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Brownfield Area Benefits Estimator Toolkit

Guidebook

Welcome

The Brownfields Area Benefits Estimator (BABE) toolkit developers invite readers to explore the contents of this guidebook to understand how to use the Brownfields Tracker (BT) and the Benefits Analysis Tool (BAT) in cleanup and redevelopment decision making with community members and organizations.

The BABE Guidebook examines the value of incorporating measures of community benefits and change associated with brownfields clean-up and redevelopment in decision making. Importantly, the tools we offer focus on specifying who is likely to be impacted by neighborhood changes and to whom any benefits might accrue.

Our tools allow a user to specify any geographic area and aides in collecting information and visualizing changes and impacts for the selected area.

We invite readers to consider these tools as community conversation starters and as a resource to examine different outcomes with community members and organizations involved in land-use decision making.

Our formulas, assumtions, data sources, and methods are all described in the BABE Guidebook so that anyone can critique, build-on, or modify elements of the tools we offer.

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PART I: Overview of BABE

INTRODUCTION:

LOCAL LAND USE DECISION-MAKING & BROWNFIELDS REDEVELOPMENT

How does redeveloping a brownfield impact a community? How can community members become more active and empowered in the redevelopment process? The Brownfields Area Benefits Estimator (BABE) toolkit responds to these questions by providing a desktop and mobile app developed to help measure the economic, environmental, and social impacts of redevelopment. This guidebook and the tools it discusses will help inform discussions about changes that will impact current residents near a redevelopment site, and will also contribute to a better understanding of to whom benefits of that redevelopment will actually accrue.

As communities evolve and neighborhoods change, so too do their built environments—not just the land, but also the buildings, structures, and infrastructures that make up the foundation of the places where we live, work, and play. During the course of this change, property owners and developers redevelop properties by adapting, demolishing and replacing old buildings for new uses. These and other land development practices greatly impact the health of residents and their natural environment. This constant recycling and redevelopment of land, buildings, and infrastructure is shaped by many forces—political, economic, social, and environmental—that play out at different scales, from the regional to the neighborhood-level. These forces and scales typically reveal competing interests, differing goals, and different legal and policy frameworks.

Local governments often serve as the primary arena for making decisions about land uses and redevelopment and resolving tensions between competing interests. To do so, local officials depend on

What is a Brownfield?

The Groundwork USA Network defines a brownfield as a "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." Under this broad definition, a "brownfield" can refer to anything from large former industrial sites with serious chemical and hazardous substances in their land or groundwater, to the corner gas station with oil pollution, to vacant or derelict properties whose past uses are unknown or where contamination with chemicals or toxins is suspected.[1]

Brownfield redevelopment programs at the federal, state, and local levels focus on facilitating the assessment, remediation, and eventual reuse of this type of property.

BABE helps users identify neighborhood-level community benefits by specifying TO WHOM benefits of redevelopment accrue.

information and data from project proponents and those who stand to benefit the most from the proposed reuse. When cities have sufficient staff capacity, they can assess and evaluate the economic and environmental impacts that may flow from the development. However, when it comes to assessing impacts on current residents, the information tends to focus more on negative impacts that need to be mitigated rather than direct community benefits. To alleviate this gap in information, cities must reach beyond project proponents and developers to engage community-based organizations, neighborhood leaders, and local residents in order to gain an understanding of that neighborhood's priorities, perspectives, and conditions.

Even with public involvement and community engagement efforts, final land development decisions often prioritize economic benefits that accrue to the developer and local government over environmental and community benefits. By valuing short-term economic benefits such as developer profits and government revenues, in the assessments of their redevelopment projects, local officials neglect to protect and ensure that those who live in proximity to the site—as well as the broader community—receive direct social, civic, economic, and environmental benefits.

One barrier that prevents local officials from prioritizing community benefits in these cases is the lack of identifiable, accessible, and shareable data. Community members who want to advocate for or against a particular type of reuse also often have difficulty identifying, tracking, and assessing the benefits that a project might produce. Potential benefits can be even more difficult to determine in the case of former industrial and commercial properties left with potential environmental contamination, or *brownfields*.

The BABE toolkit is designed to help practitioners, policymakers, and community-based organizations measure, track, and assess a range of community benefits that could result from brownfield redevelopment projects, from the perspective of impacted community members. It can also be used by community members who want to initiate or participate in redevelopment discussions and hold decision makers accountable throughout the redevelopment process.

This guidebook describes the components and underlying assumptions of BABE and proposes various ways the tools can be used to supplement community perspectives in the brownfield redevelopment process.

ABOUT THE BROWNFIELDS AREA BENEFITS ESTIMATOR (BABE) TOOLKIT

| WHAT is BABE?

BABE is a suite of tools used to project and track a variety of community benefits associated with brownfield redevelopment. The tools include an easy-to-use mobile app for baseline data gathering (Brownfield Tracker) and a web-based desktop app for data analysis and interpretation (Benefits Analysis Tool).

These data-gathering and analysis components use national, state, local, and hyper-local data as the foundation for benefit calculation formulas developed specifically for this effort. Key outputs allow communities to compare alternative reuse scenarios and estimate area changes that specify to whom the benefits of brownfield redevelopment might accrue.

BABE Toolkit Components

Brownfields Tracker (Mobile App)

Benefits Assessment Tool (Desktop App)

Technical Assistance Story Maps

Guidebook

WHY BABE?

BABE distinguishes itself from other types of redevelopment analyses that prioritize economic benefits. Instead, BABE outcomes analysis process centers a neighborhood perspective in its examination of brownfield site intervention scenarios—rather than the standard consideration of developer returns on investment (ROI) or municipal revenue benefit. To do so, BABE integrates community collaboration to create fresh data sets, and then feeds this data into a larger palette of community data that identifies benefits at the neighborhood level.

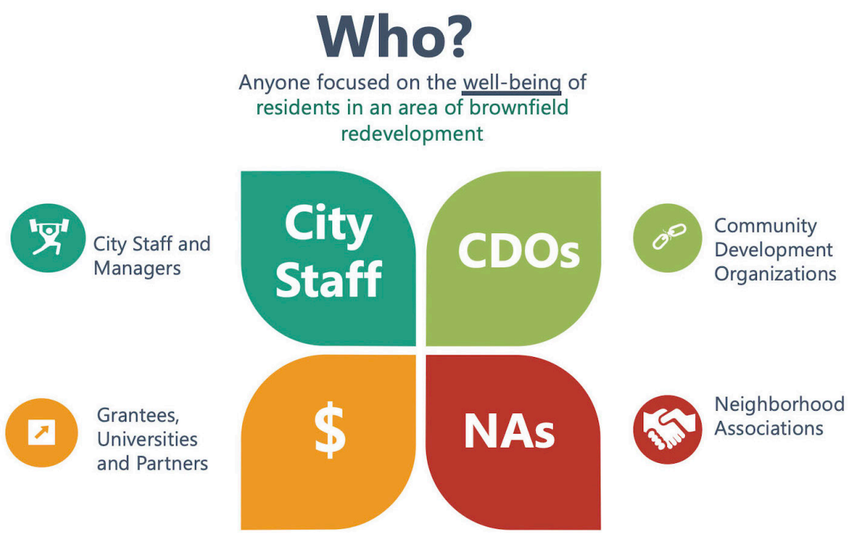
BABE findings are meant to inform and influence policy and practice decisions—whether by neighborhood people and their representative organizations, or by other parties (individuals, private entities, government agencies) that the local people want to influence. BABE findings will aid communities and organizations by fostering dialogue throughout the redevelopment process. Specifically, the toolkit outputs can assist in the following:

- Laying out the benefits of multiple scenarios of redevelopment (parks, retail, residential, and food sources) for users to compare as they develop their proposal or project
- Helping people in a community gather fresh data that informs them of existing conditions as well as their neighbors' perceptions and concerns[2]
- Providing data to aid users in articulating their unique needs, goals, and outcomes when pursuing funding/support for neighborhood objectives
- Shaping local private sector investments. Some measures of community conditions and potential change may be relevant to private sector calculations of returns on investments

WHO should use BABE and read this guidebook?

This guidebook and toolkit are intended to be used by a wide range of actors involved in redeveloping brownfields. Some sections focus on strategic considerations that everyone should review to deepen their understanding of how others approach brownfield redevelopment and community benefits. Other sections offer more technical details and analysis for those who require more in-depth guidance. BABE's intended audience includes but is not limited to:

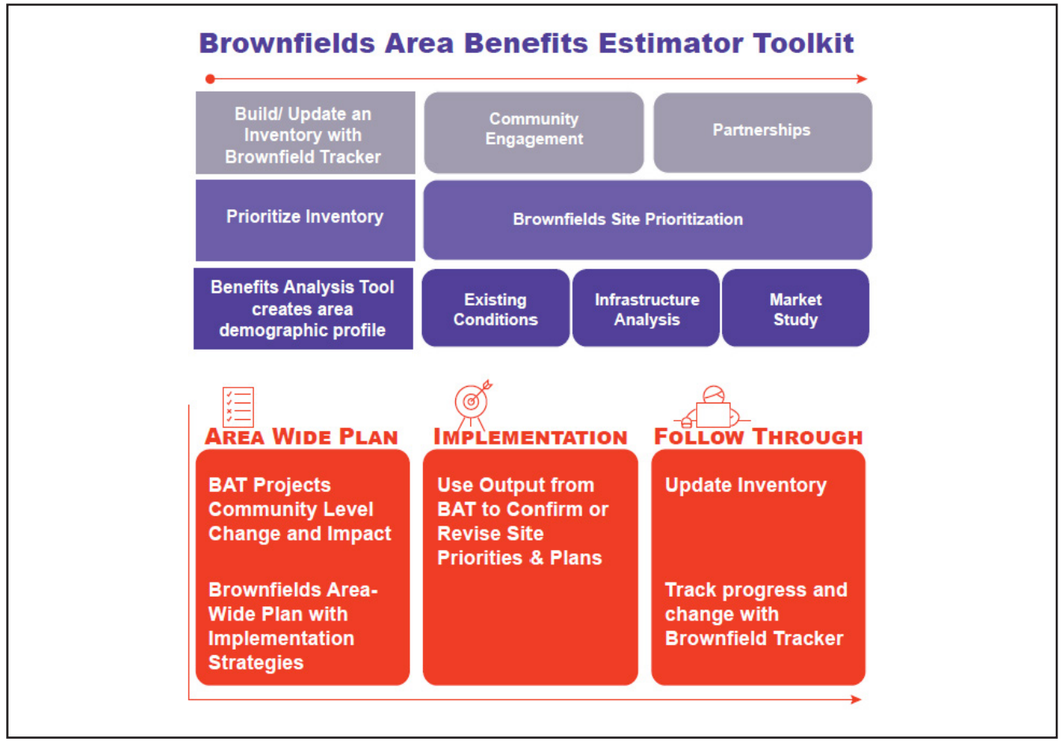
- Community-based organizations and local/regional non-governmental organizations (NGOs)
- Local governments
  - Policymakers
  - Department directors and staff
  - Economic development agencies
- Federal and state environmental and economic development agencies
- Private sector brownfields practitioners (e.g. developers, consultants, engineers, contractors)
- Institutional actors
  - Universities
  - Foundations
  - State and national associations that build local capacity around equitable land development/land recycling



WHEN and HOW to use BABE?

Components of BABE can be used prior to or during the brownfield redevelopment process. For instance, the mobile app, Brownfield Tracker, can be used to expand or verify an existing inventory or create a new inventory of sites of environmental concern. This inventory can be collected with the help of current residents and can then be used to help prioritize and articulate various re-uses for those sites. The desktop application, Benefits Analysis Tool, can use the inventory collected using the Tracker and/or an existing inventory to explore some of the options the community members envisioned for the sites under consideration for redevelopment.

The components of BABE can operate together or separately, depending on the user's needs. They can be used to augment a planning process, support or challenge proposed re-uses, and examine whether projected outcomes and benefits actually occurred. The creators of this toolkit expect the users will be creative and have therefore provided detailed information about the formulas and assumptions used for the data transformations, calculations, and projections.



HOW much expertise and information is needed to use BABE?

While anyone can explore the desktop Benefits Analysis Tool, and anyone can use the Brownfields Tracker to build, update, or verify a brownfields property inventory, those who have mapping expertise, a team of individuals to oversee and deploy the Brownfields Tracker, and knowledge of details about the sites and area in question will have better projections. Users should consider having the following base-line information for the area of interest:

- Location of known brownfields
- Location of existing parks
- Location of existing food sources
- For new retail or food source: an estimate of the square footage of the potential new business
- For residential: an estimate of the number of potential market rate or affordable/subsidized residential units and the number of rental or owner-occupied units

BAT includes default estimates for some additional inputs that the user may not have ready at hand. Importantly, the user may override these estimated defaults when appropriate to better account for local contexts. Part VI of this guidebook provides details about the default values in the tool, the user entered information, and user entered data sets.

BROWNFIELD REDEVELOPMENT POLICIES & PROGRAMS IN BRIEF

Prior to the 1990s, U.S. law held landowners responsible for the contamination on a given site regardless of whether or not that landowner caused the contamination. These "Superfund" laws were developed to address large toxic sites such as Love Canal and protect the environment and humans from historical and future contamination. Over the years, the imposition of legal liability and cleanup costs had the opposite effect as more landowners and industrial companies began to abandon sites or leave them idle rather than take responsibility for them. Business and property owners even started to walk away from modestly contaminated and even clean industrial and commercial sites to avoid liability. In response to this practice, state environmental agencies enacted new "brownfields" policies and programs designed to mitigate environmental and legal responsibilities and incentivize redevelopment.

Building on these state policy experiments, brownfield redevelopment was first placed on the national agenda in 1992 by the Northeast-Midwest Institute, which argued for the need for economic development of brownfields.[3] A division within US EPA's Superfund Cleanup Program (OSWER) issued technical assistance and modest grants to a dozen local governments to assess the levels of contamination and develop preliminary cleanup plans that could catalyze economic development of identified brownfield sites in their communities. From this initial round of assessment grants, the brownfields program at US EPA and in many respects the brownfields movement was born. Thus, it is not surprising that the main rationale the EPA provided for its brownfield grants has, until recently, been the economic benefits that remediation and reuse could offer. At one time, the EPA itself even had a unit concerned in part with brownfields that remarkably had no environmental issue or objective in its title, the Urban and Economic Development Division.

Over the course of the 1990s, the over-emphasis on economic impacts gradually waned and other factors like environmental and community/area impacts came into play, both in the EPA's internal considerations, its justification for expenditures to Congress, and in broader public understanding of the issues. These factors had profound impact in the agency's efforts to connect brownfield regeneration with efforts that promoted more sustainable economic development overall as well as area-wide approaches to brownfield redevelopment that take the broader local context into consideration.[4] However, the measures of sustainable economic impact for cities or regions cannot easily be translated into neighborhood impact, and so the specific impacts to a given community within a city or region remain an underutilized and understudied aspect of the brownfield redevelopment process.

The Brownfields Redevelopment Professional Community

Environmental justice and community-driven redevelopment are important aspects of federal, state, and local brownfields programs and projects. The EPA's Environmental Justice Office has provided nonprofit and community-based organizations from more than 1,400 vulnerable communities with $33 million dollars through its Collaborative Problem-Solving cooperative agreements and EJ small grants between 1994 and 2020. Nonprofit organizations and community-based organizations are eligible to apply for federal and state brownfields assessment, cleanup, and technical assistance grants. Numerous national organizations, universities, and professional associations also host regular educational sessions, convene workshops, and provide a wide range of research and technical assistance to communities and local governments. Many of them gather every other year at the national brownfields conference hosted by the EPA Brownfields Office and International City/County Management Association (ICMA).[5]

State & Local Approaches

Federal programs delegate actual compliance standards and cleanup oversight to state environmental regulatory agencies. This means that state programs typically serve as the backbone for the implementation of federal brownfields policies, programs and projects. State environmental and economic development programs and statutes often establish different policies and procedures for how they review, approve and monitor the cleanup and redevelopment of brownfields within their respective states. Some constrain their definition of brownfields to former industrial or commercial sites and prioritize their programs accordingly. Others include sites with any former use that may have caused harm to the environment as eligible brownfields. For instance, residential properties that left a legacy of lead pipes, paint, and asbestos, or even pesticides from private use, could come under the umbrella of some state or municipal redevelopment programs. Thus, it is always a good idea to carefully review state brownfields program rules and requirements and work with appropriate brownfields program staff and environmental regulators.

Local governments play pivotal roles in the redevelopment of brownfields. Virtually all brownfields development projects involve some level of local land development review and approval by the relevant municipal legislative body, planning commission, and/or zoning board. Local governments are by far the largest recipients of federal and state brownfields grants, resources and technical assistance. However, most brownfields redevelopment projects are still driven by the dynamics of the private real estate development markets along with land development, industry, environmental consultants, planners, and engineers. Despite changes in federal and state regulations and the millions of dollars in grants and technical assistance, many property owners, businesses, and lenders continue to avoid redevelopment of brownfields.

Risk-Based Corrective Action (RBCA)

When the US first began a national focus on the cleanup of brownfield sites in the 1980s, the goal of remediation was to remove as much pollution as possible. This approach proved to be expensive and impractical in many cases and, as such, it impeded redevelopment of the sites. Thus, the concept of Risk-Based Corrective Action (RBCA) emerged. RBCA projects allow some contaminants to remain on a site depending on its intended use. To protect people from exposure to the toxins, physical or engineering controls (such as caps over contaminated soil) are placed on the site and legal or institutional controls (ICs) are created that impose restrictions on land use (e.g. prohibiting building houses on previous industrial sites).

Examples of ICs are covenants or binding agreements recorded on property deeds that travel with the land from one owner to the next. They can include a description of prohibited activities, requirements for ongoing monitoring of engineering controls, and rights of access to the property by environmental protection agencies to enforce the covenants. An important consideration for impacted communities is that while this reliance on risk-based corrective action for brownfields redevelopment may mean substantive reduced risks, risks do persist and require a continued level of monitoring and community engagement.[6] The BABE Brownfield Tracker can be used to assist community members with this ongoing effort.

The Federal Brownfields Utilization, Investment and Local Development (Build Act 2018)

The U.S. Congress first codified the US EPA brownfields program with The Small Business Liability Relief and Brownfields Revitalization Act in 2002. Until then, the program operated informally through budget appropriations and internal program staffing without statutory authorization. The new law amended the original 1976 Superfund Law (e.g., the Comprehensive Environmental Response, Compensation, and Liability Act or CERCLA) funding assessment and clean-up of brownfields; establishing legal liability protections for existing and prospective owners; and enhancing state and tribal response programs.

Congress amended the 2002 federal law several times over the years and passed the most recent amendment, the Brownfields Utilization, Investment and Local Development (Build Act) in 2018 authorizing continued funding for and further refinements of the EPA brownfield programs. The grant, loan, and technical assistance programs include the following as of 2019:

» *Brownfields Assessment Grants* provide funding for brownfield inventories, planning, environmental assessments, and community outreach.

» *Brownfields Revolving Loan Fund Grants* provide funding to capitalize loans that are used to clean up brownfield sites.

» *Brownfields Cleanup Grants* provide funding to carry out cleanup activities at brownfield sites owned by the applicant.

» *Multipurpose (MP) Grants* provide funding to conduct a range of eligible assessment and cleanup activities at one or more brownfield sites in a target area.

» *Environmental Workforce Development and Job Training Grants* provide environmental training for residents impacted by brownfield sites in their communities.

