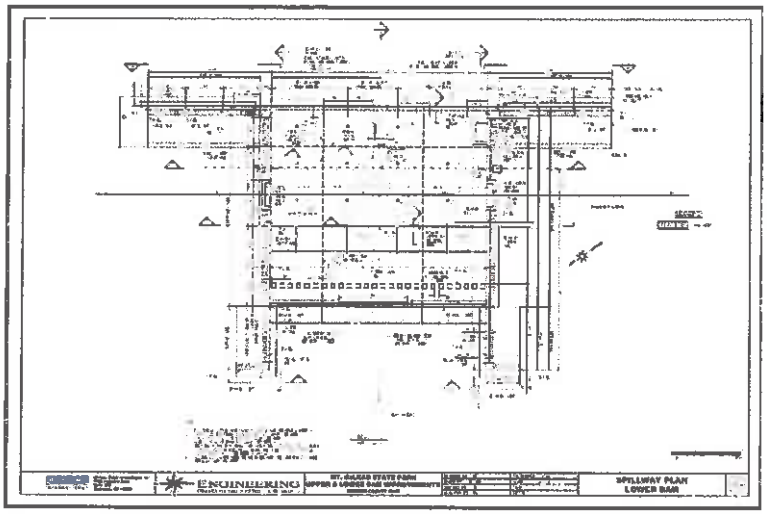




RCC LIFT LAYOUT PLAN



SPILLWAY REPAIRS/REPLACEMENT - Michael Baker has designed a wide variety of spillway replacements, ranging from simple culverts and straight drop spillways to labyrinth spillways, which are more complex in terms of their structural detailing. These designs include slab layouts, joints, structural reinforcement, water stops, and cutoffs. To reduce uplift, Michael Baker has developed designs that include drainage layers, varying slab thickness, passive anchors, and vertical relief drains. Stilling basins typically include baffles and chute blocks assist in energy dissipation. We have also developed plans for partial replacement of spillways where it makes sense. One of the best examples of that is on Chapman Dam, where the slabs had exhibited signs of uplift and prior movement due inadequate drainage; however, the training wall of the spillway and stilling basin were in very good condition and did not require replacement. By focusing the repairs to the slabs, the cost of the spillway rehabilitation was significantly reduced given the amount of demolition, excavation, formwork and concrete that was not required.



Michael Baker designed a labyrinth spillway as a replacement spillway for the deteriorating Mt. Gilead Dam. The Labyrinth spillway will be the first labyrinth spillway constructed in Ohio

We have also developed designs that focus on replacement spillways that replicate the original spillway appearance. These designs typically include improvements to the general aesthetics by utilizing architectural stained concrete, which provide a more natural appearance. While open channel concrete spillways are more common, we have designed NRCS-style principal spillway structures, rock-cut spillways, side-chute spillways, and earthen spillways. The wide range of designs completed by our Team is a good indication of our diverse capabilities and ability to evaluate alternatives to a traditional approach, if necessary.

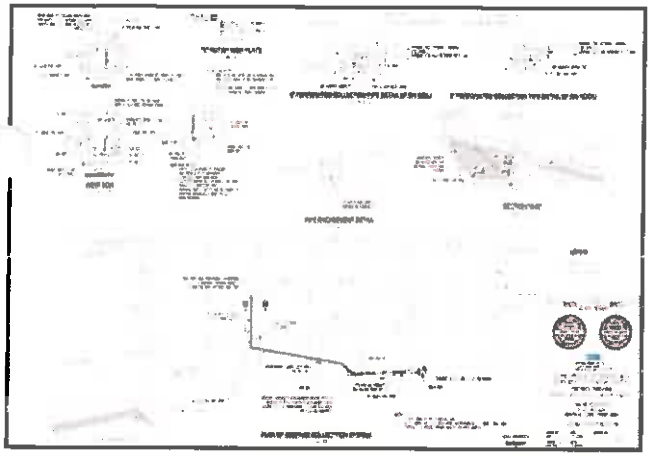
STABILITY ENHANCEMENTS – With rising construction costs, it is often preferable to stabilize an existing structure versus replace that structure with an inherently more stable structure. This is particularly true with concrete gravity dams, which typically involve the installation of high-capacity rock anchors. Michael Baker has completed a number of stabilization projects and has been nationally recognized for its innovation and foresight in incorporating contingency plans to address potential issues before they occur. A great example of that is the Canonsburg Dam, which was designed by Michael Baker and, through the firm's construction oversight, was completed one month ahead of schedule and the base project completed under the original bid. This success was due to a number of innovative features that allowed the anchoring to be completed under normal pool conditions. These features included:

Michael Baker and PFBC won an award for their work on the Canonsburg Dam given our ability to complete the project with careful consideration to the environment

- An extendable drilling sleeve was incorporated to facilitate drilling operations when fractured rock is encountered at the monolith/rock foundation interface.
- A diverter and valve system was used with a containment system and filter berm to provide a superior solution to contain drill cuttings and maximize water quality.
- An innovative movable drilling platform was used at the spillway crest to install passive dowels and eliminate the use of a barge based operation.
- An eccentric drill was used to install 30- and 36-inch diameter anchor pockets on the sloping dam face, and construction procedures were adapted to place non-shrink grout in sub-freezing weather.

Movable Drilling Platform, Causeway, and Installation of Rock Anchors and Passive Dowels

Michael Baker also applied these innovative features for the Roosevelt Lake Dam. Roosevelt differed in the number and size of anchors, but benefitted due to the efficiency of leveraging our past efforts in terms of the anchor design calculations, details, and specifications.



SEEPAGE CONTROL – All dams leak; it is merely a matter of how much and where. Michael Baker has conducted numerous seepage investigations to develop designs to address seepage through either enhanced cutoffs or improving the seepage collection capabilities of the dam. These have included chimney drains, toe drains, inverted drains as well as new cutoffs, slurry trenches, and grout curtains. We have also developed seepage collection systems that include seepage collection boxes with "V" notch weirs for monitoring flow rates. These have proven to be very useful and can be incorporated into a remote monitoring system, which can allow for real-time EAP triggers and automatic notifications if there are changes to the seepage rate through the collection system.

PERMITTING

Every design project must by permitted; however, the role of permitting is often overlooked. Michael Baker can prepare the required permitting documentation for the rehabilitation designs to obtain the required permits and authorizations. Michael Baker has an experienced Team of civil engineers and environmental specialists that have a diverse background in environmental and regulatory permitting. Permits are prepared in-house by a Team that is intimately involved with the design of the project and has working relationships with regulatory agencies. In many instances, our working relationships with the regulatory community have allowed us to fast-track permits or permit revisions due to unforeseen conditions during the construction process. This has saved our client valuable time and funding both during design and construction.

> Michael Baker prides itself on its permitting reputation. A great example was the ability to expedite permitting for Pike, Pond, and Roosevelt to meet the expedited design schedule.

STORMWATER POLLUTION PREVENTION PLANS/CONTROL OF WATER PLANS

Michael Baker routinely provides projects with Stormwater Pollution Prevention Plans (SWPPP). This is a standard practice for Michael Baker when applying for permits for dam rehabilitation projects. Along with the SWPPP Michael Baker typically includes an approved Erosion and Sediment Control Plan, allowing the Contractor to start the work as soon as practical. The Erosion and Sediment Control plan also serves as a concept Control of Water plan, which shows the Contractor one vetted method for controlling water throughout construction. During construction Michael Baker ensures the SWPPP and approved plans are being followed.

EMERGENCY ACTION PLANS (EAP)

EAPs are an essential emergency planning tool to ensure that the proper plans are in place in the unlikely situation that a dam becomes unsafe or shows signs of failure. Michael Baker maintains a staff of licensed professional engineers with experience in dam safety permitting and compliance, including the development of EAPs. Over the last two years, Michael Baker has developed more than 30 EAPs in several different states, including Ohio, Pennsylvania, and West Virginia. Michael Baker can provide support to dam owners in EAP development, maintenance, exercise, and implementation to promote emergency preparedness and assist in the training of personnel and demonstrate operational capability. Below is a listing of typical EAP components:

> Michael Baker has developed over 30 EAPs in the last two years.

- Notification flowchart
- Statement of purpose
- Project description
- Emergency detection, evaluation, and classification
- General responsibilities
- Preparedness
- Inundation maps
- Dam break analysis
- Plans for training, exercising, updating and posting of EAP
- Site-specific concerns
- EAP approval

High resolution models allow for intricate mapping in residential areas

To support the development of the EAP, a dam break model will be developed, if one is not readily available. Using GIS as a backbone, Michael Baker has developed hydrologic and hydraulic tools that facilitate the development of dam break assessment and flood studies that are routinely used for state dam safety evaluations. Michael Baker hydrologic and hydraulic engineers have used HEC-GeoRAS extensively (both steady and unsteady modes) since its inception and routinely utilize the interface between HEC-RAS and GIS (ARCMap) for floodplain/inundation mapping. This approach results in more efficient dam break models that utilize readily available mapping and is the procedure we followed when preparing the dam break models for our other projects in Ohio and Pennsylvania.

CONSTRUCTION ADMINISTRATION

Michael Baker has a robust construction management division that serves clients nationwide. Michael Baker provides the full range of construction management services, both in the office and in the field. The construction management division also provides constructability and value engineering reviews, which help to provide cost effective designs.

For the Construction Administration, Pat Fogarty, PE, will continue his service on the project as Project Manager. This will provide continuity throughout the project phases and ensure that the construction meets the intent of the design. Mr. Fogarty will continue to receive support from technical leads during construction.

Michael Baker has received praise from ODNR for our proactive approach to potential issues in the field by providing direction before that work task begins.

A Construction Management Specialist, or Project Representative, will be assigned to the Cedar Lakes Dam Restoration and Warehouse Slope Stabilization project as required. Michael Baker's Construction Management Specialists are typically involved in the design phase of the project, providing insight on construction methods, reviewing specifications, and preparing costs quantities. This allows for a seamless transition of the project from design to construction and ensures the On-Site Team is intimately familiar with the project.

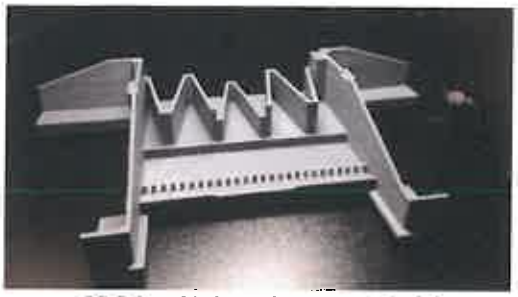
If needed, Michael Baker's on-site Project Representative can provide several important services such as:

- Monitor the contractor's progress according to the proposed schedule.
- Assess project status and the impact of a delay in any of the activities.
- Monitor the contractor's permit and regulatory compliance.
- Communicate with the contractor according to WVDOA's construction administration processes.
- Attend weekly job meetings and advise WVDOA on how the contractor can correct deficiencies and delays in schedule.
- Conduct job meetings with WVDOA and record minutes.
- Keep a daily log record when on-site.
- Report adherence to contract documents.
- Monitor bid quantities and completion of lump sum items.
- Monitor contractor resources (labor and equipment) in terms of current and future progress.
- Coordinate and review contractor draft payment estimates.
- Verify that the contractor has met all requirements for waivers of liens by subcontractors and suppliers.
- Verify the appropriateness of certifications, O&M Manuals, and other final submittals.
- Assist WVDOA with the assessment of substantial completion by the contractor and prepare a punch list.
- Assist WVDOA with the final inspection and final punch list.
- Monitor the weekly updating of as-built conditions on the contractors record set of drawings.
- Assist Michael Baker's Project Manager with preparation of final record drawings.

Building Information Modeling and 3D Modeling Capabilities

Control Tower

Building Information Modeling (BIM) is one of the most promising recent developments in the architecture, engineering, and construction industry. Michael Baker utilizes Trimble sketchup, Autodesk Infrastructure Design Suite and Autodesk 3D Studio Max to develop renderings to illustrate project elements. With BIM technology, Michael Baker is able to provide its clients with an accurate virtual three-dimensional model of the entire project. This technology helps our project managers, design engineers, and clients to visualize the proposed project in a simulated environment in order to identify any potential design, construction, or operational issues. The use of BIM provides higher quality designs, which in turn reduces cost and schedule impacts to our clients. In addition BIM modeling provides an image of the completed project which is useful in bridging the gap between the technical design and non-technical personnel as well as public relations. Our Team has successfully used BIM technology to create three-dimensional models of buildings, dams, spillways, and appurtenances for various dam related projects, including ODNR's Mount Gilead, Lake Loramie and Blue Rock Dam Improvement projects.



3D Printed Labyrinth Spillway Model

3D modeling also provides benefits for dam construction through enhanced visualization of the project during design; refinement of complex details within the Contract Drawings; modeling the anticipated construction sequence; and project visualization for the owner, public, and other stakeholders.

Contract Drawings are the backbone of every dam project, however, they are limited since they only present 2D information. Designing in 2D and later translating into a 3D structure during construction presents opportunity for misunderstanding between the design engineers and the contractor, given multiple pages of the Contract Drawings are often required to detail and construct a single structural component.

3D Rendering Used For Public Outreach

Michael Baker has used 3D modeling to realize project benefits through 3D representation of complex details like the detailing of waterstops in complex structures such as labyrinth spillways. Waterstops required between labyrinth cycles, training walls, base slabs, and cutoff walls can be visualized using a 3D model and aid in the development of isometric views and refined details of the intricate connections to be added to the Contract Drawings. This provides additional details of critical waterstop connections before construction and allows the engineer's design intent to be more clearly conveyed to the contractor.

3D modeling can also be used for constructability reviews, construction sequencing, on-site inspection, and to capture changes to the Contract Drawings as the project progresses. The structure can be built piece by piece using the 3D model to simulate construction and track construction progress. 3D renderings and scaled physical models (created using 3D printing) can also be produced from the 3D modeling, which allows enhanced visualization of the project prior to construction. These are particularly useful for presentations for owner, public, and non-technical stakeholders to visualize the project prior to construction.

