



January 7, 2025

Comments of Blueprint 2025

RE: Appalachian Hydrogen Hub – Phase 1 Virtual NEPA Scoping Meeting

AGENCY: Department of Energy

Docket No. DOE-HQ-2024-0082

The Blueprint 2025 (“BP2025”) initiative is a collaboration among infrastructure professionals, leading infrastructure development companies and public and private sector project managers, which supports plans and policies to restore the U.S.’ position as the country with the world’s most efficient, sustainable and productive infrastructure. It has long been clear to us that reform of the permitting process for major infrastructure projects is essential if the U.S. is to timely and efficiently modernize its infrastructure to meet the new needs of this century.

We view this NEPA review, led, not by CEQ but by the prestigious and technologically qualified Batelle Memorial Institute and the Department of Energy, as an unparalleled opportunity to correct the current administration’s resistance to the Builder Act’s mandate and the progress which new technology can unlock.

In 2018, we issued the attached urgent call for the use of modern digital technology and analytics to expedite and improve the NEPA review process. (see attachment 1). We reinforced that call in comments on the CEQ’s NEPA Update Regulations in February 2020 and March 2020. The essence of these recommendations was that CEQ and government in general must take advantage of modern technology—telecommunications, advanced data analysis, digitalization and Artificial Intelligence “to expedite NEPA reviews, enhance the ability of the Public to participate effectively in the process, improve the quality of the analysis conducted, and achieve more informed decisions and more sustainable and environmentally sensitive projects.”

Two years later, in commenting on CEQ’s “guidance” regarding “expedited” procedures for environmentally protective projects, BP2025 noted that CEQ, though it recognized the need to expedite approval of projects to advance environmental objectives, suggested only 1970s, 1980s and early 1990s approaches, which had proven to be ineffective, to fulfill that need. The guidance was “not good enough”.

Finally, BP2025 supported the “Builder Act” provisions in the Debt Relief Act of 2023 (42USC4336-E-NEPA) which directed CEQ to conduct a study and submit a report to Congress on the “potential for online and digital technologies to address delays in reviews and improve public accessibility and transparency” [in the NEPA process]. Unfortunately, we have not seen any indication of progress on this extremely important Congressionally mandated study.

The Hydrogen Hub project comes at an inflection point. Though the outgoing administration has

not vigorously opposed digitization, it has not really supported it, particularly in the NEPA context. On the other hand, both the Congress and the incoming Administration can be expected to continue support for the proposition that Agencies must take advantage of modern technology—telecommunications, advanced data analysis, digitalization and Artificial Intelligence “to expedite NEPA reviews, enhance the ability of the Public to participate effectively in the process, improve the quality of the analysis conducted, and achieve more informed decisions and more sustainable projects.” Courts are increasingly making clear that CEQ “guidance” is just that and that Agencies have discretion in adapting NEPA to their programs. We believe that the Department of Energy has considerable latitude to adjust this NEPA review process in ways which will accomplish the Congressional purposes and advance the National Interest.

The Notice makes clear that this process will address complex and controversial issues and early press coverage suggests active opposition. The predictive capabilities of digital/AI models and the discipline which can be provided by a digital commenting and analytics system should provide both better outcomes and insulation against litigation.

The Appalachian Hydrogen Hub project is an extremely important one which enters the environmental review process at a critical juncture. The choice presented is (1) whether it will be an important early project in the incoming Administration which confirms and ratifies the old, slow inefficiencies of the past or (2) one which will break those obstructive traditions by embracing up to date analytics to produce better decisions faster. We urge the Department to choose the latter course by stepping back from the traditional approach which the notice seems to adopt and using new technology to provide a better, more innovative future. The result will be transformational.

BP 2025’s participating colleagues will be pleased to provide additional information and to assist in any way possible.

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Blueprint 2025 Position Paper Modernizing the NEPA Environmental Review Process

Over the last fifty or so years (since enactment of the National Environmental Policy Act “NEPA”) serious deficiencies have developed in the way the U.S. Government goes about the planning and authorization of infrastructure projects. This unnecessarily burdensome administrative process delays decisions on critical infrastructure projects, severely restricting our country’s ability to modernize infrastructure to enable the technologies of the future or even to maintain the infrastructure which is now in place.

China and our other competitors have in place not only programs to plan and prioritize the infrastructure to be built, but highly efficient computer aided approaches for individual projects beginning with the early planning stages and continuing throughout their development. Though the governance systems of these major competitors might be more conducive to efficient management of the development process than is our “rule of law” system, it should be possible to at least narrow the gap by simplifying and improving the U.S. system as it has evolved (or devolved) over the last 50 years and enabling the use of modern technology to make the authorization process work more efficiently. This note outlines possible steps toward that end.

The Process for Achieving NEPA’s Goals is Outmoded and Inefficient

Despite the well-intentioned goals of NEPA to help public officials make decisions based on an informed understanding of environmental consequences, there is a large and growing number of actors in both the public and private sectors that feel the Act has evolved into an unintended project-stalling process of administrative hurdles. What was originally designed to encourage simple informed decision making has become a burdensome and expensive process resulting in undue delays, loss of investment and, perhaps, even environmental harm.¹

According to this view:

- Environmental analyses are routinely conducted for actions that reasoned judgment would conclude are not major and should not be subject to such onerous agency oversight.
- Though the act was intended to facilitate public input and participation, the environmental review process as it currently exists is esoteric and inaccessible to the average citizen who might like to weigh in. Data on the average length of an EIS is lacking, but it is not uncommon for these reports to span in excess of 1,000, 2,000, and even 3,000 pages, though CEQ regulations state that the text of final EIS reports should “normally be less

¹ See *Modernizing NEPA for the 21st Century: Oversight Hearing Before the H. Comm. on Natural Resources*, 115th Cong. (2017) (statement of Philip Howard, Chairman Common Good).

than 150 pages and for proposals of unusual scope or complexity ... be less than 300 pages.”² This added complexity often means that participation only comes from well-funded organizations or experts in a particular field. While expert comments are appreciated, and encouraged, the process was meant to invite participation on a much broader scale.

- While agencies do not routinely track data on the cost of completing NEPA analyses, it is clear that the cost of an environmental review process for a single project can run into the millions of dollars. For instance, the Department of Energy (DOE) tracks limited cost data associated with NEPA analyses, specifically, funds the agency pays to contractors to prepare NEPA analyses. According to DOE data, the average payment to a contractor to prepare an EIS from calendar year 2003 through calendar year 2012 was \$6.6 million, with the range being a low of \$60,000 and a high of \$85 million.³ DOE’s median EIS contractor cost was \$1.4 million over that time period.⁴

Though the extent and impact of these problems may be subject to debate, it seems clear that there is a great deal of room for improvement in order to mitigate what many interpret to be excessive delay, cost, and complexity.

As a recent House Natural Resources Committee hearing on the need to modernize NEPA highlighted, there remains broad support for the act’s basic objective of informing agency decision makers.⁵ However, there seems to be a consensus that the process is plagued by the kinds of problems outlined here and that as a result, NEPA has failed to fulfill the basic purpose for which it was enacted, resulting in unintended adverse impacts on the U.S. economy, the quality of our infrastructure, and in fact, on the environment itself. Solutions like those suggested at the hearing, by former CEQ General Counsel, Dinah Bear, that more and better-trained federal employees are needed—are both unrealistic and rooted in the past.⁶ NEPA, like other elements of our infrastructure, needs to be updated and brought into the 21st century. New tools including data analysis, artificial intelligence, and even virtual reality modeling can and should be effectively utilized to expedite and simplify the NEPA process, making it more accessible to ordinary citizens and yielding superior analytical results.

Current Process Dynamics

² 40 C.F.R. § 1502.7.

³ U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-14-370, NATIONAL ENVIRONMENTAL POLICY ACT: LITTLE INFORMATION EXISTS ON NEPA ANALYSES 13 (2014) (According to DOE, the cost for the \$85 million Hanford Tank Closure and Waste Management EIS includes the costs for three major EISs—waste management, high-level waste tank closure, and disposition of a nuclear reactor—that were started separately and ultimately integrated into one document spanning 3,600+ pages including agency responses to public comments).

⁴ *Id.*

⁵ See 42 U.S.C. § 4321 (NEPA’s congressional declaration of purpose states that the purposes of the act are “to declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.”).

⁶ See *Modernizing NEPA for the 21st Century: Oversight Hearing Before the H. Comm. on Natural Resources*, 115th Cong. (2017) (statement of Dinah Bear, Former General Counsel, Council on Environmental Quality).

NEPA requires federal agencies to analyze both the nature and the extent of a project’s potential environmental effects and, in many cases, document these analyses.⁷ While much has been said about the merits of this process in furthering a public dialogue and improving the quality of decision making at the federal level, CEQ regulations make explicit the need for a level of analysis that is timely, efficient, and genuinely useful. For instance, under the CEQ’s own articulation of NEPA’s purpose, “NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.”⁸ “NEPA’s purpose is *not* to generate paperwork—even excellent paperwork— but to foster excellent action.”⁹ “Ultimately, it is not better documents but better decisions that count.”¹⁰ The regulations go on to include specific instructions targeted at two additional goals: (i) to reduce paperwork and (ii) reduce delay.¹¹ These instructions highlight the needs for agencies to reduce the length of environmental impact statements (EIS); emphasize the portions of the EIS that are useful to decision makers and the public; integrate NEPA requirements with other environmental review and consultation requirements; require comments to be as specific as possible; eliminate duplication with state and local procedures by providing for joint preparation; emphasize interagency cooperation before the EIS is prepared; establish appropriate time limits for the EIS process; and use accelerated procedures for proposals for legislation.¹²

Title 41 of the “Fixing America’s Surface Transportation” Act (“FAST Act”) --- establishes a new interagency committee (the Federal Permitting Improvement Steering Council “FPISC”), which is directed to ensure use of most efficient and timely processes for environmental review, and establishment of performance schedules for the completion of the environmental reviews. Title 41 thus both confirms the basic principles outlined above and augments them by a requirement that the Council established by the Act must ensure that “best technology” will be fully utilized in the environmental review process. The Title 41 mandate requires timely action to integrate modern technology into the NEPA process. An approach to such an effort is roughly outlined below.

The Process Now in Place

NEPA is primarily a procedural statute. It does not require an agency to pursue the least environmentally harmful alternative, only that the agency give adequate consideration to the potential benefits and harms of the proposed action in order to demonstrate informed decision making.¹³

Over the last 50 years, NEPA practitioners and the courts have developed a well choreographed set of procedures designed to fulfill these procedural requirements.¹⁴

- Identify the need for action in connection with a proposal.

⁷ Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (CEQ regulations), 40 C.F.R. Parts 1500-1508, set out the level of analysis and documentation for complying with NEPA. The scope and form of these analyses can take the form of a Categorical Exclusion (CE), Environmental Assessment (EA), or Environmental Impact Statement (EIS).

⁸ 40 C.F.R. § 1500.1(b).

⁹ *Id.* at § 1500.1(c) (emphasis added).

¹⁰ *Id.*

¹¹ *See* 40 C.F.R. §§ 1500.4-1500.5.

¹² *Id.*

¹³ *See Robertson v. Methow Valley Citizens Council*, 490 U.S. 332 (1989); *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 435 U.S. 519 (1978).

¹⁴ *See* COUNCIL ON ENVIRONMENTAL QUALITY, A CITIZEN’S GUIDE TO THE NEPA: HAVING YOUR VOICE HEARD 8 (2007).

- Determine whether the action is a federal action subject to NEPA review.
- Determine whether the proposed action is a “major federal action” i.e. could it have direct or indirect effects which have the *potential* to significantly affect the quality of the human environment.¹⁵
 - If “yes,” determine whether the project qualifies for a categorical exclusion (CE).
 - If significant environmental effects are uncertain and the action fails to qualify for a CE, then agencies must move forward with an environmental assessment (EA) providing for public involvement to the extent practicable.¹⁶
- Determine whether the EA reveals a potential for significant environmental effects.
 - If “no,” then agencies must issue a Finding of No Significant Impact explaining the reasoning for their decision.
 - If, however, in the process of completing the EA, it is determined that significant environmental effects *are* likely to result, a notice must be published in the federal register of intent to prepare an Environmental Impact Statement (EIS).
- A public process to determine the “scope” of the EIS must be conducted.
- A draft EIS will be prepared and published, with a minimum 90-day period for public review and further comment.
- After addressing public input, a final EIS is published (no time limit).
- Finally, a Record of Decision is issued by the lead agency detailing its decision to move forward with the proposal or not.

NEPA for the 21st Century

Clearly there is ample room for this process to benefit from the economies and efficiencies associated with the digitization, data analytics and networking available to us in 2018, but, unfortunately, much of the analysis and “streamlining” attempted to date, whether pursuant to the FAST Act or the several Trump Administration executive orders in furtherance of those objectives, has been developed by consensus among multiple agencies and predicated on traditional “paper trail” oriented administrative processes. It has failed to take into account the advances achievable through use of modern technology

¹⁵ See 40 C.F.R. § 1508.27.

¹⁶ There is no statutory basis for the position taken by some agencies that there must be environmental review unless there is an applicable categorical exclusion. The mandatory C.E exercise is unduly cumbersome and unduly restricts the exercise of reasoned judgment by the agency head in determining whether an action is “major” An intelligent computer aided approach to this analysis could provide the equivalent of reasoned judgment based on the thousands of relevant factors which might affect a reasoned human decision.

As a result, the environmental review process has yet to embrace the efficiencies associated with software development and technological integration. While people who wish to comment on a draft EIS can now do so through online portals instead of having to mail in written comments, there are additional opportunities to take the choreographed stages of review and introduce coordination that is currently missing.

Under the framework of a modern, digital, analytic protocol, there would be opportunities to introduce disciplines for reviewing some of the mistakes and inefficiencies embedded in the existing regulations and guidance, and perhaps even codify and replace the countless pages of existing guidance proven to be redundant or unnecessary. Just as important, broad use of interactive digital platforms would enable the development of a broadly accessible national environmental data network which would limit the need to “reinvent the wheel” in environmental reviews of previously studied areas. The result might be creation of a comprehensive environmental database that includes subject specific information capable of being drawn upon to inform future projects. For example, U.S. Fish and Wildlife has a rudimentary system for archiving conservation plans across the country. It’s not terribly user-friendly but it does allow landowners and developers a chance to see what’s been done before and what they might reasonably expect going forward in similar situations. Artificial intelligence and networking capabilities ought to be employed to compile something that is (i) informative; (ii) comprehensive; (iii) user-friendly; and (iv) capable of cutting down redundancy with previous work.

In addition to introducing efficiencies that could cut down on delay and associated development costs, there is reason to believe that digitization and analytics could not only provide a quality of analysis currently lacking in NEPA review but could also substantially reduce Government costs. Two NEPA-related studies completed by federal agencies show clearly that there is no current “handle” on the total governmental cost of NEPA compliance. A 2007 Forest Service report on competitive sourcing for NEPA compliance stated that it is “very difficult to track the actual cost of performing NEPA. Positions that perform NEPA-related activities are currently located within nearly every staff group, and are funded by a large number of budget line items.

There is no single budget line item or budget object code to follow in attempting to calculate the costs of doing NEPA.”¹⁷ Similarly, a 2003 study funded by the Federal Highway Administration evaluating the performance of environmental “streamlining” noted that NEPA cost data would be difficult to segregate for analysis.”¹⁸ Since, as noted the *outside contractor cost* of environmental review of a single proposal can range to \$85 million or beyond it is clear that the overall cost of NEPA review is very, very substantial. , Digitization could introduce analytics that break down the silos of knowledge described in the Forest Service report and allow us to know, at least, what NEPA is costing.

Even more important, the use of modern communications and analytical technologies can allow us to obtain more effective reviews, more expeditiously and at a much lower cost.. Witnesses at a recent hearing before the Senate Environment and Public Works Committee estimated that NEPA related delays in permitting processes may be inflating our nation’s infrastructure costs by as much as 50% and there is at least some evidence to suggest that estimate is on the low side. There is little doubt that

¹⁷ U.S. FOREST SERVICE, COMPETITIVE SOURCING PROGRAM OFFICE, *Feasibility Study of Activities Related to National Environmental Policy Act (NEPA) Compliance* (Washington, D.C., Aug. 10, 2007).

¹⁸ U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, *Evaluating the Performance of Environmental Streamlining: Phase II* (Washington, D.C. 2003).

inefficiencies in environmental review processes, in addition to handicapping our country's ability to keep pace with global competition, are resulting in costs well into the billions and possibly beyond.

Conclusion

Over the past several decades, we've split the atom, we've spliced the gene, and we've harnessed the modern electron. New science and new technology is fostering change at a breakneck pace and we are at a crossroads. The need to bring NEPA — arguably one of the most influential pieces of environmental legislation ever enacted — up to speed in a way that's attendant to the needs of 21st century development is not a partisan issue. This was recognized in the FAST Act by specifically including a title designed to improve the timeliness, predictability, and transparency of the Federal environmental review and authorization process for covered infrastructure projects.¹⁹ President Trump has issued executive orders which further support the FAST 41 objectives and has targeted nearly a trillion dollars in infrastructure packages across the country given the state of our bridges, highways, and waterways. We are in a unique position to leverage knowledge available from actors in both the public and private sectors to bring to bear the full measure of our know-how on environmental review. Now is the time to bring the full resources of the federal government and the full reach of our collective expertise to this fundamental goal: we must modernize the NEPA environmental review process.

¹⁹ See 42 U.S.C. § 4370m *et seq.*



March 9, 2022

Comments of Blueprint 2025

Re: Carbon Capture, Utilization and Sequestration Guidance

AGENCY: Council on Environmental Quality (CEQ).

ACTION: Notice of Availability, Request for Comments

Docket No. CEQ-2022-0001

The Blueprint 2025 (“BP2025”) initiative is a collaboration among infrastructure professionals, leading infrastructure development companies and public and private sector project managers, which advances and supports plans and policies to restore the U.S. position as the country with the world’s best, and most efficient, sustainable and productive infrastructure. A central tenet of BP 2025’s policy has always been that reform of the permitting process for major infrastructure projects is essential if the U.S. is to timely and efficiently modernize its infrastructure to meet the new needs of this century. This truth is particularly evident now – when it is clear that new, innovative infrastructure is absolutely critical to the global transition to cleaner energy technologies and much of the new infrastructure to be permitted in the near and not so near future will be projects which are urgently needed in order to save the planet.

This being the case, we are pleased with CEQ’s apparent recognition that, particularly in the case of projects intended to advance environmental objectives, there is a need to facilitate reviews to support “efficient, orderly and responsible deployment...”

On the other hand, we are gravely disappointed with CEQ’s failure to exercise the level of imagination, innovation and creative thinking that must be expected from both the private and public sectors if there is to be any prospect of meeting carbon reduction goals and minimizing the effects of global warming. We simply cannot achieve climate objectives if it takes years, rather than months, to conceive, develop and authorize projects.¹

We call your attention to the attached comments submitted in response to CEQ’s earlier notices regarding *Updates to Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. The essence of these recommendations was that CEQ must take advantage of modern technology—telecommunications, advanced data analysis, digitalization and Artificial Intelligence “to expedite NEPA reviews, enhance the ability of the Public to participate effectively in the process, improve the quality of the analysis conducted, and achieve more informed decisions and more sustainable and environmentally sensitive projects.”

Now, over two years later, CEQ acknowledges the need to expedite review, analysis, and

¹ See, e.g. Nordhaus, *The Wall Street Journal*, February 17, 2022; Norman Anderson, *Vision: Our Strategic Infrastructure Roadmap*, pp. 94 et seq.

approval of projects to advance environmental objectives, but suggests only 1970s, 1980s and early 1990s approaches to fulfill that need. This reliance on outmoded past “solutions”, which have proven to be ineffective, is obviously inadequate. The private sector is expected to use “best available technology” in meeting environmental objectives. We have the right to expect a similar level of performance from an agency whose sole mission is environmental protection.

The Guidance proposed here is not good enough. It is too narrowly focused and insufficiently ambitious. The planet and its people deserve better.

Blueprint 2025’s member companies possess a broad range of expertise in this context, are committed to innovative solutions and are ready to participate fully in the concerted effort which is now so clearly necessary.

Thank you in advance for your vigorous attention to this critical need.



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February 13, 2020

Comments of Blueprint 2025

Re: Update to the Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act

AGENCY: Council on Environmental Quality (CEQ).

ACTION: Notice of Proposed Rulemaking.

Docket No. CEQ-2019-0003

The Blueprint 2025 (“BP2025”) initiative is a collaboration among infrastructure professionals, leading infrastructure development companies and public sector project managers, which advances and supports plans and policies to restore the U.S. position as the country with the world’s best, most efficient and most productive infrastructure. A central tenet of BP 2025’s policy is the recognition that reform of the permitting process for major infrastructure projects is absolutely essential if the U.S. is to modernize its infrastructure in time to allow development of the developing new technologies which will keep pace with the modernization programs of our major global competitors. The current process is cumbersome, inefficient and antiquated, it needs to be modernized and brought into the 21st century through better use of available technology. Our position, as set out in earlier comments on CEQ’s Advance Notice of Proposed Rulemaking, is that use of modern technologies to expedite NEPA reviews can enhance, rather than diminish, the ability of the Public to participate effectively in the process, improve the quality of the analyses conducted and achieve more informed decisions and more sustainable and environmentally sensitive projects.

As we have noted previously, the environmental review process has yet to embrace the efficiencies associated with software development and technological integration. While people who wish to comment on a draft EIS can now do so through online portals instead of having to mail in written comments, there are additional opportunities to introduce efficiencies that are currently missing and, more importantly, to provide immediate access to information on sustainability and environmental effects which is far superior to that which can be developed during the current review process.

After reviewing the testimony presented at the recent Denver hearings, we are even more strongly convinced that NEPA’s problems can be most effectively addressed through the aggressive application of modern technologies. For that reason, we were extraordinarily pleased by the NPR’s encouragement of the use of modern electronic communications technology as a primary means of public engagement in the NEPA process and even more pleased by CEQ’s support for the development of

...a single NEPA application that facilitates consolidation of existing datasets and can run several geographic information systems (GIS) analyses to help standardize the production of robust analytical results.

This invites development of a “National Environmental Database” -- a modern, digital, analytic protocol in which there would be opportunities to make critical information available more effectively than the many pages of hard copy currently characterizing the NEPA process.

Broad use of interactive digital platforms would enable the development of a widely accessible national environmental data network which would limit the need to “reinvent the wheel” in environmental reviews of previously studied areas. Further, it could enable creation of a comprehensive environmental database that would include subject-specific information capable of being drawn upon to inform future projects. For example, U.S. Fish and Wildlife has a rudimentary system for archiving conservation plans across the country. While not terribly user-friendly, it does provide landowners, developers and others a chance to see what’s been done before and what they might reasonably be expected going forward in similar situations. Artificial intelligence and networking capabilities ought to be employed to compile something that is (i) more informative; (ii) more comprehensive; (iii) more user-friendly; (iv) capable of cutting down redundancy with previous work and, importantly inclusive of essentially all relevant information currently available.

The immediate availability of relevant information and the ability to turn around comments quickly should not only cut down the time and expense required for environmental reviews, but also should lessen the intensity of debate over what information is to be considered. If, for example, information on cumulative impacts is readily available and accessible rather than requiring a lengthy study, there likely would be less debate as to its relevance.

Also, as suggested by the enclosed information circulated at a recent global infrastructure forum, a database of this nature, in addition to functioning as an aid to environmental analysis, can be of great assistance in siting, project engineering and design, up front environmental mitigation and early “go-no-go” decisions that can result in huge savings for all concerned

We are submitting these preliminary comments early in an effort to encourage those with technical expertise in this area to respond to CEQ’s request for comments as to

Whether additional regulatory changes could help facilitate streamlined GIS analysis to help agencies comply with NEPA

An aggressive and carefully conceived effort to put this sort of information resource in place should be relatively non-controversial and should be equally beneficial to both the public and project promoters, It should pay for itself in reduced NEPA analysis costs and, additionally, pay dividends thorough reduced delays, better projects and lower project costs. The effort need not be held in abeyance pending final resolution of the many knotty questions presented at the Denver hearing but can be commenced immediately in order that the platform can be operable as soon as practicable and adjustable to accommodate variable resolutions of the key questions currently being addressed. Blueprint 2025 strongly recommends intensive engagement and priority efforts to advance this important objective and is ready to assist in every way within its capability.

Sincerely,

Norman F. Anderson
President & CEO
CG/LA Infrastructure, Inc.
Founder Blueprint 2025

Federal Assets to Accelerate American Infrastructure

Challenge—Our natural environments are inadequately characterized and constantly changing; this uncertainty increases cost and risk to our infrastructure

Our Nation is engaged in a conversation about how we will renew our infrastructure, the diversity of which challenges the imagination. Our infrastructure includes roads, railways, bridges, dams, levees, waterways, tunnels, pipelines, coastal facilities and seawalls, airfields and navigation, power generation and distribution, wireless and wired communications, and drinking water and waste water conveyance and treatment. These assets span both built and natural infrastructure. All of this diverse infrastructure is built *within a natural environment that is inadequately characterized and constantly changing*. When we build our infrastructure, the subsurface is largely hidden, and the lands, waters and habitats of the surface are constantly changing. In the aftermath of floods, fires, hurricanes, tsunamis, earthquakes, volcanic eruptions, harmful algal blooms, avian influenza outbreaks, commodity supply chain disruptions or cost overruns in subsurface projects, we see too clearly that the fate of our infrastructure is subject to nature.

Overcoming this challenge will require cooperation. Both public and private entities have shared interests in our infrastructure, including the capital to plan, build and operate infrastructure. Consequently, public and private entities must work together to build our future. These partnerships require the trust that comes from a common family of facts and forecasts for our Nation, easily accessible to all in a timely manner. These facts and forecasts are necessary to overcome natural conditions and shape a better future.

Since 1879, the U.S. Geological Survey (USGS) has developed the facts and forecasts the Nation needs for its lands, waters, and ecosystems. Our staff work with Federal, State and local partners, Tribes, non-governmental organizations and the private sector to focus efforts where they are most needed. We:

- Characterize our Nation's natural assets and threats by sampling and mapping them;
- Monitor to provide situational awareness;
- Model to provide forecasts;
- Make these products readily available to industry, non-governmental organizations and the public.

When these four elements are wisely focused, they can provide our American enterprise with the right tools for the challenges we face together. The Nation trusts these tools because we provide facts and forecasts without advocacy. *In a natural environment that has been inadequately characterized and will always be constantly changing.*

The recommended USGS strategies can provide knowledge before national action. Below, we describe three broad strategies that leverage USGS assets to accelerate national infrastructure renewal.

Strategy one—Facts Fully Used, the next National Resource

USGS is home to a National clearinghouse of geologic, topographic, biologic, and hydrologic maps, digital geospatial data, imagery, real-time sensor data, models, and scientific publications that characterize our lands, waters and ecosystems. This breadth is a strength, if: 1) Users can easily find the information and 2) USGS provides an efficient, intuitive, on-line visualization tool that allows key infrastructure community stakeholders to seamlessly (across the Enterprise) search, discover, visualize, and access immediately relevant, application-ready USGS data. If these conditions are met, the USGS can help accelerate rebuilding of the Nation's infrastructure by:

- **Fostering economic growth** by fusing innovative combinations of our data
- **Providing** one-stop connection to data and models to make the permitting process more efficient
- **Lowering the costs** of finding and using data for the infrastructure enterprise
- **Providing** situational awareness tools to reduce loss and improve maintenance
- **Highlight and fill national gaps in data**, awareness or forecasts that can be filled by partnerships

Why do we need an easy-to-use, "blue-marble" visualization tool for our data? It now costs users time and money to discover and ingest our scientific information or to duplicate it at their own expense. We can reduce these costs if we improve accessibility to our data, making it easier to find, and delivering it in formats that do not need pre-processing for rapid use in industry-standard software. This will also offer industry opportunities to fuse different data to make new value-added products. Working with other Federal and State agencies and industry, USGS could tailor this tool to support a number of important applications for the infrastructure community including accelerating permitting processes, developing estimates of available construction raw materials, performing site planning, creating national estimates of existing infrastructure such as miles of interstate, numbers of airports, bridges, etc. Working with industry to develop these types of applications would highlight the availability and usefulness of

the available data as well as providing partnership opportunities between USGS subject matter experts and other partners. A “blue-marble” visualization tool that links to data would provide the Nation with a rich set of authoritative data provided in “plug and play” application-ready form so that it can easily be ingested and used.

For instance, what if any user could overlay user-selected maps of our Nation’s wildlife habitat over existing infrastructure (see callout 1)?

Strategy two—Partnerships to accelerate delivery of Federal assets with technology

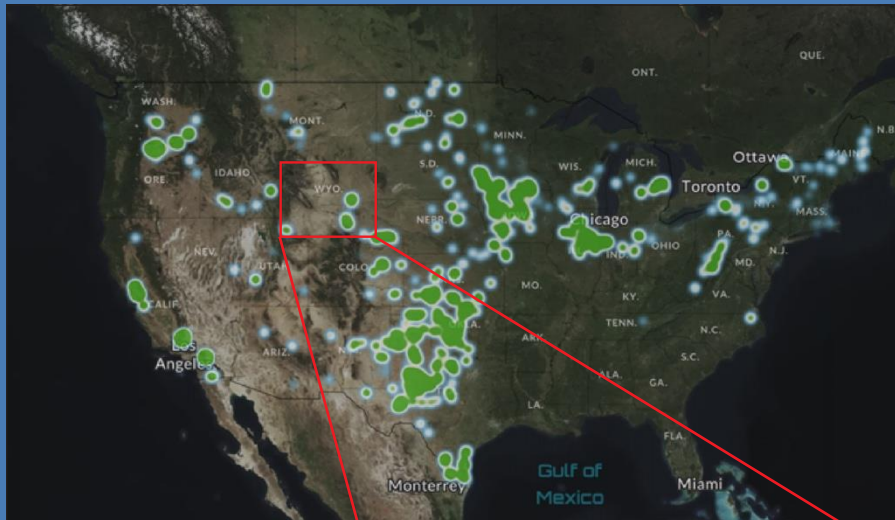
New technologies like digital project models (i.e., digital “twins”), Virtual Reality, Machine Learning/Artificial Intelligence, Uncrewed Aerial Systems (UAS) and many more are reducing infrastructure project costs (e.g., 10-20%) and leading to better outcomes across the enterprise. These same tools offer the possibility of creating improved, more efficient ways to map, monitor and model our Nation’s lands, waters and ecosystems. These products will accelerate the Nation’s infrastructure enterprise if they are easily accessible via a centralized portal, and technologically up-to-date. But we need partnerships with industry, non-governmental organizations and other Federal Agencies to pursue these opportunities, and we need modest investment to modernize our technology infrastructure so that it works more seamlessly with that of users

USGS is looking to develop partnerships in the following areas to accelerate our national infrastructure enterprise:

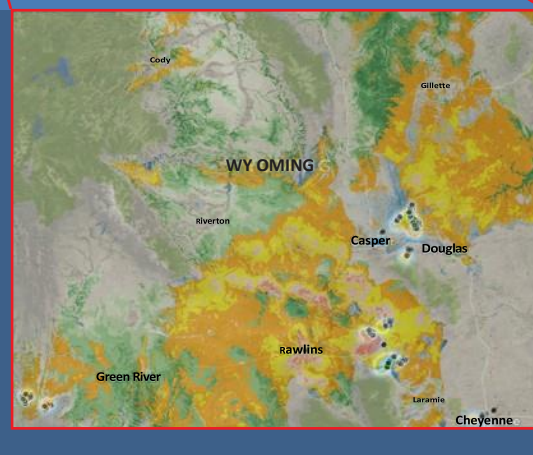
Raw materials and supporting industries data

- Use high-resolution topography (3D Elevation Program) and new geologic mapping to re-map key portions of the Nation for **industrial minerals and materials** (e.g., sand, gravel, aggregate, cement, asphalt)
- Use new geological and geophysical data (Critical Minerals Initiative) to look beneath the surface and report back to the Nation on **critical and strategic minerals** (e.g., lithium)

What if anyone could display wildlife habitat over infrastructure with a few clicks?



Wind turbine locations across the Nation (green). Inset shows intersection of individual wind turbines (dots) in Wyoming with golden eagle nest-site habitat quality. Green and blue colors show best potential eagle habitat and wind potential, with pink showing zones of greatest potential conflict. Underlying map from Tack & Fedy (2015) PLoS ONE: e0134781 and turbine locations from Hoen et al. (2018) US Wind Turbine Database V1.0. Courtesy Jason Tack, 2018. Wind turbine visualization from <https://eerscmap.usgs.gov>



Optimizing where and how to build

- Make **value-added maps from our lidar** and other geospatial products for planning and construction (industry), while providing base landscape data for digital twins
- Map three-dimensional geology at a scale necessary to inform site and design foundations for new and existing facilities, waste-disposal sites and construction projects.
- Integrate analysis-ready remote sensing data into **Land Change Monitoring, Assessment, and Projection (LCMAP)** for management of natural resources and an improved understanding causation of historical land change to develop better land change forecast models, hazard vulnerability/consequence assessments, and water resources planning.
- Provide next-generation **maps of flood extent and recurrence interval** estimates
- Map, monitor and model sediment supply to **extend the life of reservoirs**, forecast foundation scour, provide data for new ones, and keep Nation’s nearshore waters blue, not brown
- Map the distribution of critical plants, animals and habitats across space and time to facilitate project design and planning

Real-time sensors and monitoring for situational awareness

- Deploy networks of expendable sensors for **real-time awareness of hazards**
- Deliver real-time situational awareness of species to **minimize environmental impact**, promote human safety, and expedite permitting
- Increase situational awareness of **water for transport and hazards** using next-generation sensors and telemetry
- Delivery of near-real-time satellite and UAS remotely-sensed data to support land and natural resource management and disaster response/recovery efforts.

Forecasting and risk models for infrastructure design

- Provide water quantity and quality assessments for **water supply forecasts**
- Map and model geologic hazards and estimate risk, with the goal of **optimizing infrastructure placement** (tsunami, earthquake, flooding, coastal erosion, landsliding, sediment pollution)
- Map and forecast processes in extreme and rapidly-changing environments (e.g., permafrost terrain, arid lands, coasts and estuaries) to provide **risk for infrastructure planning**
- Provide ecosystem data and forecasts that would **accelerate ecotourism** and

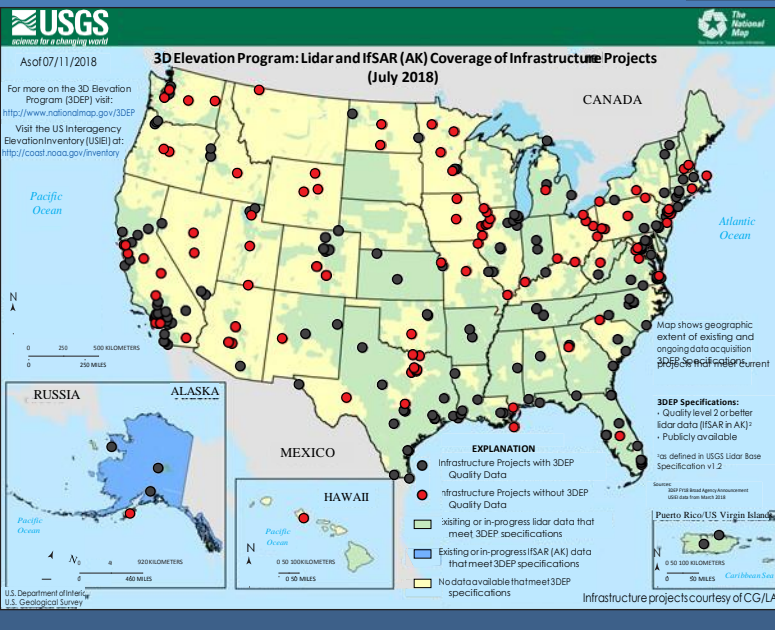
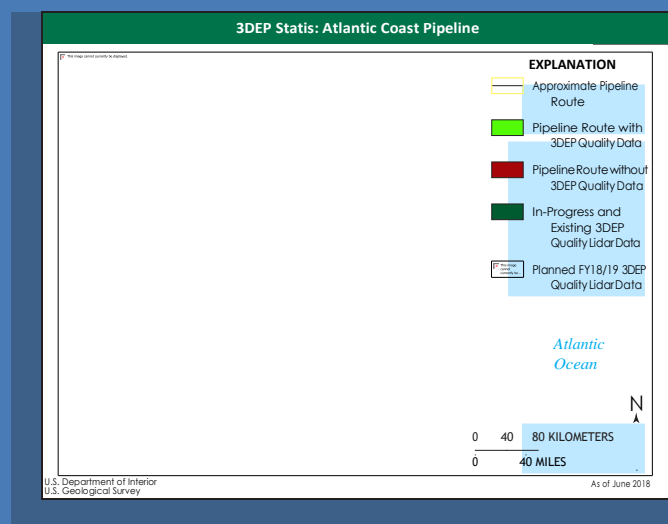
lead to new business opportunities (e.g., carbon storage, coral reef and fisheries recovery)

- **Forecast species activity for siting and real-time operations of infrastructure** (e.g., dam release to support fish migration, maximizing turbine production during migration, head-up notifications of animal activity for transportation)
- Anticipate the demands of evolving technology and infrastructure to identify the **energy and mineral resource needs of the future**
- Explore **new models for sustainable domestic mining** and energy resource development

Geospatial products help address planning and construction scenarios

Smart infrastructure planning and design begins with accurate topography. High resolution elevation data provides the foundation for infrastructure planning and design, be it earth-moving operations and estimates, or improving resiliency to environmental conditions. Relying on an authoritative source to deliver high-quality data free to all users reduces the need for industry or States to duplicate collection for individual projects, following a Map It Once – Share it Many Times philosophy.

The planned Atlantic Coast Pipeline provides one example. High-resolution elevation data from the 3DEP program is available for it (right) without a license or

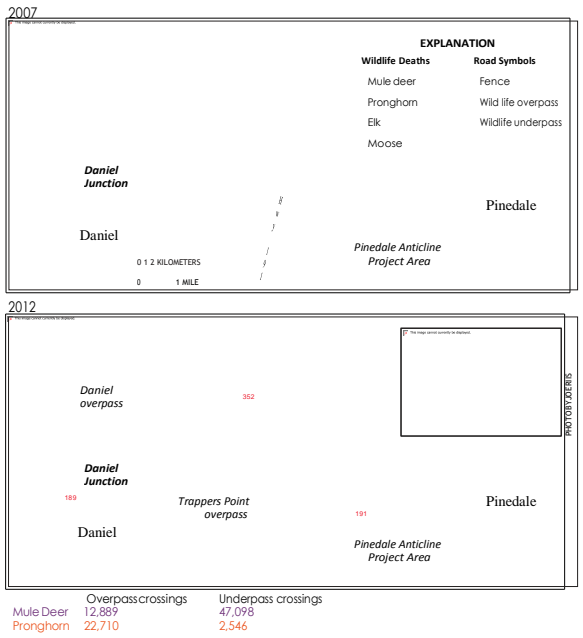


cost, adheres to a strict community-driven specification, and can be used for a wide variety of engineering, design, or construction purposes with no additional investment. Because of the open nature of the data, multiple contractors and firms can all jointly benefit without duplicative, inconsistent, and costly additional collections.

Ask us about:

- **Existing and planned geospatial products will help address planning and construction scenarios**

Wildlife Mortality before and after Crossing Structures



Infrastructure designs to minimize maintenance costs and maximize safety: Wyoming Example

Satellite tracking of big game migrations is leading to the identification of locations where highway crossing structures can be optimally located. In 2012, two overpasses and six underpasses were constructed at the Trappers Point bottleneck near Pinedale, WY, where mule deer and pronghorn caused vehicle collisions while migrating across Hwy 191 each spring and fall. The new highway infrastructure project was used by over 60,000 mule deer and 26,000 pronghorn within the first three years, reducing wildlife-vehicle collisions by 80 percent. Map and graphic from Wild Migrations: Atlas of Wyoming's Ungulates (in press) OSU Press © 2018 University of Wyoming and University of Oregon.

Ask us about:

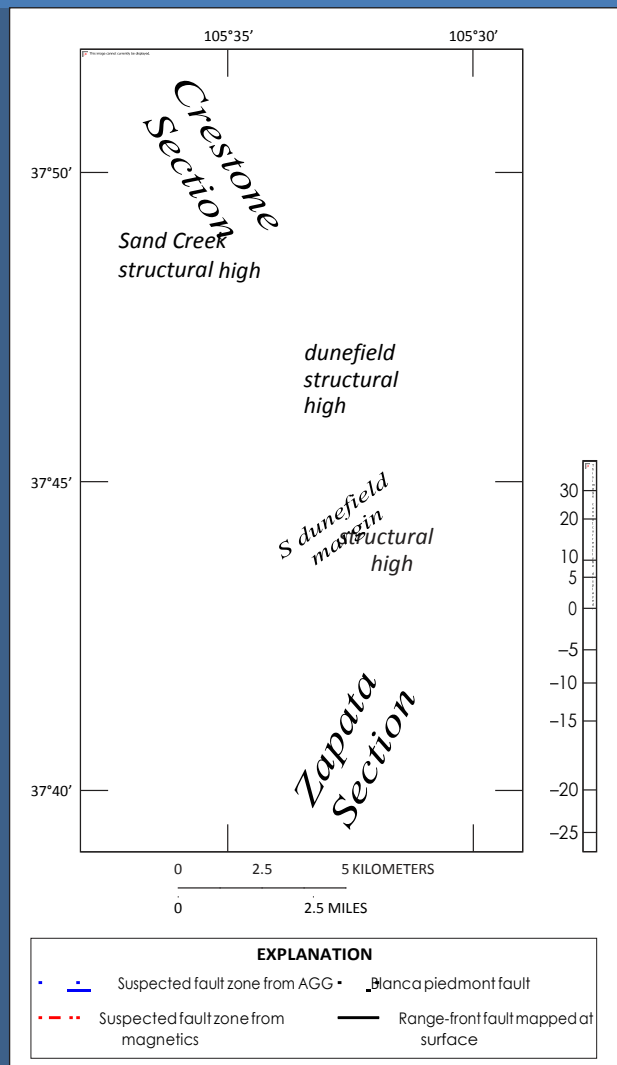
- *Ecosystem models and data accelerate ecotourism and lead to new business opportunities (e.g., coral reef and fisheries recovery)*

Securing the Future Supply of Industrial Minerals for Infrastructure

Industrial minerals such as sand, gravel, and crushed stone are the largest nonfuel mineral commodities produced in the United States and in the world, and they constitute the "critical minerals" for infrastructure projects. Geophysical surveys can assist the exploration for and characterization of industrial mineral deposits. Airborne, surface, and borehole geophysical methods can be faster and less expensive than extensive drilling and trenching. In addition, these surveys can provide three-dimensional information on the spatial and depth extent of deposits. In addition, intrusion and damage to the environment are limited when geophysical surveys are used as part of comprehensive exploration and development programs. At right is a map derived from state-of-the-art airborne gravity surveys showing relative thickness and lateral extent of sand deposits in the San Luis Basin of Colorado. Surveys of this type can delineate industrial mineral deposits regardless of vegetation and often through shallow cover by deposits of little or no economic interest. In the figure, deposit thicknesses range from ~400 meters (E ~10) to more than 2000 meters (E < -20). (Drenth, B.J., Grauch, V.J.S., Ruleman, C.A., and Schenk, J.A., 2017, Geosphere, v. 13, no. 3, p. 974–990, doi:10.1130/GES01439.1.)

Ask us about:

- *Onshore and offshore geological and geophysical mapping, coupled with targeted mineralogical and geochemical studies, will help identify new sources of high-quality construction materials and provide the foundation for future project development*
- *Characterization and assessment of these resources will also support infrastructure projects dedicated to improving resilience and accelerating recovery from future infrastructure-damaging hazards*

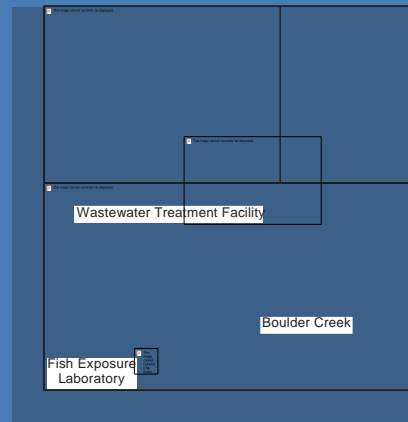


GS Science shows unintended benefits of wastewater infrastructure upgrades

The Nation's publicly-owned wastewater treatment plants are first-world components of our infrastructure. They are designed to protect public and wildlife health by removing contaminants and pathogens from domestic and industrial waste sources and in some cases from storm sewer discharge. According to USEPA, an estimated \$271 billion is needed to meet current and future centralized wastewater treatment demands including facility treatment process and maintenance of over 800,000 miles main pipes and 500,000 miles of later pipes that connect to homes and businesses.

Our wastewater infrastructure was originally designed to destroy pathogens and minimize the demand for oxygen in surface water bodies that receive effluent discharges. In recent years, communities have begun to see the negative impacts of other contaminants, including nitrogen, phosphorus, pharmaceuticals and estrogens. While there is an emerging municipal effort on costly infrastructure improvements to remove nitrogen and phosphorus, mitigating pharmaceuticals and estrogens could be even more costly.

USGS science now shows that wastewater treatment infrastructure upgrades for nitrogen and phosphorus may also mitigate pharmaceuticals and estrogen pollution. Research done at Boulder Creek in Boulder, CO, showed that mixtures

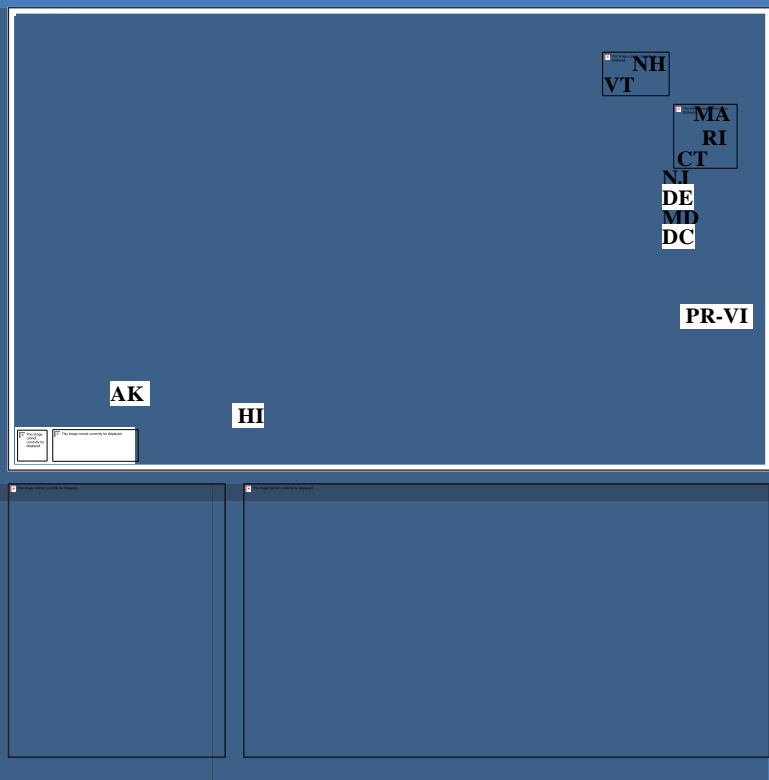


of natural and synthetic estrogens and other similar chemicals discharged from the wastewater treatment plant had adverse effects on the endocrine systems of individual fish and were linked to a change in the ratio of female to male fish in Boulder Creek downstream of their wastewater discharge.

However, Boulder Waste Water Treatment Plant subsequently upgraded treatment of 15 million gallons of effluent discharged per day to meet State requirements for nutrient reduction. Although the \$45,000,000 upgrade was designed to increase capacity and reduce nutrients only (i.e. it was not designed to remove estrogens), it serendipitously decreased estrogen-like substances in the effluent and reduced endocrine disruption in both laboratory and wild fish. This unintended benefit of a large public investment in infrastructure improvements would not have been known without the science provided by the USGS. Similar results would be expected elsewhere in the United States.

Leverage Real-Time River Monitoring systems for Inland-Waterways Navigation

The USGS operates more than 8,200 real-time streamflow monitoring stations that tell the Nation when floods are coming, their incoming water supply, and many other needs. This national asset can be leveraged to yield more value. Along the Nation's inland waterways, USGS is beginning to use this network to make navigation safer and more efficient. Navigation hazards include water velocity and depth and their rate of change. These affect how vessels steer, stay afloat, and avoid colliding with expensive infrastructure like bridges and locks. The USGS is conducting a pilot effort to add critical sensors and data streams to a few new and existing monitoring sites, and feeding the data to the US Army Corps of Engineers, and to private navigation software providers to reduce the threat of damage and impassible to our navigable rivers and associated locks, dams, and levees. Resiliency within the Nation's inland-waterway systems is critical to the well-being of the Nation. This is an example of where federal resources can be leveraged to build that resiliency. Similar opportunities to leverage USGS streamgaging include monitoring sedimentation and nitrification of reservoirs and waterways, adding short-term monitoring networks for coastal and inland flood warning; and extending the observed monitoring network using national streamflow models.



Ask us about:

- *Surface and ground water quantity and quality assessments will help estimate future water supply*
- *Next-generation maps of flood extent and recurrence interval estimates will save lives and dollars*

Forecast Tools for Natural Hazards

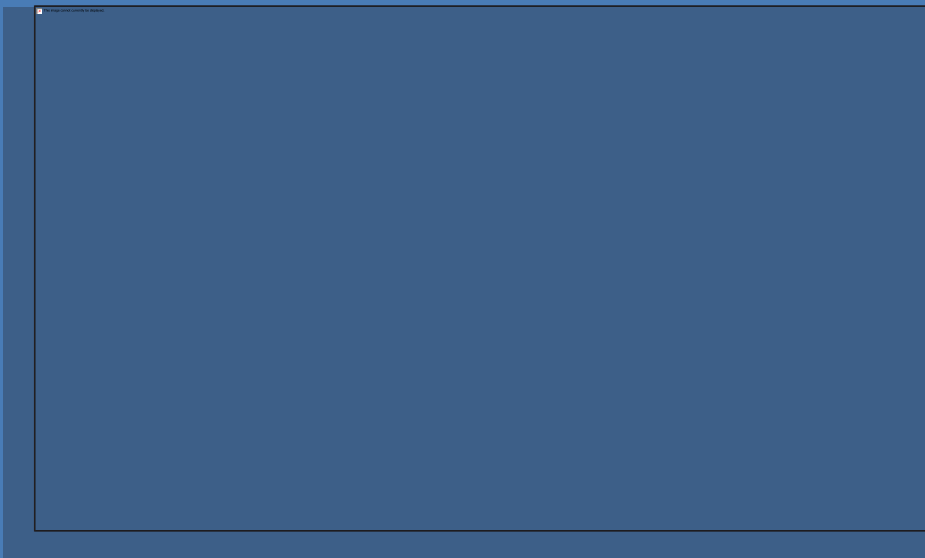
USGS uses its science to create tools to forecast the effects of natural hazards, including earthquakes and coastal storms. Two examples below highlight this capability.

1. *Shakecast: A near-real time, on-line tool to estimate earthquake damage to infrastructure*

Earthquake shaking can damage much of our national infrastructure. A USGS earthquake hazard map (to right) shows high-shaking hazard as hot colors. The USGS operates a nationwide network of seismometers that record and telemeter earthquake data in near-real time. We use this data, leveraged with models of damage based on past earthquakes, to provide the Nation with maps of potentially damaging shaking. These ShakeMaps are used for emergency response, loss estimation, and public information. To forecast potential damage to infrastructure, the USGS created ShakeCast, an automated on-line tool that generates potential damage

assessment notifications, facility damage maps, and other Web-based products for emergency managers and responders. The image above shows State transportation departments using ShakeCast, with the number of bridges and overpasses evaluated in each state for any domestic earthquake. With ShakeCast, they can automatically determine the shaking value at their facilities, set thresholds for notification of damage states for each facility, and then automatically notify (by

pager, cell phone, or email) specified operators and inspectors within their organizations who are responsible for those particular facilities. ShakeCast is in wide use in other sectors, including: Hospitals (U.S. Department of Veterans Affairs), Critical Facilities (U.S. Nuclear Regulatory Commission), Schools (Los Angeles United School District), Infrastructure and Dams (U.S. Fish and Wildlife Services), Energy (e.g., Puget Sound Energy), and Businesses (e.g., Walmart), among others.



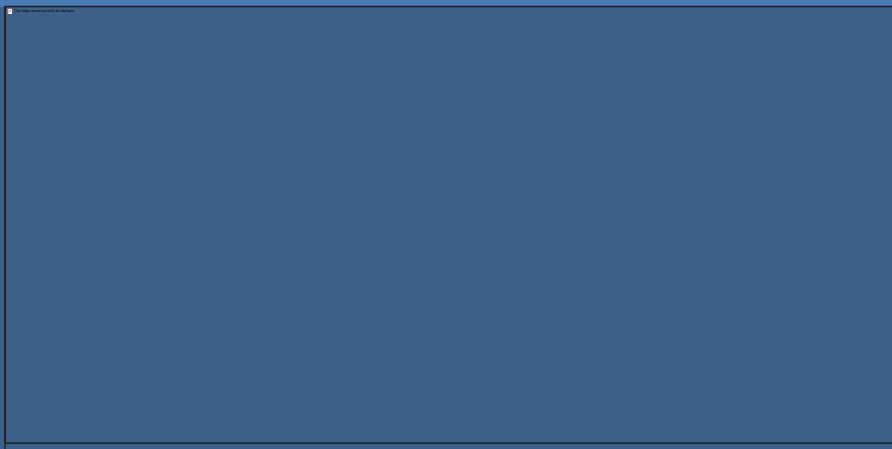
2. *A Coast Storm Modeling System (CoSMoS) to forecast coastal flooding maps*

The Coastal Storm Modeling System (CoSMoS) is a dynamic tool to forecast coastal flooding due to storms and sea level rise over the 21st Century. CoSMoS integrates models of

long-term coastal erosion to beaches and cliffs with the detailed physics of coastal storms (e.g., tides, waves, river discharge, and storm surge) and high-resolution topography to estimate local flooding. It allows communities to choose from a range of storm scenarios (daily conditions, annual storm, 20-year- and 100-year-return intervals), and

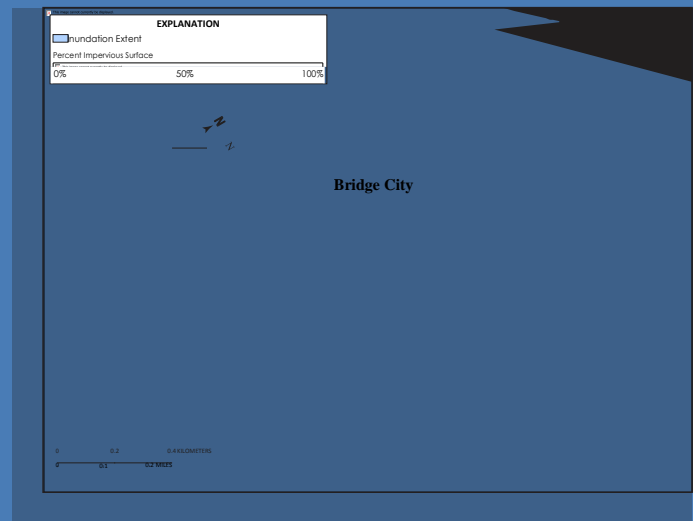
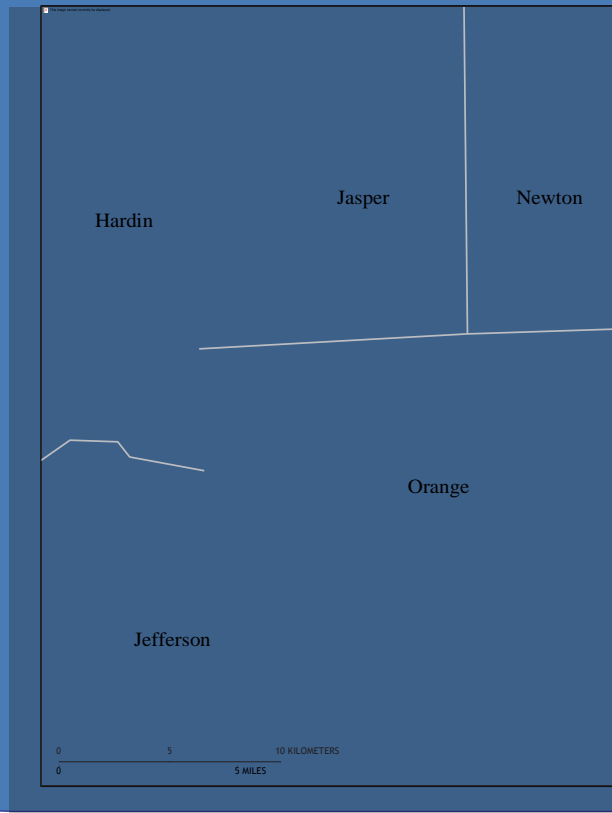
sea-level rise scenarios. This allows users to manage and meet their own planning horizons and specify degrees of risk tolerance.

CoSMoS modeling results have been used by a large number of federal and state partners as well as local communities throughout California. In the San Francisco Bay area and southern California regions, 14 municipalities, including the cities of San Francisco and Los Angeles, and 7 coastal counties (e.g., Marin, San Mateo, San Francisco, and Los Angeles) are actively using CoSMoS for local coastal planning efforts. The major utilities - Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric and the Los Angeles Department of Water & Power - are similarly using CoSMoS to assess their assets' vulnerability to sea level rise and coastal storms. CoSMoS also supports a number of state agencies and federal partners.



USGS Land Resources satellites show areas that help make floods

Floods take lives and damage regional economies. The images at right show 2017 Hurricane Harvey inundation (blue) in the Houston area of Texas, and impervious surfaces (pink & purple) that generated rapid runoff during Harvey's intense



rainfalls. Under these layers, high-resolution topography shows levees, floodplains and building footprints. Fusing these USGS layers shows the impact of levees on inundation limits, and the source for some of that water, impervious surfaces where water runs rapidly off during rainfall. The USGS Land Resources Mission has maps of impervious surfaces across the Nation, collected by rigorous back-analysis of satellite imagery since the 1980s. When these layers are fused with high-resolution USGS 3DEP topography, they can be used to show where to expect rapid runoff from intense storms like Hurricane Harvey. Combined with effective flood forecasting, this analysis makes a case for where new flood infrastructure will save lives and slow the spiraling costs of flood damages to the Nation. Maps of impervious surface changes over the last four decades also make a business case for where wastewater infrastructure will likely need upgrading.

Strategy three—Natural Disaster Risk Reduction

Natural disasters focus the attention of the Nation on restoring infrastructure through Supplemental bills that fast-track action in a reduced regulatory environment. Rapid response coupled with the emotional impact of disasters on individuals and communities can challenge wise use of funds. In partnership with other government agencies, industry, and communities, USGS assets can help guide post-disaster infrastructure investments to deliver durable reductions in long-term costs and gains in economic prosperity. We can help the Nation be more resilient to future disasters by delivering:

- Scientific data, information, and forecasts of natural disasters (likelihood and consequences) to support regional disaster planning and risk reduction efforts.
- Rapid post-disaster reconnaissance of infrastructure damage using in-situ monitoring and remotely-sensed data from satellites and airborne platforms.
- Assessments and inventories of raw materials required for construction, maintenance, and repair of infrastructure and associated risk-reduction measures.
- A trusted team of experts in the physical and biological sciences, supporting emergency managers, first responders, and those

involved in long-term recovery efforts with the interpretation of scientific information about the natural environment (hazards, materials, and fish and wildlife).

Implementing these assets for fast-moving natural disasters is challenging for our Agency, and for others. In some cases, the USGS scientific infrastructure the Nation depends on to manage risk is damaged or inoperable. For instance, in Puerto Rico, our Water Mission assets were largely destroyed during the 2017 hurricane, limiting our ability to map, monitor and model the damage. At Kilauea, our Hawaii Volcano Observatory has been compromised by the 2018 eruption. Recent experience indicates that:

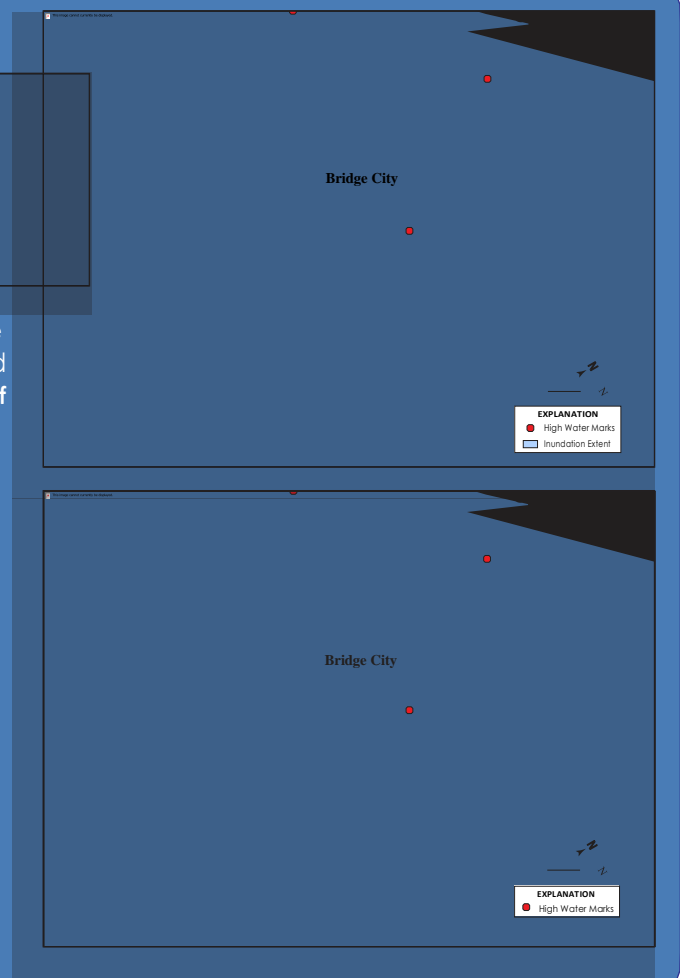
- National assets managed by the USGS may be overlooked during disaster response and recovery, even though many are frequently leveraged by FEMA.
- Our assets (facilities, equipment, and people) are often exposed and at risk or compromised by the disaster (e.g., Kilauea, Puerto Rico), frequently due to their association with studying/monitoring the hazards themselves.
- Delayed or disrupted asset and staff deployments result in lost opportunities for rapid delivery of data and information to aid response and recovery efforts.

A national plan to deploy infrastructure to save lives, money, and drive the economy.

Infrastructure can save lives, property and industry from natural disasters. Hurricane Harvey's intense rains flooded parts of Houston in 2017 (above, and right). USGS field observations and high-resolution 3DEP topography helped map the exact pattern of flooding (blue in upper right). Sharp boundaries between blue and gray show where levee infrastructure confined flood waters. Below, images of the pre-flood community draped over the same high-resolution topography. **What if we could have mapped floodwater extent before the heavy rains of Hurricane Harvey?**

USGS brings the ability to map likely flood extent across the Nation using high-resolution topography, maps of impervious our network of sensors, and the record of past floods extracted from their deposits. Based on our new high-resolution topography, a national set of maps for areas that are vulnerable to flooding would guide the design and deployment of hard and soft infrastructure. This Federal science would provide momentum for local communities to begin financing and building the infrastructure that could save them.

Could we do this for other hazards? Floods are one of the many of natural hazards that bring change. Earthquakes, volcanic eruptions, coastal erosion, landslides, sinkholes, droughts and other rapid changes also challenge our national enterprise. In partnership with other Federal Agencies and NGOs, USGS can bring mapping, monitoring and modeling to create maps that will allow communities to begin planning infrastructure to save lives and the economy.



We have begun to solve these challenges with partnerships and planning. The post-disaster infrastructure challenge offers us a focused topic with an engaged constituency. USGS should:

- **Develop shovel-ready plans** to replace or harden the key scientific infrastructure guiding the Nations' response to disasters (facilities, labs and sensor networks)
- **Reduce deployment response times** for staff and assets with activation-ready plans coordinated with other federal and non-federal government agencies.
- Focus partnerships with primary Agencies and industries that rebuild infrastructure after disasters to **understand what data gaps are most critical** and how to deliver that information in timely ways.

Summary

We have illustrated a National opportunity to work together to accelerate infrastructure development, use, maintenance and renewal, using existing and aspirational Federal assets. The current USGS is resource-limited, and our existing mapping, monitoring and modeling products are ripe for technology acceleration. New technologies offer capabilities that will save costs and lead to better outcomes for industry, non-governmental organizations and the public. This paper is the start of a conversation with these partners to inform our efforts and lead to better outcomes.

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