» *Technical Assistance, Training, and Research Grants* provide funding to organizations to conduct research and to provide training and technical assistance to communities to help address their brownfield challenges.

» *State and Tribal Response Program Grants* provide non-competitive funding to establish or enhance state and tribal brownfield response programs[6]

For links to current federal and state brownfield programs, see **https://www.epa.gov/brownfields**.

Recommended Resources

More information about navigating regulatory frameworks, case studies, and best practices surrounding brownfields redevelopment is available from a variety of EPA designated technical assistance providers, nonprofit organizations, and professional associations. Many of the guidebooks, reports, and on-line toolkits focus on community and neighborhood driven efforts as well as how to best included community members and current residents in the decision-making processes connected to brownfields redevelopment. Below is a sample of relevant resources:

» **Community Development/ Area-wide BFs Redevelopment Guide**
https://groundworkusa.org/groundwork-usa-releases-from-brown-to-blooming-a-field-tested-guide-for-getting-from-brownfield-to-neighborhood-asset/

» **Community-Based BFS Redevelopment Examples/Case Studies**
https://groundworkusa.org/wp-content/uploads/2017/04/GWUSA-Brownfields-Highlights-2017.pdf

» **Environmental Justsice 101 Guide**
https://groundworkusa.org/wp-content/uploads/2018/08/GWUSA-Learners-to-Leaders-Environmental-Justice-Literacy_Curriculum_08.10.18.pdf

» **Equitable Brownfields Development Strategic Planning Tools**
https://groundworkusa.org/ta-services/equitable-development-brownfields-planning/

» **Land Recycling 101 Online Guide**
https://www.cclr.org/land-recycling-101

» **Infill Development**
https://www.njit.edu/tab/tools-and-guidelines-implementing-infill-development-brownfield-sites-rural-areas-and-small-towns

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5. Environmental Protection Agency. n.d. “EPA Environmental Justice Grants and Communities.” (https://epa.maps.arcgis.com/apps/Cascade/index.html?appid=d426d553c4cc44a3af62bff7e175108e).

   Environmental Protection Agency. 2019, “EPA’s 2019 National Brownfields Training Conference Wraps Up in Los Angeles California.” (https://www.epa.gov/newsreleases/epas-2019-national-brownfields-training-conference-wraps-los-angeles-california).

6. Meyer, Peter B. 2010. “Brownfields, Risk-Based Corrective Action, and Local Communities.” *Cityscape* 12(3):55-69.

7. Environmental Protection Agency. n.d. “Types of Brownfields Grant Funding” (https://www.epa.gov/brownfields/types-brownfields-grant-funding).

PART II: Making the Case for Measuring Community Benefits

The BABE toolkit supplements users’ understanding of the benefits and changes associated with a brownfield redevelopment, from the perspective of the most immediately impacted community members and residents. This section of the guidebook discusses the framework that guides BABE’s analyses and why it encourages decision makers to consider information that better specifies community benefits. It summarizes the limitations that arise from relying solely on economic cost-benefit models and excluding the value of community input, voice, and knowledge.

BABE allows users to incorporate local and hyperlocal data (pg 22) that can better inform both immediate and future decision-making. Thus, this section also summarizes how local and hyperlocal data can contribute to a better understanding of community benefits and how BABE’s analysis tools incorporate these elements.

BABE contributes to brownfields redevelopment benefit analyses beyond the economic and helps to specify the benefactors of the resulting land-use changes. Ultimately this toolkit will help prepare community members to support or challenge brownfield redevelopment decisions, hold decision makers accountable for promised benefits, and advocate for re-uses they find directly beneficial to existing community members.

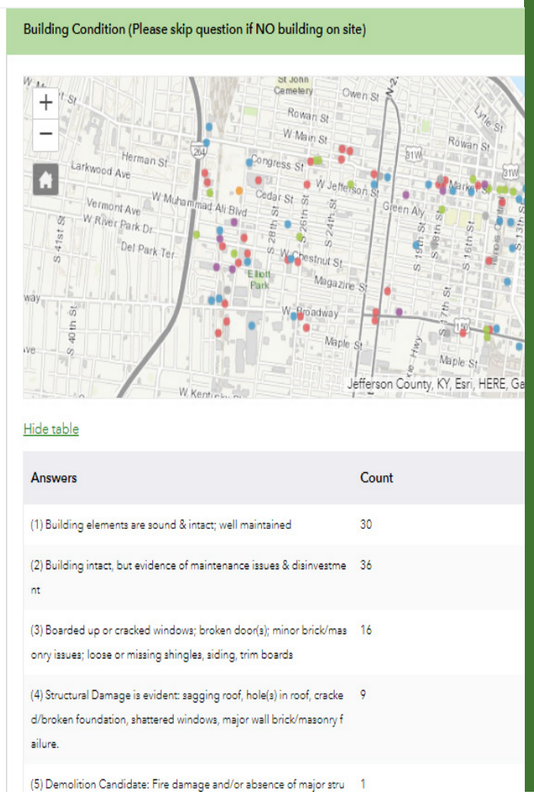
THE LIMITS OF COST-BENEFIT ANALYSIS

If all the impacts of brownfield redevelopment could be summarized in a single measure, it would be easy to determine how to achieve the best outcomes for a given community. Historically, public policy has relied on cost-benefit analysis (CBA) as such a summary measure using it to justify a variety of decisions despite critiques that highlight its over-simplifications.[1] Because brownfields redevelopment has most often been framed as an economic development problem, decision makers rely primarily on CBA and return on investment (ROI) analyses.

The reliance on a single metric to measure outcomes is justified by those who use it by defending the assumption that the complexity of the world can be reduced to a series of measurable, monetized tradeoffs between different impacts. In the case of CBA, the assumption is that—for instance—a loss of jobs in manufacturing can be offset by new jobs in retail, trade, or information technology. Furthermore, because tradeoffs are measured in monetary terms, CBA models *leave out* tradeoffs that cannot easily, or should not be monetized.

This simplification of reality ignores potential outcomes such as uneven distribution of the costs (losses) and benefits (gains) across the affected population. While simplification is inevitable in *any* model of complex socio-economic systems, it comes at a price. Without additional data, a CBA model cannot distinguish between a policy or practice that redistributes from the haves to the have-nots, from one that provides benefits to the best endowed in an economy while imposing costs on those least capable of paying them.

Even if we move beyond relying solely on economic measures like CBA as the basis for our land-use decision-making and include selected measures of social well-being and environmental improvements, we are still faced with the limited



What are Hyperlocal Data?

BABE defines hyperlocal data as any local data that are not collected regularly on a national level and may only be available at a neighborhood level if gathered by local residents or local institutions. It includes both measured and other observational data, such as facility locations and land features that can provide important contextual information for better interpretation of site information. For example, a national or state data set may provide the location of properties with underground storage tanks registered with their systems but may not include an up-to-date status of the tank's condition or if it has been removed.

Furthermore, removal of the tank may constitute a reduction of harm but does not assure that other past, current, or subsequent activity on or near the property does not pose on-going contamination risks. Only on-site observations -hyperlocal data collection- can provide that information.

Collecting Neighborhood Observations

Local residents are capable of collecting information about a variety of property conditions or uses that can be used to form the foundation of an inventory. What specifically residents record depends on the community priorities and how they want to use the resulting data collection.

Collecting Community Perceptions and Priorities Observations

Gathering data on people's attitudes can be done in many different ways. For example, residents who collect site condition and use observations might also collect information from residents in the area regarding perceptions and priorities using interviews. This has the potential benefit of getting better information and more responses from respondents when the person doing the inquiring is also a resident of the area rather than an outsider.

availability of comparable data. Local conditions, perceptions, and values change over time, which limits our ability to aggregate and include that information in projections and decision-making models. Furthermore, national-level data is difficult to access and not easily transformed for use at the local or neighborhood level. Addressing these obstacles within the technical limitations of BABE is an on-going concern.

At present, development proposal impact statements rarely include local residents' risk perceptions and realities, despite their vitality in informing community values, priorities, and sense of well-being. For instance, when developers apply for zoning changes and building permits for redevelopment projects, it is all too common for them to create presentations that focus on the purely economic benefits of the project without consideration of residents' concerns about traffic, displacement, cumulative environmental health risks, or cultural value of the proposed reuse. Furthermore, proposals often list new tax revenues from the change in use, but rarely do they adequately address increased traffic, demands for police and fire protection, and other municipal infrastructure costs they may generate, let alone whether the existing residents might directly benefit from new tax revenues.

The history of the failure of most community impact analyses to adequately address environmental justice concerns is a direct reflection of this issue. Ideally, a net benefit model would include non-monetized changes in well-being. Perceived community risks—not only documented demonstrable threats—need to be considered. These perceived concerns may be particularly important when selecting a site mitigation approach. Both removal of contamination that produces dust and containment of contamination on site pose risks if not well managed—and neighborhood perceptions of and trust in the safe implementation of those alternatives should have weight in development decisions.

Adding social and environmental effects to the equations certainly complicates economic analyses. Thus, BABE was developed with the conviction that community voices matter and integrating hyperlocal data is vital to developing more accurate and holistic decision processes and models. Furthermore, relying solely on CBA obscures a variety of area-wide impacts and may lead to promotion of projects that do more harm than good to the locality and its residents.

Without additional data, a CBA model cannot distinguish between a policy or practice that redistributes from the haves to the have-nots, from one that provides benefits to the best endowed in an economy while imposing costs on those least capable of paying them.

THE VALUE OF COMMUNITY VOICES

Planning directly with communities to collect and analyze data is not just politically correct or ethically appropriate, it is superior to planning *for* communities because only with true local involvement will the full array of impacts be identifiable, and only with local expressions of interest and concern will community valuation of development alternatives be accurate.[2]

Empowerment

In addition to the potential for brownfield redevelopment to improve a community's quality of life, participation in the redevelopment process itself empowers individuals and local organizations alike to take part in local design and decision-making processes. This participation has the added benefit of increasing overall trust and mutuality in local initiatives. Contributing to neighborhood level data collection, analysis, and interpretation, as well as proposing re-uses and responding to proposed re-uses, are all important activities that empower community members

to shape their own future. Furthermore, community members may be able to collect local data more efficiently, with more accuracy, and more cost-effectively than outsiders.

Determining Relevance and Value of Outcomes

The inclusion of community voices in brownfield redevelopment processes is necessary to accurately measure the needs and goals of a population and to evaluate the overall success of the initiative from the perspective of those most directly impacted. It may well be that an impact or metric that is acceptable or relevant to one community is not acceptable to others, even within the same city or region. Different communities may experience precisely the same economic, environmental and social impacts, but value them very differently. If our objective is to weigh alternative development plans for a community—rather than a city, state, or nation—measurement should be determined by the community's acceptance of the scale and value placed on a given impact. For instance, property value increases are often used to measure benefits of redevelopment and may indeed indicate improvement for those in the area who already own homes and can afford their mortgage, or who want to sell their homes. However, it may mean increased insecurity for cost-burdened renters who will expect their rent and other shelter costs to increase as a result.

Local Knowledge

Besides determining measurements, there are some conditions and information that only neighborhood residents and property owners can identify. After all, observations of local conditions and changes cannot be made by those who have not experienced them. The people who spend time in an area on a day-to-day basis may know more about specific sites, events, or conditions that can affect outcomes than those who only visit a neighborhood or community.

THE VALUE OF HYPERLOCAL DATA

The internal diversity of a society or economy is such that a measure appropriate to the national scale, one that reflects a universal valuation of a particular condition, good, service, or issue, is—almost by definition—not applicable to measuring well-being in any one particular local context.[3]

For example, opening a new grocery store in a city may be treated as having no net economic or social benefit at the municipal scale, since shoppers at the new store most likely moved from shopping at a pre-existing store. Profits and employment at the new store are not 'new', they have simply been shifted from one store in the area to another. Measuring benefits on a metropolitan or regional economic geography would mean that no social benefits appear to accrue. City-wide data on the number of grocery stores alone cannot capture social benefits of a new store. However, if the new grocery opens in what was previously a "food desert" neighborhood, there might be significant economic and social, not to mention health, impacts locally that could also be significant at the municipal scale.

The components of BABE, national data put into local context, and the capacity to integrate local knowledge and data collections, contribute to a better basis for understanding changes that not only impact quality of life, but also how those changes may directly benefit the existing community. Through this type of analysis and local data collection, it also encourages participatory planning and design, and can be used by many different types of organizations involved in or impacted by redevelopment processes.

See **Part IV** for more information on collecting hyperloca data using the Brownfield Tracker.

WHY IS MEASURING COMMUNITY BENEFITS SO COMPLEX?

Units of Analysis: People or Place?

One issue that complicates documenting neighborhood change is that of unit of analysis. Indicators and measures of change are used to evaluate the impact of an intervention or to help identify drivers of change. Therefore, identifying the appropriate unit of analysis of what is changing is crucial. It matters if one is measuring changes in the status of individuals who live or work in a geographic area *prior to redevelopment*, or changes in the built environment or condition of the population that ends up living in the area *after redevelopment*.[4]

Policy and program evaluation experts recommend ensuring that individual or household benefits or impacts are considered alongside place-based measures of area or neighborhood. As noted earlier, EPA brownfields programs encourage area-wide brownfields redevelopment planning. This includes identifying catalytic sites or sites expected to trigger further brownfield redevelopment and other investments in land-use improvements. However, selecting a catalytic site for redevelopment without attention to community context risks prioritizing sites that do not ultimately benefit existing community members and prioritizes place-based benefits over people-based benefits.

One way of identifying a catalytic site that takes community context into consideration is to compare the *relative value or scale of benefits* projected to impact existing community members in the area where a site is located. Area demographics such as population density, property values, residential health, and unemployment can be combined into measures and used to assess the potential scale of the contribution that the clean-up of a chosen site and its specific re-use could contribute to further brownfield redevelopments in the area as well as the scale of improvements current residents would experience.[5] For instance, a site that is redeveloped as a health

clinic that is located in an area with high population density, lower property values, poor health, and high unemployment might result in more value to existing residents and spur additional investments in other health related brownfields redevelopments than if a similar site is located in an area where the population's health is better, unemployment is lower, and property values are higher. Furthermore, the clean-up could further reduce cumulative environmental risks borne by area residents with poor health.

BABE's BAT component assists users in addressing this issue of units of analysis by paying special attention to summarizing demographics of the existing community households that will be impacted by changes. For example, BAT includes the racial and ethnic makeup of a selected area's households since areas with concentrated minoritized populations tend to be associated with more brownfields and less brownfield redevelopment activity, so success in regeneration may have greater social, environmental, and health impacts in those cases[12]. It also assists the user in better estimating those demographics for any geographic area identified specifically by the user.

Neighborhood Change and Revitalization Research in Brief

For decades, social science researchers have investigated the forces, characteristics, and dynamics of why and how city neighborhoods decline, stabilize and improve under the umbrella term of neighborhood change.[6] Researchers typically do this by documenting demographic, economic, and property-related changes. Their scholarship examines two interrelated characteristics: 1) the effect of different ***indicators*** that show what is happening, such as changes in homeownership or crime rates; and 2) the impacts of ***interventions*** deployed to change or improve a neighborhood, such as demolishing vacant houses or building affordable housing.[7]

Researchers generally view neighborhood change as a function of market forces and public policies.[8] They monitor changes in neighborhoods that result from fluctuations of market forces and classify neighborhoods by stages of economic growth, transition, decline, distress, and revitalization. Practitioners then develop assessment tools, such as market value analysis, to ensure that any policy or program interventions are appropriate for any given neighborhoods' classification.[9]

The logic behind these types of neighborhood revitalization intervention strategies assumes they can affect neighborhood conditions in two ways:

- Investments that directly improve local physical conditions such as rehabilitating properties, demolishing properties, making emergency repairs, clearing trash, etc.

- These same investments (public or private) can also *indirectly* improve local conditions by improving perceptions of and expectations for a particular neighborhood, making current and future property owners, financial institutions, and businesses more willing (and likely) to invest in ways that further boost local conditions and quality of life.

While interventions have helped transform many disinvested urban areas and neighborhoods into thriving communities, many once-solid neighborhoods that somehow survived the devastation that resulted from disinvestment during the 1960s and 1970s, have since been destabilized and begun to deteriorate. Furthermore, most cities at any point in time have neighborhoods that span one or more of these stages. Public officials, nonprofit, and philanthropic leaders respond by focusing on neighborhoods as the primary framework for a wide range of interventions and investments intended to stabilize and revitalize areas and address socio-economic and health inequities. Thus, the theories of change that support neighborhood revitalization practices have more recently shifted from focusing solely on place to elevating the role and importance of the people in that place.[10]

Geographic Boundaries

Another methodological issue in documenting neighborhood change is identifying geographic boundaries that can be accurately measured and have meaning. For instance, changes to U.S. Census data boundaries over time make it problematic to measure change in any one census-defined geographic unit. Perhaps even more important is the fact that neighborhood boundaries are defined by residents or perhaps local government policies and are often contested or unclear. Furthermore, those boundaries do not necessarily correspond with any census-defined areas. Therefore, when neighborhoods are the desired unit of analysis, that too becomes difficult to measure

and define in a manner that accounts for change over time or contested boundaries.

BABE's BAT component addresses the problem of geographic boundaries by allowing users to self-select the area of consideration using a Geographic Information System (GIS) tool. The tool then automatically estimates Census data related to households within the area selected by the user. Allowing users to easily define the geography of interest to them and explore projections based on those chosen boundaries makes the tool more adaptable and relevant for small area decision-making.

See **Appendix B** for more information on these and other technical considerations.

Local Context of Values and Interpretation of Data

No matter what the unit of analysis, the geographic area, or the individuals in the geographic area, there will always be differing values regarding what outcomes are considered beneficial or preferable. These priorities in turn drive what kind of data gets collected and how those data are interpreted. Specifically, what people consider to be important in the health and wellbeing of their community informs what kind of information gets tracked and developed as measures of improvement. Ideally, neighborhood impact measures should reflect local concerns, not just those of a city or larger region. This problem makes interpretation and comparison of benefits across time and space nearly impossible, an issue that is even further complicated when attempting to aggregate the same data up to larger geographies.

In light of this, the BABE approach encourages users to take local priorities into account by first recognizing their value: the data that a community chooses to collect reflects their priorities and can also be used to interpret results. In addition, BABE's BAT component allows the user to view and incorporate more relevant local data that can improve the output and help in interpretation. Crucial to this is the capacity to integrate data from the Brownfields Tracker, which enables community members to contribute to building a robust local brownfields inventory that includes details not usually collected in a systematic manner.

In the end, it is the user, not the BABE tools, who must interpret output using the local context and values they know best.

Additional Examples of Measures for Determining Community Benefits of Brownfields Redevelopment

» Measures of neighborhood "livability" or "sustainability" such as walkability scores, civic engagement or cohesion indexes, and community asset inventories can address the current and future qualities of community life

» Measures of the community's environmental risk exposures that may be reduced or eliminated by a redevelopment might include data on past uses, soil permeability, and local pollution receptors and how paths to exposures are reduced or eliminated[11]

» Measures of the extent of waste and waste processing operations in the neighborhood can be used to reflect a level of cumulative risks borne by current residents and thus a measure of environmental justice concerns that make clean-ups in that area a more important benefit than in a less burdened area[12]

» Measures of minority population proportions of the local residents, since higher minority population tends to be associated with less brownfield redevelopment, so success in regeneration may have greater social, environmental, and health impacts in those cases[13]

» Measures of community preference can be used to weight the values of any benefit associated with a brownfield redevelopment in accordance with how much importance community members might place on that benefit[14]

[Note: these are examples of measures that a project leader could incorporate and use concurrently with outputs from BAT and BT.]

