

Research Report

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**SURVEY OF THE IMPACTS OF  
ENVIRONMENTAL REGULATIONS ON  
STATE HIGHWAY OPERATIONS**

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## **EXECUTIVE SUMMARY**

### **Introduction**

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In recent years, the transportation industry in Kentucky as represented by Kentuckians for Better Transportation (KBT) and the Kentucky Transportation Cabinet (KyTC), have expressed concern over the growing impact of environmental regulations upon transportation activities in the state. The imposition of environmental regulations has resulted in higher costs for new construction and maintenance on roads, project delays, scheduling and financing difficulties, and the creation of additional transportation agency bureaucracy to address environmental regulation mandates. In Kentucky, the impacts of those regulations have not been thoroughly assessed nor have the attendant costs been measured. Coinciding with that lack of information is the concern whether those impacts (e.g. costs and delays) are comparable with those affecting other state transportation agencies.

KBT and KyTC contracted with the Kentucky Transportation Center (KTC) to conduct a study to 1) identify the impacts of environmental laws and regulations on KyTC and 2) determine whether the environmental impacts affecting KyTC are comparable to those affecting other state transportation agencies.

### **Scope of Study**

KyTC and KBT officials identified five primary areas of concern for environmental impacts on state transportation agency operations. Those were:

- storm water,
- wetlands,
- ground water,
- underground storage tanks (USTs), and
- solid and hazardous wastes.

To obtain relevant information related to environmental impacts, a survey was to be made of selected state transportation agencies including KyTC. It was determined that the state transportation agencies of the seven bordering states should serve as benchmarks for the survey. The North Carolina Department of Transportation agency was also chosen for participation. The benchmark state transportation agencies included:

- the Illinois Department of Transportation,
- the Indiana Department of Transportation,
- the Missouri Highway and Transportation Cabinet,
- the North Carolina Department of Transportation,
- the Ohio Department of Transportation
- the Tennessee Department of Transportation,
- the Virginia Department of Transportation, and
- the West Virginia Department of Transportation.

The survey solicited general information including scope of activity, facility, and budgetary information related to a state transportation agency. The survey also solicited information on the five primary areas for concern of environmental impacts related to state transportation agency construction, and maintenance and facilities operations.

An important factor bearing on the responses from the various state transportation agencies are the environmental laws and regulations with which they must comply. Additionally, impacts of similarly worded environmental regulations might vary between states due to different levels of enforcement. Therefore, surveys were provided to state environmental agencies to identify any extraordinary regulations and to compare those agencies' budgets and manpower (which might relate to levels of enforcement).

A questionnaire was prepared and provided to appropriate state environmental agencies in Kentucky and the benchmark states. The environmental agencies surveyed included:

- the Kentucky Natural Resources and Environmental Protection Cabinet (NREPC);
- the Indiana Department of Environmental Protection;
- the Illinois Environmental Protection Agency;
- the Missouri Department of Natural Resources;
- the North Carolina Department of Environment, Health and Natural Resources;
- the Ohio Environmental Protection Agency;
- the Tennessee Department of Environment and Conservation;
- the Virginia Department of Natural Resources; and
- the West Virginia Department of Commerce, Labor & Environmental Resources.

After the questionnaire responses were returned, they were compiled and correlated by KTC researchers. Where provided, cost data were compared. Additional comparisons were made between environmental impacts on the state transportation agencies. Areas of significant environmental impact were identified.

Questionnaire responses from the state environmental agencies were also compiled and correlated along with the state transportation agency surveys. The results of the environmental agency surveys are not emphasized in this report. They are considered supporting documents primarily intended to assist in evaluating the state transportation agency surveys.

KTC researchers also obtained geographic, demographic and economic data concerning Kentucky and the benchmark states. Those data were evaluated to provide further insightful comparisons between the states.

## Conclusions

The primary conclusions drawn from review of the geographic, demographic, and economic data indicated that Kentucky had fewer financial resources than most of the benchmark states. A review of survey information related to scope of activity, facility, and budgets indicated that KyTC was comparable to the benchmark state transportation agencies. That information suggests the cost of providing a needed Transportation infrastructure is higher than in the benchmark states. Therefore, equivalent diversions of transportation funds for environmental purposes may also result in a disproportionate loss in benefits to Kentucky businesses and residents.

KyTC survey responses indicate that the areas of major environmental impact are wetlands (for construction) and USTs (primarily for facilities). Currently, storm water and ground water environmental regulations have little impact on KyTC. Little information was provided relative to solid and hazardous waste disposal to indicate that it was a significant problem. The KyTC responses did not provide comprehensive information quantifying environmental impacts in terms of costs.

In a report of the Kentucky State Legislature Interim Joint Committee on Transportation, KyTC officials provided a detailed review of several specific environmental impacts and also a summary of annual environmental costs related to construction.

KyTC officials placed directly identifiable project environmental costs for construction at \$11,363,000 and \$8,784,000 for fiscal years 1991 and 1992, respectively. While those costs appear small relative to the KyTC annual construction budget, \$605,400,000 and \$332,600,000 for 1991 and 1992, respectively, there is also a serious effect on scheduling and financing of highway projects that is indeterminate.

Comparative review of state transportation agency survey responses indicated that KyTC was not at a regulatory disadvantage compared to the benchmark state transportation agencies. Survey responses indicated that KyTC units addressing environmental regulations were similar in organizational structure, staffing, and budget to most of the benchmark transportation agencies. Actions taken by KyTC in regard to permitting and other environmental-related activities were typical of those taken by the benchmark transportation agencies. KyTC and the benchmark state transportation agencies were comparably affected by environment regulations in the five impact areas. In some instances, the impacts described by the benchmark transportation agencies were more severe. Where cost data were provided for specific actions, KyTC costs for environmental impacts were comparable to those of the benchmark transportation agencies.

A review of responses on questionnaires returned by environmental agencies in Kentucky and the benchmark states revealed that the environmental burden in Kentucky is no less than in the other states.

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## INTRODUCTION

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### **Background**

The dependency of state and national economies on transportation has been well documented (1-5). Associated economic benefits include employment of construction workers, sales of construction materials, more timely and safer travel, attraction of new manufacturing firms, increased land values, and a multiplier effect from local spending (6-8). Funds designated for state transportation agencies are most beneficial when spent directly for construction or improvements of existing roads and other transportation related activities.

In a recent newspaper editorial, Lawrence C. Mattera, president of a management consulting firm in San Diego, CA outlined factors that affect business climates within states (9). He noted that the level of transportation facilities within a state is conducive in promoting a state's economy. Conversely, excessive environmental laws and governmental regulations are harmful. He stated that is especially true when a state's regulations or laws are more restrictive than those of neighboring states. Mattera's last comment is based on the fact that those states compete to attract the same industries and that industries gravitate toward states having more lenient regulations.

Environmental issues have a significant impact on our lives (10). Environmental laws and regulations are intended to improve the health and well being of citizenry. The attendant environmental impacts and costs of many of those regulations are not accurately forecast prior to implementation nor are they thoroughly studied thereafter. That is especially true of far-reaching environmental laws and regulations impacting the transportation industry. Governmental agencies are beginning to study those impacts, but are finding them difficult to assess, especially the resulting costs (11).

### **Study Origin**

In recent years, the transportation industry in Kentucky as represented by Kentuckians for Better Transportation (KBT) and the Kentucky Transportation Cabinet (KyTC), have expressed concern over the growing impact of environmental regulations upon transportation activities in the state. That concern has been engendered by increasing difficulties experienced by KyTC officials and other transportation-related industries in providing new and upgraded roads and by the diversion of transportation-designated funds to address environmental regulations. KyTC is also subject to hidden expenses that represent costs imposed on suppliers to address environmental regulations that impact them.

It is apparent to representatives of the transportation industry that the imposition of environmental regulations has resulted in higher costs for road construction and maintenance, scheduling and financing difficulties, project delays, and the creation of additional bureaucracy to address environmental regulation mandates. In Kentucky, the impacts of those regulations have not been thoroughly assessed nor have the attendant costs been determined. Coinciding with that lack of information is a concern whether

those impacts are comparable to ones affecting other state transportation agencies. That is especially true for neighboring states that are in direct economic competition with Kentucky.

In March 1993, KyTC and KBT contracted with the Kentucky Transportation Center (KTC) to conduct a research study to 1) identify the impacts of environmental laws and regulations on KyTC and 2) determine whether the environmental impacts affecting KyTC are comparable to those affecting other state transportation agencies.

### **Scope of Study**

KBT and KyTC officials assisted KTC researchers in formulating the study work plan. KyTC and KBT officials identified five primary areas of concern for environmental impacts on state transportation agency operations. Those were:

- storm water,
- wetlands,
- ground water,
- underground storage tanks (USTs), and
- solid and hazardous wastes.

The decision was made to assess those environmental impacts by conducting a comprehensive survey of selected state transportation agencies including KyTC. The survey instrument would be a comprehensive questionnaire seeking answers to specific inquiries concerning various aspects of environmental impacts. The questionnaire was to be submitted to appropriate personnel within selected state transportation agencies.

Besides KyTC, it was determined that state transportation agencies of states bordering Kentucky should participate as benchmarks for the survey. The state transportation agency in North Carolina was also selected as a benchmark outlier. The selected state transportation agencies included:

- the Illinois Department of Transportation,
- the Indiana Department of Transportation,
- the Missouri Highway and Transportation Cabinet,
- the North Carolina Department of Transportation,
- the Ohio Department of Transportation
- the Tennessee Department of Transportation,
- the Virginia Department of Transportation, and
- the West Virginia Department of Transportation.

The selection of transportation agencies in bordering states was made for several reasons. One was the familiarity of KBT and KyTC officials with key personnel and operations of those agencies. Secondly, those states and agencies were considered relatively similar to Kentucky and KyTC making them logical choices for conducting comparisons. Finally, the bordering states are in direct economic competition with Kentucky. It was considered



vital to identify any environmental impacts affecting KyTC that would put it (and Kentucky) at an economic disadvantage compared to them. The North Carolina Department of Transportation was selected due to its many similarities in geography, etc. with the other benchmark states and also due to the progressive stance taken by the North Carolina Department of Transportation in complying with environmental regulations.