11.0 WHY MICHAEL BAKER?

The assessment and design of remedial measures for the Cedar Lakes Dam Restoration and Warehouse Slope Stabilization Project will not just be another project to our team. We have developed a Team that combines Michael Baker's best and most experienced talent that has the technical qualifications and the relevant project experience to deliver all of the potential scope of work requirements. This is proven by our Relevant Project Experience Matrix, which illustrates that our example projects include the potential scope-of-work for the dam restoration and slope stabilization work for the project.

The summary below illustrates why the Michael Baker Team brings the right experience for this project:

- Our recent dam rehabilitation projects include the full range of dam assessment, design services, construction documents, permitting, and construction administration services that may be required for the Cedar Lakes Dams, including:
  - Dam assessment and inspection
  - Dam rehabilitation permitting (USACE, SHPO, and Local Agencies)
  - Preliminary design and analysis
  - Full construction document preparation including drawings and specifications
  - Overtopping protection
  - Structural repairs/replacement including spillways (matching existing discharge flows), lake drains, training walls, and weirs and slab replacement
  - Stability improvements (both earthen and concrete dams)
  - Repair/replacement of deteriorated concrete structures
  - Drainage and seepage collection

Michael Baker has developed construction documents for 10 major dam rehabilitations in the last 5 years

Michael Baker has experience with dam assessments, in-kind spillway replacements, overtopping protection, site planning, and permitting.

- The Michael Baker Team's office is located in close proximity to the WVDOA Charleston office, and our Charleston office is less than 30 miles away from the Cedar Lakes Dams and the Food Distribution Warehouse. Additional personnel will support the project from our Pittsburgh office. These office locations allow Michael Baker to reduce travel costs and provide WVDOA direct access to our best talent, including more than 30 licensed professionals experienced with dam rehabilitation.
- Our Project Manager, Pat Fogarty, has designed and managed projects in numerous disciplines including civil, structural and transportation engineering, site development, ecosystem restoration, planning and surveying.
- Our current and past dam work on an array of services, including over 15 dam rehabilitation projects, have been delivered on time and on budget.
- Our ability to meet aggressive schedules and provide on call services as needed, when needed. Michael Baker has demonstrated its commitment to partnering with dam owners to make projects a success.
- Ability to hit the ground running – The Michael Baker Team is very familiar with the site and developed thoughts on our proposed project approach as further described in the subsequent pages. The project approach will be further developed and refined in coordination with WVDOA to ensure your project goals are achieved. Our preliminary work along with our extensive experience with dam rehabilitation and the availability of our key staff will allow Michael Baker to begin work on the project quickly and efficiently.
- Our Technical Leads have a proven track record of successful dam rehabilitation projects and have received praise for our dedication to delivering quality projects on time and on budget. This is demonstrated through our project descriptions and the following quotes from owners and regulators.

"In the last ten days I have received NINE different regulatory permits for the three dams at Pike, Roosevelt and Pond Lick. That is quite an accomplishment by any consultant I have seen in the last 23 years when considering the amount of time required to secure regulatory permitting in today's market. ODNR appreciates the very good effort and looks forward to moving these high priority projects into construction this fall."

Gary Harsanye, P.E., Project Manager – ODNR Division of Engineering

"It truly has been a pleasure to work with Baker on the dam projects you have done for various clients. Your team has been very responsive to responding to questions and concerns with reasonable answers that address the issues. I also appreciate how quickly you respond and how easily potential problems are discussed and conclusions reached to everyone's benefit. I look forward to continuing to work with you and your team at Baker."

Joseph W. Schultz, P.E., Geotechnical Consulting Engineer – PADEP Dam Safety

Michael Baker
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Appendix A

Project Descriptions

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We Make a Difference

Millville Dam Inspection and Rehabilitation

Millville, West Virginia

Client
Cube Hydro

Point of Contact
David Fox
(240) 482-2707

Project Dates
Start: 2017
Completion: Ongoing

Project Relevance
- Dam Inspection and Assessment
- Alternatives evaluation
- Drawings
- Cost Estimates

Michael Baker is providing engineering services for inspection and rehabilitation of Millville Dam in West Virginia. Michael Baker performed a site inspection and is preparing design of repairs to the headrace canal and portions of the dam.

The Millville Hydroelectric Project, is located on the Shenandoah River near Millville, West Virginia. The project consists of a concrete gravity dam that is approximately 970 feet long, including a 36 foot long non-overflow abutment, an 813 foot long spillway, and a 122 foot long headgate structure. The powerhouse is located at the downstream end of the headrace canal.

Michael Baker developed a long term maintenance plan for the headrace canal wall as required by the regulatory agency for the dam. The headrace canal consists of a concrete and shotcrete wall on the right side and the natural rock abutment on the left side. The long term maintenance plan includes an assessment of current conditions, recommendations for long term monitoring, and engineering sketches for repairs.

Significant deterioration has been observed on the downstream sides of monoliths 3 and 4 of the dam. Michael Baker has evaluated alternatives for repair of the monoliths, including an evaluation matrix for options to address the deterioration.

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We Make a Difference

Pike Lake State Park Dam Rehabilitation

Pike County, Ohio

Michael Baker provided engineering services for rehabilitation of the Pike Lake Dam to ensure compliance with ODNR dam safety regulations with regard to overtopping protection during the Probable Maximum Flood (PMF) event. Michael Baker's services included site and geotechnical investigation, hydrologic and hydraulic analysis, permitting, dam inspection, alternatives identification and evaluation, rehabilitation design, and construction management and inspection.

Existing Dam Information. Pike Lake is the focal point of Pike Lake State Park. The dam is owned and operated by the ODNR Division of Parks and Watercraft. The dam features a 530 feet long and 30 feet high earthen embankment and a concrete five-foot square concrete box-culvert spillway.

Project Improvements. The improvements to the dam generally include: existing spillway and control tower demolition, in-kind spillway construction, stilling basin construction, construction of a control tower equipped with sluice gates and a stop log system, and roller compacted concrete (RCC) overtopping protection. The rehabilitations will bring the project into compliance with current dam safety regulations.

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis to determine the peak discharge and pool elevation for the full PMF event, which is required based on the hazard classification. The analysis indicated the existing and in-kind replacement spillway have insufficient hydraulic capacity to convey the PMF event without overtopping the embankment. Therefore, RCC overtopping protection and RCC runout aprons were designed based on overtopping and tailwater depths. Michael Baker revised the existing emergency action plans based on the revised H&H Analysis and dam-break assessments for the project.

Structural Investigation and Design. Structural assessments were performed on the existing spillway and structural components to determine the overall condition of the structural elements. Large sections of exposed reinforcement and numerous cracks were observed within the spillway. Due to the level of deterioration, it was determined that the entire spillway should be replaced. Structural analyses were performed to design the box culvert spillway, stilling basin, and control tower.

Client

Ohio Department of Natural Resources (ODNR)

Point of Contact

Gary Harsanye
(614) 265-6956
gary.harsanye@dnr.state.oh.us

Project Dates

Start: 2013
Completion: November 2014

Project Costs

$3.2 Million (Construction)
$555,000 (Fee)

Project Relevance

- High Hazard Dam
- PMF Hydrologic Analysis
- Geotechnical Investigation and Analyses
- In-kind Spillway Replacement
- RCC Overtopping Protection
- New Control Tower and Lake Drain
- Architectural Concrete
- Select Dredging
- Park Upgrades

Geotechnical Investigation. Michael Baker prepared a subsurface exploration plan to obtain borings at desired locations along the existing embankment. The subsurface information was used to evaluate overall stability and determine the seepage characteristics of the embankment. The RCC overtopping protection was evaluated and a seepage collection system was developed below the RCC.

Project Coordination and Delivery. ODNR prioritized this project and set an aggressive delivery schedule to meet funding and construction deadlines. Michael Baker held monthly concurrent review and coordination meetings with ODNR and regulatory agencies to meet the aggressive deadlines. The project was successfully bid on schedule.

Construction Documents and Construction Administration. Michael Baker prepared construction documents, including plans and specifications, for bidding of the project. Michael Baker also provided construction management, which included daily inspections and progress meetings to ensure that construction was performed in accordance with the drawings and specifications.

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We Make a Difference

Mt. Gilead Lake Upper and Lower Dam Improvements

Morrow County, Ohio

Michael Baker provided engineering services for the rehabilitation of Mount Gilead Lake Upper and Lower Dams to ensure compliance with ODNR's Dam Safety Regulations in regards to inadequate spillway capacity and overtopping protection.

Michael Baker's services included site and geotechnical investigation, hydrologic and hydraulic analysis, permitting, dam inspection, preliminary design analysis and rehabilitation recommendations, rehabilitation design, and construction management and inspection services.

Existing Dam Information. Mount Gilead Upper and Lower Lakes are located within Mount Gilead State Park in Morrow County. The Lower Dam features a concrete ogee spillway that is 90 feet long and 12 feet high. The concrete gravity section is flanked on either side with earthen embankments that are a total of 525 feet long and 20 feet high. The Upper Dam features a concrete sharp-crested spillway that is 90 feet long and 9 feet high and has earthen embankments located on either side that total 470 feet and have a maximum height of 15 feet high.

Project Improvements. The improvements to the dam generally include: select site demolition, upper dam spillway modification, lower dam demolition, complete re-construction of the lower dam embankment (including drainage filters), construction of labyrinth spillway (the first to be designed and constructed in Ohio), stilling basin, and control tower, post-tensioned soil anchors, placement of pedestrian bridge over the spillway, and site upgrades to the immediate dam area. Michael Baker evaluated options to raise the existing normal pool to create more lake depth that would offset the costs of dredging. ODNR decided to raise normal pool by 2.5 feet and raise the embankment crest by 10 feet to contain the probable maximum flood (PMF) event. Dredging was required along within the limits of the proposed embankment, which extended past the limits of the existing embankment, however ODNR decided not to dredge the entire lake since the normal pool was raised by 2.5 feet.

Client

Ohio Department of Natural Resources (ODNR)

Point of Contact

Gary Harsanye
(614) 265-6956
gary.harsanye@dnr.state.oh.us

Completion Date

Start: 2015
Completion: November 2017 (Est.)

Project Costs

$6.1 Million (Construction)
$1,256,000 (Fee)

Project Relevance

- High Hazard Dam
- Preliminary Design
- PMF Hydrologic Study
- Geotechnical Investigation and Analyses
- Replacement Spillway With Increased Capacity
- Replacement Embankment
- Dredging within Embankment Footprint
- Evaluation of Normal Pool Level
- New Control Tower
- Soil Anchors
- Sediment Control Structure
- Historic Site
- Parking Lot Paving
- Frequently Used Park

As a result of the modifications to the upper dam, the upper structure will be deregulated and will not be required to comply with dam safety regulations. The upper lake and structure will be re-purposed to serve as a sediment forebay for the Lower Lake. The rehabilitations will bring the project into compliance with current dam safety regulations.

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis to determine the peak discharge and pool elevation for the full PMF event (based on hazard classification). The replacement labyrinth spillway was designed to mimic the existing spillway flow characteristics up to and including the 100-year storm event while providing additional capacity to pass the PMF event. The lower dam inundation area was evaluated for additional flooding caused by the raised normal pool.

Structural Investigation and Design. Structural analyses were performed to design the proposed labyrinth spillway, base slabs, structural walls, and stilling basin. Structural assessments were conducted on the existing Upper Dam to determine the overall condition of the existing spillway and training walls. New training walls, anchored into the embankment using tie-backs, were designed in front of the existing walls. The upper dam spillway crest was lowered and evaluated based on the current condition.

Geotechnical Investigation. Michael Baker prepared a subsurface exploration plan to obtain borings at desired locations to support the geotechnical analysis. Test pits and material testing was performed at potential borrow areas to ensure sufficient quantities of suitable borrow material will be available on-site. A stability and seepage analysis was performed on the re-constructed embankment. The analysis was used to determine the size and location of graded filters and seepage collection systems. A settlement and stability analysis was performed for the labyrinth spillway which resulted in 12 post-tensioned soil anchors positioned on the spillway slab.

Construction Documents and Construction Administration. Michael Baker prepared construction documents, including plans and specifications, for the bidding of the projects. Michael Baker provided construction management and oversight to ensure that construction was performed in accordance with the drawings and specifications. This included site inspections, progress meetings, and daily inspections during the construction of key components.

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Lake Loramie Dam Rehabilitation

Shelby County, Ohio

Michael Baker provided engineering services for rehabilitation of Lake Loramie Dam as an interim risk reduction project. The existing spillway has exhibited severe structural deterioration and will be replaced with a labyrinth spillway adjacent to the existing spillway. Michael Baker's services included site and geotechnical investigation, hydrologic and hydraulic analysis, permitting, dam inspection, rehabilitation design, and construction management and inspection services.

Existing Dam Information. Lake Loramie is located in Shelby County, within Lake Loramie State Park. Lake Loramie originally served as the high feeder water supply for the Miami-Erie Canal that began operation after the original dam was constructed in 1844. The canals were eventually abandoned and Lake Loramie began to serve as a recreational lake. A new dam, was constructed in 1908 and features a concrete straight drop buttressed spillway that is 220 feet long and 15 feet high. The spillway is flanked on either side with a variable height earthen embankments that totals approximately 8,000 feet.

Project Improvements. The improvements to the dam generally include: select partial dam removal, embankment construction (including drainage filters), construction of labyrinth spillway, stilling basin, bank floodwall, and control tower, placement of a pedestrian bridge over the spillway, and site upgrades to the immediate dam area. Normal pool will be maintained throughout construction to limit the impact to the park, homeowners, and businesses surrounding the lake. The rehabilitations are being performed as part of an Interim Risk Reduction (IRR) Project due to the unsatisfactory structural condition of the existing spillway.

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis of the existing spillway and designed the labyrinth spillway to mimic the existing spillway flow characteristics up to and including the PMF event. As part of the Interim Risk Reduction, the hydraulic analysis considered backwater effects from the receiving channel and restricted inflow capacity due the canal system within Lake Loramie.