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PART III: What types of Impacts Does BABE Examine?

The Benefits Analysis Tool (BAT), the desktop application, the backbone of the BABE toolkit, utilizes the “triple bottom line” (TBL) to guide the selection of available data and interpretation of results. The TBL framework includes analyses of economic, environmental, and social equity outcomes, the three legs of sustainable development.[1] This section describes BABE’s approach to each component of the TBL and the associated logic upon which BAT’s projections are based. Within each leg, this section discusses the relevant impacts for the re-use types available to users to explore with BAT: Residential, Park, Food Source, and Retail.

The BAT output first provides a neighborhood/area demographic profile of current residents. This profile allows the users to consider the characteristics of the existing area or neighborhood surrounding a brownfield as well as the existing residents' and businesses' needs and vulnerabilities before they experience the economic, environmental, or social benefits of a project. These conditions shape the importance the community places on the economic, environmental, and social equity outcomes. For instance, increased property values are generally perceived as a positive economic outcome of brownfields redevelopment but they may be viewed as less important to an area with many cost-burdened renters who are likely to experience rent increases, displacement, and social disruptions as a result of increased property values.

Some demographic groups such as children and the elderly may be more sensitive than other age groups to social conditions and availability of public facilities, as well as housing instability. The areas' racial and ethnic composition may shape the value placed on reducing contamination risks due to histories of redlining and other racist land-use and housing policies that imposed exceptionally high environmental risks on residents. By including neighborhood/area demographic profiles, the BAT app makes documenting some of these considerations easier for the user.

Measuring Triple Bottom Line Impacts Across the Nation

The BABE toolkit was developed to serve communities across the country and thus uses available, consistent nation-wide data of neighborhoods and small areas. As a result, the scope of analysis of specific local conditions—economic, environmental, or social—is limited, and therefore intended to be used to supplement, not replace, the user's existing decision-making strategies. The output of BAT examines TBL impacts relevant to the user's selected geographic area, be it a neighborhood, corridor, or waterfront district.

ECONOMIC IMPACTS

Reclamation and Redevelopment Effects

The BAT does not put monetary value on the neighborhood changes it projects. Instead, it focuses on community impact assessments which are intended to supplement the economic impact analyses generally produced by developers, market analysts, or economic development consultants. BAT does not include these types of analysis in its modeling because return on investment frameworks are relevant primarily to developers and investors, and therefore do not adequately speak to community impact. Some common economic measures BAT does use in its estimates and projections include property values, median household income, property tax rates, jobs created, cost of development, and renter cost burden. However, BAT's projections of changes in these values are interpreted from the perspective of community members rather than the developer or future purchaser/owner. For instance, the new property value of the actual redeveloped site is not of much interest. Instead, BAT is interested in how property values change for

the surrounding properties and what that means for existing owners and residents.

Change in Property Values

Redeveloping an abandoned or underutilized property impacts the value of the site itself as well as other nearby properties. The extent of that impact is limited by other brownfields nearby since remaining contamination would continue to reduce both the desirability and price of real estate in the area. BAT estimates projected property value increase for properties near the new brownfield redevelopment taking into account different rates of increase related to the economic condition of the area as well as the impact remaining brownfields in close proximity continue to have on the area. This is a crucial component for those who advocate for area-wide approaches to brownfield redevelopment because it allows the user to see the continued negative impacts of other brownfield sites in the selected area.

Another important element of BAT is that on the one hand, it recognizes that higher property values are likely to negatively impact cost-burdened renters due to resulting increases in rent. On the other hand, the new taxes associated with redevelopment will show a monetary return to the local government that levies the tax. This increase in revenues can be used to justify investment of public funds in a project that might not otherwise attract sufficient investments. This may be especially useful for advocating to local government officials and lenders who do not have experience with brownfield redevelopment. It may also be used by community members to advocate that those revenues be returned to the neighborhood in the form of other types of area improvements, not just in real estate development.

For example, if a local government provides various financial incentives to attract and support a brownfield redevelopment project, residents of that area

might demand that some of the economic benefits be shared, perhaps through a community benefits agreement that advocates for projects or facilities which directly benefit the existing residents.

The Risk of Displacement and Potential for Gentrification

If property values and thus property taxes, insurance, and rent costs do rise as the result of clean-up/remediation and development, low-income residents—especially renters—will likely have an increased risk of displacement. Low-income households may have to cut back on other necessary expenses or move to an area with lower housing costs. Increases in foreclosures and evictions might also occur. The risk of these impacts is present even in the absence of any investor interest in causing neighborhood gentrification—that is, the promotion of a market for higher-value properties and residences to displace existing lower-income residents.

While displacement and intentional gentrification are risks for all brownfield

Community Benefit Agreements

How can public stakeholders ensure that a redevelopment project benefits them and not just a private developer? These negotiations rely not just on the developer themselves, but also on the relationship forged between them and the community.

The quality of the relationship between developer(s) and neighborhood can vary from no relationship at all to a high level of cooperation. For instance, some redevelopment efforts are led by community-based organizations (CBOs) with strong ties to residents. Relationships like these shape impacts ranging anywhere from the provision of jobs to residents, to preferential prices for new facilities, to even the type and extent of site cleanup. Implementing community benefit agreements can influence and solidify these outcomes. These agreements are created with for-profit or non-profit developers to hold them accountable for returns to the existing community.

Users of BABE might consider using BAT projections *while negotiating* community benefit agreements or they might compare development proposals with and without agreements using projections from BAT for each. Learn more about community benefit agreements from the US Department of Energy's Office of Economic Impact and Diversity or from the guidance offered by the Partnership for Working Families.[2]

redevelopment projects, the risk is greatest for residential development, especially those that offer market rate rentals or ownership opportunities in otherwise depressed neighborhoods. The new residents would, in these cases, be likely to have substantially higher incomes than the residents present before redevelopment, and their demands for retail goods and services and other amenities may displace existing businesses catering to the longer-term residents. They would also encourage further development of market rate housing, driving additional displacement and eventual area gentrification.

BAT estimates risk of displacement using available renter cost-burden data to determine how increases in property values (and resulting increases in rent) would change the percentage of cost-burdened renter households. These calculations capture only a small component of displacement and gentrification risk but set the stage for a deeper discussion of their impact on the social and economic well-being of existing residents. Other gentrification and displacement risk measurement models include but are not limited to the following:

» Freeman, Lance. 2005. "Displacement or Succession? Residential Mobility in Gentrifying Neighborhoods." Urban Affairs Review, 40(4): 463-491.
» Bates, Lisa. 2013. "Gentrification and Displacement Study: Implementing an Equitable Inclusive Development Strategy in the Context of Gentrification." City of Portland Bureau of Planning and Sustainability. (https://www.portlandoregon.gov/bps/article/454027).

Retail Displacement

Any development can produce displacement of households and thus have a negative impact on a community, but a retail development may pose special risks for existing retailers and their landlords. A major new retail development such as a mall or Big Box store might actually take shoppers and sales away from existing small retailers who are part of a community.

One warning of the risk of this type of displacement is the investment per acre being made as part of a retail development. The BAT models retail project impacts with users' estimates of construction cost and square footage. The tool also displays the site of the development and can output the acreage of the project. The tool itself, then, provides the information users need to be alerted to the risks of retail displacement.

» Causa Justa :: Just Cause. 2014. "Development Without Displacement: Resisting Gentrification in the Bay Area." (https://cjjc.org/publication/development-without-displacement-resisting-gentrification-in-the-bay-area/).
» Kinahan, Kelly L., Lauren Heberle, Danielle Rohret and Steven Sizemore. 2018. "2018 State of the Metropolitan Housing Report: Involuntary Displacement." Metropolitan Housing Coalition, Louisville KY. (https://metropolitanhousing.org/wp-content/uploads/2020/10/2018_SMHR_FINAL2_LoRes.pdf).

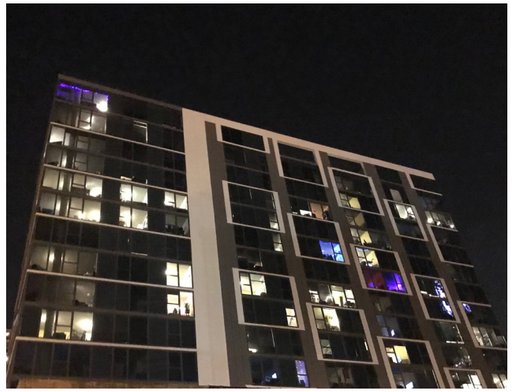
Job Creation

Any new development will produce short-term on-site construction jobs. Depending on the new use of the redeveloped site (residential, park, food source, or retail), permanent employment opportunities are likely to emerge, especially in the case of food source or retail. In addition, in the case of brownfields, jobs involving the clean-up of on-site contamination are also created. The EPA brownfields program recognizes this through their job training grants. Finally, the ripple effects of some re-uses will create further jobs in a neighborhood. However, not only is documenting actual job creation difficult, documenting whether those jobs are likely to go to current neighborhood residents or whether new employees from outside the area will

support existing local retail is very difficult. Furthermore, most people in the US do not work in the neighborhood in which they live, so job creation in a neighborhood is not always job creation for local residents. However, while skill and training mismatches may limit opportunities for residents, that they can overcome with effort devoted to neighborhood recruitment and training. Community benefit agreements can serve as vehicles to assure that projects include initiatives to overcome such mismatches and provide jobs for residents. The BAT estimates short-term jobs from construction and long-term job creation associated with food source and retail re-uses. It estimates only short-term construction job creation for residential and does not estimate job creation for parks.

Economic Benefits of Selected New Uses

Beyond the job and property value impact of any new development type in a neighborhood, other economic benefits of brownfield reclamation can depend on the specific type of new use.



RESIDENTIAL

Provision of new housing can improve housing conditions across the neighborhood. This may result in people moving to better quarters and an increase in the area's supply of low-income housing. However, this effect is typically only associated with new low- and moderate-income (perhaps publicly subsidized) units, rather than market rate housing. BABE therefore projects impacts based on the types of new residences being built.

PARKS

Economists value new parks and recreational facilities mostly in terms of the impact they will have on travel time to access them. That means that a new park has no additional value to a resident who already has access to a park closer to where they live. BAT therefore calculates how travel distance to parks changes for neighborhood residents if a brownfield is turned into a park and the increase in the number of households who have very good access to parks.

FOOD SOURCE

The economic analysis of access to new food sources is similar to that of parks. There is an additional factor that is sometimes considered, which is the effect on the prices of food. However, data on food prices and on the effects of new competition created by new food sources are not easily available at the neighborhood level, so BAT measures the impact on travel distance to full-service food sources and the number of households who gain improved access to a food source.

RETAIL

Economists might be inclined to measure the impact of new retail facilities as they would for food or even parks, but the analysis is affected by the vastly different types of "retail" that might be available—from storefront services provision to hardware and building supplies, to pharmacies and clothing stores. Moreover, retail is often so widely distributed in an urban area—in many cases with shops on every block—distance measures do not often inform decisions.

Therefore, BAT provides users with a summary picture of existing retail and retail employment in the selected area relative to that of the larger geographic region in which it is situated. It then considers economic impacts of site-based job creation and impacts related to property value changes. Ideally, one would measure the extent to which revenues generated by the new establishment stay within and benefit the neighborhood, but these data are not available on a national level and are ultimately impossible to model for all retail in any meaningful or accurate manner. Importantly, the BAT does not seek to replicate the details of retail market analysis. Rather, it seeks to provide data that can set the stage for informed community discussions about the value of retail in more general terms to the existing residents and other stakeholders in the area.

ENVIRONMENT & HEALTH

In addressing the "environmental" element of the triple bottom line, BABE primarily focuses on local environmental issues such as human exposure to pollution and access to environmental benefits such as greenspace. It does *not* address species protection, climate change, or any more global issues.

The clean-up and remediation of a brownfield is intended to reduce the risk of human exposure to harm, thus impacting both individual health and environmental wellbeing. However, any site that has earned the label "brownfield" is a property that officials believe may pose health risks. There is at least the suspicion that people may be at risk of exposure to potential hazardous contaminants from being on or near that site.

The characteristics of the on-site contamination affect the risks that property might pose to people. In turn, the reduction in those risks is mediated by the nature and extent of the cleanup process. However, the health impacts of any remaining contamination on the site will ultimately depend on the use of the redevelopment.

The on-site contamination may not be fully known when a project is initiated. As a result, the details of the site mitigation or cleanup are also unlikely to be known. The standards for cleanup differ depending on the type of reuse (in large part because of how many hours per week any one person is expected to be on a site after redevelopment). Thus, the remaining contamination risk cannot be known with any clarity. (For more information on the federal standards for how this is addressed, see "Risk-Based Corrective Action [RBCA]" on page 16).

In general, the higher the number of households near the brownfield, the greater impact any cleanup will have on the remaining risk to residents. However, when there is a cluster of brownfields, any remaining brownfields could undermine risk reduction gained from the cleanup of only one site. While BAT does not estimate health risks before, during, or after, clean-up and re-development—since that requires knowledge of the extent and type of contamination, pathways of exposure to toxins, and the baseline health of the population at risk of exposure—it does provide an estimate of the number of households that will benefit from some amount of risk reduction. It also provides an estimate of the number of households that could be more vulnerable to cumulative health risks due to household members' racial identity or age for each reuse type.

Other types of environmental and health-related considerations for each reuse type follow.

Environmental and Health Impacts of Selected Reuse Types

RESIDENTIAL

If one assumes that any new housing provided through residential development will be better quality than the pre-existing housing–with environmentally sustainable designs and materials–then we can also assume that the new housing will be less likley to have health-threatening conditions such as mold, lead paint, or loose asbestos. New housing might also help move people out of existing sub-standard housing, provide access to more affordable housing, or even just reduce overcrowding, all of which would contribute to the improved health of residents.

The impacts, however, cannot be accurately estimated due to the tremendous variation in quality of existing housing across regions of the country, among different types of cities and towns, and even within some communities and neighborhoods. BAT, therefore, does not attempt to forecast any environmental or health benefits specific to residential re-use beyond a count of the number of new units added to the housing supply in a neighborhood.

PARKS

Parks and open spaces are essential amenities to healthy lifestyles and can be considered as an environmental 'good.' They support quality of life outcomes that include health, safety, and ecological benefits.[3] In the context of brownfield re-development, the creation of a new park or open space animates potential benefits to health[4] as well as overall increased physical activity.[5]

Increase in access to greenspace and parks may improve community health by increasing a population's physical activity and improving air quality. Thus, they also may increase area property values.[6]

Proximity matters in ways beyond economists' measures of time saved: the closer a population resides to a park or open space, the more likely they will be to use the space for passive or active recreation.[7] In addition to these individual health benefits, a new park is also likely to improve neighborhood air quality by creating new green space, thus improving overall public health. BAT estimates two types of changes in household proximity to a new park to reflect these two benefits: the increase in number of households close to a park and the decrease in the average distance of households to a park allowing users to see, first, if better access and usage might result and, second, how the new greenspace might improve air quality near where people live.

Young people and elderly adults are particularly likely to benefit from close proximity to a park. Because they are likely to have more difficulty getting to parks on their own, the closer they are to a park, the more likely they are to visit and engage in physical activity.[8]

FOOD SOURCE

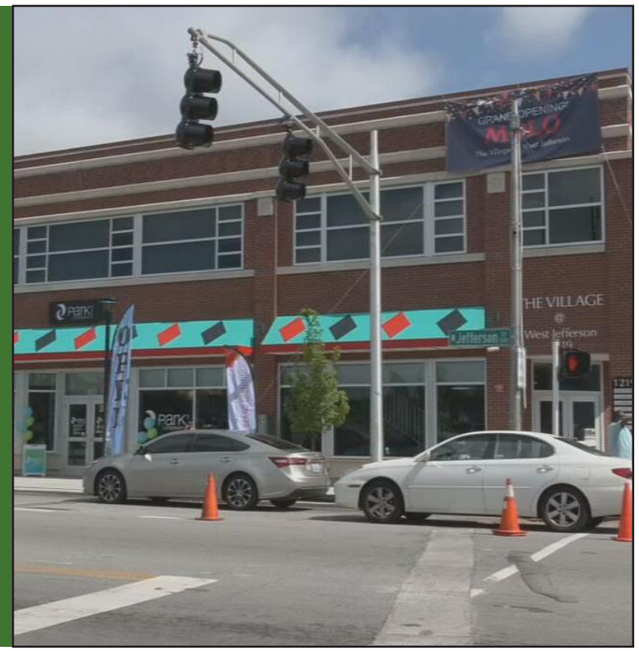
Food access is an important determinant of health outcomes, especially in urban neighborhoods and impoverished rural areas. While virtually all neighborhoods include retail establishments offering food, such convenience stores may not offer fresh produce or other choices that contribute to a healthy diet. Positive health impacts from food access depend on the food being low cost and healthy,[9] factors more closely associated with supermarkets and grocery stores than with convenient stores. Literature on nutrition regards neighborhoods without access to a variety of fresh food as "food deserts." Common practice is to define as a food desert any neighborhood that is beyond some specified distance from a food source, using a one-mile distance in urban settings and 10-miles in a rural one.[10]

BAT measures the proportion of all the households in a given area that face adverse food access conditions, and the extent to which residents might escape that condition with the opening of a full-service grocer. Accurately projecting the health impacts of a new food source depends on many factors that cannot be assumed about the new store (for instance, affordability, culturally relevant food, quality of inventory, or whether the store is welcoming to existing residents). Therefore, users are encouraged to use the projections to supplement discussions about health impacts.

What are the benefits of improving access to fresh food?

Studies indicate that eliminating food deserts improves multiple health factors, including improved dietary intake, lower overweight and obesity rates, lower rates of diabetes.[11] and a reduction in calories from solid fats, added sugars, and alcohol.[12]

The actual benefits of building a new food source will depend on the demographic composition of a given area or neighborhood. The positive effects of increased access to healthier food will also depend on households' knowledge and ability to choose and prepare foods that are healthy—factors tied closely to an individual's socio-economic background.[13] Overall, neighborhoods with greater poverty and large minority populations have less access to supermarkets[14] and have greater dependency on convenient stores as a key source of food. The addition of supermarkets or sources of high-quality and healthier foods particularly benefits lower socio-economic neighborhoods by lessening their dependence on convenience stores.



RETAIL

BAT does not attempt to estimate environmental or health impacts specifically tied to retail. However, depending on the location of the brownfield and the existing infrastructure of the area, the development of new retail establishments may help to make a given area more walkable and provide easier access to jobs and services. Walkability tends to promote healthier neighborhoods and lower greenhouse gas emissions,[15] contributing to both individual and environmental wellbeing.

SOCIAL EQUITY AND COMMUNITY

The social leg of the triple bottom line's three-legged stool addresses measures of happiness, quality of life, sense of connectedness to others, and other related human conditions. Neighborhood level data could be collected to document changes in these measures over time, and there are ways to attribute those changes to redevelopment if one is able to reliably track them over time and clearly determine that they would not have occurred if the redevelopment had not happened. It is not possible, however, to project such changes for all communities and accurately link those changes to the redevelopment of any one brownfield.

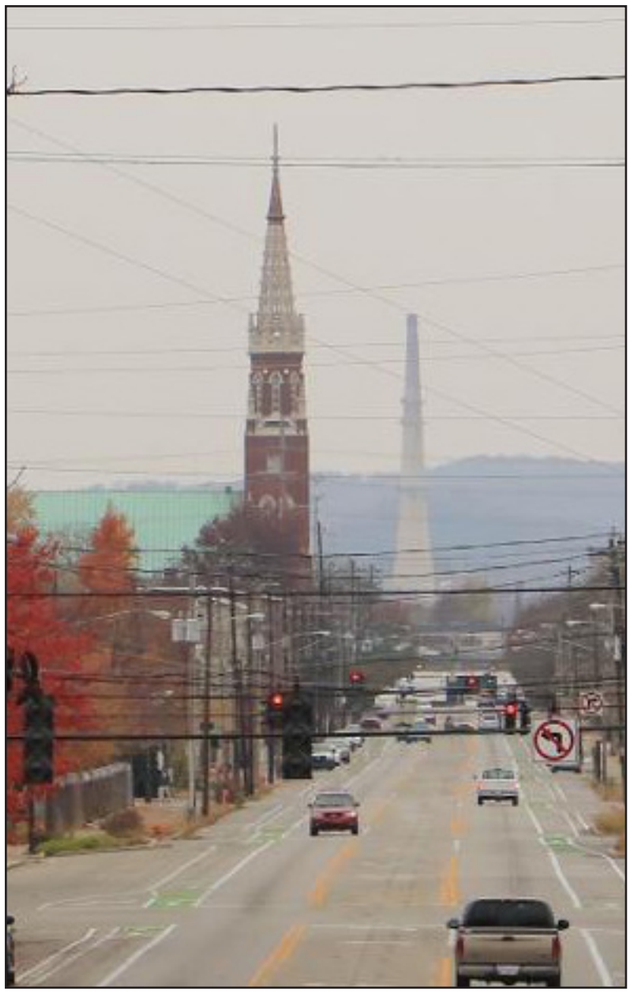
The BABE tools and resulting projections can be used to speak to three areas of social condition and well-being: empowerment, conflict, and population change.

» **Empowerment**: Community-based organizations and neighborhood residents may feel that they have little power to alter the patterns of change they face. Alternatively, they may be the drivers of change, pushing local officials to pay more attention to them and their quality of life. Utilizing the BABE toolkit can provide those residents and CBOs with a sense of what proposed changes might do to their community, and/or provide a basis for petitioning local government to pursue neighborhood-negotiated goals. This involvement could in turn help increase the local sense of empowerment and aid in lifting up the voices of residents in the decisions that affect their future.

» **Conflict**: Utilizing the BABE toolkit to examine the impacts of alternative brownfield uses could either generate or reduce conflict over redevelopment options. Depending on the users' perspectives and interests, it may reveal impacts that raise community concerns that were not previously considered important by the developer such as risk of displacement. On the other hand, it may reveal positive changes and impacts that reinforce the support of a new project such as the scale of improved neighborhood household access to an amenity or service or new tax revenues for the municipality. Ideally, the community might use BABE outputs to build alliances that collaboratively shape local brownfield redevelopment and reduce community conflict.

» **Population Change**: As indicated earlier, neighborhood populations are dynamic, and their characteristics change over time as conditions change and people move in and out of areas. Changes in population characteristics and movement can be tracked over time to help understand whether a new development contributed to those changes. Determining the extent to which current residents remain to experience benefits stimulated by brownfield redevelopments can be done by collecting local residential data and tracking the current residents' conditions and movement over time. It can also be done using census data to compare housing tenure and in and out migration to measure the residential stability over time. This can be used to determine whether the future residents are more or less likely to have lived in the area long enough to have experienced the benefits of the redevelopment. Some population changes are easier to document than others. For instance, if a majority of residents prior to redevelopment are Black and after redevelopment all the residents are white, it is safe to say that the former residents left the area and did not experience any new benefits that resulted from the redevelopment. Income is more difficult and must be combined with other measures that help determine residential stability.

The current version of the BAT generates some baseline measures of area demographics that can then be used with future versions of BAT or other data summary tools with updated data to estimate population changes. There are also certain changes associated with the types of reuse explored in BAT that inform benefits related to social equity.



Social Equity Impacts of Selected Reuse Types

Residential

New housing facilitates population changes in neighborhoods. When the population of a neighborhood changes, many community institutions are affected. For instance, the size and type of religious congregations and their prominence in the neighborhood may shift. Household demands for different services, foods types and eateries, clothing, and other shops may change. As a result, previous assets valued by the original community members might disappear. The change in-and-of itself may be considered to be positive by some long-term residents and negative by others. New residents might like the emerging trends, but their very arrival may be resented by long-time residents. This risk is exceptionally high when new residential development provides the opportunity for people to move into market- rate housing in an otherwise low-income community. Furthermore, if local policies do not adequately address access to affordable housing, any social benefits expected from building new units will only accrue to those who can afford to move in and to those who can afford to remain in the existing neighborhood. Neighborhood decision-makers can use BAT output and projections to better inform discussions about potential social benefits of new residential developments and the likelihood that those benefits will accrue to existing residents.

Parks

Public spaces, among them parks, provide community gathering and resident interaction opportunities. If they are in limited supply, the conversion of a brownfield to a park may improve the sense of community in an area and facilitate interactions that contribute to community empowerment. Perhaps more importantly, turning a brownfield into a park can help address social inequities in areas where parks or greenspace have been historically absent. For instance, BAT provides a measure of improved park access by race and ethnicity that can be used to inform decisions about how best to maximize access for those groups.

Food Source

Living in a food desert is, by definition, experiencing impaired access to good food and nutrition. If a brownfield conversion reduces the proportion of residents in food deserts, it contributes directly to improved social equity. It may also generate population change beyond the change driven by rising property values by making the neighborhood more attractive as a place to live for people with greater economic means. BAT estimates the extent to which a new food source might change the proportion of the population that has ready access to full-service groceries. It also estimates the percentage of those households that include more vulnerable residents, perhaps indicating a more meaningful impact.

Retail

The specific type of retail development can influence the amount and nature of civic engagement in a community.[16] For instance, malls may be gathering places, or places that provide new opportunities for social interaction, even if just waiting in shop lines. There is often a lack of consensus, however, as to who will benefit from specific types of new retail among community members themselves: access to new mass consumer retail (chain stores and the like) might benefit some local consumers, but harm local minority business owners and cultural institutions.[17] Whose priorities should have more weight? BABE alone cannot offer guidance on this question because details on the ownership and size of local businesses is not available in a consistent manner nationwide. However, users with that knowledge can use the tool and its outputs to help community members visualize the general state of retail in the area and some of the impacts they might experience by adding more on a brownfield.

The redevelopment of a brownfield can clearly affect local social equity and the sense of community in a neighborhood regardless of the reuse type. Projecting these kinds of impacts depends on details of redevelopment plans and actual reuse of the site. The following are additional questions a user may consider as they use BABE tools and interpret the outputs.

Additional Questions BAT Users Might Consider to Determine Impacts

- Is there already retail in this neighborhood?
- Is the proposed type of retail needed or wanted by current residents?
- Who will shop at the new retail project?
- Who will this retail employ?
- How accessible is this site?
- How will retail impact property values?
- Who will profit from increased retail spending?

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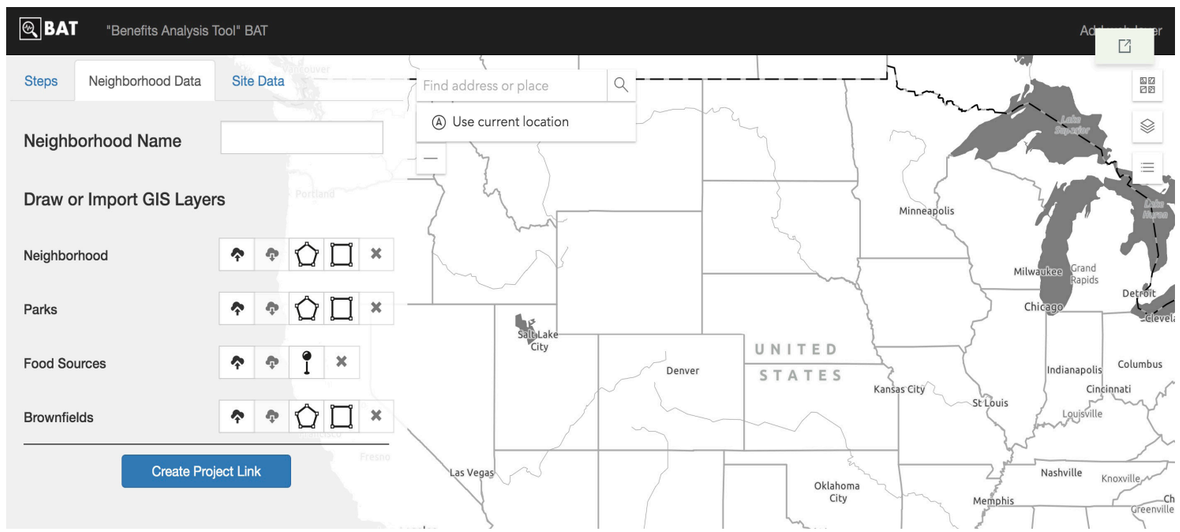
PART IV: Behind the Benefits Assessment Tool (BAT) Curtain

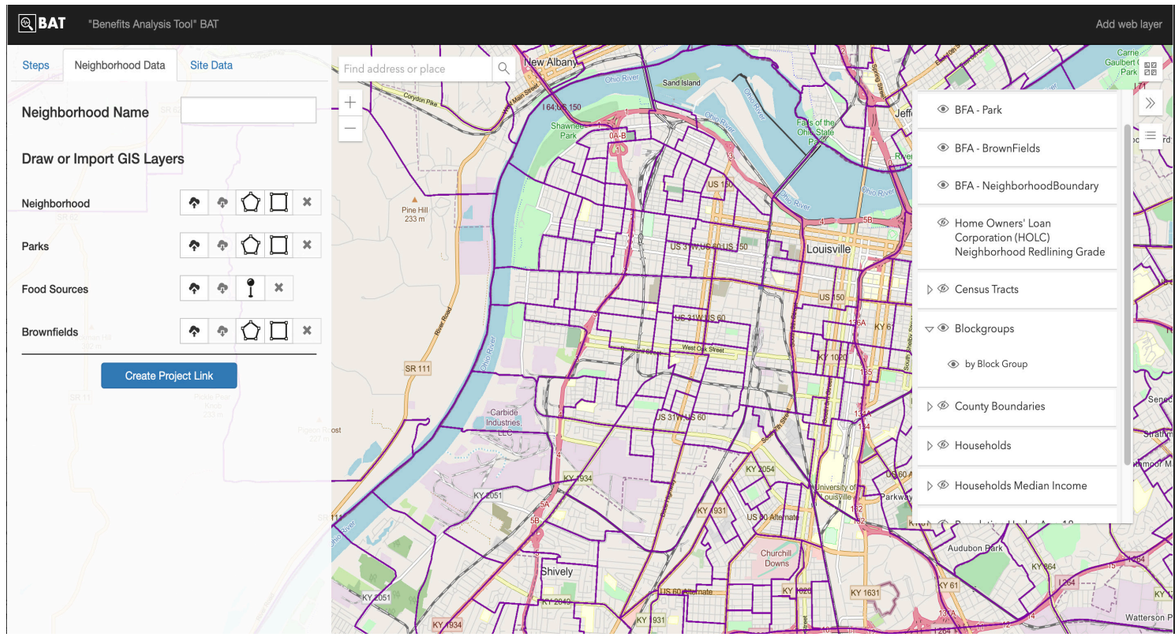
The BAT and the Brownfield Tracker (BT) can operate separately or in close coordination depending on the users' needs and stage of decision making. They are intended to be very flexible and as discussed in Part II might be used at any number of points of brownfields redevelopment processes. This section focuses on the BAT, providing a general description of how it works. We summarize key functions, data sources, and underlying assumptions. Technical details for integrating data from the BT into the BAT are discussed in Appendix B.

One of the most important features of the BAT is that users have the power to define the boundaries of the area they want to examine rather than using those defined by a city or other authority. The BAT is designed to project outcomes for any area the user defines by drawing it in the BAT or uploading a geographic shape file of the area into the BAT.

The BAT combines user-entered data with national data built into the tool to estimate changes that could result from redeveloping a brownfield as one of four different re-use types. It is not intended to serve as a stand-alone scenario planning tool. It can be a valuable contribution to area scenario planning processes.

For national applicability, the BAT models rely primarily on federal sources for data that are available at the US Census block group (BG) or Tract geographic unit. Users must also provide some information and local data so that the models can take local variation relevant to their community into account.

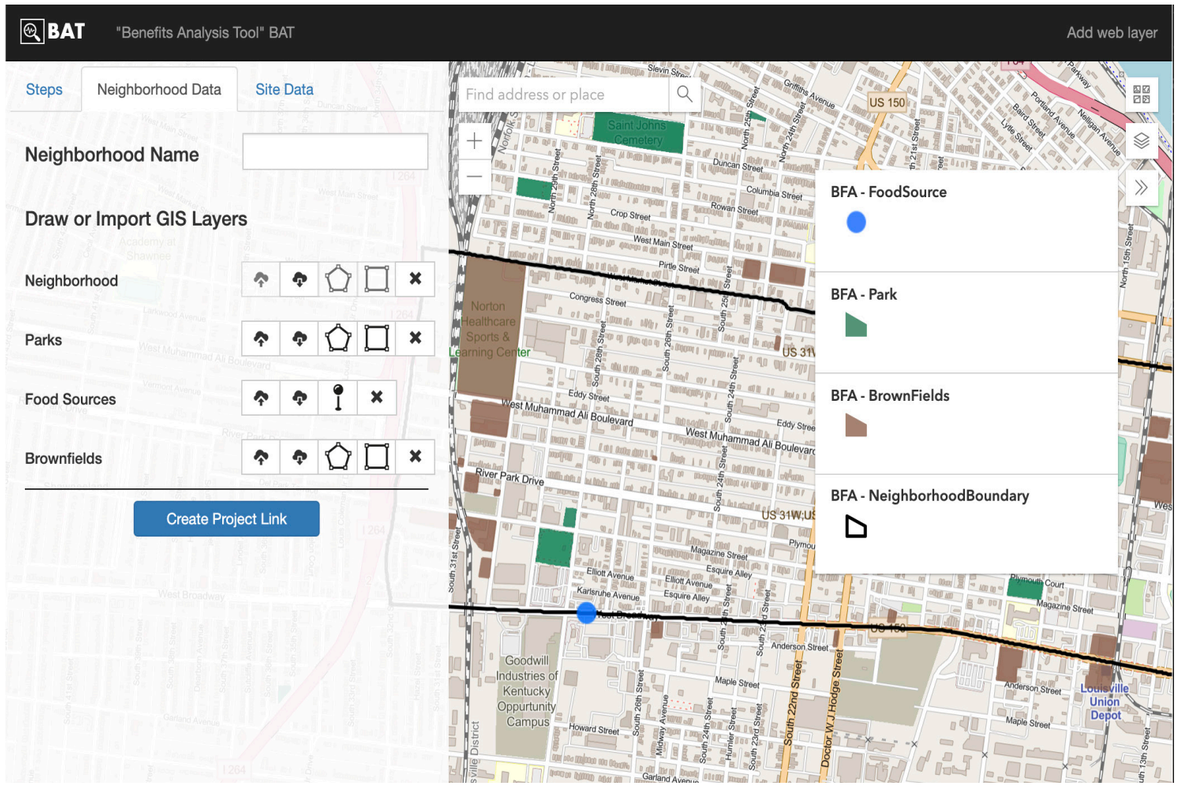




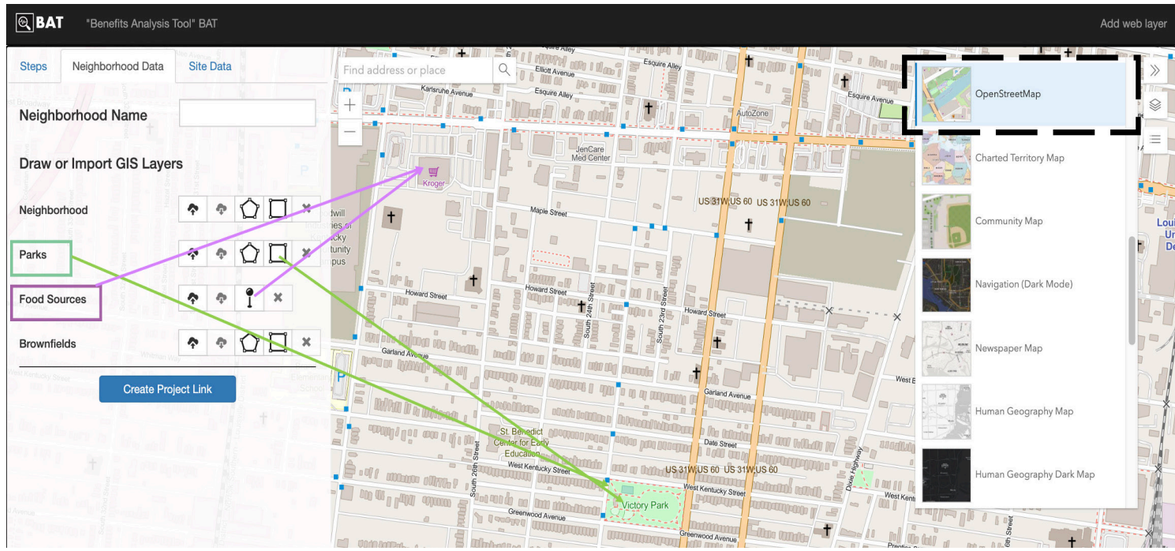
BENEFITS ASSESSMENT TOOL (BAT) DATA ENTRY AND DEFAULT VALUES

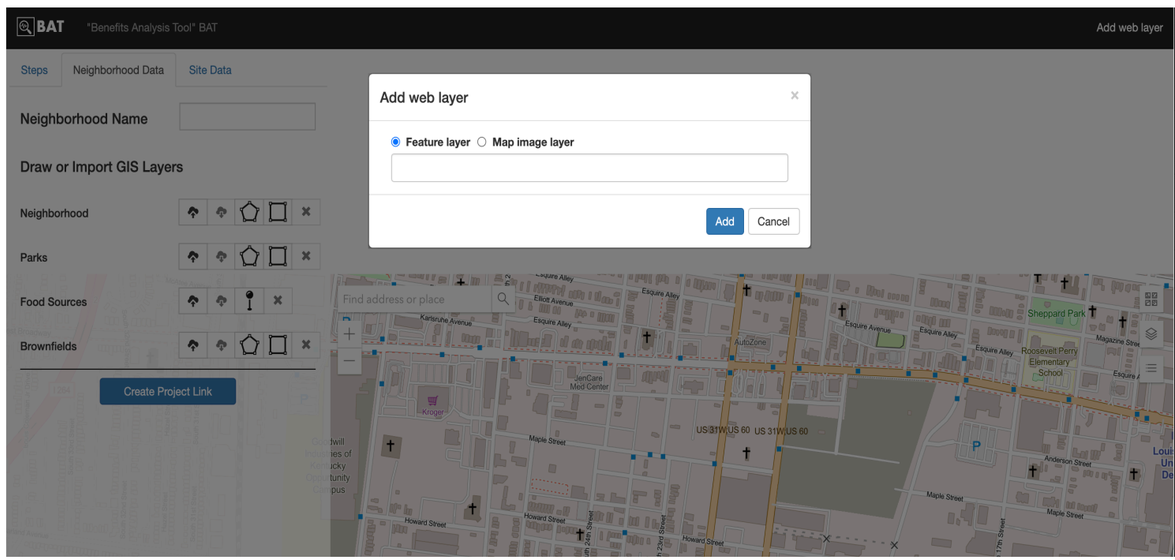
User-provided geographic data include:

- **The location and dimensions of all known brownfield sites** in or within a half a mile of the neighborhood under consideration. If the user does not have access to an inventory, they can develop one using the BABE's Brownfields Tracker or begin exploring options with the EPA's EnviroAtlas data to which the BAT connects. The tracker can also be used to verify an existing property condition inventory that can then be uploaded.
- **The location and dimensions of all public parks or outdoor recreation areas** in or within ¼ mile of the neighborhood boundaries.
- **The location of all full-service food stores** such as supermarkets in or within a mile of the neighborhood boundaries.



The location of brownfields, parks, and food sources can be hand drawn in the BAT or loaded as separate geographic shapefiles and point files. The user can also select different map layers and base maps included in the BAT that contain identifying labels for parks and stores, or they can choose a web layer that includes neighborhood level property lables to assist in hand drawing sites onto their project map.





Brownfield Inventories

Information on brownfield locations can take different forms, but BAT can deal with many of the possibilities:

- **Street addresses** tells the system the location of a property on one street. In this case, the user can see the location and use the BAT interface to hand draw the appropriate parcel or property boundary for the Brownfield.
- **"Point source" data** use the longitude and latitude to show the location of a brownfield site. Similar to an address, BAT will display the point location and the user can hand draw the parcel boundaries using the BAT interface.
- **GIS shapefiles** that specify each brownfield site boundary. Ideally, this is the format of local brownfields inventories.

There is a risk that BAT may underestimate the size or extent of a brownfield if the user relies solely on point or address data to build an inventory or identify a potential project site since some brownfields may involve several adjacent parcels of land. As users' data inputs grow and are refined, BAT produces better projections and estimates. (This is one example of how data from the BT on the apparent size of the Brownfield can be used to improve the quality of the BAT analysis and output.)

User-provided project information includes:

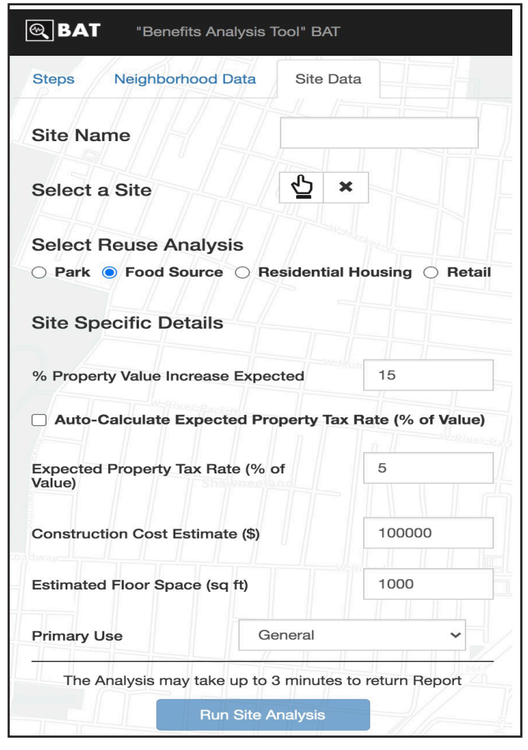
- **The anticipated cost of construction for the new development**, excluding the cost of any environmental cleanup needed on the brownfield site.
- **The estimated total square footage in the new retail or food source development** devoted to the new use.
- **The proposed number of new housing units** in the case of a residential development, with the number of market rate and affordable or subsidized units to be built and how many of each are intended to be rented out or sold. [This is information needed for BAT to calculate projections related to residential, foodsource, and retail reuses.]

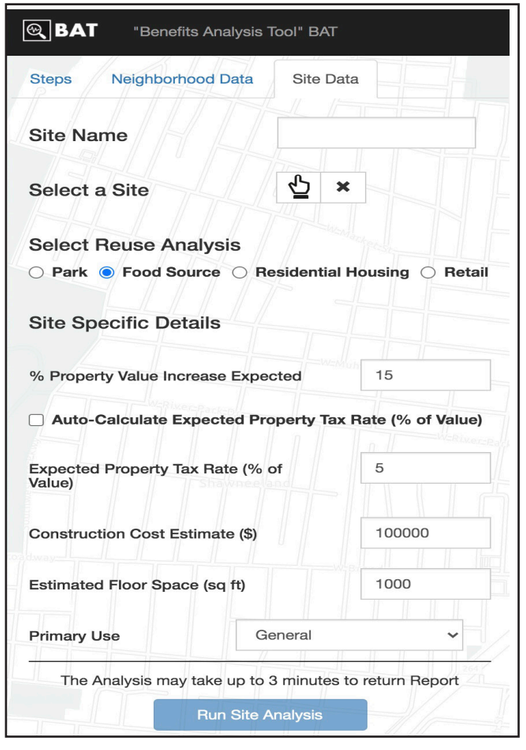
BAT-provided default values

The BAT assumes the value of several variables based on trends identified in the literature about brownfields redevelopment. However, users who have their own data can enter information to tailor or adapt the models to their local conditions.

- **The expected rate of area property value increase.** The user has the option of allowing BAT to auto-calculate this as a function of relative median incomes of the neighborhood and its county because researchers have shown that brownfields redevelopment in poorer areas have higher rates of property value increases[3]. Users can also override this rate of increase to reflect a more accurate value.
- **The local municipal property tax rate.** The user can opt to have BAT perform an auto calculation that bases its estimate on the percentage of the median property value in the area, or they can enter a value that is informed by the local context (page 68).
-

- **The distance to a park** that is considered the maximum for the park to be walkable for residents. The default value used by BAT in the absence of a user input is 1/4 mile. If the area is one in which a different distance makes more sense, the user may override this accepted distance.
- **The distance from a full-service food source** that defines a food desert or considered acceptable for residential access. The default value used by BAT in the absence of a user input is one (1) mile. This default value can be revised to account for local access to public transportation or automobiles.





Explaining the Property Tax Rates

Local real estate tax rates can be misleading, so users must be careful. Rates are usually quoted as "millage" – the dollars due for each $1000 of property value. A 5.4 millage rate on a $10,000 property value would thus be $54 in tax due. That's the same as a 0.54% rate on $10,000. The rule for converting from millage to percentage is simple: divide by 10.

But there is a problem: Published millage rates do not always indicate how the taxed "property value" relates to the fair market value of a property. Some places apply a millage rate to the full market value of a property, but others may apply it to some fraction of market value. That fraction could be as low as 10% in some cases.

That means that the data entered by BAT users cannot just be one-tenth of the published millage rate unless the property value used for taxation is 100% of the market value. If the "property value" is only a fraction of the fair market value, then the published millage divided by 10 should be multiplied by the fraction to get at the actual rate. In the example above, if the $10,000 "property value" is only half (50%) of the market value, then the $54 tax paid on a $20,000 market value is only 0.27%, not 0.54%.

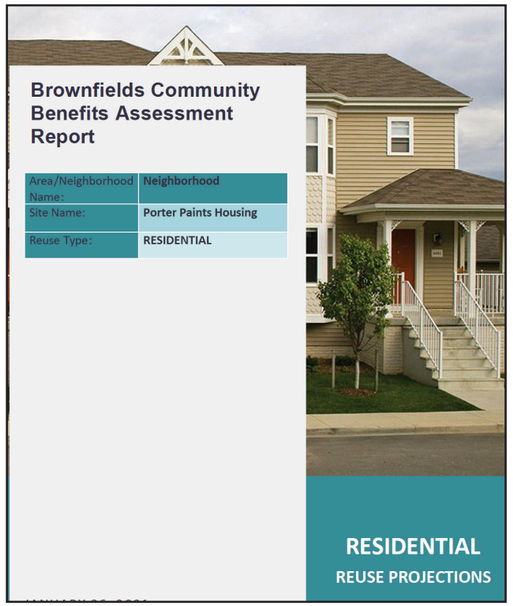
So, Real Estate Tax Rate is 1/10 times Millage Rate times the fraction of "fair market value" that is taxed.

BAT OUTPUT AND ANALYSIS

BAT Reports

Once the user has entered the necessary inputs about the area, project, and re-use option, the BAT generates a PDF report of projected community impacts for the user.

The basic mechanics are described here and in more technical detail in Appendix B.



1. Area/Neighborhood Profile – The BAT uses areal weighting to estimate the number of households in the user's selected area/neighborhood along with the percent that are renter or owner occupied. It provides a summary of household level racial/ethnic distribution for the area along with the median household income and the median income for the county in which the selected area is located. These data are used to provide the user with a picture of the existing residents in order to provide a scale of impact. For residential reuse, these data are used as a baseline to compare changes that an influx of new households may have.

Area/Neighborhood Profile[i]

	Pre-Redevelopment	
	#	%
Households in Area/Neighborhood Selected	3,405	
Renter Households	2,877	84
Owner Occupied Households	528	16
Households Headed by Elderly	638	19
Households with Children	1,573	46
White non-Hispanic Households	123	4
Black/African American non-Hispanic Households	3,156	93
Hispanic/Latino Households	63	2
Asian/Pacific Islander Households	0	0
Native American Households	0	0
Mixed/Other Households	102	3
Area/Neighborhood Median Household Income (MHI)	$ 21,948	
County Median Household Income	$54,357	
Ratio: Area/Neighborhood MHI / County MHI		40

a. Retail Area Profile – The BAT compares the share of businesses in the area that are retail with the share for the metropolitan area in which the selected area is located. It also provides the user with the same comparison for the average number of employees per retail establishment and the number of retail jobs and retail establishments per square mile. BAT estimates retail diversity by comparing the number of retail establishments per square mile in the selected area to that of the Metro area. It estimates retail adequacy by comparing the number of stores per household in the area with that in the Metro area. This sets the stage for a conversation about the value of retail to the existing households by providing the user with summary information about the neighborhood's general retail profile.

Non-Food Related Retail	Local Area	Metropolitan Area	Local/Metro Ratio (%)
Retail Businesses	7.1%	12.0%	
Retail Jobs	4.0%	10.1%	
Employees per Retail Establishment	13.6	16.6	
Retail Job Density (per sq. mile)	96.9	18.3	529.5%
Retail Establishment Diversity (per sq. mile)	7.1	1.1	645.5%
Retail Adequacy (stores per household)	0.3	0.7	42.9%

2. Distance to Important Amenities – The BAT calculates the average houshold distance to a park or food source by determining and then averaging the distance from all households in the selected area to the nearest park or food source. Then the BAT computes the change in residents' average distance to a park or food source. Households will have no change in their distance as the result of a brownfield redevelopment if they already have a park or food source that is closer to them than the redevelopment. Others will get closer resulting in a decrease in average distance. Future iterations of the BAT could examine other amenities that residents value and want to have in closer proximity or more easily accessed.

a. **For parks**, the literature suggests higher user benefits for those within the range of 0.25 miles to 1 mile[1] of the park boundary. Absent a user override, the BAT calculates the total number of households which fall within 2500 ft or about 0.5 miles of a park boundary before and after the redevelopment. This is then used to compute the increase in the percent of households in the neighborhood with park access by comparing before and after redevelopment distances as a result of a new park or as a result of new residential units.

b. **For food sources**, as we already noted, the relevant distance for households in urban areas is over one mile from a full-service grocery[2]. Absent user input that considers local expectations around food access, the BAT calculates the neighborhood households within a food desert, or more than a mile from a full-service grocery store, before and after the redevelopment of a food source or after the addition of new residential units.

Access and Distance
to a Park

	Pre-Redevelopment	Post-Redevelopment	Change
Households with Access to Parks	83%	84%	+1%
Households Headed by Elderly	14%	14%	+0%
Households with Children	39%	39%	+0%
White non-Hispanic Households	2%	2%	+0%
Black/African American non-Hispanic Households	78%	78%	+0%
Hispanic/Latino Households	1%	1%	+0%
Asian/Pacific Islander Households	0%	0%	+0%
Native American Households	0%	0%	+0%
Mixed/Other Households	12%	12%	+0%
Average Household Distance to Parks	1,574 ft	1,509 ft	65 ft

3. Job Creation – For residential, retail, and food source reuses, BAT draws on the information users enter for construction cost and size estimates of the proposed project to project short-term construction jobs created as well as long-term jobs for retail and grocery stores. For a retail reuse, BAT also reports existing labor force, high school graduates, percent high school graduates in the labor force, and the average unemployment rate in the selected area to provide measures of demand for jobs and education level of area residents as a way to begin to identify employment gaps that might need to be addressed to assure that those new jobs could go to residents.

Jobs

Area Labor/Employment Profile	Pre-Redevelopment
Labor Force in Selected Area (#)	2,206
High School Graduates or Less (25-64) in Selected Area (#)	
Percent High School Graduates or Less (24-64) in Labor Force	81%
Average Unemployment Rate (Selected Area)	26%

Post-Redevelopment	
# of Person-Years of Construction Work Created	5
# of Long-Term Jobs Created	28

4. Neighborhood/Area Property Value Increases – Research on the impact of new brownfields redevelopment on property values in a surrounding neighborhood suggests that values increase the most in areas where the median income is below 80% of the county's median[3]. Therefore, absent a user override, BAT projects an increase in property values as a function of the relationship of the neighborhood median household income to the county's. The expected property value increase is then adjusted to account for the impact of any remaining brownfields in the area have on those property values. The calculated property value increase is also used to estimate the expected property tax revenues and associated percent change for the area.

Property Tax Revenue

	Post-Redevelopment
$	+$17,575
%	+1.16%

5. Risk of Exposure –The BAT uses the baseline demographics from the neighborhood profile to project the number of households that, after redevelopment, would no longer bear health risks that may be associated with on-going exposure to the contamination on the brownfield site and who are no longer within ¼ mile of any brownfield site.

Risk of Exposure

	Pre-Redevelopment	Post-Redevelopment	Change
Total # Households at Risk of Exposure in Area/Neighborhood	2,740	2,584	-156
Households Headed by Elderly (#)	561	557	-4
With Children (#)	1,226	1,125	-100
White non-Hispanic (#)	95	94	-1
Black/African American non-Hispanic (#)	2,545	2,399	-146
Hispanic/Latino (#)	50	45	-5
Asian/Pacific Islander (#)	0	0	-0
Native American (#)	0	0	-0
Mixed/Other (#)	81	75	-6

6. Risk of Residential Displacement – Any brownfield redevelopment may cause nearby housing to become less affordable and put residents at an increased risk of displacement from their neighborhood as they become increasingly housing cost-burdened. When brownfields are redeveloped and property values rise, the BAT assumes that rents will eventually rise just as much. The rent increase may be delayed by leases that limit rent increases, but the effect will occur. The impact on housing costs for homeowners may not be as great assuming that mortgage costs do not rise along with property values, though increased taxes and insurance rates are likely. Even slight increases in housing costs can cause residential displacement for households who are cost burdened with shelter costs that exceed 30% of their yearly income[4].

To capture a measure of risk of residential displacement, the BAT estimates the percentage of renter households who are currently cost-burdened in the selected area. It then uses the property value increase to estimate percent in rent increase and calculates the number of renter households who are likely to be pushed into the cost-burdened category, paying more than 30%, and the extremely cost burdened category of paying more than 50% of their income on shelter costs. This calculation provides the user with a conservative measure of the scale of risk of displacement that might be borne by current neighborhood households.

Risk of Displacement

	Pre-Redevelopment	Post-Redevelopment	Change
% of Renters Paying 30%+ of Income on Rent	56%	58%	+2%
% of Renters Paying 50%+ of Income on Rent	35%	35%	+0%

Finally, the BAT output report includes a selection of neighborhood maps that provide the user with visual representations of area measures pre- and post-brownfield redevelopment.

AREA MAPS

Key assumptions underlying the BAT projections include the following:

» The BAT distance measures do not account for hills, valleys, rivers, streams, rail lines, or limited access highways. It thus assumes that one place poses the same barrier to movement of people or contamination as in any other.

» The neighborhood/area household demographic estimates assume that the households and people in any one Census Block Group, Tract, or other geographic unit are spread evenly across the area so, for instance, half the land area holds half the people. (See … Geographic Interpolation.)

» When property values increase in an area, the BAT model assumes that rent costs will go up by the same percentage.

» The calculation assumes that there is no risk of displacement for renter households when rents, even if they rise, remain below 30% of renter household annual income.

» The property value change impact is assumed to occur equally for all properties that are within 2500 feet of the edge of any brownfield.

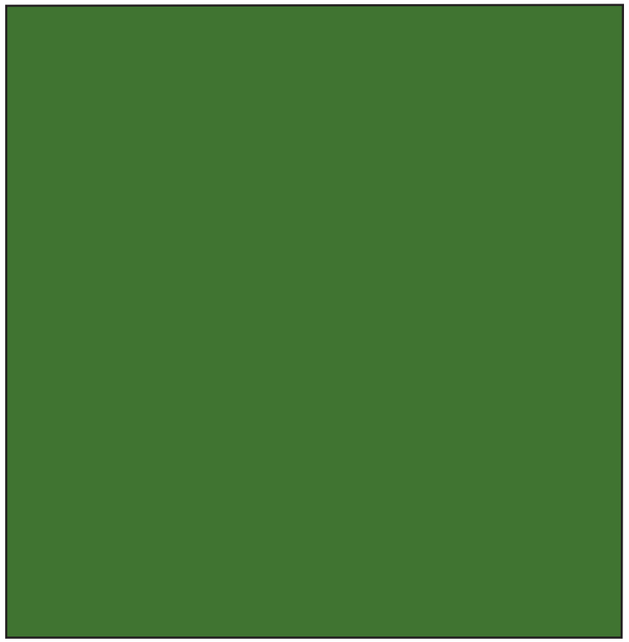
» Nearby property value increases that may be driven by reclamation and redevelopment of the brownfield under consideration are estimated to be cut in half for all properties that remain within 2500 ft of any other unremediated brownfield.

» Any decrease in risk of exposure to environmental hazards that households may gain from a nearby cleanup up of a site is nullified if the households remain with 2500 ft of another unremediated brownfield.

» When current residents of the neighborhood move into new housing built on a brownfield, their old homes will be filled by people with similar household characteristics.

» New residential re-use does not include any demolition of existing, occupied housing on the site or in the neighborhood.

» New market rate housing built on a brownfield will attract new residents to the neighborhood who will have higher estimated incomes than those living there before the redevelopment.



Data Sources

The BAT relies on existing national data. Appendix B includes a list of public data sources and a description of how they are used or transformed in the BAT. The BAT relies primarily on U.S. Census American Community Survey 5 year estimates, retail data from Census County Business Patterns that are cross walked from zip code to census tracts using HUD USPS crosswalk files.

Incorporating Community-Specific Data

The BAT incorporates community specific data and project information the user enters or uploads at the start of the analysis. This includes the area/neighborhood boundaries, a brownfield inventory with location data, locations of parks and full-service grocery stores, rough estimates of size of new retail and size of the retail footprint, and the number of subsidized and market rate residential housing units broken out by renter and owner occupied. The user can also override the BAT default calculations for the expected property value increase rates and the property tax rates as well as default acceptable distances to parks or food sources specific to the area in question based on better local knowledge.

Subsequent interpretation of the output is more valuable and informative when area and resident perceptions and values are available to put the results into context. Regardless of what measures may be collected for the environmental, social, and economic conditions of neighborhoods and how they might change as the result of different brownfield developments, there remains the question of whether or not those changes are of importance to the people in the area. Users who include their own measure of importance can reduce the number of conditions they track and focus on those that are actionable and relevant for decision making[5].

BAT SUMMARY

BAT LOCATION: https://brownfieldbenefits.com/index.html?

Key Features

» Exploratory tool with the ability to import local brownfield inventory data &/or draw in specifically desired areas of inquiry of brownfield analysis.

» Communities may supply their own data for: Neighborhood boundary (polygon), parks (polygons), food source locations (points), brownfield site locations (polygons).

» Analyze community conditions with widely available community data sets down to granular neighborhood level.

» Site specific analysis accessible via Browser, No Software Required (Chrome recommended).

» National Coverage to analyze reuse alternatives for brownfield site outcomes: Housing, Parks / Greenspace, Food Source, and Retail.

Basic Steps

Step 1: Identify and map community brownfield conditions
» Review and import a community's existing brownfield inventory data, or
» Enlist team, municipal agents and/or community partners to deploy BT form developed for Esri's Survey123 mobile app
» Augment an existing brownfield inventory or create a new one.

Step 2: Import brownfield site data from BT as a GIS feature service, review and prioritize sites for intervention using local goals and considerations.

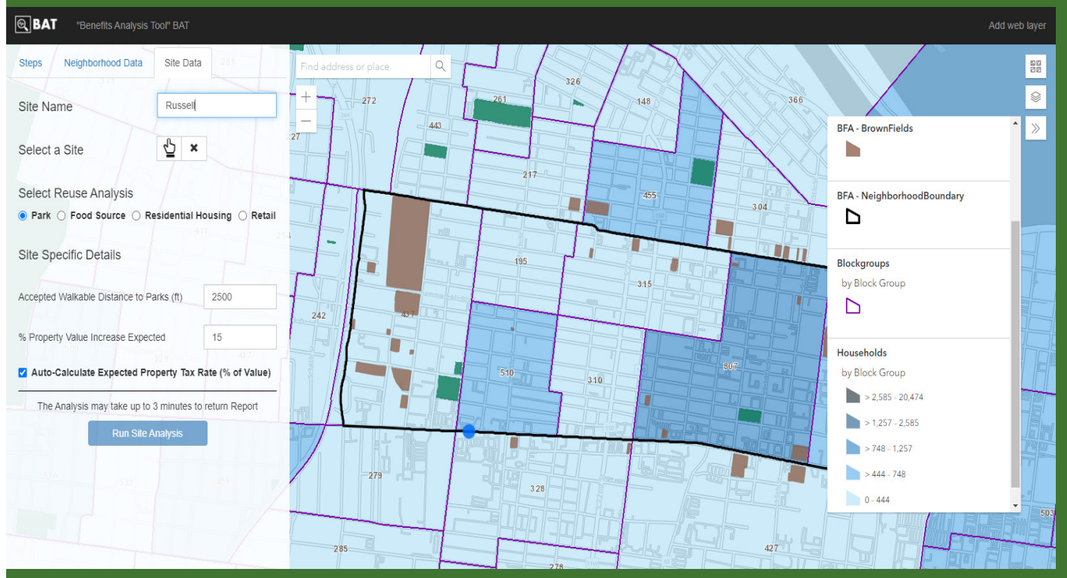
Step 3: Review brownfield inventory and priority sites in the GIS-based Benefits Analysis Tool (BAT). Use the mapping utility to identify, visualize, and analyze the brownfield sites and sites of interest for analysis with the application.

Step 4: Run the BAT to compare desired outcome of reuse scenarios:
» Residential
» Parks / Green space
» Food Source
» Retail

Step 5: Decide & implement intervention that best suits community goals.

Technical Note on Geographic Interpolation and Areal Weighting

Neighborhood boundaries do not often follow the same lines as U.S. Census geographies. Neighborhoods are made up of a collection of whole and partial census block groups or tracts. The population and other characteristics of the partial block groups or tracts should not be counted as if the whole area is in the neighborhood, but the information on the partial units should not be ignored. ***Areal weighting*** is a simple method of ***geointerpolation*** that provides an estimate for population characteristics of partial U.S. Census geographies based on the percentage of area that is included in a neighborhood or other selected area of interest[6]. If, for example, half of the area of a census block group is in the neighborhood and half outside, then only half of the households in the block group will be counted as being in the neighborhood. If only 25% of the block group area is in the neighborhood, one quarter of the households are included. As a result, the BAT adjusts the values of the census data used to account for those differences using areal weighting.



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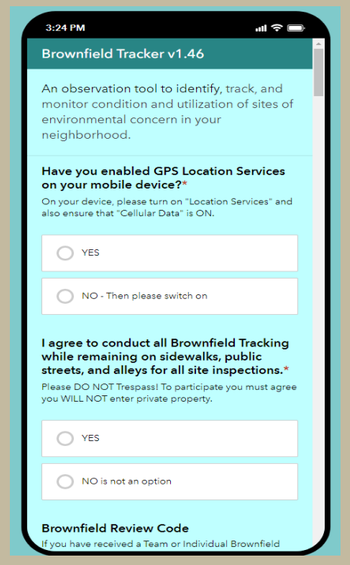
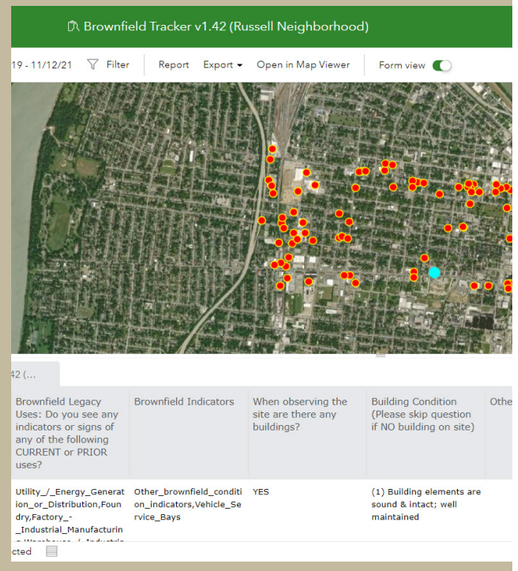
PART V: Building a brownfield inventory

Addressing brownfields requires identifying property location, condition, and history. Making a list is the first step.

What is the Brownfield Tracker?

The Brownfield Tracker (BT) is a mobile application that helps users identify and keep track of properties to be considered for a brownfield inventory. It leads users through questions that document observations of the physical and environmental condition of a specific property. The information can then be used to track of property conditions over time and prioritize addressing those that have environmental conditions of concern.





WHO CAN USE THE BROWNFIELD TRACKER?

Anyone interested in creating or updating a brownfield inventory can use the Brownfield Tracker. For example, brownfield program coordinators, economic developmnet and planning staff, consultants, or EPA Brownfield Grantees at the tribal, state, or municipal level can use it to better understand the geographic distribution and condition of properties that have environmental concerns.·

It can be used by and with community members most impacted by the environmental conditions of the suspected brownfield properties. Researchers and educators can use it to engage students in data collection and analysis for and with community members.

WHY BUILD AN INVENTORY AND WHY USE THE BROWNFIELD TRACKER

Brownfield sites are defined by how they are used. “Brownfields” and “sites of brownfield interest” exist in communities not in a condition of stasis, but rather in a continuum of use. A site designated a brownfield today, may be a corner store next month, or vice versa. Beyond a user’s perception of environmental conditions or potential contamination, a site’s designation as a brownfield is also linked to its current use at the time of the observation. As sites cycle into and out of use, they may also cycle into and out of fitting the definition of being a “brownfield”. Thus, the hyper-local team has developed BT with questions that can help communities track sites of brownfield interest as their use may shift over time. As users answer questions with geo-tagged observations over several years the sites of interest the community can review these data in context with other measures. They can then better determine the relationship between their environmental conditions, intervention choices, economic trends, and demographics, and properly align future redevelopment efforts.

DEVELOPING A BROWNFIELDS INVENTORY WITH BROWNFIELD TRACKER MOBILE APPLICATION

Through the standardized BT mobile application, users can identify and distinguish brownfield and sites of future brownfield interest. Once the sites are identified, those data can be uploaded to the BAT desktop application for projecting community benefits related to reusing sites in the inventory. Thus, the BT can be useful for both site identification and redevelopment prioritization. In addition, the BT application can be used for on-going monitoring of site conditions, and to confirm redevelopment completion and reuse.

Brownfield Tracker Technical Information

SET UP STEPS FOR PROJECT LEADERS

Step 1: Obtain access to an account with Esri ArcGIS Online. BT uses Esri's Survey123's three components:

- Survey123 field app: to use on mobile devices to gather data in the field,
- Survey123 website: a web portal to map, review and analyze the data gathered,
- Survey123 Connect: a desktop app for creating surveys.

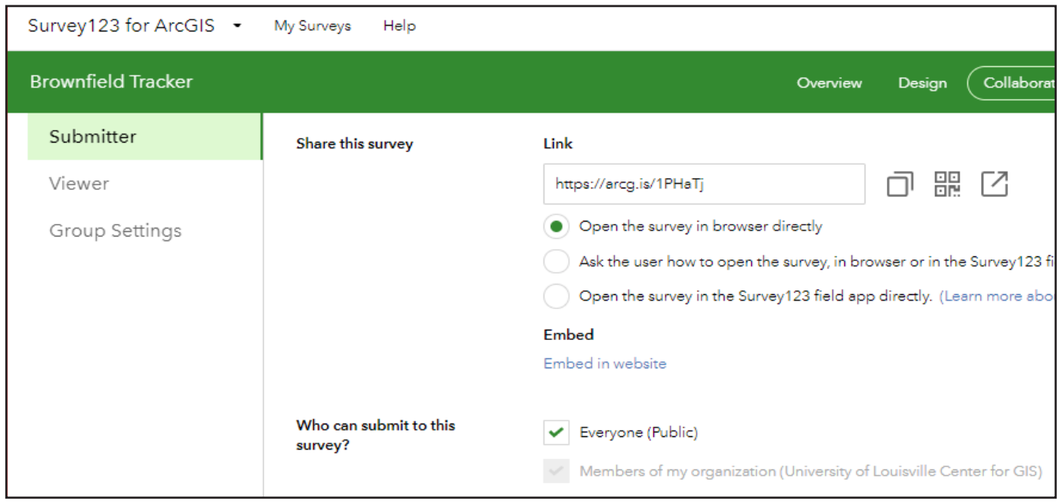
If a Project Leader does not have access to an Esri ArcGIS Online organization account, they can partner with an affiliate that does. Universities, municipalities, land bank organizations, redevelopment corporations, quasi-governmental entities, and other nonprofit organizations often hold Esri ArcGIS enterprise accounts and may prove helpful partners.

Step 2: Ensure the Esri ArcGIS account includes the Survey123 application to be able import BT. Project team members and data collection volunteers do not have to purchase Survey123 to gather data with BT.

Step 3: Download the latestes version of the BT Survey 123 template in the form of an ".XLS Form" file from the UofL CEPM team and use the "Survey 123 Connect" desktop application to import the BT Template XLS Form into the Survey 123 content folder of the account holder, idealy the Project Leader's or affialiate partner organization's account.

Step 4: Use "Survey123 Connect" to publish the BT into your ArcGIS organization for sharing with any other internal team members who will be assisting with data analysis.

Step 5: Share the new Project BT survey link with those who will collect data in the field.



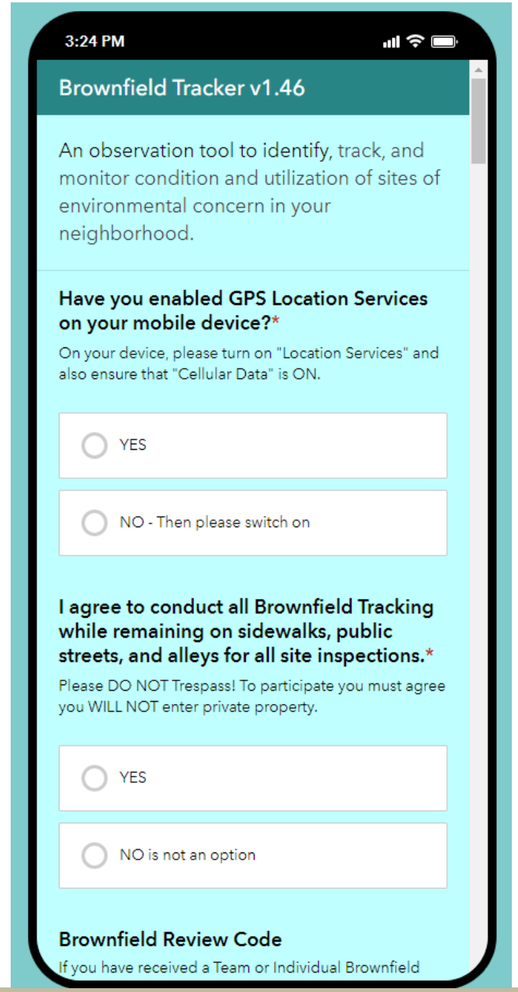
SET UP STEPS FOR USERS TO COLLECT FIELD OBSERVATIONS

There are two ways of connecting to the Project BT.

1. Data collectors use their own free ArcGIS Online Account and the free Survey123 mobile app. To do this:
   a. Download Esri's Survey123 mobile app (either IOS or Android) from Apple Appstore, or Google Play Apps on user mobile device as "native" app.
   b. initialize the BT in the app using the link provided by the Project Leader.
   c. Select using BT through a web browser or the installed Survey 123 mobile app. Using the mobile app works faster in the field.

2. Data collectors may use a web browser such as Chrome on their mobile device to simply open a link to the Project BT provided by the Project Leaader.

In both cases, mobile wireless service is required.



REQUEST BROWNFIELD TRACKER TEMPLATE FROM CENTER FOR ENVIRONMENTAL POLICY AND MANAGEMENT

https://louisville.edu/cepm/publications/tool-kits/request-access-to-brownfield-tracker-template

Collecting Community Data

Who should collect local data?

In most instances, project support and participation can only be generated through the engagement of one or more community based organizations (CBO) (e.g. churches, community development corporations, clubs, and so on). Such organizations can more readily recruit participants in data collection than any group of outsiders could. They also can provide legitimation, resulting in more honest expressions of hopes and fears by residents and businesses in the area. Moreover, they are likely to be directly or indirectly involved in the remediation and regeneration process and thus have be more invested in the outcome of an effort to determine the best possible type of redevelopment and future use.

But, who really represents a community? A community is more than a single organization. In some settings, there may be multiple CBOs with competing concerns and objectives. In other words, any effort to gather data in collaboration with any one CBO—or even a group of them—must remain sensitive to the fact that the cooperating institutions are not representative of the community for which triple bottom line impacts are supposed to be derived. HOWEVER, that does not mean that hyper-local data collected by CBOs cannot be used and indicators cannot be found.

"Community engagement" has been promoted by many in order to get residents and property owners in an area more involved in planning for proposed changes in order to avoid objections and delays once plans are made. People who are not sufficiently involved to become members of any CBOs are also not likely to become sufficiently organized to intervene once plans are made by their neighbors. They may have no political voice and that may be unfortunate, but if outreach has pursued all local CBOs, little more can be expected of planners[1].

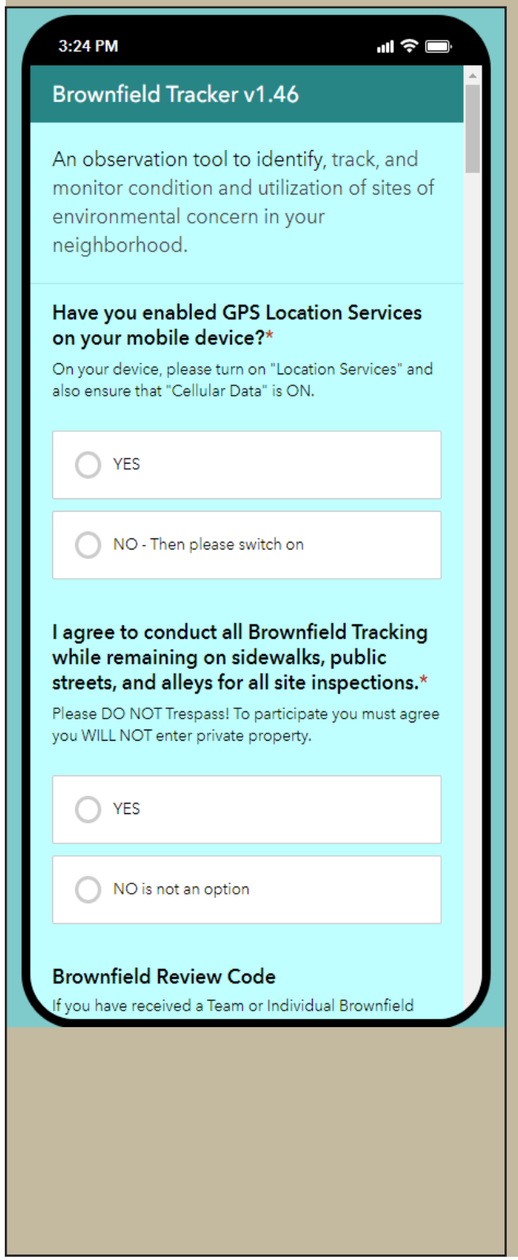
The Brownfield Tracker Inventory Questions

For all screens, the asterisk (*) indicates that answering this question is required.

Have you enabled GPS Location Services on your mobile device?*
The first question reminds users that they must ensure that their GPS location services are engaged so the data they gather in the field will include location tags for mapping the results. If wireless telecom services are used by the device, the data gathered will be uploaded to the cloud server automatically.

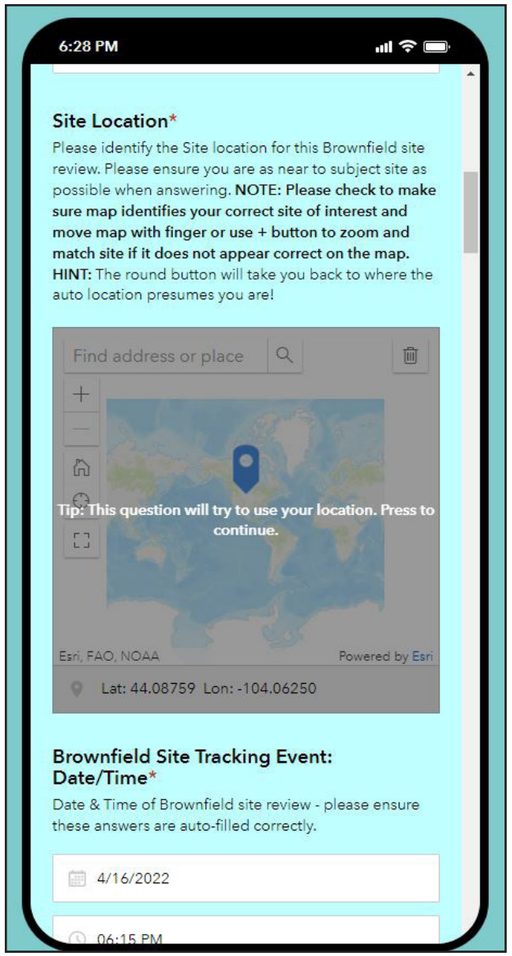
I agree to conduct all Brownfield Tracking while remaining on sidewalks, public streets, and alleys for all site inspections.*
This question reminds users that they must remain on public rights of way (sidewalks or roadways) and be sure not to encroach on private property during their Brownfield Tracker use. This is a public safety question that is a necessary reminder, and must be emphasized during training of both community members or staff users of Brownfield Tracker.
Note: The radio buttons may automatically fill after first use.

Brownfield Review Code
If you have received a Team or Individual Brownfield Tracker Code please enter it here. Otherwise, please continue.
Using a Brownfield Review Code allows teams of data collectors to be idetified using a common code that identifies their data entries for future review by the Project Leader.



Site Location*
Please identify the site location for this Brownfield site review. Please ensure you are as near to subject site as possible when answering. NOTE: Please check to make sure map identifies your correct site of interest and move map with finger or use + button to zoom and match site if it does not appear correct on the map. HINT: The round button will take you back to where the auto location presumes you are!

The Site Location item is key to locating the exact GPS location of the user's review of a particular subject site. This is the core to identifying site conditions at a specific day, date, and time. The location tool automatically pinpoints the user's location. However, the user must examine the map to ensure that the location represented is correct, and if not move the map to simply confirm the pin is within the site the user has identified. However, if the data is identified for an incorrect site in the field, the Project Leader may later use the desktop data review and adjust the location to ensure data is attributed to the correct site. This can occur with cell service disruption in the field.



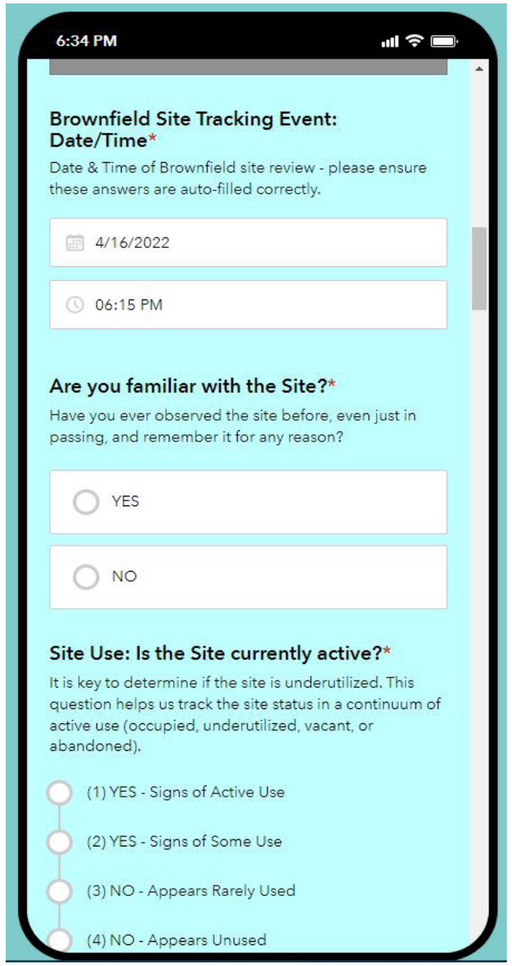
Brownfield Site Tracking Event: Date/Time*
Date & Time of Brownfield site review - please ensure these answers are auto-filled correctly.

This mobile app automatically identifies the date and time that data are entered for each site observation. Users are encouraged to confirm that the date and time is correct for when starting a particular site condition review. If not, enter the correct information.

Are you familiar with the Site?
Have you ever observed the site before, even just in passing, and remember it for any reason?
This question provides a measure of the user's level of knowledge of the site.

Site Use: Is the Site currently active?*
It is key to determine if the site underutilized. This question helps us track the site status in a continuum of active use (occupied, underutilized, vacant, or abandoned).

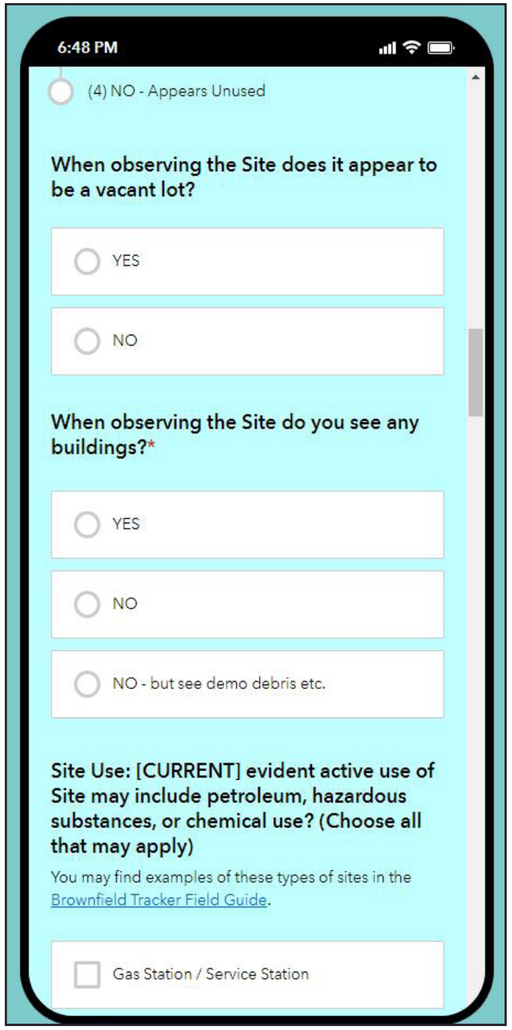
A key innovation in Brownfield Tracker is found in this question. This question identifies the current status of activity at the site. The question was designed to provide users a way to indicate conditions at the site that exist within a "continuum of use". Users may not know just by looking at the site on a particular day if the site is active and occupied, witnessing some limited use, underutilized, rarely used, or unused. However, the subjective designation that



users can provide by viewing a site is nevertheless key to helping track brownfield conditions. Users are asked to make their best judgment based on conditions witnessed when observing the site, and if they have experience with the site, it may also help inform their understanding and answers in the continuum of use for current site activity.

When observing the site does it appear to be a vacant lot?
This question documents vacant lots. Often historic brownfield site creating conditions have been removed by demolition and site clearing.

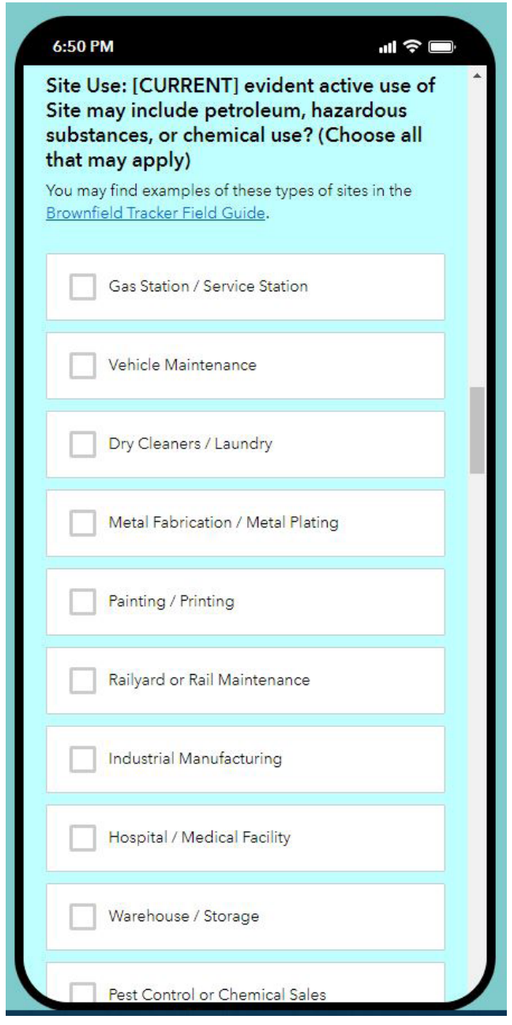
When observing the site do you see any buildings?
This question includes Yes, No, and No - but see demo debris, etc. This question lets the user quickly indicate the presence or absence of structures on the site, or indication of prior site existence. This is especially helpful to assist in tracking change in the built environment in a community, and it can also assist in vacant and abandoned building inventories. Sometimes demolition debris left on a site can itself present environmental challenges.



Site Use: [CURRENT] evident active use of Site may include petroleum, hazardous substances, or chemical use? (Choose all that apply)
The options for identifying evidence of current use include many typical brownfield creating uses derived from typical handling of petroleum (vehicle maintenance, or service), hazardous substances (dry cleaners, printers, factories, etc.), or chemicals (acids, bases, caustics. Community members, and municipal workers may easily recognize the following site uses which often lead to future brownfield site conditions:

- **Gas Station / Service Station**
- **Vehicle Maintenance**
- **Dry Cleaners /Laundry**
- **Metal Fabrication / Metal Plating**
- **Painting / Printing**
- **Rail Yard / Rail Maintenance**
- **Industrial Manufacturing**
- **Hospital / Medical Facility**
- **Warehouse / Storage**
- **Pest Control / Chemical Sales**
- **Utility Use / Coal Storage**
- **None / Unable to Determine**
- **Other: What other suspect petroleum / hazardous / chemical use do you see?**

The answers may be any, all, or none of the pre-populated options. They can include an "other" option, and also allow the user to provide an open-ended response that the user may type in. This short-list of potential CURRENT uses is based on uses that are common sources of contamination.

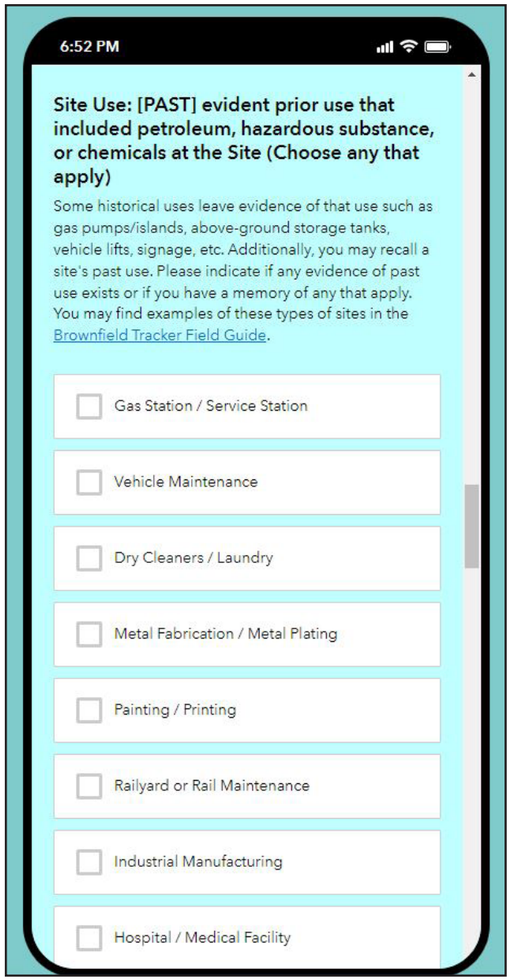


Site Use: [PAST] evident prior use that included petroleum, hazardous substance, or chemicals at the Site (Choose any that apply)

Some historical uses leave evidence of that use such as gas pumps/islands, above ground storage tanks, vehicle lifts, signage, etc. Additionally, you may recall a site's past use. Please indicate if any evidence of past use exists or if you have memory of any that apply.

This PAST site use question includes multiple choices of answers. Just as the previous question that probed the current status of the site, this past use inquiry includes many typical brownfield creating uses derived from typical handling of petroleum (vehicle maintenance, or service), hazardous substances (dry cleaners, printers, factories, etc.), or chemicals (acids, bases, caustics. Brownfield sites often retain reminders of their past use as clues that the observer can identify and log with Brownfield Tracker. Community members, and municipal workers may easily recognize the following site uses which often lead to future brownfield site conditions:

- **Gas Station / Service Station**
- **Vehicle Maintenance**
- **Dry Cleaners /Laundry**
- **Metal Fabrication / Metal Plating**
- **Painting / Printing**
- **Rail Yard / Rail Maintenance**
- **Industrial Manufacturing**
- **Hospital / Medical Facility**
- **Warehouse / Storage**
- **Pest Control / Chemical Sales**
- **Utility Use / Coal Storage**
- **None / Unable to Determine**
- **Other: What other suspect petroleum / hazardous / chemical use do you see?**



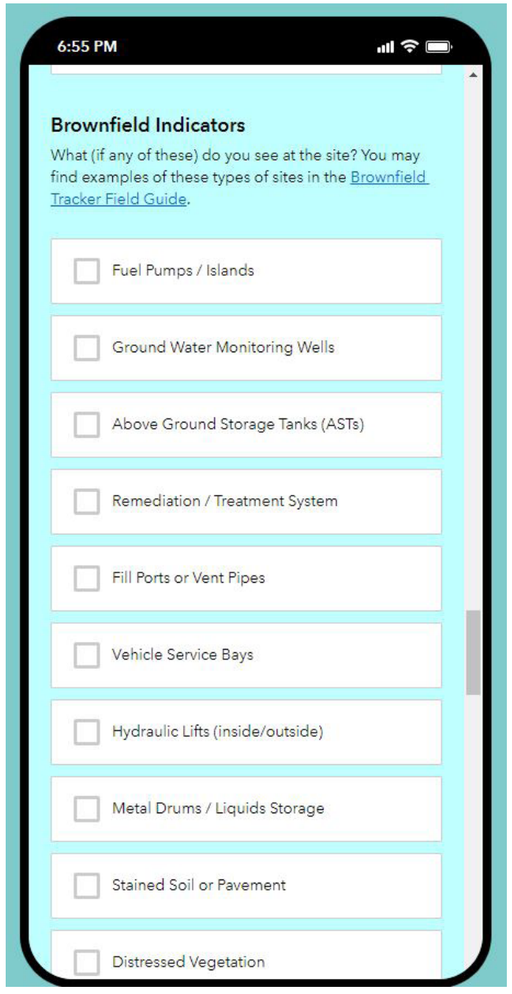
This question asks reviewers to call on their imemory of a site, and relate that historic use or operations at a site in the answers. These past use options will cover most, but not all brownfield generating uses. The final question allows the user to enter an unlisted prior use if relevant. This short list guides users without restricting their ability to document their own knowledge of PAST site uses.

Brownfield Indicators

What (if any of these) do you see at the site? You may find examples of these types of sites in the Brownfield Indicator Guide.

This question guides users to identify common items found on brownfield sites that contribute to their links harboring latent contamination from petroleum products, hazardous substances, or chemicals. This short list includes items that environmental scientists typically look for when identifying "Recognized Environmental Conditions" for Phase I Environmental Site Assessments. It is not an exhaustive list, but represents a "usual suspects" list that community partner volunteers as well as municipal employees and agents alike can readily spot during casual site inspections from the sidewalk or street.

The guide includes an example photo for each option and a brief explanation of why these are helpful indicators of possible legacy contamination and thus brownfield indicators.

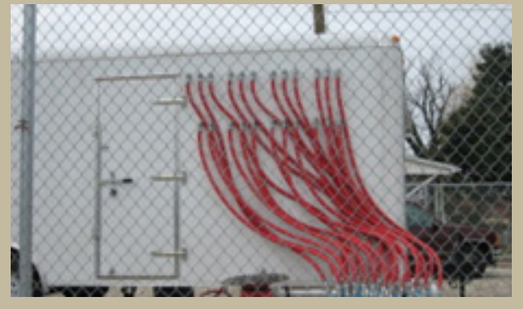


Fuel Pumps / Islands
This is a keen example of a legacy fuel pump island left behind after a former filling station / gas station era has long past and site use has changed. It represents the likelihood that fuel pumping activities previously occurred at this site, and that it is likely that spills and/or leaking underground storage tanks may still exist.

Groundwater Monitoring Wells
Groundwater monitoring wells are identified by their metal covers. These covers may lose their bolts, but are intended to prevent tampering, and guard the top of the “riser” tube that lies beneath and allows access to the groundwater several feet below. They come in many sizes, but are almost always circular in shape. They may not always say “monitoring well” on them, but the triangle shape that helps identify them as a monitoring well, as in these photos. These covers may be “nested” and come in sets of two or three near each other, or by themselves. Sites often have 3 or more, and they often continue further in the right of way spaced out at regular intervals. Ground water may be extracted from the riser tube beneath these covers to sample and determine if it is impacted by petroleum or hazardous chemicals.

Above Ground Storage Tanks (ASTs)
Above ground storage tanks (ASTs) come in many different sizes, shapes, colors, and types. A very common one is s the heating oil tank in the photo to the right. These ASTs are common both on residential sites, as well as adjacent to historic commercial buildings. This shape is often used for used oil tanks, and they are prevalent at former gas stations / service stations and vehicle maintenance shops.
Additional examples of ASTs can range from small to very large. They may hold petroleum products, chemicals, solvents, etc. in various forms. Their presence on a site acts as an indicator for potential leaks, spills, and overfilling events that may indicate legacy contamination of the soil and groundwater.

Remediation / Treatment System
Remediation systems may often be hidden in plain sight on brownfield sites and ongoing commercial sites such as gas stations. These photos show a typical trailer style and box style of remediation systems. When observing former gas station sites, vehicle maintenance sites, or dry cleaners sites may note these types of trailers and installations. These are key indicators of likely contamination at a site, and when identified should be photographed and noted as part of a brownfield inventory .



Fill Ports or Vent Pipes
Users may observe vent pipes attached to the side of a building or protruding from the roof. Fill ports (where petroleum products or hazardous substances may be filled into nearby tanks) may been seen near the side of a building at or below waist height. It is common to see fill ports in alley waysvor recessed in a parking lot:

Vehicle Service Bays
A common indicator of legacy brownfield conditions present at a site are maintenance bays or vehicle service bays. They may come on small or large overhead door configurations. These often provide a hint to past use as automotive repair, and association with use and spills of petroleum products and hazardous substances (solvents).

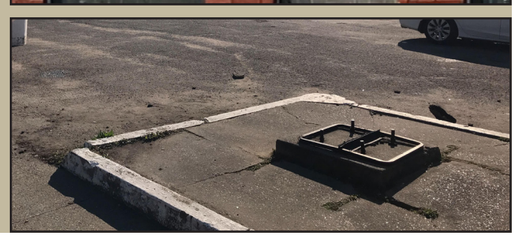
Hydraulic Lifts (Inside or Outside)
Historic vehicle maintenance operations may be recognized by the presence of hydraulic lifts. These may be in the parking lot, or exterior of the building of older service stations. But most often they are found within service bays inside the buildings. These may not be readily witnessed from the right of way, but sometimes this is possible if the service bay doors are missing, or transparent.

Stained Soil or Pavement
Spills happen. On brownfield sites they happen often and involve petroleum products, hazardous substances, and chemicals. Stained soil and pavement is a tell tale of such past occurrences. As users inspect sites in the community they should watch for these indicators.

Metal Drums / Liquids Storage
One of the most common brownfield indicators are drums, metal used oil tanks, plastic bulk liquid totes, and similar containers. When thes liquid containers are left (or dumped) on sites they portend larger issues at hand: abandonment, leaks, or potential for misuse and improper care and disposal.

Chemical Signs or Storage
Signs from past commercial use of a property are typically found on brownfield sites. It is not uncommon for a historic use of a site to be easily identified by signs left behind. Sometimes the signs are faded, or broken and sometimes they are in good condition. Former dry cleaners may have left signage, or paint on sides of buildings that indicate possible prior use of dry cleaning solvents at the site. Chemical use signs are often left behind as well. Auto body repair shops, metal fabrication firms, and various forms of heat treating, painting, powder coating businesses may leave indicators of hazardous substances use on site.

Gas / Petroleum Signage
Signs from past (or even ongoing) activities may indicate brownfield creating conditions. Gas, fuel, and petroleum signage are common and indicate potential for past spills. These signs may be typical chain corporate fuel companies, or may be just hand fashioned signs that list use of petroleum products. In fact, sometimes a missing former gas station sign can play the role of a brownfield indicator.



Other Brownfield Creating Conditions Witnessed
Although we provide a thorough list of brownfield indicators to identify with the checkbox tools within Brownfield Tracker, these are not an exhaustive list.

A user may come across many less common indicators of past (or present) brownfield creating activity at a site. The user is encouraged to check this box when an atypical indicator, or condition is witnessed. In the final question the user may leave notes to indicate condition present, or perhaps the photos captured of the conditions present will tell the tale.

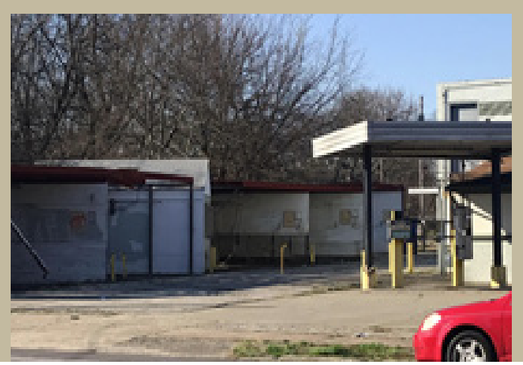
These photos are but a few examples of "other" brownfield creating conditions:

Large smokestacks often indicate boiler room operations with asbestos wrap of boilers, coal storage, and a host of other conditions of concern.

Scrap metal / appliance storage;

Obvious fire house prior use (often vehicle maintenance and fueling operations occur in fire houses);

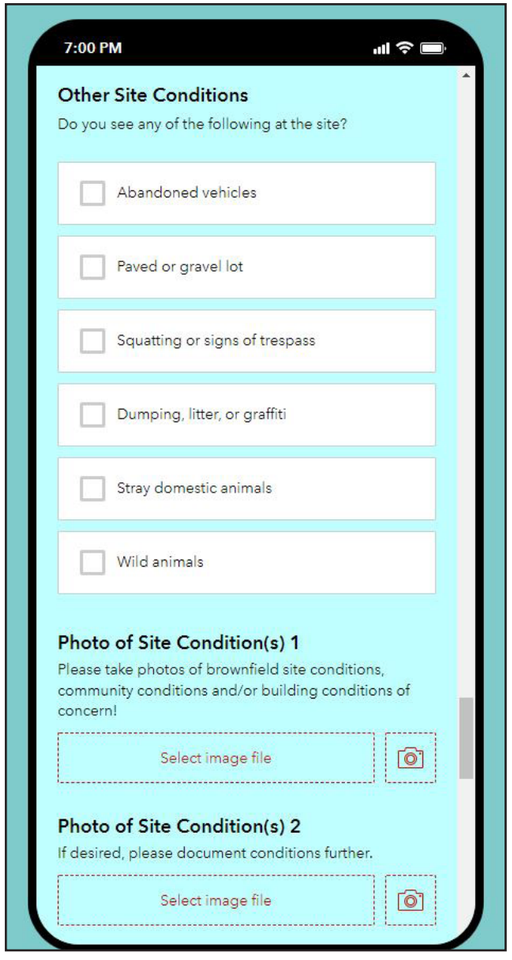
Car wash sites often create accumulated petroleum and hazardous substances collection in subsurface drainage structures;



Other Site Conditions
What (if any of these) do you see at the site?

Aside from the standard brownfield indicators noted above, when examining sites for indicators of brownfield status there are additional conditions that the user will observe. These can be less critical to some of the previous observation questions, but are nevertheless key to note. The user may check one or more of these that apply. If a user checked the "Other Brownfield Creating Conditions Witnessed " answer on the previous question, these answers provide some common examples of "other conditions" that can be quickly noted.

- Abandoned vehicles
- Paved or gravel lot
- Squatting or signs of trespass
- Dumping, litter, or graffiti
- Stray domestic animals
- Wild animals

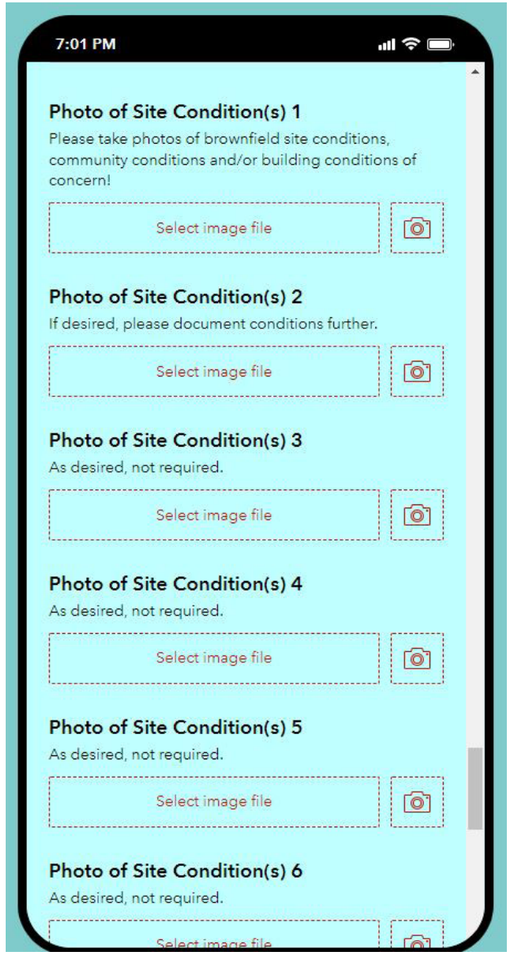


Photos of Site Condition(s) [1- 10]
Please take photos of brownfield conditions, community conditions and/or building conditions of concern!

A key component of the Brownfield Tracker app is the ability do document site conditions at any moment in time. This information, when compiled over time, can help show progress on a site, and/or allow the user to monitor the site as it changes along the "brownfield continuum of use".

The user may take up to 10 photographs under 10MB in size while in the field. If wireless data services are available and turned on, the user can upload these photos while in the field. Otherwise, the app will transmit the photos to the server when mobile wireless and/or WiFi service is reached and connected.

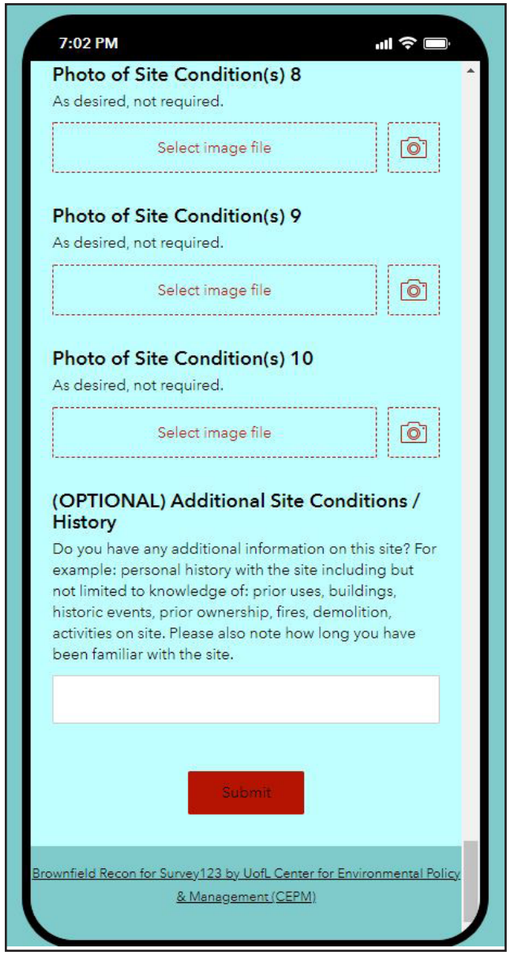
Esri Survey123 logs each photo to the GPS coordinates of the site, and enables the user to instantly review conditions on a site observed and mapped to correspond to the GPS location of the first photo taken in the field observation.



(OPTIONAL) Additional Site Conditions / History
Do you have any additional information on this site? For example: personal history with the site including but not limited to knowledge of: prior uses, buildings, historic events, prior ownership, fires, demolition, activities on site.

The user may enter any additional information in this text box. Community members often have years of history and knowledge to relate regarding sites in the neighborhood. This text box provides space for a short discussion of user's special knowledge, uses, concerns, and problems they may remember.

Providing this answer possibility allows the brownfield inventory to be linked to stories of the sites in a systematic manner. This goes beyond the typical brownfield observations, and indicators addressed in prior screens.



1. Paull, Evans. 2008. "Brownfields Redevelopment Toolbox for Disadvantaged Communities."

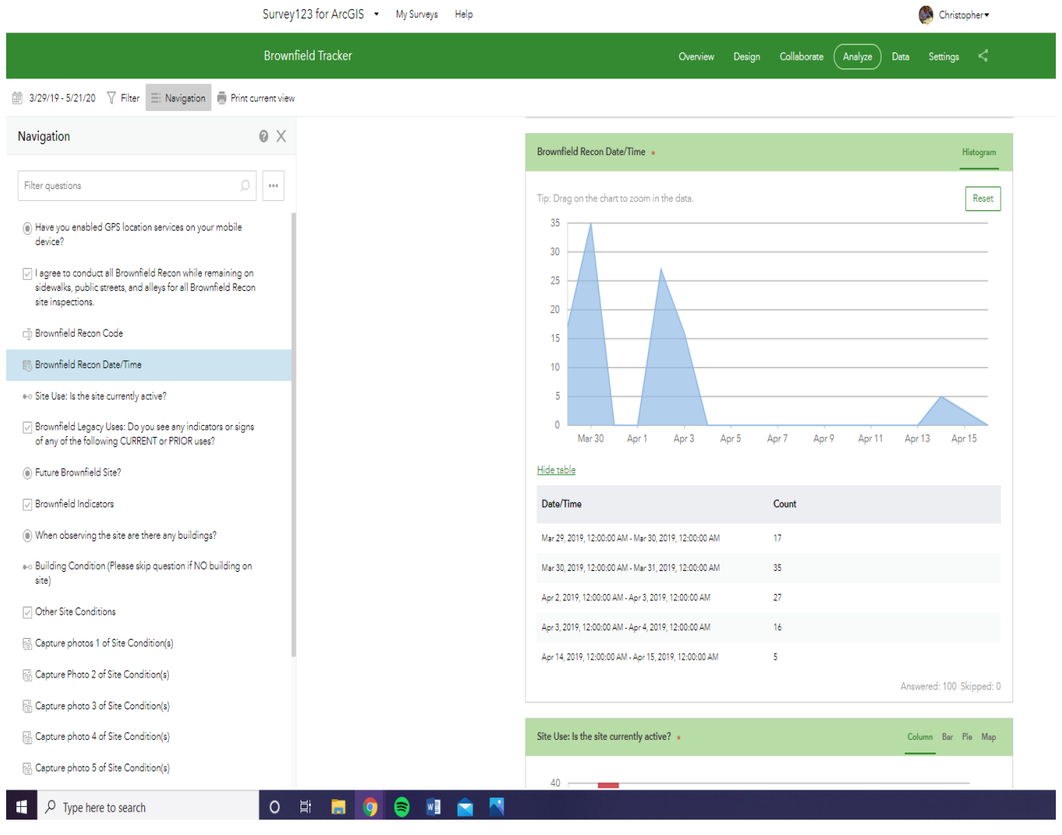
2. Rubin, L. B. 1969. "Maximum Feasible Participation: The Origins, Implications, and Present Status." The ANNALS of the American Academy of Political and Social Science, 385(1), 14–29. https://doi.org/10.1177/000271626938500103

3. Moynihan, Daniel Patrick. 1970. *Maximum Feasible Misunderstanding: Community Action in the War on Poverty.* New York, NY: Free Press.

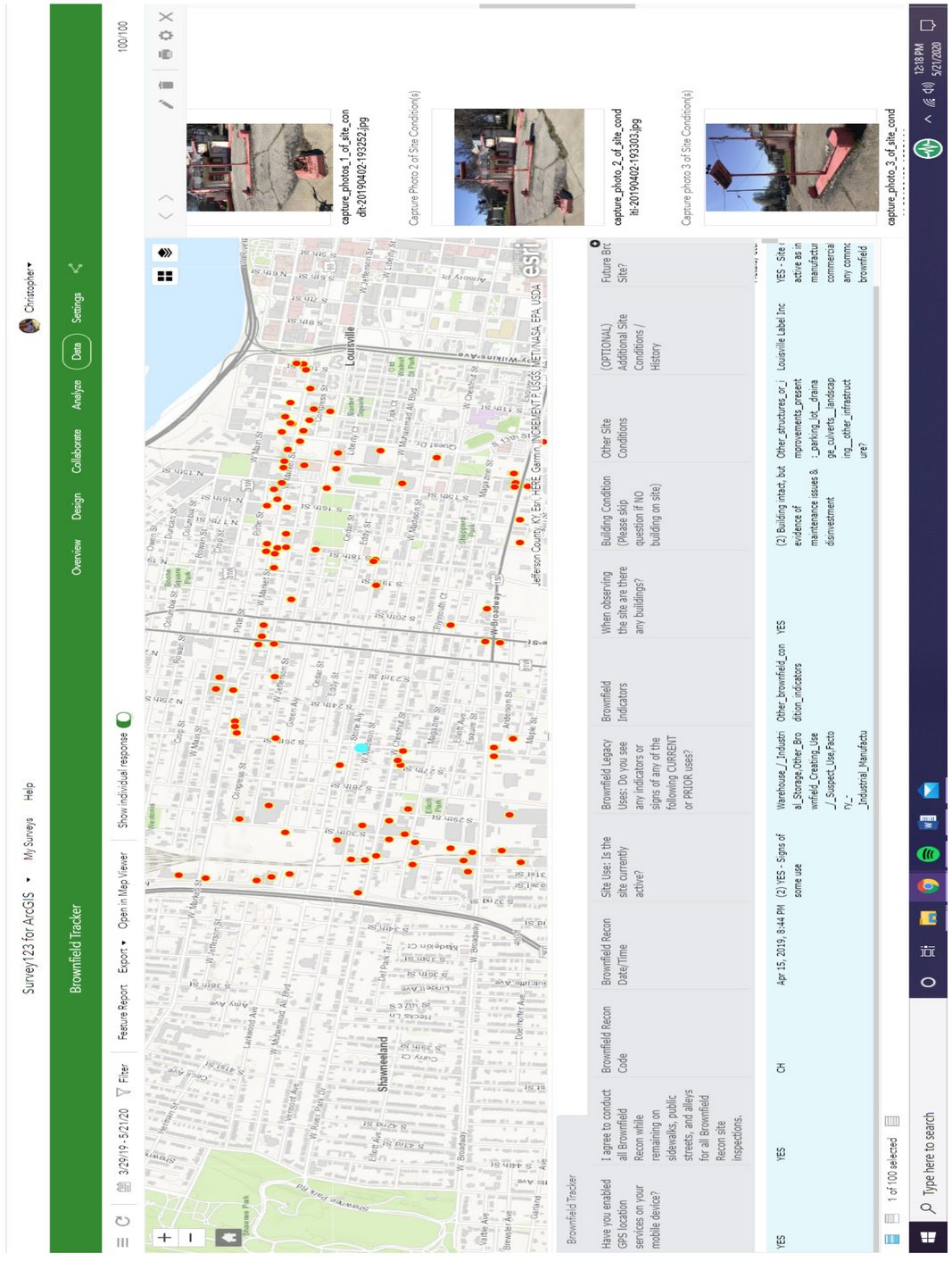
Next Steps
After gathering data in the field with Brownfield Tracker, the user can then immediately utilize the Survey123 "Data" and "Analysis" tools in Survey 123 website to map the output.

Example taken from the "Analysis" Tab in Survey123 website. Shows the output of data collected for 100 brownfield sites using the Brownfield Tracker .xls Form in Louisville, KY.

Example taken from the "Data" Tab in Survey123 website. Shows the output of data collected and mapped for 100 brownfield sites using the Brownfield Tracker .xls Form in Louisville, KY.



The BT is intended to help community and municipal users identify and track community conditions witnessed on brownfield sites. As this data is gathered it can help users prioritize brownfield sites for intervention. Over time, with repeated use, BT can help track conditions on brownfields and sites of interest. Community conditions witnessed and logged with BT can eventually be used to determine the efficacy of interventions. When examined against predicted outcomes (created and shared via the **BABE desktop app), the assumptions that guided the interventions can then be critiqued and modified.**



Acronyms

BABE: Brownfield Area Benefits Estimator

BAT: Benefits Analysis Tool

BT: Brownfield Tracker

BUILD Act: Brownfields Utilization, Investment and Local Development Act

CBA: Cost-benefit analysis

CBO: Community-based organization

EPA: Environmental Protection Agency

GDP: Gross domestic product

GIS: Geographic Information System

LEED-ND: Leadership in Energy and Environmental Design for Neighborhood Development

NEPA: National Environmental Policy Act

NGO: Non-governmental organizations

RBCA: Risk-based corrective action

ROI: Return on investment

TBL: Triple Bottom Line

Appendix A

Brownfield Resources

Brownfields Guidebooks and Policy & Practice Reports

Federal and State Brownfields Programs

1. 2019 Brownfields Federal Programs 2019. US EPA Guide. https://www.epa.gov/sites/production/files/2017-06/documents/final_2017_bf_fed_guide_5-8-17.pdf

2. Setting the Stage for Leveraging Resources for Brownfields Revitalization. 2016. (US EPA Guide) https://www.epa.gov/sites/production/files/2016-04/documents/final_leveraging_guide_document_4-19-16.pdf

3. State Brownfields and Voluntary Response Programs 2017. (US EPA Guide) https://www.epa.gov/sites/production/files/2017-12/documents/state_brownfields_voluntary_response_program_report_508_11-2017_web.pdf

Community Based Brownfields Guides

4. Community Actions that Drive Brownfields Redevelopment (2017). US EPA Guide. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100WWVK.PDF?Dockey=P100WWVK.PDF

5. Community development/area wide BFs redevelopment guide: https://groundworkusa.org/groundwork-usa-releases-from-brown-to-blooming-a-field-tested-guide-for-getting-from-brownfield-to-neighborhood-asset/

6. Community based brownfields redevelopment examples/case studies: https://groundworkusa.org/wp-content/uploads/2017/04/GWUSA-Brownfields-Highlights-2017.pdf
.

Environmental Justice and Equity

7. Environmental Justice 101 guide: https://groundworkusa.org/wp-content/uploads/2018/08/GWUSA-Learners-to-Leaders-Environmental-Justice-Literacy_Curriculum_08.10.18.pdf

8. Equitable Brownfields Development Strategic Planning Tools: https://groundworkusa.org/ta-services/equitable-development-brownfields-planning/

Land Development, Green Infrastructure and Resilience

9. Land Recycling 101: https://www.cclr.org/land-recycling-101

10. Infill Development: https://www.njit.edu/tab/tools-and-guidelines-implementing-infill-development-brownfield-sites-rural-areas-and-small-towns

11. Green Infrastructure How to Video guide: https://www.njit.edu/tab/how-videos

12. Brownfields redevelopment and resilience: https://www.ted.com/talks/colette_santasieri_redevelopment_for_resiliency_transforming_brownfield_sites_for_communities_to_bounce_back

13. Real Estate Development Process on line guides: https://groundworkusa.org/development/

14. Brownfields and River Restoration: https://groundworkusa.org/where-the-water-meets-the-land-connecting-brownfields-and-urban-waters-restoration/

Brownfield Area Benefits Estimator Toolkit Link:

https://louisville.edu/cepm/publications/tool-kits/brownfields-community-benefits-assessment-guide

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