It was anticipated that the questionnaire would be distributed to diverse personnel within each state transportation agency. Therefore, the questionnaire was composed in several sections and subsections that could be separated and distributed to different parties for concurrent response. The main sections of the questionnaire were the General Information Section and the Applied Section.

The General Information Section solicited state transportation agency information related to scope of activity, facilities, and budgets. That section was prepared to provide data for overall comparisons of the state transportation agencies. The Applied Section was divided into two subsections, one addressing Construction and the other Maintenance and Facilities. Questions in each subsection addressed the five primary areas of concern for environmental impacts on state transportation agency operations. That section was prepared to provide information and data for comparisons of environmental impacts.

An important factor influencing the responses of the state transportation agencies was the potential for variances of environmental laws and regulations impacting them. Congressional legislation has created and/or empowered federal agencies with regulatory and enforcement powers related to environmental issues. While some overlap in authority exists between empowered federal agencies, it could be generally considered that the resulting impacts on the state transportation agencies would be uniform. However, state governments have been authorized to assume much regulatory and enforcement power under federal government "fully equivalent to/more stringent" guidelines. As a result, state legislatures have created and/or charged their environmental agencies with regulatory and enforcement powers. In some cases, state legislatures and environmental agencies have adopted the federal regulations as written. In other instances, more restrictive or inclusive laws and regulations have been enacted and promulgated. The federal government has usually retained oversight authority related to state environmental agency enforcement efforts.

KBT and KyTC officials initially assisting with the study were concerned that some state transportation agency responses might be related to environmental regulations specific only in particular states. Additionally, impacts of similarly worded environmental regulations might vary between states due to different levels of enforcement. They concluded that it would be worthwhile to survey state environmental agencies to identify any extraordinary regulations and to compare those agencies budgets and manpower (which might relate to levels of enforcement).

A questionnaire was prepared and provided to appropriate state environmental agencies in Kentucky and the benchmark states. The environmental agencies surveyed included:

- the Kentucky Natural Resources and Environmental Protection Cabinet,
- ~~the Indiana Department of Environmental Protection,~~
- the Illinois Environmental Protection Agency,
- the Missouri Department of Natural Resources,
- the North Carolina Department of Environment, Health and Natural Resources,
- the Ohio Environmental Protection Agency,
- the Tennessee Department of Environment and Conservation,
- the Virginia Department of Natural Resources, and
- the West Virginia Department of Commerce, Labor & Environmental Resources.

Organization of that questionnaire was generally similar to the one sent to the state transportation agencies.

After the questionnaire responses were returned, they were compiled and correlated by KTC researchers. Where provided, cost data were compared. Additional comparisons were made between environmental impacts on the state transportation agencies. Areas of significant environmental impact were identified. Questionnaire responses from the state environmental agencies were compiled and correlated in a similar manner as was the state transportation agency survey. The results of the environmental agency surveys are not emphasized in this report. They are considered supporting documents primarily intended to assist in evaluating the state transportation agency surveys.

KTC researchers also obtained geographic, demographic, and economic data concerning Kentucky and the benchmark states. Those data were evaluated to provide further insightful comparisons between the states.

## **PRIMARY AREAS OF CONCERN FOR ENVIRONMENTAL IMPACTS**

### **Background**

Prior to discussing the survey results, a brief review is provided of the five areas of concern for environmental impacts. It is intended to provide background information concerning the impact areas, federal and Kentucky laws and regulations affecting those areas, and historical impacts on the transportation sector. Those impacts were gleaned from reports and articles identified in a KTC literature search. This review should assist in understanding the survey responses.

In discussing federal laws and regulations, the National Environmental Protection Act of 1969 (NEPA) deserves mention. That law requires a federal agency or other entity receiving federal funds or applying for an environmentally-related federal permit to assess the environmental resource (ecologic and biologic) impacts of proposed projects to ensure those resources are preserved (12,13). Not only is an agency required to assess those impacts, but also it must determine alternatives to any proposed action that might

cause an adverse impact. That act mandates that the subject agency prepare an Environmental Assessment (EA) which is a preliminary review of the potential for any project to have an environmental impact. If that potential is discerned, a more detailed assessment is required which is to be reported as an Environmental Impact Statement (EIS). The EIS serves as both a decision tool for proper action and a public disclosure document. With the advent of new federal laws and regulations, the environmental assessment process required by NEPA has become more complicated.

The reporting process required by NEPA is extensive for any highway project. It encompasses the five impact areas addressed in this report. Most major highway projects employ federal funds or require federal permitting. NEPA reporting is a federally mandated component of all such projects and the general requirements of that act are uniform for all state transportation agencies. A significant portion of environmental-related bureaucracy in those agencies addresses NEPA requirements.

### **Storm Water**

Municipal public works, construction projects, chemical manufacturers, and other industrial operations are required to control pollution from water runoff brought on by high flows during storm activity. Excessive runoff often overwhelms sanitary and storm water systems causing sewers to overflow and release sewage into receiving waters. Recent studies by the Environmental Protection Agency (EPA) indicate that storm water runoff from industrial and urban settings may release pollutant concentrations similar to industrial waste water discharges (14). Storm water runoff from highway construction has been found to contain solids, heavy metals, nutrients, oil and grease, pesticides, and bacteria (15). A significant source of such discharges is suspended sediment carried from construction sites, especially slopes (16).

Congress enacted laws requiring states to develop comprehensive programs to control storm water runoff with the 1987 Water Quality Act amendment to the Clean Water Act of 1972. Prior to 1990, the EPA established a National Pollution Discharge Elimination System (NPDES) which focused on industrial waste water and discharges from municipal water treatment plants. In 1990, the NPDES was expanded to include storm water discharge regulations for both areas (17).

Kentucky is one of 38 states which has its own NPDES program referred to as the Kentucky Pollution Discharge Elimination System (KPDES). Industries in Kentucky must apply for construction and general permits from the Natural Resources and Environmental Protection Cabinet (NREPC) Division of Water (18). All of the benchmark states have their own NPDES programs.

The transportation sector must adhere to industrial storm water regulations that currently apply to construction sites, waste water treatment plants, and landfills. Major impacts to transportation agencies are mainly in three areas: 1) highway storm sewers that convey runoff to municipal waste water systems subject to permitting, 2) construction projects affecting areas greater than five acres, and 3) facilities such as

maintenance shops and materials handling facilities (19).

## **Wetlands**

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Wetlands comprise swamps, inland marshes, wet meadows, ponds, sloughs, flood plains, mud flats, bottom land, hardwood forests, and other transitional areas between open water and dry land. All wetlands contain either herbaceous vegetation, trees and shrubs, or a combination of both.

In determining whether a specific area is to be managed as wetlands, the appropriate interpretation of wetlands must be applied (20). Currently, the governing definition of wetlands is contained in the 1989 **Federal Manual for Identifying and Delineating Jurisdictional Wetlands**. The manual establishes three conditions or criteria that must be present for identification and delineation of wetlands. Those are: 1) hydrophytic vegetation, 2) hydric soils, and 3) wetlands hydrology.

Wetlands provide one of the richest ecosystems on earth. In the United States, wetlands provide critical habitat for 150 kinds of birds and 200 species of fish (21). Many U.S. wetlands are listed as critical habitats through the Federal Endangered Species Act. They provide a haven for 26 percent of the plants and 45 percent of the animals protected under that act (22). Wetlands perform many other important functions such as retaining large amounts of carbon largely as peat. They provide feeding, spawning, and nursery grounds for more than half the salt-water fin and shell fish harvested annually in the U.S. Wetlands absorb and filter pollutants that would otherwise degrade lakes, rivers, reservoirs, and aquifers. They buffer the impact of storm tides on populated uplands and reduce flood crests downstream by sponging up runoff. Wetlands also stabilize shorelines and riverbanks (23).

In Kentucky, an estimated 360,000 acres of natural wetlands remains (24). Of that area, approximately 20 percent of Kentucky wetlands is forested.

Wetlands activities are commonly regulated by federal agencies. Four federal agencies are involved in wetlands identification and delineation -- the (U.S. Army) Corps of Engineers, the Environmental Protection Agency, the Fish and Wild Life Service, and the Soil Conservation Service. These agencies act according to authority provided through the "Clean Water Act," Section 404, the "Swamp Buster" provision of the Food Security Act of 1985 and Section 10 of the Rivers and Harbors Act of 1899 (25).

When a natural wetlands is situated in areas of impending highway construction or other transportation activities, there are usually three options available: build over it, detour around it (avoidance), or replace it (mitigation). There is a federal "No Net Loss Policy" that is preferential towards preserving natural wetlands over mitigation-type replacement. However, that policy does not eliminate mitigation as an option (26). Mitigated wetlands are referred to as "created wetlands" (27). After completion, they fall under the same regulations as natural wetlands. "Constructed wetlands" are man-made systems that simulate natural wetlands for human benefit such as drainage or waste

water treatment. "Constructed wetlands" cannot be substituted for natural wetlands by replacement mitigation (28, 29).

The impact of wetlands have been extensive, especially in states such as Louisiana having large swamps. Typically, road construction in such areas has entailed expensive "end-on" construction whereby miles of bridges are built in lieu of roads, typically by end launching of bridge superstructures on to driven piles (30-32). More cost-effective approaches in areas of limited wetlands involve mitigation by replacement.

Wetlands mitigation by replacement requires acquisition of land, development of a mitigation plan, and approval from the NREPC Division of Water and the Corps of Engineers (33). Currently, industries and some federal and state agencies are researching and employing "wetlands banking" operations. Those operations involve the acquisition and set aside of relatively large blocks of lands suitable for use as mitigated wetlands. When wetlands in another location are eliminated for construction purposes, those set aside lands or portions thereof are rehabilitated to wetlands standards (if necessary) and "exchanged" in equivalent or greater acreages to compensate for the loss of wetlands through construction-related development. In wetlands banking, the type and location of banking site may be critical. Regulatory agencies may need to approve various wetlands sites before they can be considered equivalent for exchange purposes.

