

### Executive Summary

TRC was retained by Garfield County to develop the first phase of the Energy Resource Inventory Project (Project): collection of publicly-available digital information and develop opportunity and constraints maps utilizing geographic information systems (GIS). The energy resource maps and energy resource constraint maps can be used to supplement the County's adopted Comprehensive Plan as either a new element or to enhance existing elements. While the size of the resource and constraint maps provides a general tool for macro-planning, they can be used to initiate conversation regarding land development guidelines for developers, landowners, and agencies alike.

Garfield County naturally possesses a variety of energy resources that include both renewable and traditional fossil fuel -based resources in a landscape that is home to abundant wildlife, active recreation opportunities, agriculture, and rural living. Energy development has been a part of the County's landscape and a driving force of the economy for decades, with peaks of development occurring energy booms and shifts towards specific development driven by market demand. These elements occur at a point in time where US policy strives towards energy independence and recovery from the Great Recession of 2008. The County has benefitted from the balance between energy resource development and the natural resources that attract recreationists to wilderness areas and trail, tourism to the downtown areas, and quality of life in rural and agricultural areas.

Energy resource development has historically occurred across throughout the County, and its anticipated that energy resources will continue to be developed in the foreseeable future. However, no comprehensive inventory of existing energy resources or development constraints had been generated to identify areas of where future energy development may occur. The identification of energy resources and potential areas of development can lay the foundation of future energy resource development policies and guidelines, provide the County with a base of information for response to proposals to develop energy resources on state and federal lands, as well as laying groundwork for the preservation of natural resources and the landscape that contribute to the quality of life for County residents, recreation and tourism opportunities, as well as scenic beauty that attract visitors to the County.

TRC collected data from local, state, federal, and non-governmental organizations related to natural resources such as surface water and wildlife, transportation, infrastructure, land ownership, federal lease areas, and other applicable information. The data was collected and tracked in a spreadsheet that identified the type of information by energy resource or constraint, date of information, source of data, and name of data layer. A simplified version of the matrix is located in Appendix A. The data will be transferred directly to the County by TRC.

Baseline data was used to develop resource maps for each of the energy resources located in the County. The studied energy resources include:

- Biomass
- Coal

- Coalbed Methane
- Geothermal
- Gravel / Aggregate
- Hydroelectric
- Natural Gas
- Oil
- Oil Shale
- Solar
- Uranium
- Wind

For geographic purposes, each map is depicted at the County scale and includes the major cities and towns, major roads, and geographic terrain for orientation. Resources are depicted using publicly-available GIS data. Some of the data was developed by an agency utilizing some private data. However, TRC did not develop original data for the Project, but may have graphically modified the information for visual clarity and illustrative purposes. While the energy resource information is depicted on a map formatted to a specific size, the GIS data can be incorporated and used by the County or a user in ArcGIS or an affiliated tool for planning or analysis purposes at a variety of scales. The scale and level of detail of the base information may vary based upon the type of data, scale of each resource, and agency collection methods. However, most of the information depicted on the energy resource maps is at the County scale and provides information for macro-planning purposes. The energy resource maps are located in Appendix B.

The energy resources are geographically scattered across the County. Some resources are specific to the landscape: hydroelectric and geothermal are closely tied to the presence of water resources and terrain. Conventional resources such as oil, oil shale, and natural gas are in a similar area in the central part of the County. Renewable energy resources such as hydroelectric, solar, and wind are closely affiliated with the terrain that could maximize energy generation for each.

Developmental constraints can range from physical constraints such as slope of terrain, water bodies, 100-year floodplains, and wildlife habitat to regulatory constraints that include local, state, and federally protected areas such as conservation areas, No Surface Occupancy (NSO), Wilderness Areas, Areas of Critical Environmental Concern (ACEC), or land use compatibility. Many of the constraints have corresponding GIS data that could be used by the County and developers to guide development of energy resources as well as avoidance of potentially sensitive or protected resources or landscapes.

A list of constraints was developed by TRC that included both the physical and regulatory constraints based upon typical resources and issues that an energy development Project may encounter. In discussion with the County, it was determined that some physical and regulatory constraints present varying degrees of challenge, some more than others depending on the energy resource and location in the County. TRC collaborated with the County Planning Staff

and the County Commissioners and developed a master list of constraints for energy resource development. However, TRC found that some constraints are difficult to depict because they involve additional data development or analysis (such as visual resources), the information is not publicly available, or depicts data for a point at a specific point in time (such as air quality). While these constraints are important, they may be better identified and developed through the County's energy resource development policy phase of the Project.

The County Commissioners provided guidance as to the constraints that would likely affect energy resource development and ranked the constraints based upon their perspective and opinion into three categories: major, moderate, and minor. A major constraint would have serious impact to an energy development opportunity; a moderate constraint must be recognized and considered for an energy development opportunity; and a minor constraint would not have an impact on an energy development opportunity. The Commissioners identified major constraints as air quality, Areas of Critical Environmental Concern, jurisdictional wetlands, roadless areas, and Wilderness Areas. Very few resources or issues were identified as minor constraints; therefore, a broad list of constraints was identified for analysis.

Constraints were identified for specific energy resources: many are similar because they affect both conventional and renewable resources alike, such as No Surface Occupancy, jurisdictional wetlands, and specific wildlife habitat. Each energy constraint map was developed using the base energy resource map and "layering" constraints on top of the base like a cake. For this Project, each constraint was given an equal value. The layering of constraints developed a constraint density which is depicted by a range of color: green visually depicts fewer constraints, yellow has a moderate number of constraints, and red has the most constraints. The energy constraint maps are located in Appendix C.

The constraint map for each energy resource identifies the constraints used to develop the map; however, identification of each specific constraint and the location context to the energy resource would have to be conducted by using ArcGIS or similar mapping tool. This type of detailed analysis is not part of this Project, but the GIS information is provided to the County for their use and analysis.

Each energy resource constraint map has a land ownership key map, which identifies the type of ownership (federal, state, local, private) and if applicable, the agency. Land ownership was discussed as a potential constraint; however, it is context and regulatory specific to the energy resource and other regulatory constraints which may or may not apply to a specific area. An example is lands managed by the Bureau of Land Management: oil and gas lease areas are designated for exploration and production, but the agency also can designate areas where development is highly unlikely to occur because of regulatory policies in their Resource Management Plan (RMP), which may include No Surface Occupancy, Areas of Critical Environmental Concern, and similar restricted areas.

The energy resource maps and the energy resource constraint maps provide a foundation in which the County is able to develop energy resource development policies that can direct

development of energy resources in context to existing natural resources and regulatory constraints. It also provides the County with data that can be developed for further analysis in the event that a proposed state or federal policy or regulation may affect a natural resource located in the County or energy resource development on publicly-managed lands.

Future phases of the Project may include the development of a user-friendly publicly available tool that citizens, landowners, and energy developers may use at a variety of planning scales. The information could be used to enhance energy resource development as well as identify areas or natural resources that may need protection from potential impacts or effects. Guidance and caution should be identified regarding the scale of the GIS information available for site-specific or micro-planning as some of the GIS data is not parcel-specific.

Additional work is needed to identify and analyze resources such as rural residential development, lack of appropriate zoning, visual resources, public safety, and air quality. This may involve a combination of additional data collection and generation, public input through an outreach process, and data configuration so each can be considered as a resource or constraint.

Energy resource policy is a logical next step in the process. The energy resource maps identify the location and context of existing resources in the County. Stakeholder and public meetings could facilitate the discussion of energy resource development in the County and further identify resources or constraints of concern. A broad list of constraints was identified with input from the County Commissioners and public input would further identify other critical issues which may be tied to GIS data including water resources, transportation, air quality, recreation, visual resources, and wilderness resources.