Structural Investigation and Design. Structural assessments performed on the existing spillway indicated that the existing spillway should be

Client

Ohio Department of Natural Resources (ODNR)

Point of Contact

James Hilovsky
(614) 265-6967
james.hilovsky@dnr.state.oh.us

Project Dates

Start: 2016
Completion: April 2018 (Est.)

Project Costs

$4.2 Million (Construction)
$1,205,000 (Fee)

Project Relevance

- High Hazard Dam
- Interim Risk Reduction
- PMF Hydrologic Study
- Design Option Evaluation
- Labyrinth Spillway With Increased Capacity
- New Embankment Construction
- Construction While Maintaining Full Pool
- USACE Individual Permit
- Stream Mitigation
- Historic Site
- Architectural Concrete
- Frequently Used Park

replaced due to the severity of deterioration. Structural analyses were performed to design the proposed labyrinth spillway, base slabs, structural walls, and stilling basin. A bank floodwall, in lieu of embankment, was designed and located along portions of the new lake bank due to space limitations.

Geotechnical Investigation. Michael Baker prepared a subsurface exploration plan to obtain borings at desired locations along the existing embankment and within the footprint of the new embankment. Stability and seepage analyses were performed on the new embankment. The analyses were used to determine the dimensions of the new embankment and the size and location of graded filters and seepage collection systems. A settlement and stability analysis was performed for the labyrinth spillway.

Special Constraints. Michael Baker considered several special constraints when designing the rehabilitations to Lake Loramie Dam. Some of the Special Constraints are outlined below:

- Construction of Lake Loramie required normal pool to be maintained throughout the project. As such, the project has been phased and the structural elements have been designed to account for fluctuations in pool elevations during construction. Temporary water control measures have been provided during construction to control flood events up to and including the 100-year design event. Additionally, the replacement structure was built adjacent to the existing structure, thereby allowing normal and flood flows to pass around the work area without impacting construction.
- A full cultural resources assessment was conducted due to the age of the structure and its history revolving around the canal system. This required mitigation efforts with the Ohio State Historic Preservation Office.
- A mussel relocation effort was also performed to facilitate a protected mussel species discovered on the project site. The project required an individual permit through the United States Army Corps of Engineers.
- The project limits were maintained on ODNR property limits with minor land acquisitions from surrounding property owners. A bank floodwall was designed instead of embankment placement to limit the amount of land acquisition. Michael Baker successful coordinated all construction efforts with surrounding property owners to limit the inconveniences and hindrances of living adjacent to active construction site.

Public Meetings. Michael Baker conducted three public meetings to get community concurrence, discuss the project, and address any questions or concerns. Three dimensional (3D) renderings and scaled 3D printed models were created to help the attendees visualize the final dam arrangement. Because of the public meetings and additional information provided by Michael Baker, the project has been well-received by the public.

Construction Documents and Construction Administration. Michael Baker prepared construction documents, including plans and specifications, for the bidding of the projects. Michael Baker provided construction management and oversight to ensure that construction was performed in accordance with the drawings and specifications. This included site inspections, progress meetings, and daily inspections during the construction of key components.

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We Make a Difference

Blue Rock State Park Dam Rehabilitation

Muskingum County, Ohio

Michael Baker is providing engineering services for the rehabilitation of Cutler Dam in Blue Rock State Park to ensure compliance with ODNR Dam Safety Regulations in regard to inadequate spillway capacity and overtopping protection. Michael Baker's services included site investigation, hydrologic and hydraulic analysis, permitting, dam inspection, rehabilitation design, and construction management and inspection services.

Existing Dam Information

The lake and dam are owned by the ODNR Division of State Parks and Watercraft. The dam was constructed in 1937 with repairs conducted in 1970. Cutler Dam is a 385-foot long earthen dam featuring a 74-foot concrete, curved ogee shaped weir. The ogee spillway outlets into a 20-foot wide concrete chute, which releases water 320 feet downstream into Mann's Fork Salt Creek. The height of the embankment is 31 feet at its maximum height with 3H:1V upstream slopes and 2H:1V downstream slopes. A control tower is located within the western portion of the lake and includes a 24-inch square sluice gate and a 16-inch diameter cast iron pipe lake drain that outlets downstream of the dam. Currently, the dam is not able to pass the Probable Maximum Flood (PMF) event and the concrete spillway and chute are deteriorated beyond repair.

Site Constraints. This rehabilitation project required the existing site infrastructure to be considered during design. Originally, the lake served as a water supply reservoir and the raw water was treated in the water treatment plant located downstream of the embankment toe. The treatment plant is no longer active and the abandoned raw water line is still located within the embankment. The raw waterline will be grouted and properly abandoned. Active water and electric lines are located downstream of the dam and are currently routed under the spillway. The water and electric line will be replaced and concrete encased below the replacement spillway. A sanitary treatment plant, which serves the existing park building and must remain active during construction, is located adjacent to the spillway chute. The design of the horizontal and vertical layout of the replacement spillway considered the stability of the facility during construction.

Client
Ohio Department of Natural Resources (ODNR)

Point of Contact
Gary Harsanye
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Project Dates
Start: 2016
Completion: July 2018 (Est.)

Project Costs
$4.0 Million (Construction)
$682,000 (Fee)

Project Relevance
- High Hazard Dam
- PMF Hydrologic Analysis
- Geotechnical Analysis
- Replacement Spillway With Increased Capacity
- Dual Frequency Bathymetric Survey
- Building Demolition
- Park Shelter Design
- Utility Coordination
- Asphalt Pavement
- Site Constraints
- Frequently Used Park

Project Improvements. The improvements to the dam generally include: removal of the existing concrete spillway and chute, select site demolition, construction of a labyrinth spillway, converging chute, and stilling basin, improvements to the existing control tower, extension of the existing lake drain, construction of an earthen embankment with permanent drainage collection, erection of a pedestrian bridge over the spillway, installation of concrete culvert crossing, and a new picnic shelter. The rehabilitations will bring the project into compliance with current dam safety regulations and improve the Park's functionality.

Hydrologic and Hydraulic Analysis. Hydrologic and Hydraulic Analyses were performed for the spillway, converging chute, and stilling basin. The labyrinth spillway was designed to mimic existing spillway flow characteristics up to and including the 100-year storm event with additional capacity to convey the PMF event without overtopping the embankment in compliance with current ODNR Dam Safety regulations.

Structural Investigation and Design. Structural assessments revealed severe deterioration of the existing concrete spillway. The labyrinth spillway, chute, and stilling basin have been designed to replace the existing spillway. The labyrinth spillway cycles, slabs, and walls have been designed based on the full PMF loading in order to meet current ODNR Dam Safety regulations. Additionally, a pedestrian bridge has been designed to cross over the spillway and modifications to the existing control tower were also considered and evaluated.

Geotechnical Analysis. Geotechnical analyses were conducted for the embankment and the labyrinth spillway, chute, and stilling basin. Passive dowels were designed and spaced to prevent potential uplift of the slabs based on the stability analysis. Seepage and settlement analyses performed for the embankment revealed that the existing embankment is stable as constructed. Inverted drains were added to the embankment toe to improve the stability and monitor seepage through the dam. Graded filters were added to new embankment sections designed based on the geotechnical evaluation. All explorations and analyses were summarized and recommendations were provided to the client upon completion of the final design of the proposed rehabilitation. Michael Baker was able to provide cost effect solutions while also limiting the impacts to the existing dam embankment.

Construction Documents and Construction Administration. Michael Baker has provided final construction documents including plans and specifications for bidding. Michael Baker will also provide construction management oversight and will perform daily inspections, will attend monthly progress meetings, critical pre-installation meetings, and will response to Request for Information to ensure construction is conducted in accordance with the drawings and specifications. The project was successfully bid within the client's allotted budget and mobilization is anticipated in summer 2017.

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We Make a Difference

Buckeye Lake Dam Improvements

Licking and Fairfield County, Ohio

Michael Baker has partnered with another engineering firm to bring ODNR's Buckeye Lake Dam into compliance with current dam safety regulations. Michael Baker has provided engineering and construction management services for the rehabilitation of Buckeye Lake Dam. Michael Baker's services included site civil designs, utility removal and relocation, and construction management and inspection.

Client
Ohio Department of Natural Resources (ODNR)

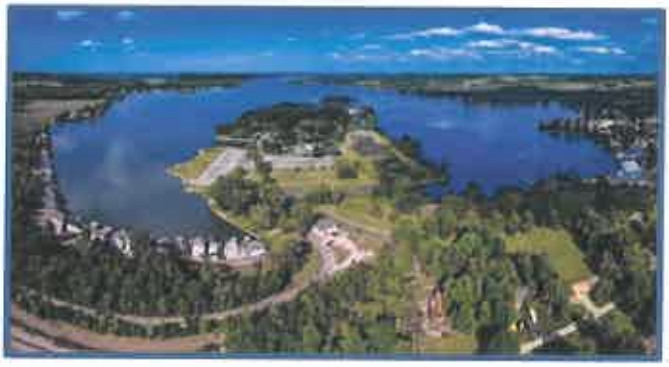
Point of Contact
James Hilovsky
(614) 265-6967
james.hilovsky@dnr.state.oh.us

Project Dates
Start: 2015
Completion: Ongoing

Phase 1 Project Costs
$100 Million (Construction)
$2.5 Million (Fee)

Project Relevance
- High Hazard Dam
- CMR Contract
- Site Layout, Demolition and Phasing Plans
- Individual Permit
- Interim Risk Reduction Phased Approach
- Frequently Used Park
- Park Upgrades

Existing Dam Information. Buckeye Lake has a long and rich history dating back nearly two centuries, which is unique for water retaining structures. Originally built in the early 1830s as a canal lake, the methods used to construct the 4.1 mile long earthen dam did not meet current standards. Since its original construction, the dam has been renovated at different times to include a masonry wall and a sheet pile wall on the upstream face of the embankment for erosion protection. The dam has been classified as a Class 1 high hazard structure by Ohio Department of Natural Resources (ODNR) as failure of the dam may result in loss of life.



Dam Inspection. Inspections performed on the dam revealed serious defects with the existing embankment including uncontrolled seepage conditions, sheet pile and masonry wall deterioration, trees growing on the embankment, persistent wet areas, and subsidence. Approximately 370 residential structures are located on the embankment and multiple docks and utilities have been connected to or penetrated the embankment. ODNR as the dam owner and regulator faced many challenges enforcing regulations, and inspecting and maintaining the embankment under such a scenario.

Project Improvements. The entire dam is being rehabilitated using a phased approach and the modifications will ensure public safety and long-term performance, as well as provide functional and aesthetic improvements. Phase I of the project is the Interim Risk Reduction Phase, which includes rapid development of interim risk reduction measures and construction that required close coordination with ODNR. The interim risk reduction measure selected for this project was a stability berm constructed along

the entire upstream face of the existing dam structure that will not rely on the existing embankment for strength and stability. Deep soil mix seepage cutoff wall was drilled in the stability berm to help reduce the amount of seepage through the dam. Phase 1 also included demolition of existing docks, utility penetrations, and trees located on the embankment. Phase II is currently being designed and will include the creation of an independent dam with additional sections of deep soil mixing in order to create a free standing structure. Various other site improvements will be performed during Phase 2.

Contract Approach. Construction at Buckeye Lake has been phased to expedite construction and to ensure the best use of public funds. Given the extremely accelerated schedule, ODNR elected to utilize a Construction Manager-at-Risk (CMAR) approach in order to rapidly engage contractors, which is crucial to achieve the aggressive milestones set out by ODNR. Michael Baker served as the Lead Construction Administrator and the central point of contact for ODNR, the A/E, and the CMAR. In this role, all coordination during construction was facilitated through Michael Baker.

Construction Administration. In addition to the design aspects, Michal Baker provided Construction Administration services which included inspection of construction activities around the clock. Because of the severely aggressive schedule, inspection services were required at least 6 if not 7 days a week. This required over seven fulltime staff for the majority of the construction, as well as numerous office staff reviewing submittals and RFI's.

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Chapman Dam Rehabilitation

Warren County, Pennsylvania

Michael Baker is providing engineering services for the rehabilitation of Chapman Dam to ensure compliance with PA Dam Safety Regulations in regards to inadequate spillway capacity and overtopping protection. Michael Baker's services included site and geotechnical investigation, hydrologic and hydraulic analysis, permitting, dam inspection, rehabilitation design, and will perform construction management and inspection services.

Existing Dam Information. Chapman Dam is located on the West Branch of Tionesta Creek, within Chapman State Park and is owned and operated by Pennsylvania Department of Conservation and Natural Resources. The dam consists of a 515 feet long earthen embankment with a maximum height of 24 feet. The normal pool is maintained by the 150-foot open-channel concrete spillway that outlets into a stair-step dissipater downstream of the spillway crest. The spillway features a stop-log system adjacent to the right spillway abutment to control pool elevations. A control tower houses a 24-inch gate valve and concrete-encased corrugated metal lake drain.

Project Improvements. The improvements to the dam generally include: select demolition, spillway slab replacement, spall repair, control tower modifications and lake drain extensions, roller compacted concrete (RCC) overtopping protection, placement of grout curtain, and lake dredging. The rehabilitations will bring the project into compliance with current dam safety regulations.

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis to determine the peak discharge and pool elevation for the Probable Maximum Flood (PMF) event. The analysis indicated the spillway has inadequate capacity to convey the PMF event without overtopping the embankment. RCC overtopping protection and the RCC runout apron were designed based on overtopping and tailwater depths. Hydraulic calculations were performed to verify the lake drain has adequate capacity to dewater the lake.

Structural Investigation and Design. Structural assessments of the existing spillway and control tower revealed that the primary spillway is in adequate condition and requires minor spall and crack repairs. Several spillway slabs need to be replaced since drainage layers beneath the spillway were determined to be in poor condition. Inspections of the control tower discovered severe deterioration above the water surface elevation and inoperable outlet works. The deteriorated portions of the control tower will be repaired and the lake drain will be slip-lined.