## **Ground Water**

Ground water is an important source of drinking water for many Kentuckians. It accounts for 90 percent of rural domestic water supplies and 30 percent of the public and domestic supplies. Ninety-five percent of Kentucky's fresh water resources come from ground water (34). Over half of Kentucky's terrain is a geologic formation known as karst associated with fissures, underground caverns, and sink holes. Those features provide direct links from the surface to underground water resources (35).

The federal Clean Water Act of 1972 and its amendments regulate the direct discharge of wastes into receiving waters. Those have been implemented in Kentucky by statutory law (KRS 224.70-120). Those laws are enforced by the NREPC Division of Water under regulations promulgated in 401 KAR Chapter 5. However, while those (and other) regulations are very thorough in addressing direct pollutant discharges into surface waters, they have little impact on most sources of pollutants that seep through the soil and contaminate the underlying water supply (i.e. ground water).

Presently, there is no comprehensive Kentucky program to regulate ground water though there is a proposed regulation currently under consideration. In part, that is due to a lack of a federal ground water protection program to serve as a model and also to the absence of data on Kentucky's 1) ground-water resources, 2) their uses, and 3) the extent and causes of ground water contamination (36).

Recently, a partnership was formed between the EPA and the state governments referred to as the Comprehensive State Ground Water Protection Program. The Program intends

to develop a coherent, effective approach to protecting the nation's ground water resources (37). In Kentucky, the NREPC has spearheaded this program. The NREPC ~~Division of Water seeks to implement a ground water protection program in 1993/1994.~~ A Ground Water Consensus Group was established to prepare draft regulations for adoption by the NREPC (38).

When ground water regulations are promulgated, they will have some effect on state transportation agencies. Those regulations will affect both the construction and the maintenance and facilities areas.

### **Underground Storage Tanks**

Most USTs used nationwide hold petroleum products for retail and industrial purposes. Approximately five percent of them store hazardous wastes. In 1990, there were approximately 1.4 million USTs regulated under Subtitle I of RCRA. Eighty percent of them are believed to be constructed of bare steel which may corrode quickly and release contaminants into the environment (39). A recent market analysis of federally regulated USTs states that tank owners will spend about 38 billion dollars between 1991 and 1995 to test USTs, replace and remediate leaking USTs, to close unwanted tanks, and to upgrade existing tanks to meet federal and state regulations. Approximately 15 billion dollars of that amount will be spent on remediation of contaminated soils (40).

USTs are defined in KRS Chapter 224.810 as, "... any one or combination of tanks used to contain an accumulation of regulated substances and the volume of which is 10 percent or more beneath the surface of the ground." The KRS definition excludes many tanks such as: farm or residential tanks with less than 1,100 gallon capacity used for storing noncommercial motor fuel, heating oil tanks, septic tanks, pipeline facilities, and storage tanks situated in underground areas such as basements, cellars, mine shafts, or tunnels.

KRS regulated substances include those defined in the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as petroleum or crude oil products which are liquid at standard conditions. Regulated substances do not include hazardous wastes as defined under Federal Resource Conservation and Recovery Act (RCRA) Subtitle C Regulations.

In Kentucky, there are more than 34,000 USTs containing materials such as gasoline, oil, diesel fuel, or hazardous materials. The EPA estimates that 25 percent of those tanks are leaking (41). That poses problems for ground water quality. Currently, that situation is being addressed based upon EPA regulations. Those regulations require stringent controls for new USTs governing: 1) installation, 2) spill and overflow protection, 3) corrosion prevention, and 4) leak detection. After 1998, those controls become retroactive to existing USTs.

Kentucky regulates USTs based on Kentucky statutes (KRS 224.60-105). The NREPC Division of Waste Management is charged with enforcement of regulations promulgated in 401 KAR Chapter 42. In Kentucky, owners are required to register their USTs with

the Division of Waste Management. A state Petroleum Storage Tank Environmental Assurance Fund has been initiated that provides financial assistance to tank owners ~~faced with costs of leak remediation. Access to that fund is conditional based on~~ requirements for tank registration, financial responsibility, and leak detection (42). To date, the Kentucky Transportation Cabinet has not applied for financial assistance from the fund although it intends to in the future.

State transportation agencies commonly experience problems with USTs when they are owned by an agency as part of a facility or are located on construction right of ways that the agency wishes to purchase, already owns or wishes to sell.

## **Solid Waste**

The Resource Conservation and Recovery Act (RCRA) defines solid waste as: "...any discarded material that is abandoned to disposal or incineration; recycled in a manner constituting disposal; burned for energy recovery or reclaimed; or is inherently waste-...",". Most solid wastes generated in Kentucky are categorized as household solid waste, commercial solid waste, solid municipal waste, industrial waste, or special waste. Those wastes are defined in Kentucky statutory laws (KRS 224.005 and 224.868). Those definitions relate to the source of waste generation, the specific type of waste, and how it may be disposed.

The amount of solid waste generated by Kentuckians has increased drastically doubling in weight over the past 30 years. Commercial and industrial waste generation has also increased (43). Elimination of those wastes must be managed in some manner. Options for solid waste management include storage by landfilling and waste quantity reduction by incineration and recycling.

Nationwide, approximately for 84 percent of all municipal solid waste generated is placed in landfills, about nine percent is recycled, and the remaining seven percent is incinerated (44). Currently, Kentucky depends upon landfilling for disposal of almost 100 percent of its solid waste (45). There are four categories of solid waste landfills in Kentucky: 1) construction & demolition debris landfills, 2) contained landfills, 3) residual landfills, and 4) special waste landfills. Most typical solid wastes generated by KyTC relate to the first two categories (46). Currently, in Kentucky, there are 37 permitted solid waste landfills of various categories, three of which are closed and two which are private (47). There is one permitted solid waste incineration facility in Kentucky (48).

In Kentucky, the NREPC Division of Waste Management is charged with enforcing regulations related to facilities for waste disposal, including solid waste landfilling. The classification of landfill types is contained in 401 KAR Chapter 47 and technical requirements for those facilities are contained in 401 KAR Chapter 48.

Solid wastes generated by state transportation agencies includes paving material, organic waste, spent building material, dirt and rocks that are removed during earth moving operations. Most of those wastes may be disposed in contained or demolition and debris

landfills (49).

~~State legislation (KRS 45A.520) empowered the Finance and Administration Cabinet to mandate regulations for minimum recycled content for goods, supplies, equipment, and materials used by state agencies. This will be implemented through 200 KAR 5:330 which covers state agency contracts for repair, construction, renovation, and demolition of public facilities. All contractors supplying goods to the state must meet, to a reasonable or practicable limit, the minimum required content of recycled material. This recycled content requirement also applies to all bonds issued by the state. This legislation parallels 1991 amendments to KRS 224 mandating a 25 percent reduction of landfill use in Kentucky by 1997 (50). KyTC is currently working to incorporate recycling into its solid waste management program.~~

### **Hazardous Waste**

RCRA defines a hazardous waste as "... a solid waste or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

- 1) Cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or
- 2) Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

The EPA classifies hazardous wastes as listed or characteristic. Listed wastes are related to specific or non-specific sources typically associated with manufacturing. Characteristic wastes are not specifically associated with any manufacturing process. RCRA lists specific wastes by number denoted whether the waste is listed or characteristic - characteristic wastes have a "D" prefix and a specific hazard (i.e. ignitable - D0001, corrosive - D0002, reactive - D0003, or EP toxic -D0004 to D0017. "EP" signifies the term "Extraction Procedure". For example, lead is an EP-toxic waste with an RCRA waste number of D0008. A mixture of a hazardous waste and a non-hazardous waste will be considered hazardous if the concentration of the hazardous material exceeds a specified regulatory threshold. Kentucky definitions of hazardous wastes are provided in 401 KAR Chapter 31.

The EPA regulates hazardous wastes under RCRA Subtitle C. Kentucky assumed RCRA regulatory authority of hazardous wastes under statutory law (KRS 224.16-60). The NREPC Division of Waste Management is responsible for regulation of hazardous wastes under regulations promulgated in 401 KAR Chapters 30 through 34.

Special permitting is required to generate and dispose of hazardous wastes. A waste may be stored at the site of generation for a limited period under strict conditions. Eventually, the material must be transported to a permitted hazardous waste landfill for



disposal or to a treatment facility where it may be rendered non-hazardous. After suitable treatment, the waste may be stored at a RCRA Subtitle D industrial landfill.

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Currently, there are no commercially available hazardous waste landfills in Kentucky. The Division of Waste Management has authorized only one solid waste landfill to accept hazardous wastes from limited quantity generators [i.e. parties that generate less than 220 lb (100 kg) per month]. Typically, hazardous wastes are taken out of state for treatment and/or disposal. Transportation costs related to hazardous wastes may be significant for transportation agencies in states not having treatment and/or disposal facilities.

Hazardous wastes most commonly generated by state transportation agencies comprise lead in paints commonly found on bridges and on highway delineation lanes. It is estimated that over 80 percent of all steel bridges nationwide employ lead-based paint. Those materials become hazardous wastes when removed by abrasive blasting prior to maintenance painting. Environmental regulations related to the generation, collection, and disposal of hazardous waste have typically tripled or quadrupled the cost of bridge painting operations where lead paint was involved (51). Solvents and waste paint used/generated by maintenance forces in paint stripping are also considered a major hazardous waste disposal problem. Kentucky is moving towards privatization and more environmentally compatible paints to deal with that problem.

### **Geographic, Demographic and Economic Comparisons**

In comparing environmental impacts on the various state transportation agencies, it was considered logical to examine the geographic and demographic characteristics of the states. Comparisons of state economies were also considered worthwhile for assessing the ability of those states to absorb environmental impacts financially.

A comparison of demographic and geographic data reveals the status of Kentucky in terms of population and natural resources relative to the eight benchmark states (Table 1). Kentucky ranks eighth in population with 3,713,475 people. That is only about 32 percent of the most populous benchmark state, Illinois which has 11,542,841 people. The average population of the eight benchmark states was 6,304,323 people. The only state having a lower population was West Virginia which has 1,800,936 people.

Kentucky ranks seventh in population density having about 93.5 people per square mile or one person for every 6.7 acres. Ohio has the highest population density (267 people per square mile). West Virginia has the lowest population density (74.8 people per square mile).

In terms of total area, Kentucky ranks seventh with 40,410 square miles. Only three states - Missouri, Illinois, and North Carolina, are significantly larger than Kentucky. The total area of Kentucky is within five percent of three larger states - Ohio, Tennessee, and Virginia. The states having less total area are Indiana (36,185 square miles) and West Virginia (24,232 square miles).

Kentucky ranks sixth in terms of land area with 39,732 square miles.

~~Kentucky ranks sixth in water area with 678 square miles. North Carolina ranks first with 3,915 square miles. West Virginia has the least water area with 145 square miles. It should be noted that much of Kentucky's waterways are comprised of over 89,000 miles of rivers and streams. While regulations in the subject states may be similar in scope, topographic features such as numerous waterways may provide more situations or potential incidents that result in environmental impacts.~~

The topography of the benchmark states varies considerably. Kentucky has elements of topography that are similar to its neighboring states including mountainous areas, rounded hills, and fertile plains. Leading industries in Kentucky, such as manufacturing, mining, and agriculture, are also important in neighboring states. Kentucky's climate tends to be moderate compared to the more pronounced weather patterns in some of the westerly and northern bordering states.

Comparative personal income and employment distribution data are provided in Table 2. Kentucky ranks eighth in total employment having 1,944,858 persons employed. Illinois ranks first with 6,358,875 persons employed. West Virginia has the lowest employment with 774,756 persons employed. Kentucky ranks eighth in total personal income with \$58,027,444,000 compared to \$239,293,413,000 for top-ranked Illinois and \$25,754,407,000 for bottom-ranked West Virginia. Kentucky ranks eighth in per capita income with an average personal income of \$15,626. That is 25 percent lower than top-ranked Illinois which has a per capita income of \$20,731. It is 16 percent lower than the average per capita personal income for the benchmark states (\$18,551). West Virginia has the lowest per capita income (\$14,301).

The distribution of employment among the major economic areas reveals Kentucky ranked sixth in manufacturing of durable and non-durable goods with 14.9 percent of the total work force involved in those activities. Kentucky ranks seventh in services with 23.5 percent of the work force. In wholesale and retail trade, it ranks somewhere between sixth and eighth with 21 percent of the work force. It ranks somewhere between third and seventh in transportation and public utilities with five percent of the work force engaged in those activities. Kentucky ranks first in farming with a total of six percent of the work force involved with farm-related activities. Kentucky ranks second in mining (including coal, gas, and oil) with 1.8 percent of the work force involved in those activities. Kentucky ranks fourth in employment for government and government enterprises with 15.6 percent of the work force involved in those activities. For miscellaneous activities including construction, finance, and non-farm areas such as agricultural services, forestry, and fisheries, Kentucky ranks sixth with 12.2 percent of the work force engaged in those activities.

Kentucky's economy is also reflected by its annual gross product (Table 3). Kentucky ranks eighth compared to the benchmark states with an annual gross product of about \$65,858,000,000. That is only about one fourth of the \$256,478,000,000 annual gross product for top-ranked Illinois and about twice that of bottom-ranked West Virginia

(\$27,922,000,000). The average annual gross product for the eight benchmark states was \$125,116,000,000.

In terms of annual gross product by industry, Kentucky ranked eighth in manufacturing of durable and non-durable goods with a little more than half of the average value for the eight benchmark states, eighth in services with less than half the amount for the other states, eighth in the wholesale and retail trade, eighth in transportation and public utilities, fourth in farm gross product, second in coal mining, eighth in government and government enterprises, and eighth in miscellaneous activities.

Those comparisons of economic factors indicate that Kentucky is one of the less affluent states in this study. Some of the differences can be attributed to the low population and size of Kentucky compared to some of the larger more populous neighboring states. However, the economic position of Kentucky is reflected by its comparatively low per capita personal income.

## **SUMMARY OF STATE TRANSPORTATION AGENCY SURVEYS**

This section of the report summarizes responses contained in the state transportation agency surveys. For brevity, most responses from the transportation agencies will be referred to by state.

### **General Information Section**

The General Information Section of the questionnaire solicited information concerning state transportation agency inventory of roadway facilities and organizational structure. One reason for seeking that information was to determine the scope of operations of the state transportation agencies. That would directly affect expenditures related to environmental issues including funding for divisions within transportation agencies that dealt with transportation-related environmental issues. A second reason was to assess the function and disposition of divisions or branches within the state transportation agencies dealing with environmental issues, to determine their areas of responsibility and authority, and to make comparisons in terms of agency budgets and manpower.

1. The state transportation agencies were asked to provide statistical information concerning transportation agency road, bridge and facility inventories, operating budget, and manpower.

a) lane miles of federal primary roads in the state<sup>1</sup> - Kentucky reported 9,920 lane miles

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<sup>1</sup> Currently, state transportation agencies are in a period of transition from the old federal aid system to the new national highway system (NHS). Some of those agencies are further along in the updating process than others and have reported NHS mileage while others have reported federal aid system mileage. As a result, there is some inconsistency in the data.

of road on the proposed national highway system ranking seventh compared to the benchmark states. The average lane miles for the benchmark states was 21,402 miles. ~~North Carolina ranked first with 36,780 lane miles. Indiana reported 4,870 lane miles~~ on the interstate system and ranked ninth. That excludes 7,877 principle arterial lane miles in Indiana which are probably on the old federal aid primary system. West Virginia probably ranks last with 8,904 lane miles.

**b)** lane miles of state secondary roads - Kentucky had 50,198 lane miles of state secondary roads. The average for state secondary roads in the eight benchmark states was 49,697 lane miles. North Carolina ranked first with 125,314 lane miles. Illinois ranked last with only 8,408 lane miles.

**c)** lane miles of city and county roads not previously enumerated under highway authority - Kentucky reported 64,920 lane miles of city and county roads ranking fifth compared to the bench mark states. The average reported by the benchmark states was 103,562 lane miles. Illinois ranked first with 209,976 lane miles. Virginia ranked last with 3,673 lane miles.

**d)** number of state maintained bridges - Kentucky had 8,682 state maintained bridges ranking fourth compared to the benchmark states. The average number of state maintained bridges for the benchmark states was 10,382. Ohio ranked first with 14,963 state maintained bridges. Indiana ranked ninth with 5,425 state maintained bridges.

**e)** number of city and county bridges - Kentucky reported 4,394 city and county bridges ranking sixth compared to the benchmark states. The average number of city and county bridges reported by the benchmark states was 11,087. Ohio ranked first with 27,851 bridges. West Virginia ranked ninth with 166 bridges.

**f)** number of state operations facilities - Kentucky had 180 operations facilities located at 145 sites ranking seventh compared to the seven reporting benchmark states. This does not include toll booths, rest areas, or weigh stations. The average number of operations facilities for the reporting benchmark states was 649. That figure was inflated by North Carolina which reported 2,664 operations facilities. Second ranked Tennessee had 540 facilities. The lowest ranked reporting state was Illinois which had 135 operations facilities.

**g)** number of miles driven yearly on state-maintained roads - Kentucky reported at 30,475,000 miles driven annually ranking eighth compared to the benchmark states. The average for the eight benchmark states was 42,605,000 annual miles driven. Illinois was top ranked with 57,814,000 miles driven annually. West Virginia was ranked ninth with 15,769,000 miles driven annually.

**h)** annual transportation agency budget (last two fiscal years) - Kentucky reported an annual budget of \$1,326,152,600 for fiscal year 1991 and \$1,272,316,800 for fiscal year 1992. The annual transportation budget for Kentucky in both fiscal years ranked fifth compared to the benchmark states. The average benchmark annual budget for the

benchmark states was \$1,590,824,889 for fiscal year 1991 and \$1,616,064,326 for fiscal year 1992. In both fiscal years, Illinois ranked first with a annual transportation budget of \$4,825,227,000 for fiscal year 1991 and \$4,724,418,000 for fiscal year 1992. In both years, West Virginia ranked last with an annual budget of \$705,002,000 for fiscal year 1991 and \$716,818,000 for fiscal year 1992.

i) annual new road construction budget (last two fiscal years) - The Kentucky construction budget was \$605,400,000 for fiscal year 1991 and \$332,600,000 for fiscal year 1992. Kentucky ranked third in fiscal year 1991 and fifth in fiscal year 1992. The average annual construction budget reported by the benchmark states was \$624,120,573 in fiscal year 1991 and \$661,176,062 in fiscal year 1992. Illinois ranked first for both years, with construction budgets of \$2,789,083,300 for fiscal year 1991 and \$2,607,036,500 for fiscal year 1992. Indiana ranked ninth for both years with construction budgets of \$46,200,000 for fiscal year 1991 and \$108,600,000 for fiscal year 1992.

j) annual maintenance budget (last two fiscal years) - The annual maintenance budget for Kentucky was \$135,425,800 for fiscal year 1991 and \$129,510,400 for fiscal year 1992. In both years, Kentucky ranked eighth compared to the benchmark states. The average maintenance budget reported by the benchmark states was \$289,608,576 for fiscal year 1991 and \$290,033,380 for fiscal year 1992. Virginia ranked first for both years with a budget of \$671,163,000 for fiscal year 1991 and \$675,914,000 for fiscal year 1992. Tennessee ranked ninth for both years having a maintenance budget of \$88,300,000 for fiscal year 1991 and \$88,633,000 for fiscal year 1992.

k) lane miles of new road construction (last two fiscal years)<sup>2</sup> - Kentucky reported 504 lane miles of newly constructed road for fiscal year 1991 and 22 lane miles in fiscal year 1992. Kentucky ranked first in lane miles of new road construction in fiscal year 1991 and tied for last in 1992. In fiscal year 1991 the average number of lane miles of newly constructed reported by the responding benchmark states was 172. Of the reporting benchmark states, Tennessee ranked second to Kentucky with 435 lane miles of road constructed in fiscal year 1991. Indiana ranked ninth with only 17 lane miles of newly constructed road. For fiscal year 1992, the average number of new constructed roads for the reporting benchmark states was 235 lane miles. Tennessee ranked first with 470 lane miles. Indiana was tied with Kentucky for last with 22 lane miles.

l) Total number of state highway agency employees - Kentucky reported 5,089 state

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<sup>2</sup> This information was extracted from data furnished by the KyTC Division of Special Services of the Roadway Planning Branch. The difference in new road construction between the two fiscal years may be explained, in part, by the definitions for "new constructed roads" employed by KyTC. That includes road widening projects that require realignment. It does not include widening projects using the same alignment. Also, extensive work may be performed in one fiscal year on a project that is not completed (or counted) until the following fiscal year.

employees ranking eighth compared to the benchmark states. The average number of state employees reported by the benchmark states was 7,617. North Carolina ranked first with 12,907 employees. Tennessee ranked last with 5,019 employees.

2. State transportation agencies were also to provide a description of divisions within the state transportation agency dealing with environmental issues and their areas of responsibility and/or authority related to environmental regulations. The agencies were also asked the staff size in each division that dealt directly with environmental issues.

Kentucky replied that the Division of Environmental Analysis (DEA) is the agency responsible for the identification of potential social, economical, and environmental effects of highway projects (i.e. NEPA requirements). The DEA is charged with identifying and addressing the potential environmental impact of a proposed project and with preparing environmental assessment documentation required by federal regulations (e.g. categorical exclusions, EAs, EISs, etc.). Project analyses may include air quality, noise, water quality, water and land ecology, socio-economics, history and culture, and archaeology.

Those analyses allow KyTC agencies to formulate decisions concerning project alternatives. Those analyses facilitate adoption of alternatives that minimize harmful environmental effects while maximizing beneficial ones.

The DEA is also responsible for inter-agency coordinating of the various analyses, developing mitigation measures to reduce environmental impacts, performing air and noise analyses, providing technical expertise to other KyTC Divisions, attending interdisciplinary team meetings, project review committee meetings, public hearings, and preparing environmental impact documents when required.

The DEA has 22 people. In addition, there are two full-time staff assigned to the Cabinet of the Secretary of Transportation to review environmental matters. Kentucky has recently established the Office of Environmental Affairs at the Secretary's level to ensure cabinet-wide compliance to environmental regulations including those impacting maintenance operations. The underground storage tank removal program has also been placed in that office. Eight persons are currently assigned to the new office.

Responses from the eight benchmark state transportation agencies indicated they possess environmental units similar to the DEA that address common issues (e.g. NEPA regulations) in a similar manner. In some cases, there are differences in placement of those units within the state transportation agency organizational structure. In Indiana, Ohio, and Virginia, those units are situated at the Division or Branch level. In Illinois, Missouri, North Carolina, Tennessee, and West Virginia, they are sections or groups situated at a lower administrative level. In Missouri and Tennessee, other divisions assume some environmental functions such as permitting. Illinois, Indiana, Ohio, and Virginia employ full-time personnel at the district level that address environment issues. Until June 1993, Indiana handled all environmental issues at the district level. Thereafter, a central Division of Environment was established in Indianapolis.

The staffing of the central units in most benchmark states was similar to the DEA ranging from 44 employees in Ohio (Division of Environmental Services) to 11 in West Virginia (~~Environmental Services Section in the Division of Roadway Design~~).

3. The state transportation agencies were asked to provide organizational charts showing the appropriate chain of authority and locating the divisions or agencies dealing with environmental issues.

### **Construction Section**

This section of the questionnaire solicits information concerning state transportation agencies operational activities related to construction permitting and related compliance measures due to environmental regulations of state and federal agencies. The initial questions address general issues followed by those addressing the five areas of concern for environmental impacts (i.e. storm water, wetlands, ground water, USTs, and solid & hazardous wastes).

#### **General**

1) The state transportation agencies were asked what responsible entity(s) within the agency is charged with obtaining the necessary construction-related permitting, registration, certification, etc.

Kentucky replied that the Division of Design and the DEA obtained necessary permits and approvals. The DEA obtains Section 401 (water quality) certifications, UST registrations, hazardous wastes registrations, etc. While the Division of Design obtains storm water discharge, flood plan and similar permits, many other activities are assigned to district offices to ensure compliance, e.g. demolition of buildings, on site construction demolition and burial, burning of debris, etc.

In Indiana and Missouri, permitting is accomplished within design divisions. In Virginia and Ohio, permitting is coordinated between personnel of the centralized environmental division and district personnel. In North Carolina, permitting is done by the Planning and Environmental Branch (Environmental Planning Group). In Tennessee, permitting is obtained by the Hydraulics and Permit Section of the Structures Division. In West Virginia, permitting is obtained by the Structures Division and registrations are obtained by the Construction Division.

2) The state transportation agencies were asked to provide information concerning permitting, remediation, and mitigation actions that must be taken by the agency for construction to conform to environmental regulations. That would include actions taken in planning, design, and construction.

Kentucky reported that storm water permits are required to insure that proper erosion control measures are taken. Wetlands mitigation often requires the acquisition of land and development of mitigation plans. Wetlands mitigation requires approval from the

NREPC Division of Water and the Corps of Engineers. Underground storage tank removal and hazardous waste mitigation requires the testing and removal of contaminated and hazardous materials.

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When combined, responses from the benchmark transportation agencies appear to cover broader scope of actions than described in the Kentucky response. Since Kentucky is considered to be in compliance with all environmental regulations, it is unlikely that the permitting actions taken by those agencies exceed those being undertaken by Kentucky.

Indiana, North Carolina, Ohio, Tennessee, Virginia, and West Virginia consider NEPA activities (e.g. ecological, historic, cultural and archaeological work) adjunct actions that are an important part of the permitting/remediation and mitigation process. Indiana and Ohio stated those factors were addressed during NEPA assessments early in the project planning phase. In Indiana, detailed mitigation plans are formulated during the design phase, while, in Ohio, attempts are made to avoid environmental impacts in the planning phase.

Indiana and Virginia reported obtaining permitting during the design phase. North Carolina commonly performs permitting shortly after right of way acquisition, prior to construction. Indiana attempts to have remediation completed prior to land acquisition or during the early construction phase. Tennessee and Virginia perform remediation prior to construction.

Of the three impact areas discussed in the Kentucky response, storm water permitting was also identified as an impact area by Illinois, Missouri, Virginia, and West Virginia. Wetlands permitting/mitigation was noted by Illinois, Missouri, Ohio, Virginia, and West Virginia. Hazardous waste actions were reported by Tennessee, Virginia, and West Virginia.

Several specific or unusual permitting requirements were noted among the various highway agencies. Illinois, Tennessee, Virginia, and West Virginia noted, or alluded to Section 404 permits related to channel dredging. Illinois mentioned a burning permit to eliminate of landscaping waste. Missouri reported mandatory annual water quality testing on 10 percent of the construction projects. Virginia noted a seasonal restriction on in-stream work to protect certain species of fish. West Virginia mentioned efforts related to special landscaping, flood planning, design of aesthetic bridges and air quality.

**3)** The state transportation agencies were asked to provide information concerning planned avoidance actions taken by the agency for construction to avoid the impact of environmental regulations. Those were to include actions taken during planning, design, and construction.

Kentucky replied that alternative alignments (i.e. avoidance actions) were considered in environmentally sensitive areas. However, selection of such an alignment must be proven to be the only prudent and feasible alternative. If an environmental impact is to occur, it will be done only after considerable discussion, consideration of all alternatives,



and obtaining approvals within KyTC. Where impacts occur, numerous approvals are commonly required from outside agencies including Federal Highway Administration (FHWA). One method of avoiding NEPA requirements and the preparation of impact statements is by using 100 percent state funding for a project. However, this is being seriously compromised by the actual potential for environmental harm which is Kentucky's goal to prevent!

All responders from the benchmark transportation agencies stated that avoidance of environmental regulation impacts is an important objective when assessing projects. Several states, Illinois, Missouri, North Carolina, and Virginia noted that it is desirable to identify possible areas of environmental impact as early as possible in the planning stage or, there about, to determine avoidance procedures.

Missouri reported a plan to increase the staff in the Environmental Studies Unit to allow more avoidance analyses to be performed in the design stage. That would allow them to circumvent future problems.

North Carolina stated that increased attention to avoidance of environmental impacts during long-range planning is cost effective and an emphasis has been placed on pre-identification of environmentally sensitive sites during the long-range planning phase. Early review allows prompt coordination with environmental and resource agencies (e.g. state and federal EPAs, wildlife protection agencies, Corps of Engineers, etc.) possessing information on known locations having critical habitat for protected species, national register sites, wetlands areas, and parks and recreation areas. That information would be incorporated into long-range road construction plans. North Carolina responders noted that earlier consideration of environmental issues results in cost savings during the project planning, design, and permit-acquisition phases.

Virginia has entered into a Memorandum of Agreement (MOA) with environmental agencies under the Virginia Secretary of Natural Resources and other related environmental and resource agencies. This MOA allows state environmental and resource agencies to comment on highway improvements during the project initiation phase. That procedure assures consideration of state environmental agency interests (and requirements) at the earliest time and implementation of proper actions to avoid or mitigate potential environmental impacts at the earliest opportunity. Similar early input is sought from federal agencies.

Concurrent with the term "avoidance of environmental impacts," six of the benchmark states included the term "minimize," referring to activities undertaken in initiating a transportation project to reduce unavoidable environmental impacts.

Environmental impact sites identified by the benchmark states that may be dealt with effectively using avoidance include wetlands, areas having contaminated soils, locations where erosion is a problem, archeological sites, historical properties, habitats for endangered species, areas where stream re-channeling would be necessary, and locations where noise is a significant issue.

4) The state transportation agencies were asked what division/programs are currently dedicated to addressing construction related environmental regulations? How many agency personnel in each division/programmers are specifically assigned to this task?

Kentucky replied that the DEA addresses most of the environmental regulations. The Division of Design has a two-person Permit Section that obtains most required permits. The Division of Right of Ways/Utilities provide a four-person crew to inspect buildings to be demolished that contain asbestos and district office resident engineers are responsible for ensuring contractor compliance.

Illinois, Indiana and, West Virginia reported their design divisions address most construction-related environmental regulations. In North Carolina, Ohio, and Virginia, the centralized environmental divisions are responsible for addressing the construction-related environmental regulations. In Ohio, district personnel also assist with construction regulations. In Missouri, they are processed by the Construction Division. In Tennessee, Section 404 permits are obtained from the Corps of Engineers by the Structures Division. Other permitting is handled by the Planning Division Environmental Planning Office.

Personnel requirements to address construction-related environmental regulations were provided as follows: Kentucky-22, Illinois-22, North Carolina-108, Ohio-44 (plus 16 persons in the districts), Tennessee-22, Virginia-119, and West Virginia-11.

5) The state transportation agencies were asked to provide the in-house budgetary cost of those personnel and programs for the last two fiscal years.

Kentucky reported the salary cost of the Division of Design Permit Section totalled \$155,000 for the past 2 years. The DEA budget (including both charges to projects and overhead) was \$891,000 and \$925,000, for fiscal years 1992 (June 30, 1991 through July 31, 1992) and 1993 (June 30, 1992 through July 31, 1993) respectively.

Four benchmark states provided data or estimates related to this question. North Carolina estimated that it spends about \$1,000,000 a year devoted for plans preparation. Environmental protection would account for 10 to 15 percent of that expense. Ohio estimated that its in-house environmental personnel cost was about \$2,493,000 per year. Tennessee estimated that its in-house personnel and program costs for 1991-1992 were \$666,886 and \$2,566,674, respectively. For 1992-1993, those costs were \$680,496 and \$4,949,864, respectively. West Virginia estimated that the total cost of its environmental program over the past two years was \$880,000.

## **Storm Water**

6) The state transportation agencies were asked to describe the impacts of environmental regulations related to storm water runoff (NPDES) on construction costs and delays and operational procedures. They were also asked to include the number of point discharge and storm water runoff permits applied for, obtained, or maintained during the last year.

Kentucky responded that no projects have been delayed to date due to storm water permitting and that design costs are minimal. Approximately 100 projects under construction for October 1992 had received post-dated approval. Since that time, 35 more projects had received approval. Currently, one project is under the threat of sanctions.

Illinois, Missouri, and North Carolina have obtained general (blanket) NPDES permits from their state environmental agencies. Virginia is developing a similar general permit program. Ohio, Virginia, and West Virginia noted that construction-related NPDES permits are required only for projects involving land disturbances of more than five acres.

Most of the responding states said that storm water permitting did not constitute an unusual problem or expense. Tennessee noted that some increases in construction cost may arise due to stricter erosion controls. Tennessee reported that it takes approximately two man hours of in-house work to prepare an NPDES permit. Virginia noted that once the general permit program is in place, each NPDES permit will cost about \$200. Virginia also provided storm water maintenance basin costs for construction and right of ways of approximately \$11,000 for rural areas, approximately \$35,000 for urban areas, and approximately \$300,000 for highly developed areas. West Virginia noted paying a NPDES permitting fee to the West Virginia Department of Environmental Protection, but did not specify the amount.

Of the benchmark states having to apply for individual permits during the last year, Tennessee applied for 128 permits and West Virginia applied for 40. While Illinois receives a blanket permit, it reported that the permit would encompass approximately 100 projects per year.

## **Wetlands**

7) The state transportation agencies were asked to describe the impacts of environmental regulations related to wetlands on construction, cost, delays, and operational procedures. The agencies were also requested to indicate the number of acres affected.

Kentucky replied that wetlands and replacement lands must be identified by the U.S. Soil Conservation Service. Replacement acreage is at a 2 to 1 or 3 to 1 ratio based on dictates from the Corps of Engineers and the NREPC Division of Water. Kentucky must find willing land sellers prior to initiation of condemnation proceedings. Then, mitigation plans are formulated based on the acquired lands. For wetlands construction, approval must be obtained from the Corps of Engineers and the NREPC, Division of Water, prior to a project letting.

Several benchmark states indicated that wetlands did not have a major impact on their highway construction programs. Indiana had not encountered many problems with wetlands since it only had a few affected acres on projects each year. Illinois also reported that it was not a significant problem and its wetlands acreage replacement ratio was 1.5 to 1. The other states reported significant problems.

Missouri and Tennessee noted problems in dealing with regulatory agencies. Missouri stated it is a major cause of construction delays. Missouri reported that the Corps of Engineers public interest reviews were extremely slow. Federal and state environmental and resource agencies were considered to have an uncoordinated, disjointed approach towards Section 404 permitting from a public comment standpoint. Missouri also has a problem dealing with its state environmental agency related to Section 401 permitting. Tennessee reported problems reaching a consensus on mitigation (related to site selection and hydrologic restoration) with the various regulatory agencies who commonly possess different points of view. Tennessee has experienced high construction costs and noted that little attention is paid to functional value by the environmental and resource agencies.

Missouri, North Carolina, Tennessee, and West Virginia reported problems with construction-related delays involving wetlands. North Carolina and West Virginia reported having to re-evaluate previously approved projects due to revisions in environmental regulations. West Virginia experienced construction delays up to 18 months.

Missouri, Ohio, Tennessee, and Virginia provided wetlands mitigation cost data. In Ohio, mitigation costs range from \$40,000 to \$100,000 per acre. Virginia reported average costs for wetlands compensation measures of about \$34,328 per acre. In West Virginia, impacted wetlands mitigation has been performed at an average replacement acreage ratio of 1.5 to 1 with an average cost of about \$10,000 per acre. West Virginia cited costs for created wetlands of \$50,000 per acre and \$5,000 an acre for enhanced wetlands (including property acquisition). The total wetlands mitigation costs in West Virginia has been about \$4,000,000 over the past 10 years.

In terms of the number of acres impacted by wetlands, Indiana reported a figure of 10 to 15 acres per year. In Missouri, approximately 60 to 80 acres of wetlands are currently involved in construction projects representing five to six different sites. North Carolina noted projects involving 500 acres of wetlands over the last two years. Ohio reported 142 acres of wetlands impacts which will result in 120 acres being mitigated. Tennessee indicated that the size of wetlands impacted along roadways typically ranges from 0.1 to 20 acres. Over the last 10 years, Virginia has had approximately 240 acres of wetlands impacted. A wetlands compensation program or wetlands banking system has been established comprising 233 acres of wetlands at many sites across the state. In West Virginia during the last 10 years, wetlands mitigation has involved approximately 200 acres.

8) The state transportation agencies are asked to describe their wetlands banking system (if they have one).

Kentucky responded it does not have a true banking operation. However, several projects involving Daviess, Henderson, and Hopkins counties were mitigated at a common site in Union County.

North Carolina, Tennessee, and Virginia employ wetlands banking.

~~North Carolina currently has two types of wetlands banking programs: a bottom land hardwoods bank and a swamp bank. Additional properties are being sought for further mitigation banking. Some restoration is needed for wetlands used in a banking system. Those restoration efforts as well as management responsibilities are part of an MOA with the relevant environmental and resource agencies.~~

Tennessee presently has a 136-acre wetlands bank and is letting a contract this fall to develop a 500-acre bank. Tennessee has also entered into a MOA with the appropriate environmental and resource agencies concerning use of those banks.

In 1982, Virginia established one of the first wetlands banks in the country consisting of a 10.5-acre tideland salt marsh. With regulatory approval (on a project by project basis), Virginia has used this bank for off-site compensation on 17 roadway improvements. At the current rate of usage, it will serve for several more years. Virginia is also looking at establishing wetlands banks for inland areas.

Missouri and Ohio are currently considering wetlands banking programs.

## **Ground Water**

9) The state transportation agencies were asked to describe the impacts of environmental regulations related to ground water on construction. Costs, delays, and operational procedures, were also to be included.

Kentucky responded that regulations related to ground water have been developed but have not been enacted. A process similar to storm water permitting is expected. A major anticipated impact will be related to the continued usage of sinkholes for receipt of surface water discharges. Another potentially major impact anticipated is a required plugging of exploratory drilling holes.

Most of the responding benchmark states indicated that ground water is not a problem area. Illinois, Ohio, and Virginia all commented that ground water is an issue related to remediation of contaminated soil. Illinois noted the sealing of abandoned wells. Indiana replied that ground water is a factor in two areas of the state. One is located in a sole aquifer area (a similar impact was noted by Tennessee) and the other is where karst topography exists. To date, costs related to the sole source aquifer have been minimal. However, substantial funds are being spent to research ground water in areas having karst topography. North Carolina noted potential cost increases for subsurface exploration during project development.

## **Underground Storage Tanks**

10a) The state transportation agencies were asked to describe the impacts of environmental regulations related to USTs on construction. Cost, delays, and operational

procedures were also to be included.

~~Kentucky replied that when USTs are located on design projects, the district pre-construction engineer notifies the DEA. Statewide contracts would be utilized for drilling and testing of sites. If contamination is minimal, the normal recommendation is to buy a problem area as a portion of the right of way. However, minor contamination may create lengthy project delays or cancellation. The letting process involving UST investigation adds several months and delays right of way acquisition. In 1991 and 1992, USTs and affected materials cost approximately \$100,000. Kentucky anticipates that cost will increase in the future. Also, obtaining NREPC clean-closure (to background levels) is considered to be a more stringent and timely exercise for Kentucky.~~

Seven of the benchmark states noted problems related to USTs. Ohio reported inspecting for leaking tanks on right of ways. Illinois, Missouri, North Carolina, and West Virginia noted increased project costs. Missouri, North Carolina, Virginia, and West Virginia have experienced significant construction delays.

In terms of specific costs, Illinois removed six USTs in 1992 at a cost of about \$3,300 each. North Carolina provided an estimated cost for UST removal during construction of \$2,000,000 over a 4 1/2-year period (from 1988 to July 1993). Tennessee reported UST removal costs during construction are approximately \$5,000 per tank and site clean-up costs average about \$70,000 per site. West Virginia noted several very expensive UST remediation projects. One construction site cost \$350,000. The other is estimated to cost about \$300,000.

In terms of delays, four benchmark states noted significant delays related to removal of USTs on construction right of ways. Missouri and Virginia reported delays in the range of three to four months. Virginia and West Virginia had both experienced delays exceeding a year. One Virginia project has been delayed three years. The two previously mentioned West Virginia projects also entailed significant delays -- one lasting a year and the other, still in progress, has been delayed six months to date with another 18-month delay anticipated before final site remediation.

Ohio and Virginia noted that avoidance is a worthwhile tactic for use in dealing with potential UST problems. Of interest is a Tennessee comment noting that the state typically attempted to make previous land owners pay remediation costs prior to land acquisition.

**10b)** The state transportation agencies were asked how many USTs had been removed in the past two years and how many did the agency anticipate removing in 1993 and 1994.

Kentucky reported removing 15 USTs over the past two years. No estimate was provided for the following two years.

For the period of 1991-1992, the number of tanks reported being removed by the

responding benchmark states ranged from six to 125. Illinois and West Virginia had both removed six tanks, Missouri 16, Ohio somewhere between 10 and 15, North Carolina 56, and Tennessee 125. Three of the responding states provided projections for tank removal in the following two years; 10 to 15 for Missouri, 100 for North Carolina, and 125 for Tennessee.

## **Solid and Hazardous Waste**

**11)** The state transportation agencies were asked how many disposal facilities they employed to dispose of construction related solid waste and hazardous waste (in-state and out-of-state).

Kentucky leaves the disposal of construction related solid waste and hazardous waste to the contractor and does not track this information.

Most states provided no answer or responses such as "many" or "zero." West Virginia reported using four in-state and no out-of-state sources for disposal of hazardous waste. Illinois, Tennessee, and Virginia indicated they do not dispose of hazardous or solid waste. That work is typically performed by general contractors. Commonly, states do not take an active role as to where or how the waste is being disposed. Indiana reported using approximately 37 in-state facilities for solid waste disposal.

**12)** The state transportation agencies were asked to identify the types of construction waste and quantity commonly sent to those facilities for disposal.

Kentucky responded that contractors are responsible for all solid waste disposal including earth, rock, trees, pavements, etc. In rare instances, where there are limited disposal sites, KyTC may acquire land for disposal to achieve a cost savings. Kentucky also noted that hazardous waste is hauled to permitted facilities for incineration.

The benchmark states reported that construction waste sent to solid waste disposal sites included debris from building removal, bituminous and Portland cement concrete that is not recycled or used for engineering purposes, lumber, shingles, siding, appliances, house trash, furniture, and other construction related debris. Generally, states try to minimize this type of disposal. Asbestos was another material mentioned that usually is disposed as a solid waste. Wastes that might be classified as hazardous include gasoline-contaminated soils and abrasives from lead paint removal operations. Those are generally sent to hazardous waste disposal sites.

Ohio reported a cost of \$25 to \$50 per ton for petroleum remediation of contaminated soil. West Virginia noted it would seek treatment of contaminated soils using aeration/evaporation. Otherwise, it would dispose of contaminated soil by landfilling.

**13)** The state transportation agencies were asked to describe the permitting process for generation and disposal of hazardous waste for construction projects. If the agency receives a blanket permit for all construction projects, they were asked to describe the

conditions and processes involved.

The Kentucky responder said that no actual permit is obtained for hazardous waste. The NREPC is contacted for any instances involving hazardous waste and provides concurrence or comments on recommended actions. The contractor is responsible for obtaining the required EPA registration of the site and subsequent reports.

Illinois, Indiana, and Tennessee stated that contractors are responsible for hazardous waste permitting and removal. Illinois noted that consultants are occasionally employed to oversee contractors. None of the benchmark states received blanket permits. West Virginia noted that the Health Department dealt with permitting processes related to hazardous waste.

14) The state transportation agencies were asked to describe their policies for waste reduction or mandatory reuse of solid waste generated in construction. The agencies were asked what wastes were covered by that policy.

Kentucky replied that there is no policy mandating waste reduction or reuse. Excavation is utilized as much as possible to create fills. Non-contaminating materials could be placed in those fills.

None of the benchmark transportation agencies have a mandatory reuse policy that is enforced at all times. Illinois and Virginia indicated that they require mandatory reuse of pavement materials on experimental or selected projects. West Virginia noted having a policy to use recycled materials where economically viable. Tennessee also reported a policy for using waste materials in construction where the products are suitable and economical. Tennessee recycles asphalt, tires, batteries, oil, and paper. Tennessee and Kentucky use outside wastes such as slag, fly ash, and waste rock from ore production where possible. Other states indicated they recycled paving material for fill or occasional reuse in pavements.

15) The state transportation agencies were asked what costs are incurred due to construction related generation and disposal of solid and hazardous waste. The agencies were asked to provide costs for disposal or specific examples of wastes generated (types and amounts) and corresponding typical disposal cost. They were to indicate whether the waste were disposed of in-state or out-of-state.

Kentucky did not provide disposal costs for most waste materials. The costs for disposal of petroleum contaminated soil is approximately \$45 per cubic yard. Kentucky responders noted disposal costs for hazardous waste varied based on where and how material disposal is affected.

Illinois, Indiana, North Carolina, and Tennessee provided disposal costs. Illinois provided costs of \$25 per cubic yard for the disposal of 17,643 cubic yards of special waste and \$250 per cubic yard for the disposal of 150 cubic yards of hazardous waste. Illinois also noted that the contractor selects a state-approved disposal site. Indiana reported



spending \$60,000 in fiscal year 1992-1993 for waste disposal using in-state contractors. North Carolina preferred to recycle when possible, secondly to compost, and landfill as a final option. Avoidance of landfilling is emphasized. North Carolina provided solid waste landfill tipping fees of \$20 to \$50 per ton. Tennessee noted the cost for cleaning and repainting structural steel with full containment (hazardous abrasive blasting residue) has increased the painting cost from \$200 per ton of bridge steel to as much as \$500 per ton. The addition of crumb rubber to asphalt has increased the price to \$130 per ton. Tennessee disposes of most hazardous wastes at out-of-state facilities.

## **Maintenance and Facilities Section Questions**

This section of the questionnaire solicits information concerning the state transportation agencies' operational activities related to maintenance and facility permitting and related compliance measures resulting from state and federal environmental regulations. The initial questions address general issues followed by others addressing the five areas of concern for environmental impacts (i.e. storm water, wetlands, ground water, USTs, and solid & hazardous wastes).

### **General**

1) The state transportation agencies were asked what responsible entities within the agency are charged with obtaining the necessary maintenance and facility related permitting, registration, certifications, etc.

Kentucky replied that the District Offices are responsible for maintaining their facilities in compliance with the issued KPDES permits. Oversight and guidance is provided by the Office of Environmental Affairs (OEA).

Illinois, Indiana, Missouri, Ohio, and Virginia assign district offices responsibility in whole, or in part, for obtaining most necessary permits, registrations, and certifications. In Illinois, the duty is shared between the districts and the Central Bureau of Operations. In Indiana, the Central Office Division of Operations Support shares some of the permitting responsibilities with the districts. In Missouri, permits are initiated by districts and obtained by the main office. Virginia reported that districts are responsible for obtaining maintenance-related permits. However, permitting is coordinated through the central office and the Environmental Division. In Tennessee, permitting is handled by the Maintenance Division. In West Virginia, permitting is handled by the Materials Control, Soil, and Testing Division.

2) The state transportation agencies were asked to provide information concerning permitting, remediation, and mitigation actions that must be taken by the agency for maintenance and facilities to conform to environmental regulations. That included actions taken in planning, design, and construction.

Kentucky reported a policy of eliminating on-site treatment of sewage where practical. No new maintenance facilities are being built with USTs at this time. The Cabinet is

pursuing a fuel card distribution system. No point discharges are being allowed in new construction for floor drains, etc.

KyTC has centralized all remediation activities into the OEA. A Memorandum of Understanding was developed between the NREPC and KyTC to ensure that all facilities, including existing highways, are in compliance. All UST removals are coordinated through this central office. Eleven of the District Office Traffic Facilities are registered as hazardous waste generators. Training is provided by the OEA to the District Offices for proper handling and disposal of this material. District personnel sample facility discharges under the KPDES.

Responses from benchmark states revealed additional areas of permitting, remediation, and mitigation actions and some different approaches to certain issues.

Illinois is required to obtain permitting to burn prairie grass and to store scrap rubber and waste tires. USTs must be registered and permits obtained to remove or replace tanks or dispose of contaminated soil. Waste petroleum products must be moved from maintenance facilities by licensed waste haulers. Persons applying herbicides must be licensed.

Indiana noted that district facilities are registered with the state environmental agency for handling of hazardous waste either as large quantity generators for district facilities or small quantity generators for subdistricts. All employees involved with hazardous waste are trained according to RCRA requirements. Emergency response and contingency plans are in place at each facility.

Missouri categorized facility and maintenance activities into four different areas. In rest areas, water sampling and analyses are performed for bacterial contamination. NPDES permitting is obtained for waste water discharges from those sites. Leaking USTs at maintenance facilities are removed according to federal and state guidelines and remediation is performed according to state guidelines. Landfilling is conducted according to solid waste regulations. For maintenance operations, waste oil is identified, manifested, and disposed according to applicable regulations. In-house activities to mitigate waste related problems included good housekeeping plus the use of environmentally acceptable products. For traffic applications, Missouri uses lead-free paint. Paint gun runoff is contained during clean out. Containerization and disposal of waste traffic paint are performed according to RCRA.

North Carolina indicated that erosion control permits are obtained for ground disturbing activities. Discharge permits are obtained for waste water discharged into municipal systems.

Ohio noted that if cited by a regulatory agency, a violation would be handled at the district level and the central office would become involved only if a district needed special assistance.

Tennessee reported it is exempt from storm water permits. However, Tennessee obtained waste water permits, Section 104 permits for the Coast Guard, UST operational permits, ~~herbicide permits where roads cross to national forests and parks~~, air pollution permits for state laboratory and highway marking buildings, air pollution permits for fleet inspection, and potable drinking water permits at rest areas. Tennessee exercises sediment control near streams and constructs covered salt storage bins at facilities to prevent pollution and runoff.

Virginia reported that its maintenance and facilities are subject to the same permitting, remediation and mitigation actions required for construction projects. However, for maintenance projects that require replacement of an existing facility, if the footprint does not change and there is no in-stream construction work, permitting is not required.

West Virginia eliminated outside cleaning of equipment to prevent runoff. Wash water is treated or recycled and NPDES discharge permits are obtained including those for municipal, industry, or storm water waste. Remediation includes the installation of water treatment equipment or oil separators. USTs are regulated by the West Virginia Department of Environmental Protection and remediation occurs when leakage is detected. During UST installation, ground monitoring wells are added to detect leakage.

3) The state transportation agencies were asked to provide information concerning planned avoidance actions taken by the agency for maintenance and facilities to avoid the impact of environmental regulations. Those were to include actions taken in planning, design, and construction.

Kentucky is changing from in-house traffic striping to privatization. Also, efforts are underway to change to water borne and lead-free paints. Enclosures are being placed over salt piles and runoff will be diverted away from all similar outside stored materials. Environmentally sound operating procedures are being developed and implemented and an ongoing task force has been established to continue this process.

Illinois, Indiana, Missouri, and West Virginia reported the use of covered storage facilities and/or secondary containment to prevent runoff of materials such as de-icing salts, herbicides, and gasoline. Illinois and Indiana noted that fuel tanks (including USTs) are removed from many facilities. Illinois also noted that fuel facilities are not located within a potable or a wellhead protection zone. Indiana reported that oil separators have been installed at district and subdistrict garages.

Missouri and Ohio attempt to minimize generation of hazardous wastes. Missouri frequently assesses the in-house use of hazardous materials. Ohio avoided the purchase of land containing hazardous waste.

Missouri reported that its officials follow and comment on draft legislation for state and federal rules and regulations.

Tennessee noted that its new facilities are designed and constructed to meet EPA and

state health department regulations. Virginia has entered into a MOA with the state environmental and resource agencies whereby those agencies review all maintenance and facility plans at the project initiation stage. That provides the opportunity to avoid, minimize, or mitigate any conflicts with environmental regulations at the earliest possible stage.

West Virginia reported employing wash water recycling systems and containment areas for control around liquid bituminous material storage. They also provide erosion control and runoff protection during maintenance activities.

4) The state transportation agencies were asked what divisions/programs are currently dedicated to addressing maintenance and facility related environmental regulations. The agencies were also asked how many transportation agency personnel in each division/program are specifically assigned to do this task.

Kentucky replied that the Division of Maintenance Traffic and Equipment are working with related divisions in assessing environmental practices at these facilities. The intent is to develop environmentally correct guidelines for highway maintenance and operations personnel. However, no full-time maintenance employees are assigned to this activity. The Office of Environmental Affairs (OEA) has ten employees dedicated to this task. The OEA is considered the centralized information response center for regulatory concerns. All divisions within the Cabinet, including one at each District Office has designated one person as environmental coordinator to assist in these efforts.

Illinois and Ohio have personnel addressing hazardous materials at the district level. Illinois has formed a Hazardous Substance Committee to address maintenance and facility related environmental issues.

Indiana and North Carolina do not have a division dedicated to addressing environmental regulations at maintenance facilities. Indiana noted the recently formed Environmental Division will coordinate environmental compliance for maintenance and facilities operations.

Missouri's Maintenance and Traffic Division addresses all environmental compliance issues. Tennessee's Maintenance Division handles their programs. Virginia's environmental division addresses maintenance and facilities environmental issues. West Virginia reported having a UST tank program, a well point protection program, and a ground water protection program.

North Carolina and Tennessee reported that no full-time personnel are assigned to address maintenance-related environmental regulations.

Illinois employs one site coordinator per district who is assigned the duty of insuring environmental compliance. Ohio has a hazardous waste coordinator at each district. Other staff members within districts and the central office are trained as required by environmental and resource agencies.

Indiana and Missouri both reported that three persons are assigned to maintenance-related environmental regulations at centralized divisions. Indiana's are located in the Environmental Division and Missouri's in the Maintenance and Traffic Division. Virginia has 110 persons assigned to address maintenance-related environmental issues throughout the state. West Virginia employs 15 persons addressing its various programs. Two employees are assigned to waste water and 13 employees monitor underground storage tanks.

5) The state transportation agencies were asked to provide the in-house budgetary costs of those personnel and programs to the agency. The agencies were requested to provide costs for the last two fiscal years.

Kentucky reported that the Division of Maintenance has not tracked the total expenditures of employees who address that activity on a part-time basis. A recent field audit of division employees at 133 maintenance sites cost \$60,000. The anticipated operational expenses for the OEA (including the UST program) are expected to run \$400,000 annually. Approximately 3.5 million per biennium has been dedicated to environmental compliance efforts.

Illinois, Missouri, North Carolina, Tennessee, and Virginia were unable to provide those costs.

Indiana is establishing a new program to finance environmental programs. Six million dollars is to be allocated for this purpose over the biennium. However, that sum might change due to budget cuts. West Virginia was the only state to supply in-house budgetary costs for environmental activities. The budgetary costs were \$203,500 and \$194,500 for fiscal years 1992 and 1993, respectively.

### **Storm Water**

6) The state transportation agencies were requested to describe the impacts of environmental regulations related to storm water runoff (NPDES) on maintenance costs, delays, and operational procedures. The agencies were asked to include the number of point discharge and storm water runoff permits applied for, obtained, or maintained during the last year.

Kentucky replied that presently 216 discharge points are known. Thirty-seven sites were applied for under a general permit and 65 individual permits had been filed. None of those permits have been issued to date. The program was initiated by the Division of Real Property and has been transferred to the OEA. It has become one more burden to deal with during a time of reduced resources added to district office personnel. The most impact of storm water compliance will be felt by the normal operating budget which must absorb its cost. However, where discharges are to be corrected, many internal practices (i.e., washing equipment inside buildings, pouring liquids down drains, etc.) will take time to implement. Kentucky has developed a KPDES manual and has conducted training for staff. Whenever UST removal requires KPDES permits, existing permits

must be modified for the one time discharge due to a difference in permitted parameters.

~~Illinois, Indiana, Missouri, and Tennessee~~ replied that they do not need to submit NPDES permits for most maintenance and facility activities. Illinois reported it does not need to submit a permit application for maintenance facilities and no maintenance operations were completed which required permits. Indiana filed a statewide NDPEs group permit application with the state environmental agency in 1991. The agency notified Indiana that it was not subject to the group permit program. The only time that Indiana must apply for permits is when it engages in maintenance activities involving over five acres. Missouri is also not required to obtain NPDES storm water permits for maintenance lots although runoff must conform to water quality standards. Missouri has obtained NDPEs general permits for land farming of underground storage tank containments at approximately five locations. Tennessee reported applying for two NPDES permits where USTs are being remediated.

North Carolina has filed for an individual permit to cover all construction and maintenance storm water discharge systems. The application is an outline for, and a commitment, to implement a storm water management program. Approval of the application is pending.

Ohio applies for NPDES permits on all projects affecting more than five acres. To date, that has not created a problem. Ohio reported developing a "Best Management Practices" guide and plan notes to control storm water runoff. Point source discharge permits apply only to rest areas. Only one or two are applied for each year.

Virginia uses storm water maintenance basins which are new to the state and for which extensive cost experience has not been compiled. To date, Virginia has 175 basins completed or under construction. The basins are inspected twice each year.

West Virginia reported applying for 30 point discharge storm water runoff permits.

7) The state transportation agencies were asked to describe the impacts of environmental regulations related to wetlands on maintenance costs, delays, and operational procedures. The agencies were asked to provide the number of acres affected.

Kentucky reported that it has not placed areas classified as wetlands in the maintenance inventory. Maintenance policy prohibits elimination of wetlands without prior approval from the Director of Maintenance. Discharges from facilities are being scrutinized by the NREPC for impacts on receiving wetlands. Cleanups of pollution sources have been required and will increase as stormwater permits are issued. Operating practices around wetlands are open for intense scrutiny and planning with the advent of groundwater regulations.

Illinois, Indiana, Missouri, Ohio, and North Carolina reported no impacts of wetlands related environmental regulations on maintenance activities. Tennessee, Virginia, and West Virginia reported minimal impacts. Tennessee reported costs related to tree

replacement and cleaning up of litter created by individuals using an area. Those areas ranged in size from 15 to 200 acres. Recent conversations with Tennessee personnel revealed problems in obtaining permits to clean ditch lines along wetlands right of ways. Virginia reported that maintenance activities have a minimal effect on wetlands. A Virginia responder noted that proposed maintenance work is routinely reviewed to insure that authorization is not required prior to the initiation of work. The review process covers work such as ditching, channel clean outs, bridge rehabilitation, etc. West Virginia noted the need to properly select spoil dump sites near wetlands.

## **Ground Water**

8) The state transportation agencies were asked to describe the impacts of environmental regulations related to ground water on maintenance and facilities. The agencies were to include costs, delays, and operational procedures.

Kentucky's ground water regulations were in draft mode at the time of this writing. Significant changes are going to be required in order that these regulations are implemented. Kentucky groundwater regulations focus on prevention and require site specific plans be developed and signed for each facility. Oil, pesticides, and salt applications are also required to have protection plans. Kentucky has to clean UST contaminated groundwater to background levels, i.e., 1 ppb for soil and 5 ppb for water.

Illinois stated that facility siting must avoid potable water wellhead protection zones. Indiana described the two locations previously discussed in the Construction Section related to a sole source aquifer and to karst topography. Missouri noted that ground water monitoring would only be conducted related to USTs. The costs are variable due to different circumstances including the extent of clean up and geologic conditions.

Missouri, Ohio, Tennessee, