Alternative Delivery Procurement Approaches

for the Federal Highway Administration's Culvert Aquatic Organism Passage (AOP) Program

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Acknowledgements:
- Grace Edinger, Procurement Policy Strategy Lead
- Garrett Altmann, Western Restoration Program Manager
- Thank you to the many dedicated restoration practitioners and experts who allowed us to interview them during the course of our research for this paper.

Suggested citation: K. Kapur Macleod and P. Higgins, 2024. "Alternative Delivery Procurement Approaches for the Federal Highway Administration's Culvert Aquatic Organism Passage (AOP) Program." Environmental Policy Innovation Center, Washington D.C.

This paper was developed with support from the William and Flora Hewlett Foundation. For more information, email kavita@policyinnovation.org.

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EXECUTIVE SUMMARY

Culverts dot the landscape of many states, allowing water to move under roadways but in a constrained way that limits the ability of water to flow naturally and impairs fish and other species' passage in streams and riverways. In addition to blocking aquatic species, sediment and debris can also be blocked by these structures. According to the U.S. Department of Transportation (DOT), there are almost 70 million culverts under roads that were built using designs that neglected impacts to aquatic species in the nation's waterways.[1] Removing these passage barriers is critical to restoring the health of certain aquatic species, and can have other important co-benefits such as flood risk reduction and local job creation. To address this problem, the Infrastructure Investment and Jobs Act (IIJA) provided multiple agencies with nearly $2 billion for aquatic and ecosystem restoration that supports fish passage. The IIJA will fund projects over five years (FY2022 - FY2026) and could result in a transformational impact to aquatic species, their habitats, and the resiliency of surrounding communities. This report focuses on the Federal Highway Administration's (FHWY) Culvert Aquatic Organism Passage (AOP) Program, a new program at the DOT with $1 billion in funding over five years to address culverts and weirs that have a transportation nexus.

Five years is a short period in which IIJA funding must be deployed, and we are already well into the timeframe. Providing project developers with the on-ramps they need to design and implement great culvert projects - especially based on lessons learned from the funding that has been deployed to date - is paramount to the effort to quickly deploy IIJA funds and bring radical benefits to aquatic species and ecosystems. Unfortunately, status quo government procurement can create barriers that slow down project development. These barriers are compounded by the realities of culvert projects, which have a high design and up-front cost threshold that must be met in order to fully scope projects. Federal government procurement is siloed within agencies even for similar projects and grants are typically funded on a reimbursement basis, which means that project developers must have the capacity and resources to apply for funding from multiple sources and the capital to fund work themselves until receipts are submitted and funds released to them from federal grants.

In this funding environment, culvert removal/upgrading projects are often formulated as individual projects by an entity and funding is sought for the individual project. This largely precludes landscape scale or watershed-based approaches involving multiple culvert removals/upgrades that could bring important economies of scale to project developers and better environmental outcomes to fish species (not to mention flood resilience, tribal cultural benefits and more). The process of designing and securing funding for culvert projects is lengthy and labor-intensive.

The use of alternative delivery procurement approaches - procurement methods that break from the status quo - could speed culvert project implementation by making it easier to deploy funding faster to great projects. Alternative delivery procurement methods considered in this report, that are most relevant to fish passage projects, include public-private partnerships (P3s), full delivery contracts that combine design and implementation, and Pay for Success (PFS) models. In general, these methods allow the government to define the outcome it seeks and the private and nonprofit sectors to use specialized expertise to select and implement

1 https://www.transportation.gov/briefing-room/biden-harris-administration-announces-first-ever-grants-fix-more-160-fish-culverts

projects efficiently and cost-effectively. These methods shift the risk of project success from the government to the project developer, and lower the capacity needs of the government to sort through and select from large applicant pools of projects.

This report makes the following recommendations to speed culvert project implementation through the Culvert AOP Program:

- ***Recognize P3s as an eligible funding arrangement in the next Culvert AOP Program Notice of Funding Opportunity (NOFO).*** Through stating that P3s are eligible for funding and socializing the ideas with culvert project developers, the Culvert AOP Program could catalyze more applications for P3 arrangements to meet fish passage needs. These P3s would engage local contractors to implement project work, with important potential co-benefits to local job creation and economies. The P3 arrangement could work particularly well in those areas that have already inventoried and prioritized fish barriers for removal or upgrading.

- ***Consider other eligible funding arrangements.*** Phased funding in which a grantee is provided with design funding and then implementation funding based on cost and other specifics determined in the design phase would help alleviate the burden on grantees of separate applications for design and implementation work and the risk of cost overruns, which grants often do not cover. Block funding would allow funding to flow to a set of culvert projects within a particular watershed or priority area to accomplish an overall environmental objective, with flexibility provided to the project developer during the design phase to determine the highest priority culverts (based in part on cost-effectiveness).

- ***Leverage existing interagency coordination to aggregate culvert project funding to the watershed scale.*** Planning, prioritization, and funding for fish passage projects could be better aligned across government agencies that fund these projects to facilitate the flow of funding and resources to the best projects that will have the greatest direct benefits to aquatic species and indirect benefits to habitats and communities. An important step has been taken with the development of the Interagency Fish Passage Portal in 2022. The effort around developing this portal could be leveraged to build an interagency funding clearinghouse for culvert projects that could solicit projects and assign them to the most appropriate funder - perhaps as a pilot in a specific geography to start.

- ***Leverage what other agencies are already doing to increase the quality and efficiency of culvert projects.*** Examples of practices with efficiency gains that are already in use include a Letter of Intent (LOI) process and pre-proposal technical assistance to increase applicant engagement with an agency ahead of proposal submission and using more efficient payment technologies to allow funding to flow to grantees faster.

According to the U.S. Department of Transportation (DOT), there are almost 70 million culverts under roads that were built using designs that neglected impacts to aquatic species in the nation's waterways.

INTRODUCTION

Funding through the Infrastructure Investment and Jobs Act (IIJA) was provided to multiple agencies through new and existing programs that fund aquatic and ecosystem restoration to remove fish passage barriers. The funding has been provided for FY2022—FY2026, a relatively rapid period of time to deploy this level of funding. To date, roughly 221 fish passage projects have been funded by five federal agencies through the IIJA funding, totalling nearly $300 million.[2]

This report focuses on the National Culvert Removal, Replacement and Restoration Grant Program (Culvert AOP Program)—a new program for culvert and weir replacement, removal, and upgrading housed in the Federal Highway Administration (FHWA) within the Department of Transportation (DOT). This program received $1 billion over five years and has conducted one round of funding, for which FHWA granted a total of $200 million to 169 projects. The Notice of Funding Opportunity (NOFO) for the second round is expected to be coming out in early 2024, but at publication of this report had not yet been announced.

IIJA funds must be spent by the end of FY2026 (i.e., September 2026), including by the Culvert AOP Program. However, culvert projects and the programs that fund them have several challenges that slow project development and implementation and will be important to address if IIJA money is to be spent efficiently and effectively over the required funding period. In particular, traditional procurement methods risk slowing down project implementation to a point that threatens success. Federal government procurement is typically funded on a reimbursement basis, meaning that project developers must assemble projects to some degree of completion, write and submit a grant application, and then if awarded funding, implement and pay for the project and wait to be reimbursed by the government after receipts for completed work are submitted. This process can be time-consuming and risky for project developers, and can preclude smaller and less well-resourced entities from developing projects.

Further, grant-based government funding programs may have rules requiring separate applications and contracts for project developers and builders, and sometimes for entities that will then maintain the project. This further complicates and lengthens the time during which a project developer must find resources to support project design and implementation and increases the burden on government staff who must review and select funding recipients for multiple stages of a project separately. Finally, reimbursement-based procurement comes with no guarantee of project success—the actual environmental outcomes of projects do not determine whether a project receives funding.

This report suggests rapid fund deployment approaches that could help overcome barriers to project development and funding evident through traditional procurement methods.

This report suggests rapid fund deployment approaches that could help overcome barriers to project development and funding evident through traditional procurement methods. Research to inform the report's recommendations was conducted through interviews with restoration experts from the nonprofit and private sectors, as well as with federal agency staff.

2 https://interagency-bil-fish-passage-project-1-fws.hub.arcgis.com/; estimate includes projects funded by BOR, NOAA, USACE, USFWS, and USFS. Estimate does not appear to include DOT AOP and other fish passage projects, which may have been determined after production of this map.

BACKGROUND ON THE CULVERT AOP PROGRAM

The IIJA appropriated $1 billion for the Culvert AOP Program over five years from 2022-2026. The focus of the program is to restore fish passage through culvert or weir replacement, removal, and/or repair for anadromous fish. In the first round of funding, the Notice of Funding Opportunity (NOFO) detailed the parameters and criteria for applicants. Key grant parameters include:

- **The range of potential awards was wide.** Nearly $200 million was allocated for grants in the first round with an award floor of $10,000 and an award ceiling of $20 million.

- **The NOFO indicated that grants are provided primarily on a reimbursement basis...** According to the NOFO, "Culvert AOP Program funds will reimburse recipients only for reasonable and authorized costs incurred and for work performed after a grant agreement has been executed, allowable expenses are incurred, and valid requests for reimbursement are submitted."[3]

- **...but a pathway for other forms of funding was left open.** The NOFO included the statement, "At DOT's sole discretion alternative funding arrangements may be considered on a case-by-case basis"[4], showing potential flexibility to consider some of the innovative methods for rapid fund deployment discussed in this report.

- **Funding was made available for multiple stages of the project cycle.** The NOFO stated that eligible activities included planning and design-stage related activities, such as preliminary environmental and engineering studies, and consultation and permitting activities in addition to project implementation activities. Subsets of the activities were also eligible.

- **Nonprofit organizations (and for-profit organizations) were not included as eligible applicants.** Eligible applicants included Tribes, and state and local governments only. These eligible entities may have significant capacity limitations to apply for and implement grants at scale and transaction costs associated with smaller grants may not make financial sense.

- **Cost-share was waived for Tribes but required for other applicants.** The Federal share for Tribes is 100% but up to 80% for other applicants, requiring other applicants to locate a minimum 20% cost-share for their projects. This is a heavy burden for economically impoverished communities and other environmental justice communities.

3 https://www.fhwa.dot.gov/engineering/hydraulics/culverthyd/aquatic/culvertaop_nofo.pdf
4 https://www.fhwa.dot.gov/engineering/hydraulics/culverthyd/aquatic/culvertaop_nofo.pdf

In September 2023, the Culvert AOP Program announced its first round of awards. In total, FHWA received 102 applications for the NOFO, reflecting a total of $345 million in requested funding.[5] Of this, the full annual allocated amount of $200 million was awarded to 169 culvert projects. Projects were located in ten states: Alaska, California, Idaho, Maine, Massachusetts, New Hampshire, North Carolina, Oregon, Virginia, and Washington. Key details of this award cycle were:

- The annual award budget was fully allocated.
- Funded projects reflect a diversity of activities/interventions.
- Projects in different phases of the project cycle (planning & prioritization, design, construction, and monitoring) were funded.
- Projects were funded that included multiple barriers in a single project.

The NOFO for the next round of funding should be released sometime in early 2024.

Photo by Andrew Mitchell on Unsplash

5 https://highways.dot.gov/newsroom/biden-harris-administration-announces-first-ever-grants-fix-more-160-fish-culverts-across

CULVERT PROJECT CYCLE

Culverts come in different shapes and sizes. The Culvert AOP Program funds projects that replace, remove, or repair culverts and/or weirs that meaningfully improve or restore fish passage for anadromous fish.[6] For weir projects, the Program will also fund infrastructure that facilitates fish passage around or over a weir, and weir improvements. Culverts are structures that allow water to pass underneath road or railway infrastructure, while weirs are low dams extended across waterways that change water flow and usually also river level. Due to their structures, both culverts and weirs have potential to significantly alter conditions for aquatic species. Figure 1 illustrates four types of culvert structures: box, pipe, open or slab, and arch culverts, and also illustrates a weir structure. Within each category, variations exist in size, materials, and overall design of the structures.

Figure 1: Culvert and Weir Structures

Pipe culvert

Pipe culverts

Slab culvert

Box culvert

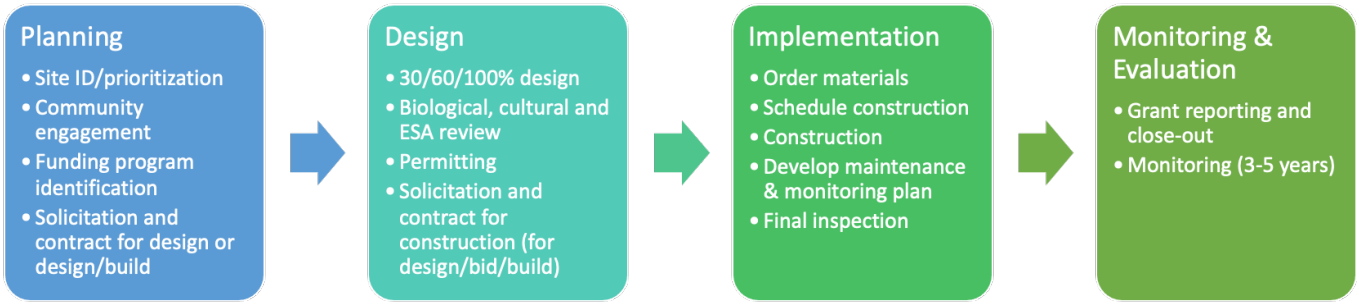
6 Anadromous fish include species that spend different parts of their life cycle in salt and freshwater, moving from the ocean to freshwater streams to spawn.

Arch culvert

Weir

Culvert projects—whether barrier removal or replacement/upgrading—are complicated and site-specific, with multiple required activities in each phase of the project cycle. Figure 2 shows the general phases of a culvert project cycle: planning, design, implementation and monitoring and evaluation.