Client
Pennsylvania Department of General Services (DGS)

Point of Contact
David Folk
(717) 346-4021
dafolk@pa.gov

Project Dates
Start: 2014
Completion: 2018 (Est.)

Project Costs
$11 Million (Construction)
$540,000 (Fee)

Project Relevance
- High Hazard Dam
- H&H Analysis
- Geotechnical Analysis
- Salvaged Existing Spillway (modified)
- RCC Overtopping Protection
- Lake Dredging
- Lake Drain Modifications
- Dam Instrumentation

Geotechnical Investigation. Michael Baker prepared a subsurface exploration plan to assess the embankment and the existing drainage layers under the spillway. Geotechnical investigations performed revealed seepage concerns within the embankment. Michael Baker designed a grout curtain within the embankment to address seepage. Drainage layers will be provided below the RCC layers to collect additional seepage and prevent the build-up of uplift pressures.

Permitting and Project Coordination. Michael Baker's in-house team of engineers and environmental specialists conducted the required wetland investigation and prepared all the environmental permits required to complete the project. Michael Baker employed a proactive approach with all regulatory agencies by holding joint meetings with the owner to discuss all viable alternatives. The joint meetings allowed the all parties to discuss concerns with the regulatory agency and understand any cost implications. This approach has expedited the review process and has aided the Pennsylvania DGS, Pennsylvania Fish and Boat Commission, and Pennsylvania Department of Environmental Protection in achieving consensus on decisions.

Michael Baker
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Dutch Fork Lake Dam Rehabilitation

Washington County, Pennsylvania

Michael Baker provided engineering services for rehabilitation of Dutch Fork Lake Dam to ensure compliance with PADEP dam safety regulations with regard to overtopping protection during the Probable Maximum Flood (PMF) event. Michael Baker performed site assessment, geotechnical investigations, hydrologic and hydraulic analysis, permitting, rehabilitation design, and construction management.

Existing Dam Information. Dutch Fork Lake Dam is located in Washington County, Pennsylvania, and is owned and operated by Pennsylvania Fish & Boat Commission (PFBC). Dutch Fork Lake serves as a recreational facility. The dam was constructed in 1959 and featured an 81-foot concrete weir with a converging chute. The spillway is positioned along the left abutment and flanked by 450 feet of earthen embankment with a maximum height of 35 feet. As a result of substantial spillway damage sustained during Hurricane Ivan (2005), the spillway was breached and dewatered.

Project Improvements. The improvements to the dam generally include: existing spillway demolition, in-kind spillway replacement, stilling basin construction, installation of sluice gates and stop logs within the existing control tower, lake drain extension, roller compacted concrete (RCC) overtopping protection, installation of piezometers, and site improvements. The rehabilitations will bring the project into compliance with current dam safety regulations.

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis to determine the peak discharge and pool elevation for the full PMF event, which is required based on the hazard classification. The analysis indicated the existing and in-kind replacement spillway have insufficient hydraulic capacity to convey the PMF event without overtopping the embankment. Therefore, RCC overtopping protection and RCC runout aprons were designed based on overtopping and tailwater depths. A hydraulic analysis was performed on the new type III stilling basin to verify that energy will be dissipated within the stilling basin.

Client

Pennsylvania Department of General Services (DGS)

Point of Contact

David Folk
(717) 346-4021
dafolk@pa.gov

Project Dates

Start: 2011
Completion: November 2012

Project Costs

$4,765,000 (Construction)
$676,000 (Fee)

Project Relevance

- High Hazard Dam
- PMF Hydrologic and Hydraulic Analyses
- Geotechnical Investigation and Analyses
- In-kind Spillway Replacement
- Stilling Basin Design
- Control Tower Modifications
- Lake Drain Extension
- RCC Overtopping Protection
- Drainage Improvements
- Dam Instrumentation

Geotechnical Investigation and Design. Michael Baker prepared a subsurface exploration plan to obtain borings and corings at desired locations along the dam. The geotechnical investigation under the existing spillway revealed that the drainage features under the structure were in poor condition and susceptible to excessive uplift pressure, which are believed to have been attributed to the failure of the structure. The replacement spillway incorporated vertical relief drains to alleviate the uplift pressures and seepage collection systems to monitor seepage. The subsurface information was used to evaluate overall stability and determine the seepage characteristics of the embankment and spillway. Since the in-kind replacement spillway has insufficient capacity to contain the PMF, the RCC overtopping protection was designed and evaluated for stability and seepage.

Structural Analysis and Design. Structural assessment was performed on the existing spillway and control tower. Since the spillway was breached in 2005 and required complete replacement, structural analyses were performed on all components of the replacement spillway. The thickness of the new spillway slabs ranged from 1 foot thick at the top of the spillway to 3 feet thick at the bottom and stilling basin in order to counteract the uplift pressures at the toe of the dam. To minimize excavation, the stilling basin walls utilized the base slabs as their foundation. Structural designs were also performed on the lake drain extension and concrete bulkhead within the control tower which accommodated a new sluice gate and stop log system.

Project Coordination and Delivery. As a proactive approach, Michael Baker coordinated joint meetings between the owner and the regulatory agencies to present and discuss viable alternatives. By doing so, the regulatory agency was involved in the selection of the design alternative and the owner understood the cost implications of the alternatives. Ultimately, all major stakeholders concurred with the direction of the project which expedited the review process.

Construction Administration. Michael Baker provided construction management oversight to ensure construction was conducted in accordance with the drawings and specifications. This task involved conducting daily site inspections, attending monthly progress and/or Preinstallation meetings, responding to Request for Information, and reviewing pay requests. Michael Baker staff was present on site for all critical phases of construction including spillway and stilling basin construction, RCC placement, control tower modifications, and embankment placement. Michael Baker conducted fulltime inspection during the RCC placement, which included the review of the proposed RCC mix and placement plan, oversight during initial batching and test placement, as well as placement of RCC in its entirety. Michael Baker also oversaw the RCC quality assurance testing to ensure proper gradation, moisture, and placement densities were achieved. During construction, unforeseeable geotechnical conditions adversely impacted the proposed RCC tie-in along the right abutment. Michael Baker was able to expeditiously prepare a design solution, which was vetted with the contractor, to ensure a cost effective solution was implemented. Michael Baker was able to leverage its positive relationships with regulatory agencies to achieve approval within hours of submission; thus ensuring the changes did not impact the contract completion date.

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Canonsburg Lake Dam Rehabilitation

Washington County, Pennsylvania

Michael Baker provided engineering services for rehabilitation of Canonsburg Lake Dam to ensure compliance with PADEP dam safety regulations with regard to stability of the concrete gravity dam. Michael Baker performed site assessments, subsurface investigation and geotechnical analyses, hydrologic and hydraulic analyses, permitting, and construction management.

Client
Pennsylvania Department of General Services (DGS)

Point of Contact
David Folk
(717) 346-4021
dafolk@pa.gov

Project Dates
Start: 2011
Completion: November 2012

Project Costs
$2,116,000 (Construction)
$611,000 (Fee)

Project Relevance
- High Hazard Dam
- H&H Analysis
- Stability Analysis
- Dredging Plan
- Construction While Maintaining Normal Pool
- Post-Tensioned Rock Anchors
- Award Winning Project

Existing Dam Information. Canonsburg Lake Dam is located in Washington County, Pennsylvania, and is owned and operated by Pennsylvania Fish & Boat Commission (PFBC). Canonsburg Dam was built in 1943 and served as a water supply reservoir for ALCOA's Canonsburg Forging Plant during World War II. Currently, Canonsburg Lake serves as a recreational facility. Canonsburg Dam is 515-foot concrete gravity dam with an ogee spillway section consisting of 225 feet.

Project Improvements. The improvements to the dam generally include: select site demolition, installation of post-tensioned rock anchors in the spillway and non-overflow sections of the gravity dam, partial wall replacement, crack and spall repair, seepage collection, and site improvements. All work was performed, using batter boards along the spillway crest, to maintain normal pool throughout construction. The rehabilitations will bring the project into compliance with current dam safety regulations.

Hydrologic and Hydraulic Analysis. Michael Baker performed hydrologic and hydraulic modeling to develop the hydraulic loading parameters for the stability analysis. This evaluation included the development of a complex stage discharge curve for the spillway since the non-overflow section of the gravity dam is overtopped during the Probable Maximum Flood (PMF).

Geotechnical Investigation and Design. Michael Baker prepared a subsurface exploration plan to obtain borings at the desired locations upstream of the dam to determine the foundation conditions of the dam. Since the lake remained active during investigation, borings within the lake required the use of barge to collect the required samples. All available existing information from previous studies was reviewed and utilized to assist in the development of the drilling plan to reduce the amount of sampling required. A stability analysis was

conducted based on the US Army Corps of Engineers (USACE) guidance, EM 1110-2-2100 to determine the number, size, and location of anchors that were needed to meet the required safety factors for sliding and overturning.

Innovative Design. Michael Baker incorporated a number of innovative features into the design to address potential issues with the installation of anchors within the concrete dam while maintaining normal pool. These innovations included the following:

- An extendable drilling sleeve was incorporated to facilitate drilling operations when fractured rock is encountered at the monolith/rock foundation interface.
- A diverter and valve system was used with a containment system and filter berm to provide a superior solution to contain drill cuttings and maximize water quality.
- An innovative movable drilling platform was used at the spillway crest to install passive dowels and eliminate the use of a barge based operation.
- An eccentric drill was used to install 30- and 36-inch diameter anchor pockets on the sloping dam face and construction procedures were adapted to place non-shrink grout in sub-freezing weather.
- A unique retrofit solution was utilized to mitigate a distressed portion of one of the concrete training walls.

Project Coordination and Delivery. As a proactive approach, Michael Baker coordinated joint meetings between the owner and the regulatory agencies to present and discuss viable alternatives. By doing so, the regulatory agency was involved in the selection of the design alternative and the owner understood the cost implications of the alternatives. Ultimately, all major stakeholders concurred with the direction of the project which expedited the review process.

Construction Administration. Michael Baker provided construction management oversight to ensure construction was conducted in accordance with the drawings and specifications. This task involved conducting daily site inspections, attending monthly progress and/or Preinstallation meetings, responding to Request for Information, and reviewing pay requests. The construction of Canonsburg was a great success for the DGS, PFBC, Pennsylvania Department of Environmental Protection (PADEP), Michael Baker, and the Contractor. This was accomplished through close coordination with the Contractor, working as a collaborative team to tackle the diversities encountered throughout the project, and employing innovative design features noted above.

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Somerset Lake Dam Rehabilitation

Somerset County, Pennsylvania

Michael Baker provided engineering services for rehabilitation of Somerset Lake Dam to ensure compliance with PADEP dam safety regulations with regard to overtopping protection during the Probable Maximum Flood (PMF) event. Michael Baker performed site assessment, geotechnical investigations, hydrologic and hydraulic analysis, permitting, and rehabilitation design services. Construction management services will be provided by Michael Baker once the construction contract has been awarded.

Existing Dam Information. Somerset Lake Dam, located in Somerset County, Pennsylvania, is owned by the Pennsylvania Fish & Boat Commission (PFBC). The dam was constructed in 1956 and serves as heavily utilized recreational facility. The dam features a 68-foot wide ogee spillway with a converging spillway chute. The dam consists of 1,500 feet of earthen embankment with a maximum height of 25 feet.

Project Improvements. The improvements to the dam generally include: existing spillway demolition, labyrinth spillway and stilling basin construction, control tower modifications with sluice gates and stop logs, lake drain extension, in-kind spillway replacement, and partial embankment re-construction which included drainage filters and seepage collection, installation of piezometers, and site improvements. The design included raising the embankment crest by 4 feet to contain the PMF rather than designing overtopping protection. The rehabilitations will bring the project into compliance with current dam safety regulations.

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis to determine the peak discharge and pool elevation for the full PMF event (based on hazard classification). The replacement labyrinth spillway was designed to mimic the existing spillway flow characteristics up to and including the 100-year storm event while providing additional capacity to pass the PMF event. Dam break modeling was conducted to support the development of an Emergency Action Plan (EAP).

Geotechnical Investigation and Design. Michael Baker prepared a subsurface exploration plan to obtain borings and corings at desired locations along the dam to assess the embankment stability, determine the condition of the drainage layers under the spillway, and determine the composition of the embankment. The

Client
Department of General Services (DGS)

Point of Contact
David Folk
(717) 346-4021
dafolk@pa.gov

Project Dates
Start: 2013
Completion: Fall 2018 (Est.)

Project Costs
$7.5 Million (Construction)
$807,000 (Fee)

Project Relevance
- High Hazard Dam
- PMF Hydrologic and Hydraulic Analyses
- Alternatives Analysis
- Spillway Replacement With Increased Capacity
- Dam Instrumentation
- Control Tower Modifications and Lake Drain Extension
- Frequently Used Park
- Embankment Height Increased

borings revealed a sand layer located below the embankment that transmitted water under the dam and artesian conditions located within the left abutment. Appreciable seepage and saturated soils were encountered downstream of the dam. During the investigation, vibrating wire piezometers were installed to monitor the water pressures present in the existing dam foundation and determine the response during reservoir level fluctuations. The embankment incorporated sheetpile at the upstream embankment toe to minimize transmission of water under the dam and a seepage collection system was designed along the embankment toe.

Structural Investigation and Design. A structural assessment of the existing spillway and control tower were conducted. The primary spillway was found to be in good structural condition and only minor spall and crack repairs were required from a structural standpoint. However, due to poor subsurface conditions, it was determined that the spillway should be replaced with a labyrinth spillway capable of passing the PMF. All structural components of the spillway were designed and the stability of the spillway was analyzed. Michael Baker determined the number, size, and spacing of dowels to be embedded into the underlying rock to meet current spillway stability requirements. An assessment of the existing control was performed that indicated that the control tower inspection is in good condition and did not require any structural work at this time other than the replacement of the steps.

Project Coordination and Delivery. As a proactive approach, Michael Baker coordinated joint meetings between the owner and the regulatory agencies to present and discuss viable alternatives. By doing so, the regulatory agency was involved in the selection of the design alternative and the owner understood the cost implications of the alternatives. Ultimately, all major stakeholders concurred with the direction of the project which expedited the review process.

Construction Administration. Michael Baker will provide construction administration and inspection services throughout construction to ensure that the all project components are constructed in accordance with the drawings and specifications. This will involve site inspections, progress meetings, and daily inspections during the construction of key components.

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Kyle Lake Dam Rehabilitation

Jefferson County, Pennsylvania

Michael Baker provided engineering services for rehabilitation of Kyle Lake Dam to ensure compliance with PADEP dam safety regulations with regard to overtopping protection during the Probable Maximum Flood (PMF) event. Michael Baker performed site assessments, geotechnical investigations, a hydrologic and hydraulic analysis, permitting, topographic services, and rehabilitation design services. Construction management services will be provided by Michael Baker once the construction contract has been awarded.

Existing Dam Information. Kyle Lake Dam is located in Jefferson County, Pennsylvania, and is owned and operated by Pennsylvania Fish & Boat Commission (PFBC). Kyle Lake serves primarily as a recreational facility. The dam was constructed in 1910 and features a 50-foot wide primary spillway and a 74-foot wide auxiliary spillway located on opposite abutments of the dam. 1,000 feet of earthen embankment with a maximum height of 30 feet separate the two spillways. A concrete control tower is located within the lake and a lake drain extends through the embankment.

Project Improvements. The improvements to the dam generally include: partial demolition and in-kind replacement of the auxiliary spillway, partial demolition and re-construction of the control tower, installation of sluice gates and stop logs within the existing control tower, lake drain extension, articulated concrete block (ACB) overtopping protection, installation of piezometers, and site improvements. The rehabilitations will bring the project into compliance with current dam safety regulations.

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis to determine the peak discharge and pool elevation for the full PMF event, which is required based on the hazard classification. The analysis indicated the existing and in-kind replacement spillway have insufficient hydraulic capacity to convey the PMF event without overtopping the embankment. Therefore, ACB overtopping protection and ACB runout aprons were designed based on overtopping and tailwater depths.

Client
Pennsylvania Department of General Services (DGS)

Point of Contact
David Folk
(717) 346-4021
dafolk@pa.gov

Project Dates
Start: 2012
Completion: Fall 2018 (Est.)

Project Costs
$3.4 Million (Est. Construction)
$450,000 (Fee)

Project Relevance
- High Hazard Dam
- PMF Hydrology and Hydraulics Analysis
- Geotechnical Investigation and Analyses
- In-kind Spillway Replacement
- Control Tower Modifications
- Lake Drain Extension
- ACB Overtopping Protection
- Drainage Improvements

Geotechnical Investigation. Michael Baker prepared a subsurface exploration plan to obtain borings and corings at desired locations along the dam. Borings within the lake required the use of a barge to collect samples. The subsurface information was used to assess the spillway and embankment foundation, evaluate overall spillway and embankment stability, and determine the seepage characteristics of the embankment and spillway. The ACB overtopping protection was evaluated and a seepage collection system was developed below the ACB.

Structural Investigation and Design. Structural assessments performed on the existing principal and auxiliary spillways and control tower. At the time of the assessment, the principal spillway was in satisfactory condition and did not require replacement. The auxiliary spillway was in poor condition and required in-kind spillway replacement to match current flow characteristics. The control tower inspection revealed that the existing concrete at and above the normal pool level was in poor condition and required replacement. Michael Baker utilized the results of the assessments to develop partial replacement plans to help reduce the total construction cost. Structural designs were performed on the auxiliary spillway replacement elements and the control tower portions to be replaced.

Project Coordination and Delivery. As a proactive approach, Michael Baker coordinated joint meetings between the owner and the regulatory agencies to present and discuss viable alternatives. By doing so, the regulatory agency was involved in the selection of the design alternative and the owner understood the cost implications of the alternatives. Ultimately, all major stakeholders concurred with the direction of the project which expedited the review process.

Construction Administration. Michael Baker will provide construction management oversight to ensure construction is conducted in accordance with the drawings and specifications. This task will involve conducting daily site inspections, attending monthly progress and/or Preinstallation meetings, responding to Request for Information, and reviewing pay requests.

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Donegal Lake Dam Rehabilitation

Westmoreland County, Pennsylvania

Michael Baker provided engineering services for rehabilitation of Donegal Lake Dam to ensure compliance with PADEP dam safety regulations with regard to overtopping protection during the Probable Maximum Flood (PMF) event. Michael Baker performed site assessment, geotechnical investigations, hydrologic and hydraulic analysis, permitting, and rehabilitation design services. Construction management services will be provided by Michael Baker once the construction contract has been awarded.

Existing Dam Information. Donegal Lake Dam is located in Westmoreland County, Pennsylvania, and is owned and operated by Pennsylvania Fish & Boat Commission (PFBC). Donegal Lake serves primarily as a recreational facility. The dam was constructed in 1967 and features a 74-foot wide ogee spillway with a converging spillway chute. The dam consists of 400 feet of earthen embankment with a maximum height of 25 feet.

Project Improvements. The improvements to the dam generally include: existing spillway demolition, in-kind spillway replacement, stilling basin construction, installation of sluice gates and stop logs within the existing control tower, lake drain extension, roller compacted concrete (RCC) overtopping protection, installation of piezometers, and site improvements. The rehabilitations will bring the project into compliance with current dam safety regulations.

Client

Pennsylvania Department of General Services (DGS)

Point of Contact

David Folk
(717) 346-4021
dafolk@pa.gov

Project Dates

Start: 2012
Completion: Fall 2018 (Est.)

Project Costs

$4.6 Million (Est. Construction)
$541,000 (Fee)

Project Relevance

- High Hazard Dam
- H&H Analysis
- Geotechnical Analysis
- Alternatives Analysis
- In-kind Spillway Replacement
- RCC Overtopping Protection
- Passive Dowels
- Dam Instrumentation

Hydrologic and Hydraulic Analysis. Michael Baker conducted a hydrologic and hydraulic analysis to determine the peak discharge and pool elevation for the full PMF event, which is required based on the hazard classification. The analysis indicated the existing and in-kind replacement spillway have insufficient hydraulic capacity to convey the PMF event without overtopping the embankment. Therefore, RCC overtopping protection and RCC runout aprons were designed based on overtopping and tailwater depths.

Geotechnical Investigation. Michael Baker prepared a subsurface exploration plan to obtain borings and corings at desired locations along the dam. While drilling, artesian conditions were experienced within the right abutment and the required drainage collection systems were designed to control this condition. Assessments were performed on the spillway subgrade and revealed that the subgrade is in poor condition. The observed subgrade was one of the factors which lead to the replacement of the spillway. The subsurface information was used to evaluate overall stability and determine the seepage characteristics of the embankment and spillway. The RCC overtopping protection was evaluated

and a seepage collection system was developed below the RCC. Passive dowels under the spillway crest were designed to be anchored into the underlying bedrock based on the results of the stability analysis.

Structural Investigation and Design. Structural assessments performed on the existing spillway and structural components revealed only minor spall repair would be required on the spillway. Due to the condition of the subsoils and drainage below the spillway, it was determined that in-kind spillway replacement was the preferred option to address the concerns. Structural analyses were performed on the spillway, spillway chute, stilling basin, and all structural walls.

Project Coordination and Delivery. As a proactive approach, Michael Baker coordinated joint meetings between the owner and the regulatory agencies to present and discuss viable alternatives. By doing so, the regulatory agency was involved in the selection of the design alternative and the owner understood the cost implications of the alternatives. Ultimately, all major stakeholders concurred with the direction of the project which expedited the review process.

Construction Administration. Michael Baker will provide construction management oversight to ensure construction is conducted in accordance with the drawings and specifications. This task will involve conducting daily site inspections, attending monthly progress and/or Preinstallation meetings, responding to Request for Information, and reviewing pay requests.

Michael Baker
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Pettit Landslide Remediation

Greene County, Pennsylvania

An approximate 180 foot scarp developed upgradient of high pressure natural gas pipeline along a rural hillside in Greene County, Pennsylvania during November, 2015. Michael Baker was contracted for a full breadth of services to remediate the landslide which included a subsurface and site investigation, interim and permanent remedial solutions, acquiring necessary permits, coordinating with the Pennsylvania Department of Environmental Protection, and overseeing construction to ensure the design was implemented properly.

Client
Confidential

Point of Contact
Confidential – Available upon request

Project Relevance

- Landslide evaluation
- Landslide remediation
- Subsurface investigation
- Slope Stability Analysis
- Construction Documents
- Construction Oversight

As part of the investigation, Michael Baker directed the drilling of 11 test borings to determine subsurface conditions, installation of 4 inclinometers to monitor ground movement, and installation of 3 piezometers to monitor groundwater levels.

Given the sensitive nature of the project with a pipeline, Michael Baker designed a rock toe buttress to support the hillside above the pipeline and blanket drain to provide drainage to the perched water tables observed in the limestone beds underlaying the site. The initial short-term, stability remediation measures were completed and implemented within a week of the initial reconnaissance. These measures provided a stable area during the period of monitoring and construction required in the coordination with PADEP.

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Pitcairn Road Landslide Remediation

Borough of Pitcairn, Pennsylvania

The Allegheny County Department of Public Works retained Michael Baker to perform design engineering and construction support services for the Dirty Camp Run realignment and Pitcairn Road embankment repair within the Borough of Pitcairn, Allegheny County, Pennsylvania. The project was the result of the collapse of a 100-foot long section of Pitcairn Road due to the slope failure (landslide) of the adjacent wooden crib wall. For safety reasons, one lane of Pitcairn Road was closed to traffic. This roadway is a major artery that conveys traffic to and from Pitcairn, Wall, Turtle Creek and Monroeville Boroughs and the Pennsylvania Turnpike.

Generally, this project included the relocation of approximately 500 feetof Dirty Camp Run, a tributary stream to Turtle Creek, away from Pitcairn Road in order to improve stream flow and provide roadway support. The project also included a new 20' wide x 7' high (inside dimensions) precast concrete box culvert to replace the existing corrugated metal circular culvert at the Sugar Camp Park entrance. The project also included Pitcairn Road repair, construction of an earthen embankment at an approximate slope of 2:1 to remediate the slope failure/landslide, demolition of selected existing utilities, an existing culvert and the existing timber wall, general grading & site work and Sugar Camp Park access, parking and landscaping improvements. **This project received a Diamond Award Certificate for Engineering Excellence from the American Council of Engineering Companies.**

Client
Allegheny County Department of Public Works

Point of Contact
Public Works – Design Engineering
412-350-5585

Project Costs
$400,000 (Construction)
$35,000 (Fee)

Project Relevance
- Landslide evaluation
- Landslide remediation
- Slope Stability Analysis
- Construction Documents
- Construction Oversight

A unique aspect of the project was the County's desire to incorporate the needs of three other entities – Pitcairn Borough, PADEP Harrisburg and PADEP Pittsburgh as well as the County's own need to open Pitcairn Road in a timely manner. Economically, the project will save the taxpayers approximately $300,000 to $500,000 by coordinating with PADEP and their future project.

Michael Baker
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Appendix B

Resumes

Patrick W. Fogarty, P.E., P.S.

Project Manager

Project Role and Qualifications

Exceeding the client's expectations begins with a dedicated Project Manager. Michael Baker is proposing Pat Fogarty, PE, as the Team's Project Manager because of his proven commitment to deliver a project on time and on budget. Mr. Fogarty has been responsible for technical and management aspects of civil design and surveying projects within the state of West Virginia for over 30 years and is based in the Charleston office. Mr. Fogarty has designed and managed projects in numerous disciplines including civil, structural and transportation engineering, site development, ecosystem restoration, planning and surveying. These projects have included airports, streets/highways, bridges, parking lots, buildings, sanitary systems and structures, stream restoration as well as boundary and topographic and photogrammetric surveys. Duties included field surveying, drawings and specification preparation, design, design drafting, construction inspection, quality control testing, shop drawing review, project management, contract administration and report preparation.

Experience

Open-End Architectural and Engineering Services, West Virginia State University, Institute, West Virginia. *West Virginia State University.* Project Manager. Engineer-of-Record. Responsible for the engineering design. Michael Baker provided architectural and multidisciplined engineering services under a ten-year open-end agreement to design renovations, alterations, reconstruction, or extensions of facilities. Michael Baker's services included programming, planning, design development, construction documentation, evaluations, feasibility studies, cost estimating, and construction contract administration.

Flood Protection Options Report-Bonham Elementary School, Kanawha County, West Virginia. *West Virginia Division of Homeland Security and Emergency Management.* Project Manager. Responsible for the development of a report listing potential flood protection options for the facility. Michael Baker was retained by the West Virginia Division of Homeland Security and Emergency Management to prepare a report to address flood protection options for Bonham Elementary School in Kanawha County, West Virginia.

Blennerhassett Island Bridge, Appalachian Corridor D, Wood County, West Virginia and, Washington County, Ohio. *West Virginia Department of Transportation, Division of Highways.* QA/QC. Responsible for quality assurance review of final computations. Michael Baker provided engineering services for the Blennerhassett Island Bridge; the "missing link" final segment of Appalachian Highway Corridor D. Michael Baker's services included project management, environmental engineering and location studies,

Years with Michael Baker: 13
Years with Other Firms: 19

Degrees

B.S., 1985, Civil Engineering, West Virginia University Institute of Technology

Diploma, 1993, Surveying and Mapping, International Correspondence Schools

Licenses/Certifications

Construction Documents Technologist, 1996, [redacted]

FAA, Eastern Region Laboratory Procedures Manual Certificate [redacted], 1992

Professional Engineer, Kentucky, 2000, [redacted]

Professional Surveyor, Kentucky, 2001, [redacted]

Professional Engineer, North Carolina, 2008, [redacted]

Professional Engineer, Ohio, 1996, [redacted]

Professional Surveyor, Ohio, 1996, [redacted]

Professional Engineer, Pennsylvania, 2003, [redacted]

Professional Engineer - Civil/Structural, West Virginia, 1990, [redacted]

Professional Surveyor, West Virginia, 1993, [redacted]

Asphalt Paving Technician, West Virginia, 1991, [redacted]

Concrete Technician, West Virginia, 1991, [redacted]

permitting, preliminary and final design, and construction services for this network tied-arch bridge that carries U.S. 50 over the Ohio River. The bridge is 100 feet, six inches wide, and the total length of the structure is 4,008 feet, nine inches. It has an 878-foot, six-inch-long main span, network tied arch with a rise of 175 feet and is ranked as the longest of its type in the United States and one of the longest in the world.

Drainage Improvements and Reclamation Measure Design for Four Abandoned Mine Sites, Kanawha County, West Virginia. *WVDEP - Office of AML&R.* Project Manager. Responsible for the management and coordination of all activities. Michael Baker is providing surveying and mapping, field investigation, subsurface investigation, water testing and sampling, and conceptual, preliminary and final design for the reclamation of four abandoned mine sites that are affected by uncontrolled drainage, debris, and hazards from open portals. Michael Baker is also providing bid phase and construction phase support for the remedial measures.

Engineering Design for Remediation of Crooked Run #5, Harrison County, West Virginia. *WVDEP - Office of AML&R.* Project Manager. Responsible for the management and coordination of all activities. Michael Baker provided engineering services to remediate seven abandoned mine sites along Crooked Run Stream near Clarksburg, West Virginia. Services included field investigation and surveys; core boring and water sampling; conceptual, preliminary, and final design of remediation measures; and bid phase and construction phase support.

A/E Services for the Office of the Adjutant General, West Virginia Army National Guard, Division of Engineering and Facilities, Charleston, West Virginia. *State Army National Guard Headquarters.* Project Manager. Responsible for the management and coordination of all activities. The Facilities Management Officer (FMO) for the State of West Virginia, Division of Engineering and Facilities (DEF), West Virginia Army National Guard (WVARNG) selected Michael Baker for a lump sum/fixed fee contract for architectural and engineering services. Michael Baker was selected by the Division of Engineering and Facilities to provide complete design and construction administration services for the renovation of the first floor of the entire wing of the Office of the Adjutant General (TAG). The Owner requested the need for modernization of approximately 12,000 square feet of existing outdated office space - project elements included new acoustical ceilings, flooring, energy-saving light fixtures, duplex outlets, communications jacks, alterations to the existing floor plan, exterior door replacements, new interior doors and hardware, new wall finishes and asbestos removal.

Engineering Services to Remediate Landslide Caused by Abandoned Mine Activity, McDowell County, West Virginia. *WVDEP - Office of AML&R.* Project Manager. Responsible for the management and coordination of all activities. Michael Baker provided field investigation, engineering services, and construction support to remediate a landslide on private property caused by drainage from abandoned mine portals. Michael Baker provided conceptual, preliminary, and final design documents for remedial drainage measures and provided support during construction.

Mine Subsidence Remediation Design, Marion County, West Virginia. *WVDEP - Office of AML&R.* Project Manager. Engineer-of-Record responsible for the coordination of all activities. Michael Baker provided engineering services to mitigate the effects of mine subsidence at four residential sites. Michael Baker's services included surveying and mapping; field investigation; conceptual, preliminary, and final design of subsidence remediation measures; and bid-phase and construction-phase support.

Abandoned Mine Lands, West Virginia. *Department of Environmental Protection Statewide Contract.* Various Locations, West Virginia. As a Project Manager, provided services for civil design for various Abandoned Mine Land (AML) projects throughout West Virginia. Various types of AML projects include landslide correction include retaining wall design and site grading and drainage improvements, acid mine drainage collection and neutralization, water line upgrade and extensions, and various projects requiring site regrading and drainage upgrade. Work on these projects also included establishing horizontal and vertical control surveys for aerial photogrammetry mapping, baseline layout, referencing control points, generating check cross sections and site surveys including all physical and topographic features of each unique site.

Russell E. Hall, P.E.

Principal In Charge

Years with Michael Baker: 14
Years with Other Firms: 18

Degrees

B.S., 1985, Civil Engineering, West Virginia University Institute of Technology

Licenses/Certifications

Professional Engineer, West Virginia, 1990, [redacted]

Professional Surveyor, West Virginia, 1996, [redacted]

Project Role and Qualifications

Mr. Hall currently serves as a Vice President of Michael Baker, as well as Office Executive of our Charleston, West Virginia office. He is an experienced engineer who has been involved in numerous bridge and highway design projects in West Virginia for many years. His project management responsibilities involve overseeing staff from project inception through completion, and ensuring that the clients' needs and requirements are met.

He also has many years of office management experience. His office management responsibilities include financial oversight and accountability for a staff of over 30 engineers, scientists, and administrative personnel for Michael Baker's Charleston office. His major strengths include organizing and managing a project team, quality control and quality assurance, and problem resolution. He provides overall direction and maintains direct communications with all clients.

Mr. Hall is very proud of the fact that he has been able to spend his entire career in West Virginia.

Experience

Appalachian Corridor H Environmental Impact Statement, Appalachian Highlands Region, Elkins, West Virginia. *West Virginia Department of Transportation, Division of Highways.* Principal-In-Charge. Responsible for oversight of project finances, resource allocation, schedules, and quality control. The Appalachian Corridor H is a 100 mile proposed four-lane highway intended to provide access from Interstate 81 in Northwestern Virginia through the rugged, mountainous terrain of West Virginia's Appalachian Highlands Region. Michael Baker was responsible for preparing the tiered Corridor H Supplemental EIS study. This consisted of a corridor-level study evaluation (Corridor Selection EIS) to determine the environmental and engineering constraints existing along 24 potential alternative corridors (Tier 1) and a follow-on Alignment Selection FEIS (Tier 2). Michael Baker also provided advanced preliminary engineering on the preferred alignment. Following the 1996 Record of Decision, the WVDOT and FHWA were sued in Federal District and Appeals Courts by a coalition of 13 environmental groups. Michael Baker provided lawsuit support for legal counsel during that period-project is now under construction and Michael Baker is providing environmental monitoring and engineering services.

Open-End Architectural and Engineering Services, West Virginia State University, Institute, West Virginia. *West Virginia State University.* Principal-In-Charge. Responsible for oversight of project finances, resource allocation, schedules, and quality control. Michael Baker provided architectural and multidisciplined engineering services under a ten-year open-end agreement to design renovations, alterations, reconstruction, or extensions of facilities. Michael Baker's services included programming, planning, design development, construction documentation, evaluations, feasibility studies, cost estimating, and construction contract administration.

WVDOH-PENNSYLVANIA AVENUE TUNNEL. *West Virginia Department of Transportation, Division of Highways.* Principal-In-Charge. Responsible for oversight of Project Management.

Appalachian Corridor H, Section 6, E. Hardy County 220/8 to WV 55 Interchange, Moorefield, West Virginia. *West Virginia Department of Transportation, Division of Highways.* Principal-In-Charge. Responsible for oversight of project finances, resource allocation, schedules, and quality control. This project involved the study, design, and

final construction plan development for a new roadway beginning 0.6 miles southeast of Hardy County 220/8 and continuing eastward 6.6 miles to an interchange with WV 55. This project included an interchange with the Moorefield Bypass, a ramp connector road south of the corridor west from the possible future Moorefield Bypass to a proposed reconstruction of US 220, a closure study of the floodwall on the north end of Moorefield near this Section 6 proposed highway location, six bridges and completion of an interchange (two ramps) with WV 55 on the east end of the project.

Design Manual for Deep and Shallow Foundations, Statewide, West Virginia. *West Virginia Department of Transportation, Division of Highways.* Project Manager. Responsible for oversight of project finances, resource allocation, schedules, and quality control. The goal of this project is to develop geotechnical factors for LRFD, as found in AASHTO Specifications and update other geotechnical guidelines for the WVDOT/DOH Bridge Design Manual.

Elk Twomile Creek Bridge Design, Kanawha County, West Virginia. *West Virginia Department of Transportation, Division of Highways.* Principal-In-Charge. This is a bridge replacement project. Due to the very tight geometric restrictions, the bridge was designed using staged construction, keeping one lane of traffic open at all times during construction rather than closing the roadway down. It is highly skewed (56 degrees), 8 steel girder system with a single span length of 49'-0" and a total deck width of 25'-4". Abutments are semi-integral and founded on steel piling. The bridge crosses a FEMA studied stream with an established floodway and is located in an area that is prone to flooding.

I-64/U.S. 35 Interchange Study, I-64 to WV 34 Interchange, Putnam County, West Virginia. *West Virginia Department of Transportation, Division of Highways.* Principal-In-Charge. Responsible for oversight of project finances, resource allocation, schedules, and quality control. Michael Baker performed an interchange study for Phase 1 of this project, which included two locations: Crooked Creek and Cow Creek. Seven types of Interchanges were studied, three at Crooked Creek, and four at Cow Creek. Michael Baker also assisted in presentation of the alternatives at public involvement meetings with the client.

Davis Creek Wye Bridge Design, Davis Creek Wye Bridge over Davis Creek, West Virginia. *West Virginia Department of Transportation, Division of Highways.* Principal-In-Charge. Responsible for oversight of Project Management. Michael Baker performed the study, design and preparation of construction contract plans and related documents for the replacement of the Davis Creek Wye Bridge. The new bridge will be constructed in the same location as the current bridge, using a detour to re-route traffic around the construction site. The bridge is designed as a 25° skewed, single span prestressed adjacent concrete beam superstructure, situated on full height concrete abutments founded on steel piling.

Kanawha River Bridge, Charleston, West Virginia. *Brayman Construction Company.* Principal-In-Charge. Responsible for oversight of project finances, resource allocation, schedules, and quality control. Michael Baker's Charleston, West Virginia office redesigned seven piers for the contractor and performed a complete analysis of the superstructure and substructure to properly size the piers.

West Virginia Riverine Flood Analysis, Statewide, West Virginia. *West Virginia Division of Homeland Security and Emergency Management.* Principal-In-Charge. Responsible for oversight of Project Management. Michael Baker is providing an analysis of potential riverine flood hazards throughout the state, using Hazards U.S. Multi Hazard (HAZUS-MH) MR3 to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. Michael Baker is providing hydrologic and hydraulic analyses, using 10-year, 25-year, 50-year, and 100-year flow events to delineate floodplains.

Stephen Kramer, P.E.

Quality Control Lead

Years with Michael Baker: 32
Years with Other Firms: 1

Degrees

B.S., 1985, Civil Engineering, University of Pittsburgh

Licenses/Certifications

Professional Engineer, Pennsylvania, 1990, [redacted]

Project Role and Qualifications

Mr. Kramer will serve as Quality Control Manager and will be responsible for reviewing all deliverables prior to submission and for providing senior-level technical guidance throughout the project. Mr. Kramer's 33 years of Civil Engineering experience has been focused on the evaluation and design of water resources projects. Mr. Kramer has served as Quality Control Manager for all dam rehabilitation projects for Ohio Department of Natural Resources, Pennsylvania Fish and Boat Commission (PFBC), Pennsylvania Department of Natural Resources (PA DCNR), and a number of Virginia and West Virginia dams. Mr. Kramer's experience in design and construction on several water resources projects enables him to provide insightful and construction-related comments during the quality control process.

Experience

Roosevelt Lake and Pond Lick Dam Rehabilitation. *Ohio Department of Natural Resources.* Quality Control Lead. Responsible for QA/QC reviewing all deliverables for the rehabilitation of the two dams which were designed, bid, and constructed under one contract. Mr. Kramer reviewed design reports, design alternatives, construction drawings, specifications, cost estimates and oversaw the submission of all regulatory permits. He provided senior level technical guidance on key components of the design including the spillway rehabilitation, RCC design, structural and geotechnical stability, and seepage collection.

Pike Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* . Quality Control Lead. Responsible for QA/QC review of all deliverables including geotechnical and hydrologic and hydraulic reports, design alternatives, construction drawings, specifications, cost estimates and regulatory permits. Mr. Kramer provided senior level technical guidance from the design stages through construction.

Lake Loramie Dam Rehabilitation. *Ohio Department of Natural Resources.* Quality Control Lead. Responsible for QA/QC review of all deliverables including geotechnical and hydrologic and hydraulic reports, design alternatives, construction drawings, specifications, cost estimates and regulatory permits. Mr. Kramer oversaw the development of phasing and water control plans to ensure public safety throughout construction.

Mount Gilead Lake Upper and Lower Dam Rehabilitation. *Ohio Department of Natural Resources.* Quality Control Lead. Responsible for QA/QC review of all deliverables. Mr. Kramer reviewed the geotechnical and hydrologic and hydraulic analyses included in the preliminary design report, spillway design alternatives, construction drawings, specifications, cost estimates and regulatory permits. Mr. Kramer oversaw the design and analysis of the labyrinth spillway, the first of this type to be designed and to be constructed in Ohio.

Canonsburg Lake, Chapman Lake, Dutch Fork Lake, Donegal Lake, Kyle Lake, and Somerset Lake Rehabilitation. *Pennsylvania Department of Conservation and Natural Resources and Pennsylvania Fish and Boat Commission.* Quality Control Lead. Responsible for QA/QC review of all deliverables including design reports, design alternatives, construction drawings, specifications, cost estimates and regulatory permits. Mr. Kramer oversaw the design and analysis of all components of the design including the replacement spillway, RCC and ACB overtopping protection, control tower rehabilitation, lake drain extensions, and water control and phasing plans. Mr. Kramer has also provided construction oversight and guidance during the construction of the dams.

Joseph Kudritz, P.E.

Hydrologic and Hydraulic Lead

Project Role and Qualifications

Mr. Kudritz will serve as the Hydrology and Hydraulics Lead and will be responsible for the technical design aspects. Mr. Kudritz is a Water Resources Engineer experienced in hydrologic and hydraulic computer modeling and design for dams and other hydraulic structures. He has performed an integral role on a variety of dam rehabilitations, including the Hydrology and Hydraulics Lead and Lead Design Engineer for Lake Loramie, Mount Gilead, and Blue Rock as well as dams rehabilitated for Pennsylvania Fish and Boat Commission (PFBC) and Pennsylvania Department of Conservation and Natural Resources (PA DCNR). Mr. Kudritz is well versed in all aspects of dam rehabilitation, rehabilitation designs and dam safety inspections.

Years with Michael Baker: 9

Degrees

Graduate Studies, Water Resources and Environmental Engineering, University of Pittsburgh, Pittsburgh Campus

B.S., 2007, Civil Engineering, Geneva College

Licenses/Certifications

Professional Engineer, Idaho, 2015, [redacted]

Professional Engineer - Civil, Pennsylvania, 2013, [redacted]

Experience

Mount Gilead Lake Upper and Lower Dam Rehabilitation. *Ohio Department of Natural Resources.* Hydrologic and Hydraulic and Civil Design Lead. Responsible for leading the design of Mount Gilead Dam replacement and overseeing the hydraulic and hydrologic analysis for the existing and proposed dam. The labyrinth spillway, the first of this type to be designed and to be constructed in Ohio, has been designed to conform to published guidance documents and model studies. The spillway was designed utilizing flows developed precipitations from the Statewide PMP Study. Mr. Kudritz also oversaw the updated Emergency Action Plan (EAP) for the new dam. Mr. Kudritz prepared preliminary and final construction drawings, incorporated all structural and geotechnical aspects of the dam construction, and developed conceptual construction sequencing and phasing plans.

Lake Loramie Dam Rehabilitation. *Ohio Department of Natural Resources.* Hydrologic and Hydraulic and Civil Design Lead. Responsible for leading the design of Lake Loramie Dam replacement and overseeing the hydraulic and hydrologic analysis for the existing and proposed dam. The labyrinth spillway to mimic existing flows up to the 100-year design event while providing additional capacity to convey the PMF event. Mr. Kudritz also oversaw the development of the updated EAP. Due to site constraints, the replacement spillway was designed adjacent to the existing structure and phased to maintain normal pool throughout construction.

Blue Rock State Park Cutler Dam Rehabilitation. *Ohio Department of Natural Resources.* Hydrologic and Hydraulic and Civil Design Lead. Responsible for overseeing the design of dam replacement and performing the hydraulic and hydrologic analysis for the existing and proposed dam. The labyrinth spillway was designed to mimic existing flows up to the 100-year design event while providing additional capacity to convey the PMF event without overtopping the embankment. Mr. Kudritz also oversaw the development of the updated EAP.

Donegal Lake, Kyle Lake, and Somerset Lake Rehabilitation. *Pennsylvania Fish and Boat Commission.* Hydrologic and Hydraulic and Civil Design Lead. Responsible for performing the hydrologic and hydraulic analyses and preparing a design report for each dam. The replacement spillways were designed to match existing flows. Mr. Kudritz oversaw the design of overtopping protection when the replacement spillway had inadequate capacity to convey the PMF design flow. Mr. Kudritz helped to develop all deliverables including design reports, design alternatives, construction drawings, specifications, cost estimates and regulatory permits.

Donald Green, P.E.

Geotechnical Lead

Years with Michael Baker: 11
Years with Other Firms: 28

Degrees

M.S., 2004, Civil Engineering, University of Pittsburgh

B.S., 1978, Civil Engineering, University of Pittsburgh

Licenses/Certifications

Professional Engineer, Pennsylvania, 1985, [redacted]

Project Role and Qualifications

Mr. Green will serve as the Geotechnical Lead and will be responsible for the technical design aspects of the geotechnical investigation and design. Mr. Green is a Geotechnical Engineer with 40 years of geotechnical consulting experience in dam inspection and design, geotechnical and environmental engineering, planning, laboratory and field investigation, engineering analysis and design, plans and specifications preparation, and project supervision and management. Mr. Green has implemented geotechnical investigations for a number of earthen embankment dams belonging to Ohio Department of Natural Resources (ODNR), Pennsylvania Fish and Boat Commission (PFBC), Pennsylvania Department Conservation and Natural Resources, and other agencies. Mr. Green has been responsible for overseeing the investigation and design for numerous landslide investigation and remediation projects, including two of the projects identified in this EOI.

Experience

Roosevelt Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Geotechnical Lead. Responsible for conducting a geotechnical investigation of the existing dam and preparing a geotechnical report based on the stability and seepage analyses performed for the existing dam. The geotechnical analysis was used to develop final anchoring calculations and detailed construction drawings for passive dowels and high capacity post-tensioned anchors to improve overturning and sliding resistance of the existing spillway. Mr. Green also assisted in the development of the RCC overtopping protection plans and specifications since the spillway had inadequate capacity to pass the PMF design flow.

Mount Gilead Lake Upper and Lower Dam Rehabilitation. *Ohio Department of Natural Resources.* Geotechnical Lead. Responsible for conducting a subsurface exploration plan of the existing dam to support the re-constructed embankment. Mr. Green performed a stability and seepage analysis for the embankment, which featured a zoned embankment, graded filter, and seepage collection and monitoring system. The embankment design also addressed seepage issues at the historic stream channel and poor embankment construction. The geotechnical analysis was used to develop a plan for post-tensioned soil anchors to improve overturning and sliding resistance and meet current dam safety regulations.

Ryan Homes On-Call Geotechnical and Engineering Services, Various Locations in PA, Buffalo, NY, and Nashville, TN. *NVR, Inc.* Task Manager. Responsible for being the client's point-of-contact to provide on-call engineering services ranging from foundation stabilization, landslide investigation and stabilization, mitigation of groundwater intrusion, and wall movement. Michael Baker was responsible for providing professional geotechnical engineering services, on an on-call basis, to assist Ryan Homes when problems were encountered during the development of residential lots. Michael Baker was responsible for investigating the cause and extent of the problem and recommending methods for remediation and stabilization.

Structural Engineering Services Open-Ended Contract, Pittsburgh, Pennsylvania. *City of Pittsburgh, Pennsylvania.* Geotechnical Engineer. Responsible for evaluation of structural distress and discern the probable period over which the distress occurred for damaged residential properties. Also responsible for evaluating the impact of an active landslide on the structural integrity of multiple structures. This Open-Ended Agreement to provide Structural Engineering Services to the City of Pittsburgh has been used for a wide variety of structural, as

well as geotechnical tasks. Tasks have ranged from the inspection of pedestrian and roadway bridges to investigations and recommendations for action related to deterioration/failure of a steel crib retaining wall. Other services have included preparation of rehabilitation plans for deterioration of a steel rigid frame bridge structure, as well as investigations for various retaining wall alternatives

Lake Loramie Dam Rehabilitation. *Ohio Department of Natural Resources.* Geotechnical Lead. Responsible for conducting a subsurface exploration plan and geotechnical analysis of the existing and new embankment section to be constructed through the existing stream channel. Mr. Green provided construction drawings for the new zoned embankment, graded filter, and seepage collection and monitoring system. A sheet pile system was also designed through the new embankment to reduce the seepage through the embankment. Mr. Green developed conceptual phasing plans and sketches that utilize the existing spillway convey normal flows while maintaining normal pool throughout construction.

Blue Rock State Park Cutler Dam Rehabilitation. *Ohio Department of Natural Resources.* Geotechnical Lead. Responsible for performing a geotechnical analysis of the existing and proposed dam. The downstream embankment slope, which was constructed at 2:1 (H:V), was analyzed for embankment stability. A new embankment toe seepage collection and monitoring system was designed to improve embankment stability. Mr. Green analyzed the stability of the labyrinth spillway and designed anchors into the underlying bedrock to meet current dam safety regulations.

Canonsburg Lake Dam Rehabilitation. *Pennsylvania Fish and Boat Commission.* Geotechnical Lead. Responsible for conducting a subsurface exploration plan to determine the quality of the foundation materials for design of the high-capacity post tensioned soil anchors that would improve overturning and sliding resistance and meet current dam safety regulations. The rehabilitations were performed while the lake was maintained at normal pool.

Rehabilitation of Donegal Lake Dam, Donegal Township, Pennsylvania. Pennsylvania Department of General Services. Geotechnical Engineer. Responsible for completing a geotechnical investigation and provided design recommendations for collection of seepage and other drainage improvements, replacement of spillway slabs, extension of outlet conduit. and roller compacted concrete embankment overtopping protection. Michael Baker provided engineering services for rehabilitation of the Donegal Lake Dam to ensure compliance with Pennsylvania Department of Environmental Protection regulations for spillway capacity and overtopping protection during the design event. Donegal Lake Dam, located in Westmoreland County, Pennsylvania, is owned by the Pennsylvania Fish and Boat Commission. The dam was constructed in 1967 and creates Donegal Lake, which is a heavily used recreational facility. Michael Baker's tasks included reviewing existing drawings and reports; performing a field assessment. hydrologic and hydraulic analysis, topographical survey, and subsurface investigation to evaluate the current condition of the dam; identifying and screening alternatives and developing remediation designs and cost estimates; and providing construction oversight.

West Greene Elementary Center -Design Retaining Wall Repair. *West Greene School District.* Technical Manager. Responsible for an independent forensic investigation to determine the cause of the collapse of a modular block retaining wall and 20 foot high concrete revetment, was responsible for final design and preparation of pricing documents under a Guaranteed Maximum Price (GMP) contract, to construct a replacement concrete cantilevered retaining structure and a separate buried anchored retaining structure to support a landslide-prone soil mantle. Also responsible as the Design Professional of Record to complete final design, provide design consultation during construction, coordinate with the Contractor to facilitate cost-reduction enhancements under the GMP contract, make weekly site visits to confirm design compliance during construction, review shop drawings and submittals, and issue a Certificate of Final Completion. Work was completed under an accelerated schedule to provide a site that was secure for occupancy to commence the 2015-2016 school year on time. Attention to detail and partnering with the Contractor resulted in this project being named as a nominee finalist for the 2015 Master Builders' Association Building Excellence award.

Brian Afek, P.E.

Geotechnical Engineer

Years with Michael Baker: 4
Years with Other Firms: 6

Degrees

B.S., 2006, Civil Engineering/Geotechnical Engineering, The Ohio State University

Licenses/Certifications

Professional Engineer, Ohio, 2011, [redacted]

Professional Engineer, Pennsylvania, 2015, [redacted]

Project Role and Qualifications

Mr. Afek is a geotechnical engineer with expertise in dam inspection; design of dam rehabilitation components, including RCC overtopping protection, spillways, stilling basins, and control towers; replacement of outlet works; seepage monitoring; post-tensioned anchors; Emergency Action Plans; project management; and construction administration and oversight.

Experience

Blue Rock State Park Cutler Dam Rehabilitation. *Ohio Department of Natural Resources.* Project Manager. Responsible for acceptance of all parts of the design and management of the project from start to finish, including budget, schedule, coordination, task management, permitting, final design, and construction management. Improvements to the dam include replacement of the deteriorated spillway, repairs to the lake drain system and outlet channel, and modifications to the dam embankment.

Lake Loramie Dam Rehabilitation. *Ohio Department of Natural Resources.* Project Manager. Responsible for full management of the project including budget, schedule, coordination, task management, permitting, final design, presentations to the client and other agencies, public meetings, and construction management. The project required the design to accommodate many challenges including: designing a spillway while maintaining lake level, designing a spillway that can mimic the existing hydraulic characteristics, minimal area for construction due to close property boundaries and environmental impacts, and an expedited schedule that required multiple agencies to cooperate in order to meet expectations.

Mount Gilead Lake Upper and Lower Dam Rehabilitation. *Ohio Department of Natural Resources.* Project Manager. Responsible for project management during construction and the geotechnical design aspects of the replacement spillway, earthen embankment, and stability of the existing and proposed structures to ensure compliance with Ohio's dam safety regulations. A new Lower Dam will be constructed downstream of the existing dam and the embankment and spillway of the Upper Dam will be modified to act as a sediment forebay for the lake.

Roosevelt Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Geotechnical Engineer. Responsible for the geotechnical aspects of the spillway rehabilitation, post-tensioned anchor design, partial embankment reconstruction, and RCC overtopping protection. Mr. Afek oversaw the stability analysis of the existing and proposed structures to ensure compliance with Ohio's dam safety regulations. Mr. Afek played a significant role to ensure that the project was completed on an expedited schedule.

Chapman Lake Dam Rehabilitation. *Pennsylvania Department of Conservation and Natural Resources.* Geotechnical Engineer. Responsible for evaluating the existing dam, performing geotechnical analyses on the dam, preparing a geotechnical report, and performing designs for the RCC overtopping protection and seepage control. Mr. Afek was responsible for overseeing the preparation of a dredging plan, sampling and classifying the lake bed sediment, and securing all necessary environmental permits.

Jese H. Vance, P.E.

Geotechnical Engineer

Years with Michael Baker: 5
Years with Other Firms: 1

Degrees

B.S.E., 2012, Civil Engineering, Marshall University

Graduate Studies, Civil Engineering/Geotechnical, University of Illinois at Urbana-Champaign

Licenses/Certifications

Engineer-In-Training, West Virginia, 2012, [redacted]

Professional Engineer, West Virginia, 2017, [redacted]

Society of Professional Rope Access Technician I (SPRAT), 2016, [redacted]

General Qualifications

Mr. Vance is a Geotechnical Engineer at Michael Baker's Charleston, West Virginia office. Mr. Vance has over six years of experience in bridge inspection, core boring programs, hydrology/hydraulics, civil design, surveying, and the oil and gas industry.

Experience

Statewide Quality Assurance Management Services. *West Virginia Department of Transportation, Division of Highways.* Civil Associate. Responsibilities included assisting with the development of RFP and RFQ documents and reviewing geotechnical reports.

Appalachian Corridor H. *West Virginia Department of Transportation, Division of Highways.* Civil Associate. Responsibilities included oversight of drilling operation that included 167 borings and 8,900 linear feet of drilling in mountainous terrain, pulling soil and rock core samples to be sent to a materials testing laboratory, and erosion and sediment control inspection.

Dingess Tunnel Phase 1. *West Virginia Department of Transportation, Division of Highways.* Civil Associate. Responsible for completing geotechnical desktop review of project site.

Ohio River Bridges Downtown Crossing, Louisville, Kentucky. *Kentucky Transportation Cabinet.* Civil Associate. Responsible for assisting with special substructure inspection of various bridges in the spaghetti junction in Louisville, Kentucky. Michael Baker participated in a workshop where various contracting methods for final design were discussed and evaluated during preliminary design. Current responsibilities include engineering design reviews and oversight for the downtown cable stayed bridge crossing of the ORB design-build project. Michael Baker is currently assisting the KYTC by providing engineering design reviews and project development oversight for the downtown crossing of the ORB project.

Open-End Architectural and Engineering Services, West Virginia State University, Institute, West Virginia. *West Virginia State University.* Civil Associate. Responsibilities included overseeing contractors and performing surveying and topographic mapping of area surrounding combined sewer. Michael Baker provided architectural and multidisciplined engineering services under a ten-year open-end agreement to design renovations, alterations, reconstruction, or extensions of facilities. Michael Baker's services included programming, planning, design development, construction documentation, evaluations, feasibility studies, cost estimating, and construction contract administration.

X342-H-40.21 02. *West Virginia Department of Transportation, Division of Highways.* Civil Associate. Responsibilities included writing core boring contract documents, field reconnaissance for core boring program, developing boring schedules, boring plans, soliciting for bids and creating various other documents used for assembling a complete boring program package.

Donald Marburger, P.E.

Structural Lead

Years with Michael Baker: 38
Years with Other Firms: 2

Degrees

B.S., 1974, Civil Engineering, Carnegie Mellon University

Licenses/Certifications

Professional Engineer, Arkansas, 2015, [redacted]

Professional Engineer, Pennsylvania, 1983, [redacted]

Project Role and Qualifications

Mr. Marburger will serve as the Structural Lead and will be responsible for the technical design aspects regarding the structural investigation and design. Mr. Marburger's 36 years of professional experience has involved the design, inspection, analysis, and rehabilitation of concrete and steel structures. He conducted structural assessments to determine the integrity of the structures and designed the spillways and stilling belonging to Ohio Department of Natural Resources (ODNR), Pennsylvania Fish and Boat Commission (PFBC), Pennsylvania Department Conservation and Natural Resources. Mr. Marburger has completed structural designs and structural reports for conventional and complex labyrinth spillways and stilling basin. Mr. Marburger is also well versed in the design of bridge structures; having designed pedestrian and vehicular access bridge over spillways and from embankments to control towers.

Experience

Roosevelt Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Structural Lead. Responsible for the structural investigation of existing spillway, analysis and design for training wall replacement and new control tower, and the development of construction plans and specifications for spillway and structural elements.

Pike Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Structural Lead. Responsible for the structural investigation and evaluation of the existing dam, control tower, and structural elements. The results of the structural assessment revealed that the spillway would need to be replaced. Structural analyses and designs were performed for the in-kind replacement spillway and new control tower. Mr. Marburger oversaw the construction drawings and specifications for the replacement spillway, stilling basin, and control tower.

Pond Lick Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Structural Lead. Responsible for conducting a structural assessment of the existing box culvert spillway, control tower, and structural elements to determine if any members can be salvaged. The structural elements were in poor condition and a new, in-kind replacement spillway and control tower were analyzed and designed. Mr. Marburger oversaw the preparation of construction drawings and specifications for the replacement spillway, stilling basin, control tower, and lake drain.

Mount Gilead Lake Upper and Lower Dam Rehabilitation. *Ohio Department of Natural Resources.* Structural Lead. Responsible for conducting structural calculations and preparing structural detailing for the new labyrinth spillway, which has been designed to replace the deteriorated ogee spillway. Mr. Marburger was responsible for developing construction details for the complex spillway geometry, which included joint and PVC waterstop layout. Mr. Marburger also designed new training and wing walls and incorporated a new control tower within the spillway footprint.

Canonsburg Lake, Chapman Lake, Dutch Fork Lake, Donegal Lake, Kyle Lake, and Somerset Lake Rehabilitation. *Pennsylvania Department of Conservation and Natural Resources and Pennsylvania Fish and Boat Commission.* Structural Lead. Responsible for performing structural assessments and investigations for all spillways, control towers, and retaining walls. Mr. Marburger performed structural analyses for all new structures and prepared construction drawings, specifications, and cost estimates.

Kimberly Bartos

Environmental Lead

Years with Michael Baker: 5
Years with Other Firms: 12

Degrees

B.S., 1999, Biology/Applied Ecology, University of Memphis

Licenses/Certifications

Wetland Certification Training, Pennsylvania, 2003

Wetland Certification Training, Pennsylvania, 2012

Rosgen I, Applied Fluvial Geomorphology, 2004

Project Role and Qualifications

Ms. White will serve as the Environmental Lead and will be responsible for the environmental aspects of the project including wetland delineations and assistance with permitting. Ms. Bartos' environmental permitting experience has focused on the delineation of wetlands, identification of water courses, and preparing environmental assessments associated with the permitting of water resources projects. Ms. Bartos has also prepared mitigation plans, prepared designs and construction documents for wetland and stream restoration and mitigation projects, conducted environmental assessments, macroinvertebrate surveys, and conducted Phase I Environmental Assessments. Ms. Bartos is very familiar with the Ohio permitting regulations from experiences with the Ohio Department of Natural Resources dam rehabilitation projects.

Experience

Lake Loramie Dam Rehabilitation. *Ohio Department of Natural Resources.* Environmental Scientist. Ms. Bartos assisted the aquatic resource evaluations that were conducted within and along the banks of Loramie Creek. The evaluations were performed within the expected project disturbance limits in support of the 401/404 permitting process. The disturbance limits were minimized to the extent possible to reduce environmental impacts and minimize permitting costs. Ms. Bartos assisted with the relocation of mussels within the stream channel work limits in Loramie Creek and mussel relocation discovered in Lake Loramie during work area drawdown. Ms. Bartos prepared environmental mitigation documents for impacts to Loramie Creek and wetlands located along the stream bank. All permits were submitted and obtained without delaying the project schedule.

Mount Gilead Lake Upper and Lower Dam Rehabilitation. *Ohio Department of Natural Resources.* Environmental Scientist. Ms. Bartos conducted aquatic resource evaluations within the project disturbance limits. The study limits extended from the footprint of the existing dam to the proposed borrow areas. The findings from the evaluations were summarized and included in the Nationwide Permit. All permits were submitted and obtained without delaying the project schedule.

Blue Rock State Park Cutler Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Environmental Scientist. Ms. Bartos was responsible for conducting the aquatic resource evaluation within the project disturbance limits. The findings from the evaluations were summarized and included in the Nationwide Permit.

Canonsburg Lake, Chapman Lake, Dutch Fork Lake, Donegal Lake, Kyle Lake, and Somerset Lake Rehabilitation. *Pennsylvania Department of Conservation and Natural Resources and Pennsylvania Fish and Boat Commission.* Environmental Scientist. Responsible for performing aquatic resource evaluations for all dam rehabilitation projects. Ms. Bartos evaluated the areas within the spillway rehabilitation areas, within the downstream receiving areas, and within potential borrow areas. The evaluations were performed to support the environmental assessments and regulatory permits required for the state dam rehabilitation permits. Ms. Bartos also assisted in the development of a dredging program for Chapman Lake. Ms. Bartos was responsible to perform a Phase I Environmental Site Assessment (ESA) Screening to classify potential contaminants of the lake bed sediment. Ms. Bartos was responsible for identifying an appropriate disposal site and all regulatory permits for dredging activities.

Ralph Gromley, P.L.S., P.S.M.

Senior Surveyor

Years with Michael Baker: 3
Years with Other Firms: 31

Degrees

High School Graduate, 1980, College Prep, Jefferson Area High School

Licenses/Certifications

Licensed Surveyor, Pennsylvania, 2011, [redacted]

Land Surveyor, Ohio, 1992, [redacted]

Professional Surveyor and Mapper, Florida, 2007, [redacted]

Project Role and Qualifications

Mr. Gromley will serve as the Senior Surveyor for the project. Mr. Gromley will be responsible for establish site survey controls and perform the topographic survey of the existing spillway, embankments, warehouse slope, and surrounding site features within the project limits. Mr. Gromley has experience surveying around dams and water retaining structures, having performed topographic and bathymetric surveys for Ohio Department of Natural Resource's dam rehabilitation projects.

Experience

Buckeye Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Senior Surveyor. Mr. Gromley was the senior surveyor in charge of performing topographic and bathymetric survey at Buckeye Lake. Bathymetric survey was performed to determine lake bottom elevations within the limits of the Emergency Stability Berm and around existing boat docks. The survey was performed using a Sonarmite Depth Finder and GPS mounted to a remote control boat which allowed survey to be collected around congested dock piers.

Blue Rock State Park Cutler Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Senior Surveyor. Mr. Gromley was the senior surveyor in charge of performing topographic and bathymetric survey within the lake at Blue Rock State Park. Bathymetric survey data was obtained upstream of embankment in areas expected to be within the project limits. To survey the lake bottom, a Sonarmite Depth Finder and GPS was mounted to boat with an electric motor. Data was collected at a frequency to obtain adequate elevation of the lake bottom. Mr. Gromley imported the data into AutoCAD Civil 3D to create tin surfaces of the lake bed sediment and firm bottom elevations to quantity the amount of dredge material required to be handled.

Lakeview Christian Life Church Dam Demolition and Site Restoration. *Lakeview Christian Life Church.* Senior Surveyor. Mr. Gromley was the senior surveyor responsible for performing topographic and bathymetric survey at Lakeview Christian Life Church. The nature of the project was to demolish and breach the existing dam, site grading that incorporated the existing embankment and lake bed sediment as fill, and incorporating general site features (pedestrian bridge, select grading, sidewalks, plantings). Mr. Gromley performed a full topographic survey capturing site features, underground utilities, and sufficient ground shots of the dam and the surrounding area to create a complete tin surface. Mr. Gromley performed a dual frequency bathymetric survey within the entire lake footprint using a Sonarmite Depth Finder and GPS mounted to boat with an electric motor. The survey data was collected at a frequency to obtain adequate elevation of the lake bottom. The topographic and bathymetric surveys were utilized to create base mapping for the construction drawings.

Surveying Services for Natural Gas Lines, Washington County and Green County, Pennsylvania. *Vista Gathering, LLC.* Senior Surveyor. Mr. Gromley was responsible for providing surveying services for new natural gas pipelines ranging in length from one mile to nine miles throughout Southwestern Pennsylvania. Mr. Gromley performed preliminary topographic surveys to locate obstructions, property evidence, proposed pipeline routes as indicated by land agents, woodland, utility, road, stream, and railroad crossings. The resultant mapping was converted into the state plane coordinate system and vertical datum by the use of OPUS to generate the alignment sheets. Mr. Gromley oversaw construction stake-out surveys, performed preliminary centerline staking for property owner review, delineated and staked out right-of-ways and limit of disturbances, and developed construction as-builts.

Jacob Bench, E.I.

Construction Inspector

Years with Michael Baker: 4

Degrees

B.S., 2014, Civil Engineering, The Ohio State University

Licenses/Certifications

Engineering Intern, Ohio, 2014

Project Role and Qualifications

Mr. Bench will serve as the Construction Inspector for this project. Mr. Bench's experience covers all aspects of construction management that includes review of construction schedules and pay applications, preparation and review of change orders, and attendance at progress meetings. Mr. Bench also provides inspection services that include oversight of all aspects of construction projects, inspection of cast-in-place concrete, reinforcement bars, formwork, and waterstop placement, concrete testing, post-tension anchor installation and testing, embankment placement and compaction, and project close-out inspection.

Mr. Bench has taken an innovative approach to construction management and inspection by producing three dimensional 3D computer models of the construction drawings during the design phase. Mr. Bench uses the 3D model as a tool to track construction sequence and progress schedule, clarify any questions or issues from the contractor, and provide the client with a visual rendering of the project. The 3D printed model is a tangible rendering that has been used to resolve questions in the field, inform the public and major stakeholders during meetings. This approach has produced a more informed and engaged team (consisting of the Engineer, Contractor, and Owner) that has resulted in increased communication, fewer construction issues, and faster resolution to issues regarding unforeseen conditions.

Experience

Buckeye Lake Dam Rehabilitation. *Ohio Department of Natural Resources.* Construction Inspection. Mr. Bench was responsible for inspection and observation during mobilization and staging, installation of erosion and sediment control, placement of the stability berm on the upstream embankment slope, deep soil mixing wall, and utility relocation to ensure that project is constructed in accordance with the Contract Documents. Mr. Bench was responsible for submitting daily inspection reports, attending progress meetings, and reviewing pay applications.

Mount Gilead Lake Upper and Lower Dam Rehabilitation. *Ohio Department of Natural Resources.* Construction Inspector. Mr. Bench served as the on-site Project Representative representing Michael Baker and the Ohio Department of Natural Resources. Mr. Bench has inspected all facets of the project including initial mobilization, installation of erosion and sediment controls, water control plan, demolition, sheet pile installation, post-tension soil anchors, cast-in-place concrete placement, and waterstop installation, installation of piezometers, and embankment placement. Mr. Bench reviewed submittals, oversaw all progress and pre-installation meetings, reviewed all pay applications, and adequately resolved all construction issues.

Lake Loramie Dam Rehabilitation. *Ohio Department of Natural Resources.* Structural Engineer. Mr. Bench has served as on-site project representative on an as-needed basis. He has reviewed the contract documents and contractor submittals and has been available to resolve on-site construction issues. Mr. Bench created a 3D model of the spillway and embankment.

Blue Rock State Park Cutler Dam Rehabilitation. Ohio Department of Natural Resources. Construction Inspector. Mr. Bench reviewed the design for potential waterstop and constructability issues. Mr. Bench prepared a 3D model of the labyrinth spillway, spillway chute, and stilling basin and included the reinforcement, waterstop, and complex geometry to develop a comprehensive review of waterstop and other complex components of structure.