Figure 2: Activities in the Culvert Project Cycle



The planning phase identifies which culverts to potentially bring into a project and funding that may be available for projects. During the planning phase, culvert locations are identified and prioritized, and should ideally involve community engagement in order to reflect community priorities, secure community buy-in, and socialize the project in the area. Identifying the location of culverts and prioritizing them for removal/replacement in the planning phase can be done using various criteria—such as cost-effectiveness and environmental outcomes (e.g., miles of stream/habitat opened). Prioritization efforts at the watershed scale—usually implemented by state, county, and nonprofit partners—allow for maximizing/optimizing environmental benefits to species through selecting and grouping specific culvert and other barrier (e.g., dams and other road crossings) projects for greater connectivity of aquatic species' habitat. Some states—particularly in the Western United States—have conducted planning efforts to guide and support project development, including inventorying the locations of fish passage barriers and developing tools to allow users to prioritize specific barriers following

certain criteria.[7] Similar planning work is underway at the national level, such as through the National Aquatic Barrier Inventory & Prioritization Tool being developed using local, state and national barrier datasets by the Southeast Aquatic Resources Partnership to guide selection of high priority barriers. The inventory and prioritization tool should be expanded nationally by 2025; currently, barrier data is incomplete for Alaska, Nevada, California, the Great Lakes Region, and the Northeast Region.[8]

During the planning phase, project developers can solicit and contract entities to conduct design studies on potential culvert sites. These contracts can also include the construction phase in a design/build contracting/procurement arrangement where a firm is engaged to provide both services.

During the design phase, site-specific design for culverts selected for potential inclusion in a project is conducted. Projects designed to replace or remove culverts can vary in their complexity given the site-specific hydrologic, land use, and infrastructure conditions. Project developers must contend with multiple constraints in the landscape surrounding the actual culvert, such as water and sewer lines, buried utility lines, and existing easements. The spectrum of culvert projects ranges from simple culvert removals to free waterflow, to culvert replacements and associated work in the stream channel, to culvert removals/replacements that involve bridge construction and movement or modification of the roadway infrastructure at the project site. Culvert projects can be located on land owned publicly, by Tribes, or on private land, therefore requiring certain additional engagement and outreach to secure project development agreements. Even small culvert projects can be complicated and expensive, such as when they are located in urban areas.

The design phase is critical to determining overall project costs and funding requirements as site-specific permits and construction requirements are surfaced. Usually, a project needs to be at 30% design in order to understand total project costs. Getting to 30% design, however, can be expensive—around $15,000, but potentially more depending on site characteristics—and project developers need up-front sources of funding to cover these costs. Further, preliminary assessments to determine feasibility in the design phase sometimes result in a finding that a project or a culvert component of a project is not feasible and will not proceed.

Culvert projects—whether barrier removal or replacement/upgrading—are complicated and site-specific, with multiple required activities in each phase of the project cycle.

During implementation, culverts selected for the project are constructed. Once culverts are selected from the design phase, construction commences. A completed construction phase is critical to a project's environmental outcomes. Culvert projects are not scalable; for success, a culvert project has to be 100% complete. A partially removed culvert will not result in desired fish passage outcomes.

7 For example, the Washington State Department of Fish & Wildlife has developed a Fish Passage Web App that identifies the location of fish barriers in the state, and a Fish Passage Inventory, Assessment, and Prioritization Manual that assists users in prioritizing fish passage barriers for removal or replacement. The California Department of Fish & Wildlife inventories known and potential fish passage barriers to anadromous fish in California from agencies, organizations and landowners in the state and visualizes location information in the Passage Assessment Database (PAD). Since 2011, the Agency has also released annual lists of priority barriers for removal/replacement, such as the 2023 Fish Passage Priority List, and visualizes the spatial location of barriers through the Bios tool. The Oregon Department of Fish & Wildlife inventories fish habitat and barriers in its Fish Habitat Distribution and Barriers web map and also has a Statewide Fish Passage Barrier Prioritization List that the agency is currently working to update.

8 https://aquaticbarriers.org/

FUNDING-RELATED CHALLENGES TO CULVERT PROJECTS

Securing funding and financing for culvert projects can be complicated given the nature of these kinds of projects described in the preceding section. Specifically:

Costs associated with culvert projects are variable. Cost data from several sources, including personal communication with nonprofit and for-profit companies that implement culvert removal and replacement projects, show the variability in culvert costs depending on the design and other site requirements. Generally, culverts of a similar size can have similar base costs for the infrastructural components, with variability introduced by site-specific conditions and permit requirements. Installation of smaller corrugated metal pipe culverts on rural roads are relatively low-cost, at around $30,000—$50,000. Estimates for prefabricated (standard sized) culverts can range from $100,000 to $800,000, while arch culverts can range from $500,000 to $1.4 million per unit.

Table 1 shows the proposed funding and total number of barriers for each state within which applicants were awarded grants in FY2022 of the Culvert AOP program. Results show that on average the cost per barrier in this applicant set varied widely from around $400,000 to almost $3 million per barrier, with an average overall of $1 million per barrier. At this rate, the $1 billion in total funding will fund work on improving fish passage for on average 1,000 barriers—a small fraction of the 70 million culverts identified by DOT.[9]

Table 1: Culvert AOP Year One (FY 2022) Grant Award Recipients

State	Number of Applications				Proposed Funding	No. of Barriers	Average cost per barrier (calculated)
	Total	State	Local	Tribal			
Alaska	9	4	0	5	$44,087,431	45	$979,721
California	6	3	2	1	$28,785,490	10	$2,878,549
Idaho	4	4	0	0	$7,029,950	9	$781,106
Maine	4	3	0	1	$35,119,271	27	$1,300,714
Massachusetts	1	0	1	0	$2,000,000	3	$666,667
New Hampshire	1	0	1	0	$421,600	1	$421,600
North Carolina	1	1	0	0	$472,000	1	$472,000
Oregon	9	1	7	1	$19,308,792	26	$742,646
Virginia	1	1	0	0	$434,400	1	$434,400
Washington	23	1	16	6	$58,218,424	46	$1,265,618
Grand Total	59	18	27	14	$195,877,358	169	$1,159,038

Source: U.S. Department of Transportation, Federal Highways Administration, https://www.fhwa.dot.gov/engineering/hydraulics/culverthyd/aquatic/2022recipients.cfm

9 The culverts included in DOT's estimate may include very small structures that are much less expensive than the $1 million figure to upgrade, and so this may be an underestimate of the number of barriers the funding could address. https://www.transportation.gov/briefing-room/biden-harris-administration-announces-first-ever-grants-fix-more-160-fish-culverts

Culverts that are better for aquatic species will require up-front funding to absorb up-front design and permitting costs, and higher installation costs. Design and permitting costs associated with fish passage projects can be significant, and on average may comprise around 20% of the total cost of a project (see Box 1 for an overview of permitting requirements and potential streamlining ideas).[10] Initial installation costs can also be much higher for culvert upgrades. A USDA study estimated the net present value (NPV) of two culvert scenarios over a 25-year period: (1) installing and maintaining a standard 4-foot round culvert, including replacing the culvert every 10 years as is typically required; or (2) installing a 5-foot high arch culvert, a culvert design that does not typically require maintenance and has a lifespan of 50 to 75 years.[11] The cost of installing a round culvert (~$5,000) was estimated as substantially lower than the cost of installing an arch culvert (~$50,000), but the round culvert requires periodic replacement (every 10 years) and maintenance. The NPV analysis showed that the average annual cost for the landowners was lower for the round culverts than the arch culverts, but these annual costs become much lower for the arch culvert when cost-share is applied.[12] Without cost-share or some form of financial incentive therefore, landowners realize lower costs for round culverts that can restrict fish passage if they aren't maintained regularly.

10 Two caveats for this percentage estimate are that (1) the percentage of a project's total cost for design will vary significantly with the complexity of the fish passage structure being designed; and (2) some cost estimates used in the calculation predate the introduction of programmatic permits, which have resulted in significant cost savings for permitting-related work. Estimate calculated from cost data compiled by the California Fish Passage Forum to aid in restoration planning in 2021.

11 USDA, The Economics of Culvert Replacement, available at: https://efotg.sc.egov.usda.gov/references/public/ME/Archived_Economics_of_Culvert_Replacement_100302.pdf.

12 The study notes that arch culverts—but not round culverts—are eligible for cost-share under NRCS's WHIP program, which offers 90% cost-share for the practice. USDA, The Economics of Culvert Replacement, available at: https://efotg.sc.egov.usda.gov/references/public/ME/Archived_Economics_of_Culvert_Replacement_100302.pdf.

Box 1: Programmatic Approaches/Permit Streamlining

Permit requirements (and the capacity-related costs associated with securing them) for culvert projects are not final until a project is well into the design phase, and can be significant. Culvert projects can require multiple permits at different jurisdictional levels from different federal and state agencies, including required permitting under Section 404 of the Clean Water Act (U.S. Army Corps of Engineers) which can be administered at the tribal or state level; consultation and potential incidental take permits under the Endangered Species Act (Fish & Wildlife Service); NEPA requirements, and cultural resource (Section 106 of the National Historic Preservation Act) and county floodplain-related permits. These permits require some sequencing and many require similar information. It is not uncommon for multiple state and federal agencies and counties to be involved in a single culvert project. Together, obtaining all required permits can take roughly six months to complete but timing will vary depending on the size and potential impacts of the project.

Programmatic permits and categorical exclusions are two potential tools to streamline permitting for culvert projects.

For example, The US Army Corps' General Permits are "...used to authorize particular categories of activities in waters of the United States that have been determined to result in no more than minimal adverse environmental effects and provide for a streamlined Department of the Army review process."[13] General permits include State Programmatic General Permits, Regional General Permits, and Nationwide Permits. In the restoration space, US Army Corps Nationwide 27 Permit covers stream restoration activities. General permits reduce the amount of time required for project review, thereby creating efficiencies for project developers. A General Permit for fish passage restoration/culvert removal could greatly speed up the time it takes for culvert projects to receive permit approvals.

Categorical exclusions (CatExes) under NEPA requirements allow projects to avoid detailed environmental analysis of potential project impacts where a categorical exclusion exists that determines a project's minimal impact on the environment. CatExes are "a list of activities which agencies have determined from analysis and experience to not have significant environmental impacts and therefore do not require more detailed environmental analysis." CatExes are typically issued by each Agency separately. For example the US Forest Service has a CatEx for restoration projects that includes activities such as removing diseased trees and restoration streams.[14] Notably, in 2023 in the Fiscal Responsibility Act, CatEx rules were expanded to allow one agency to adopt another agency's CatEx determination for substantially similar proposed actions.[15]

The planning, design, and implementation phases of culvert projects have potential for project delays, cost overruns and changes. Contingencies that can further delay projects and complicate costs include inflation, supply chain disruptions, mitigation requirements associated with regulatory compliance such as under the ESA or Section 404 of the Clean Water Act, weather/seasonal closures, staff availability/turnover, contractor availability, cost increases and budget shortfalls. Recently, the state of Washington, under court order to repair or replace a sufficient number of culverts to meet Tribal treaty fishing rights by 2030, is facing nearly double the cost of original estimates due to rising construction costs and more expensive culvert projects as the state completes the more cost-efficient projects. For example, the eleven most complex and costly projects in the state's plan to meet the court order are estimated to cost $1.4 billion.[16]

13 https://www.nab.usace.army.mil/Missions/Regulatory/Permit-Types-and-Process/#nwp
14 https://www.fs.usda.gov/emc/nepa/revisions/pcesupportinginfo.shtml#:~:text=The%20categorical%20exclusions%20cover%20certain,community%20organizations%20and%20civic%20groups.
15 https://crsreports.congress.gov/product/pdf/IF/IF11549
16 https://www.seattletimes.com/seattle-news/times-watchdog/huge-spike-in-costs-to-help-salmon-could-derail-wa-transportation-budget/

Most grants do not reimburse for cost overruns. Costs can increase throughout the construction phase as unforeseen variables, such as inflation, mount. Furthermore, if a culvert has to be replaced by a bridge, annual inspections are another line item in the project budget. Most grants do not reimburse for cost overruns, creating additional risk for would-be project developers to engage in certain culvert projects.

Estimating the total cost of a culvert project requires up-front funding for planning and design work. Project proponents will need access to financing or funding for up-front planning and design work, either relying on grants or their own balance sheets. This can increase the risk for project developers if they are not relying on grants that reimburse for design studies and are instead either funding or financing the work themselves. Smaller and/or less-resourced organizations may not have cash on hand or be able to secure funding/financing for this up-front work. Larger and/or better-resourced organizations may have a finite ability and limited capacity to use existing balance sheets or borrow or apply for money to cover these early project costs. In both cases, the number of culvert projects on the landscape is likely reduced.

Funding must be available for the life-cycle of a culvert project in order to achieve environmental outcomes. With other types of restoration projects—such as stream restoration—partially complete projects may also be considered successful. For this reason, securing funding for the complete life-cycle of the culvert project is critical to the environmental outcomes generated by these projects.

Program-Related Funding Barriers

Given the relative complexities of culvert projects, it is important that funding programs are sensitive to culvert project cycle realities and funding-related challenges as described above. However, culvert projects are more often funded as single projects on a reimbursement basis through grant funding by different public agencies, leading to challenges that impact the quantity and quality of culvert projects on the ground. There are also equity implications.

Reimbursement-based grants cannot address up-front funding needs of projects. Grants on a reimbursement basis are challenging for grantees, who have to figure out paying up front for project expenses and then waiting a period of time for the government to reimburse them. The third and fourth quarters of the year can be particularly challenging if organizations complete restoration work in the summer months and then have to wait for reimbursement.

Siloed fish passage funding programs create inefficiencies for culvert projects. The current norm is for culvert projects to be funded by individual agencies, or for one project to apply for and receive funding from different agencies with different requirements.

Inconsistencies across funding programs creates extra capacity burdens on applicants. Different requirements of different programs make it difficult to navigate funding for grantees. Financial and staff capacity is required to determine eligibility and program requirements, and to submit multiple applications for funding.

Quick timelines to spend the money make meeting match requirements challenging. Meeting match requirements of certain programs (required match under the Culvert AOP Program is 20%) is challenging for project developers, especially those that are less resourced. Some state and local governments also cannot meet the match requirement where, for example, a state

pool of funding to match aquatic restoration work is not available. The Culvert AOP Program has waived the match requirement for Tribes.

Eligible grantees are unlikely to have the staff capacity necessary to administer large grants. Public sector and tribal governments have limited staff and resources and may be limited in their ability to take on funding to support projects at scale. Funding to build capacity, or the opportunity to take advantage of external consulting capacity, could help here.

ALTERNATIVE DELIVERY PROCUREMENT APPROACHES

Alternative delivery procurement methods exist outside of the typical procurement methods of the public sector for goods and services. These typical public procurement methods include:

- **Grant-based competitive procurement for individual projects by individual agencies.** Usually, a single government agency solicits individual projects from entities through a competitive RFP or Notice of Funding Opportunity (NOFO) process and awards funding through an evaluation process using specific scoring criteria. In this model, applicants need to have enough of their project designed to write a compelling application but do not know whether their up-front investment will lead to funding. Often, government agencies funding similar types of projects are not aligned and have different application forms and application requirements.

- **Reimbursement-based contracting.** The government only pays contracted entities after work is completed and the entity has invoiced the government. In this model, project developers must pay for the project components and wait to be reimbursed by the government after they submit receipts for the work. Needing to either invest from an entity's balance sheet or borrow money for project work ahead of government reimbursement may be too time-consuming and risky for smaller organizations with limited capacity and resources.

- **Design-bid-build procurement.** Governments, especially local and state governments, may have rules that require separate applicants and contracts for project developers, builders, and then for those who maintain the project. A similar dynamic exists where capacity grants that fund planning and/or design work are separate applications from grants that fund implementation of a project.

Alternative delivery procurement methods that can address some of the challenges of traditional government procurement include public-private partnerships (P3s), full delivery, and Pay for Success (PFS). These methods would address some of the funding-related challenges culvert projects face, allowing more culvert projects to be implemented across the landscape using IIJA funding.

- **Public-Private Partnerships (P3s):** A P3 is a procurement method governments can use to procure public goods and/or services, such as infrastructure, from the private sector. P3s combine the financial resources of the public sector with the sector-specific expertise of the private sector. A common example of a P3 is a public agency contracting with a private sector entity to build/rehabilitate, operate, and/or maintain infrastructure—whether gray or green—that also provides a public service benefit. P3s allow public entities with a public benefit focus to take advantage of the speed and efficiencies that specialized private sector entities can bring to projects like green infrastructure, especially for quickly deploying capital to implement restoration and other projects.

P3s can take many forms, with varying degrees of involvement of the private sector in the project cycle, ranging from the planning and design to construction and operation & maintenance phases (Figure 3). In "full delivery" projects, the private sector takes on the full project cycle from design to operations and maintenance.

	Identify Infrastructure Need	Propose Solution	Project Design	Project Financing	Construction	Operation/ Maintenance	Ownership
Bid/Build	Public Sector				Private Sector	Public Sector	
Design/Build	Public Sector		Private Sector	Public Sector	Private Sector	Public Sector	
Design/Build/Finance	Public Sector		Private Sector			Public Sector	
Design/Build/Finance/ Operate/Maintain	Public Sector		Private Sector				Public Sector

Figure 3: Private Sector Engagement in Different P3 Contracts
Source: Brookings Institution, "Private Capital, Public Good: Drivers of Successful Infrastructure Public-Private Partnerships", 2016. Available at: https://www.brookings.edu/wp-content/uploads/2016/07/BMPP_PrivateCapitalPublicGood.pdf

Depending on the level of private sector responsibilities in the infrastructure project cycle, P3 contractual agreements shift risk between public and private sector entities (Figure 4), with the private sector taking on more of the project risk than traditional procurement.

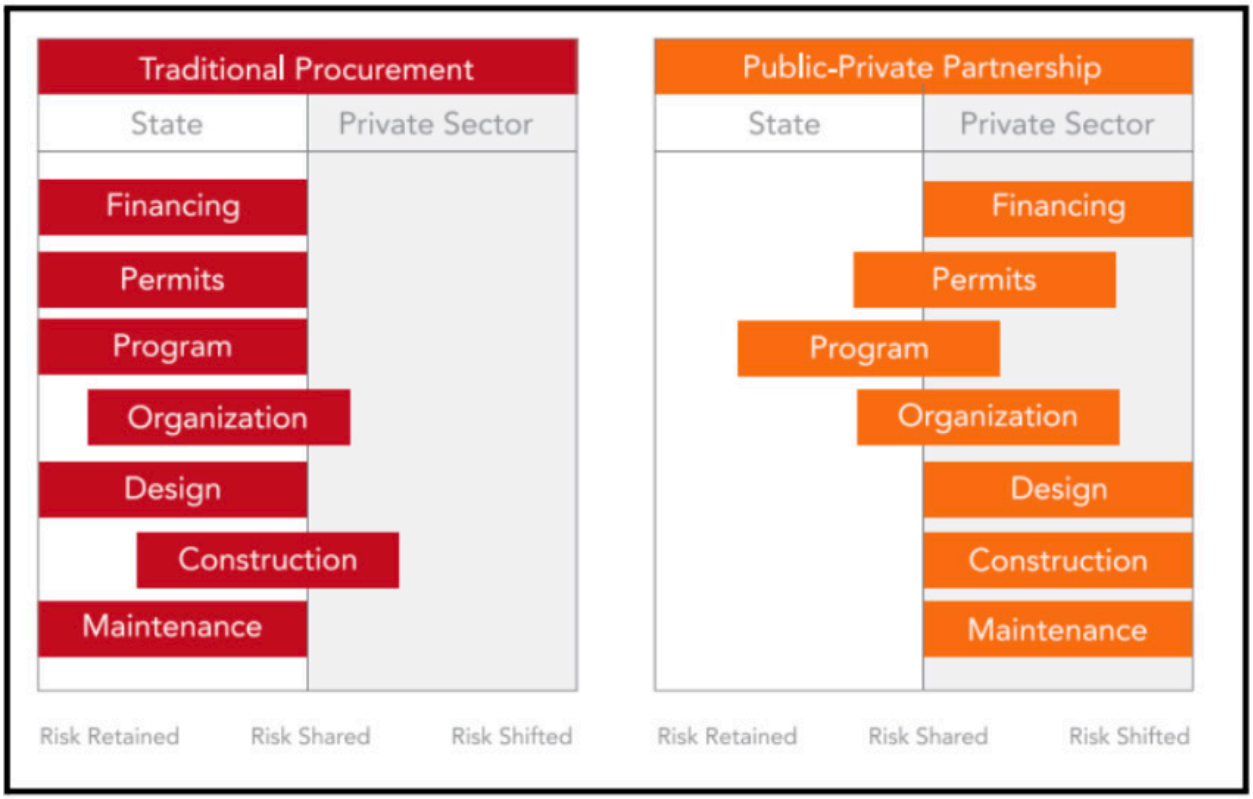


Figure 4: Shifting Risk through a P3
Source: https://thecleanwaterpartnership.com/program-goals/#1508194235542-5d0c136f-270b

A recent example of a successful P3 is the Clean Water Partnership (CWP) in Prince George's County, MD.[17] The CWP is a 30-year, $250 million Community-Based P3 with a private company that is retrofitting impervious acres in the County with green infrastructure in order to help meet the county's Municipal Separate Stormwater System (MS4) permit compliance needs that address the Chesapeake Bay's Total Maximum Daily Load (TMDL). The CWP is the first P3 through which the entire project cycle of green infrastructure (design, build, finance, operation and maintenance) is being procured from the private sector to meet regulatory requirements of an MS4. Under the P3, the private company invests its capital to design, construct, and maintain green infrastructure and is repaid by the County for the green infrastructure acres delivered.

- **Full Delivery[18]:** Traditional government procurement can involve issuing separate contracts to design, construction, and maintenance providers using the "design-bid-build" procurement process. Contracting and payments for services are awarded at different stages of a project's life cycle, leading to more work and resources for both project developers and government staff. In full delivery approaches, by contrast, the government issues an RFP for all phases of a project's cycle, thereby saving time and money associated with project developers submitting multiple proposals and

17 https://thecleanwaterpartnership.com/
18 Full delivery involves a project where the contractor manages and integrates both the design and construction elements. Full-delivery projects include a preliminary step that involves the contractor acquiring property and a post-construction step that verifies outcomes. full delivery projects utilizes Pay for Success contracting, but this term encompasses more than just the outcomes-based contract structure. For more, see https://www.policyinnovation.org/blog/whats-in-a-name-one-writers-frustration-with-technical-term-redundancy.

government staff having the role of a general contractor for the project—that role is given to a specialized, private sector firm. In Florida, pivoting to a full delivery contracting approach for stormwater treatment has allowed the state to reduce the time to implement a project from 16 to 6 years and led to state legislation.[19] Box 2 provides a recent example of a full delivery effort for river restoration work in the Northwest.

Box 2: Klamath River Restoration Full Delivery Contract

An example of a project with a full delivery contract that incorporates PFS is the restoration work being conducted in the wake of the removal of four dams on the Klamath River on either side of the California-Oregon border. The contract includes a fixed fee contract between the Klamath River Renewal Corporation and the restoration firm, RES. RES is further subcontracting with the Yurok and Karuk tribes to carry out many of the restoration activities needed to fulfill the contract, including revegetation and stream restoration.

Image Source: RES

Payments under the contract will be tied to key ecological performance milestones, for things such as connected streams and tributaries, sediment stabilization, revegetation, and monitoring. RES is fully obligated to complete their restoration plan as written in the contract. There is no force majeure clause, but they can push the timeline if necessary, such as in events of fire or flooding.

Developing the full delivery contract was an iterative process involving the contractor and the government agencies involved in overseeing the restoration. In the process of defining the performance outcomes and restoration priorities, agencies received more than 2,000 public comments, which helped them develop a plan that prioritizes the restoration activities that deliver the best outcomes for the overall contract price.

A key feature of the contract is that means and methods are not dictated: RES must deliver the agreed-upon outcomes, but their means for doing so are not prescribed by the contract. This is one of the ways in which this structure is different from more traditional design-bid-build contracts.

- **Pay for Success (PFS)[20]:** PFS is a procurement method through which a funding entity pays for specified outcomes upon outcome delivery. Tying payments to outcomes in this way ensures that desired environmental outcomes are produced through the funding provided. The PFS model encourages greater private sector participation in restoration projects by guaranteeing payment for verified outcomes so project developers can anticipate revenues and plan project costs and financing accordingly. If the government

19 For more detail, see https://static1.squarespace.com/static/611cc20b78b5f677dad664ab/t/63c9a9aac0f7527ae3a98dac/1674160589507/PurhasingEnvironmentalProgress.
20 Also known as Pay-for-Performance, Pay-for Results, or Outcomes-Based Procurement.

- creates a positive, repetitive signal that it will purchase a certain outcome every year, there may be less risk for the developer under an assumption of a guaranteed buyer. This would require consistent funding over a long period of time to realize.

  The details of PFS programs can vary in how and when project proposals are solicited (e.g., bidding processes), how and when contracts are signed, and payment schedules.[21] PFS mechanisms can be included as part of P3 and full delivery arrangements, which can increase the benefits to both the public and private sector partners through introducing efficiencies in project selection and development. PFS programs in the environmental space have been evident primarily at the state and local (e.g., county, city) level, but given the features of IIJA funding (delegated funding, defined desired goals, and a rapid timeline for deploying funds), there is opportunity to utilize this method at the federal level as well. Again, a grant to a local entity could support administration of a PFS program that contracts to the private sector at the local level.

  A typical PFS procurement cycle is as follows:

  1. Government releases an RFP stating the desired outcomes and evaluation criteria for bids. In the case of culvert projects, the outcome being purchased could be miles of stream reconnected, miles of access restored for aquatic species, or number of barriers removed or replaced, etc.
  2. In response to the RFP, potential project developers develop and submit bids for projects, naming the price at which they can provide the specified outcomes. For example, a county might release an RFP asking for 20 culvert removals in a specific watershed; project developers would then respond with a bid of the total price at which they could provide that outcome. Bids are usually developed and submitted before construction begins, but after some preliminary planning and design work has been completed to inform the cost estimates that comprise the bid price. Under the PFS model, project developers have the ability to design and implement projects and make changes and corrections as needed; the government only sees the final price of the outcomes generated.
  3. Government evaluates bids following the scoring and evaluation criteria contained in the RFP. Government selects winning bid(s) for funding.
  4. Government and selected project developers negotiate specific contract terms and sign the contract for provision of specified environmental outcomes at a specified price.
  5. Selected project developers finish design and implement projects to produce the environmental outcomes. Selected project developers may need private financing to fund costs before government payments are received. In this case, risk may be lowered for any potential investors because the outcomes contract serves as a guaranteed repayment source for the loan.
  6. Government releases payment to selected project developers following the contracted schedule.

21 Some PFS programs are solicited on a regular, annual basis, like Anne Arundel County's impervious acre credit solicitation: (https://www.aacounty.org/public-works/bwpr/watershed-restoration-projects/full-delivery-turnkey-water-quality-improvements). Others are one-offs that meet specific needs as they arise. Additionally, the payment schedules can vary greatly. Anywhere from 20%—100% of payments are held until the project is verified. EPIC generally advocates for 40%—60% withheld until verification depending on project type.

PFS could have the following benefits for project developers:

- **PFS would allow project developers to combine projects at a watershed scale.** PFS allows a project developer to submit a price for outcomes that are generated through the number, type and design of projects the developer selects. Aggregating project design and implementation activities would allow for greater economies of scale. Design, planning and permitting activities could be combined in creative ways across a portfolio of projects. Construction work could also be coordinated across project sites. These economies of scale would be realized through spreading costs across multiple project sites, but also through reducing time delays associated with uncoordinated efforts. Importantly, the ability to prioritize projects in the landscape would mean environmental benefits could be increased or maximized through intentional project siting.

- **PFS would allow project developers more freedom in assembling project teams.** Because the government cares about outcomes in a PFS model, there is less involvement in the details of the project cycle. If government contracting is conducted separately for the design and build phases, project developers have to apply for design funding and then may have to assemble and apply for build contracting with another construction entity. Through PFS, project developers are free to assemble teams and workflows as efficiently and effectively as they are able to, while the government sees the environmental outcome and the price per unit of producing that outcome at the end of the project cycle.

Alternative delivery procurement methods change the risk/reward profile between government funders and fund entities (Figure 5). In traditional grant funding, the buyer (here, the government) takes on a high level of risk for project success—grants are awarded before projects are implemented and therefore before project success is known—and the producer reward is lower given the funding and financing needs discussed above. Buyer risk decreases—and producer reward increases—with PFS, which can be implemented as a part of P3s and full delivery contracts. P3s and full delivery contracts take the risk further off the government and introduce more benefits to producers through the efficiencies and guarantees they create for both the public and private sector partners.

Alternative delivery procurement methods change the risk/reward profile between government funders and fund entities.

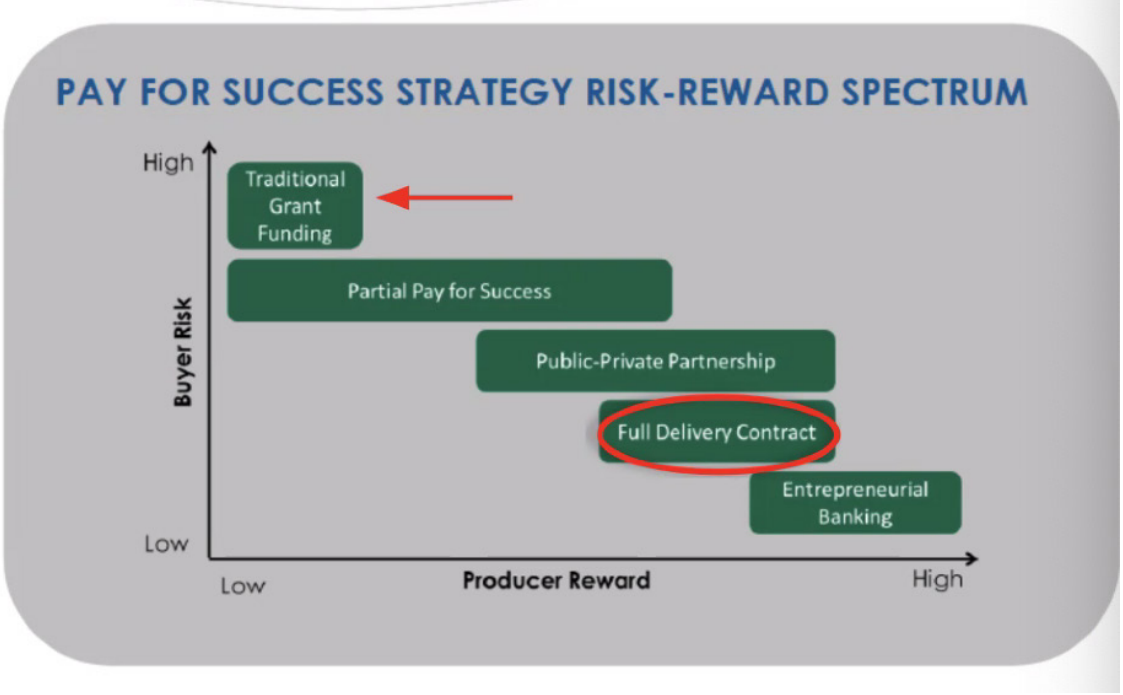


Figure 5: Risk/Reward Profile Across Alternative Delivery Procurement Methods
Source: https://enviroaccounting.com/strategies/

Implementing alternative delivery procurement methods is growing in the environmental space. There are multiple examples of state- and local-government level programs procuring environmental outcomes (and other important co-benefits such as local job creation and economic growth) through P3s and PFS, with these methods sometimes combined in one program. A prominent example of this is the Clean Water Partnership, described above, through which a private entity implements county stormwater projects through subcontracting with local businesses. Twin benefits of stormwater mitigation and local business development have been realized from the Partnership, which has exceeded targets to date. The P3 has a PFS structure through which the private entity is repaid by the County upon delivery of the green infrastructure acres. Another P3 in Maryland between Anne Arundel County and private companies has a PFS structure whereby the county pays private companies on an impervious acres treated basis. The cost per acre treated under this arrangement has reduced costs drastically from traditional contracting methods, and costs per acre continue to drop.[22]

PFS and other alternative delivery procurement methods are less apparent at the federal level for environmental programs but there are some examples and current momentum. PFS procurement is being implemented by the Department of Treasury through the Social Impact Partnerships to Pay for Results Act (SIPPRA) that was signed into law on February 9, 2018. This Act authorized the Department to "pay for a project only if predetermined project outcomes have been met and validated by an independent evaluator, a system called a "pay for results partnership."[23] Precedence for PFS in the federal environmental space is evident in the Natural Resources Conservation Service (NRCS) Regional Conservation Partnership Program (RCPP), for which the 2018 Farm Bill provided statutory language permitting alternative funding arrangements (AFAs): "The Agriculture Improvement Act of 2018 (2018 Farm Bill) amendments to RCPP provides examples of project types that might be implemented through RCPP AFA:

22 See https://static1.squarespace.com/static/611cc20b78b5f677dad664ab/t/649c581c4f5a54012155a504/1687967796529/EPIC_ChesapeakeBayPrivateCapital_FINAL.pdf, page 14.
23 https://home.treasury.gov/services/social-impact-partnerships/sippra-pay-for-results

Projects that use innovative approaches to leverage the Federal investment in conservation; Projects that deploy a pay-for-performance conservation approach; Projects that seek large-scale infrastructure investments that generate conservation benefits for agricultural producers and nonindustrial private forest owners."[24] Implementation of this authority is underway, with two grant cycles completed to date. There is also seemingly increasing momentum evident through recently introduced legislation that would authorize PFS at the federal level, including through the STREAM Act[25], the Protect the West Act[26], the Outdoor Recreation Act[27], and the Watershed Results Act[28].

24 https://www.nrcs.usda.gov/sites/default/files/2022-09/USDA-NRCS-NHQ-RCPPAFA-21-NOFO0001096.pdf

25 The Support to Rehydrate the Environment, Agriculture, and Municipalities Act, or STREAM Act, authorizes the use of Pay for Performance-based contracts for environmental restoration projects with a particular emphasis on projects that have multiple benefits for a watershed. https://www.congress.gov/bill/117th-congress/senate-bill/4231/actions?s=1&r=4&q=%7B%22search%22%3A%5B%22stream+act+feinstein%22%5D%7D

26 This bill establishes and provides funding for the Restoration and Resilience Grant Program and the Restoration and Resilience Partnership Program. https://www.congress.gov/bill/118th-congress/senate-bill/540?s=1&r=36

27 Manchin S. 3266, also known as the Outdoor Recreation Act, was introduced to the Senate in November of 2021. While much of this bill is targeted towards accessible outdoor recreation for youth 25 years or younger, SEC 302: Forest Service Conservation Finance Partnerships proposes the use of innovative finance strategies to benefit federal parkland. https://www.congress.gov/bill/117th-congress/senate-bill/3266/text?r=1&s=1

28 The Watershed Results Act (Wyden S. 2807), introduced in the fall of 2021 authorizes the construction of 2-5 pilot programs, each with a $15 million annual budget and an additional $2 million for advance watershed analytics. The goal of these pilots is for federal agencies to quickly execute Pay for Success contracts, thus securing environmental outcomes in a reasonable timeframe. https://www.congress.gov/bill/117th-congress/senate-bill/2807?s=1&r=50

RECOMMENDATIONS

Recommendations to speed up deployment of IIJA funds for culvert projects and optimize environmental benefits from funded culvert projects are provided below. Recommendations center on the benefits of P3 arrangements for achieving fish passage goals, but also consider other programmatic changes that could help FHWA solicit great proposals for positive aquatic species benefits.

Recognize P3s as an eligible funding arrangement in the next Culvert AOP Program NOFO. The Culvert AOP Program has provided a pathway to support P3s and PFS arrangements in its program language, where it indicates in the first NOFO that "At DOT's sole discretion **alternative funding arrangements** may be considered on a case-by-case basis."[29] By recognizing P3s as eligible funding arrangements, FHWA could encourage counties, states, and/or Tribes to submit proposals for funding to set-up, administer, and fund projects through a P3 with a private company/contractor or cohort of contractors to implement project activities. The P3 arrangements could be structured to pay contractors either on delivered outcomes (in a PFS structure) or at specified milestones. Either way, the grantee could specify the outcomes desired, which could be specific prioritized culverts across a watershed based on local planning efforts. It is likely that grants to stand-up P3 arrangements would be on the higher end of the funding range ($20 million for the Culvert AOP Program) in order to fund the administration of the P3 and work by contractors. The Culvert AOP Program could socialize the P3 model in the environment space across the potential grantee community by holding informational webinars showcasing successful examples of P3s such as those described above (e.g., the Clean Water Partnership).

Metrics used to select contractors for the P3 could be formulated to meet other goals of the Culvert AOP Program. For example, the grantee could have metrics associated with requiring that 80% of the workforce of the contractors has to be from the county or be women-owned businesses, or some percentage of barriers removed have to have some beneficial impact on historically disadvantaged communities.

Photo by Jeff Dewitt on Unsplash

P3 arrangements can be implemented quickly where grantees are able to leverage existing planning and prioritization efforts, though planning and prioritization work could be built into the arrangement for particular watersheds critical to certain anadromous fish species. P3 arrangements could be especially beneficial in those areas that have already developed culvert/barrier inventory and prioritization tools as listed and described above (e.g., California, Oregon, Washington). A PFS mechanism within a P3 is most likely to have success across a portfolio of culvert projects that are of similar size and require similar design. These projects are less likely to have cost volatility and any project risks that may impact costs could be spread across the portfolio. In addition, where the projects are geographically proximate, cost efficiencies could be realized by sharing project resources across culvert sites.

29 https://www.fhwa.dot.gov/engineering/hydraulics/culverthyd/aquatic/culvertaop_nofo.pdf

Consider other eligible funding arrangements. Other funding approaches that could address funding challenges of culvert projects short of a P3 or PFS arrangement include taking a phased funding or block funding approach. Currently, project developers often have to apply for multiple grants for different parts of a culvert project—separate grants for the planning/design phase and implementation phase of a particular culvert project. A **phased funding approach** takes into account the heavy load of the design phase of culvert projects and potential for cost overruns and other unpredictable budget issues; with a phased funding approach the project developer doesn't have to apply for multiple grants for different parts of the project cycle but rather a first phase could fund design and allow the project developer to refine cost estimates; the second phase would be a larger grant for construction and could include a contingency for potential cost overruns. Another option would be to implement a **block funding approach** in which the government would provide funding to a project developer to complete several projects in a watershed area, including completing planning, prioritization, and design work and then implementing construction of the culvert removals/replacements from highest to lowest priority.

Leverage existing interagency coordination to aggregate culvert project funding to the watershed scale. Greater environmental outcomes for fish passage are possible through optimizing the locations of culvert projects; however the current system of funding is siloed within agencies. While it is promising that proposals containing multiple culvert projects have been funded by individual agencies, further synchronizing funding across agencies could bring more benefits to fish at the watershed scale, and lend some economies of scale to culvert projects through coordinated planning, design, and permitting. There is already interagency coordination happening through the Interagency Fish Passage Portal developed in 2022 through the Federal Interagency Fish Passage Task Force. The Portal provides information on funding opportunities across government agencies, information on grants awarded to date, and an evolving resource library.

Build an interagency funding clearinghouse for culvert projects. The Interagency Fish Passage Portal effort could be leveraged to further coordination of funding across agencies for fish passage projects, such as through creating a funding clearinghouse. In this model, applicants would submit one application and the onus would be on the Federal agencies to match applicants with appropriate funding (by one or more agencies). This funding clearinghouse model would allow agencies to take a watershed perspective on funding, to pool resources, and to potentially allow for follow-on funding for successful early-stage projects (without requiring the applicant to submit another application). The funding clearinghouse would increase efficiency and save time and resources for both the Federal agencies and the applicants. The clearinghouse could be initiated through a pilot program focused on a particular region to control for capacity limitations at federal agencies to administer such a clearinghouse at a national scale.

Leverage what other agencies are already doing to increase the quality and efficiency of culvert projects. Other existing programs received additional funding through the IIJA and offer comparative examples that could aid FHWA in developing the Culvert AOP Program to increase the quantity and quality of culvert projects on the ground.

- **Consider a Letter of Intent (LOI) process and greater engagement with potential applications pre-proposal submission.** The Fish & Wildlife Service's National Fish Passage Program utilizes a letter of intent (LOI) process and depends on direct agency to applicant coordination for full application submission: regional staff are available to answer questions for applicants.

- **Explore utilizing ASAP.gov.** The Automated Standard Application for Payments (ASAP) is a free electronic payment system managed by the Treasury Department and available to all Federal agencies. ASAP allows Federal agencies to enroll recipient organizations (including state and local governments, nonprofit organizations, and Tribal governments and organizations), authorize payments, and manage accounts. Recipient organizations are able to receive payment from the Federal government and pay invoices to subcontractors in a timely manner. The system provides flexibility to project developers, allowing them to manage grant money by drawing down on one account.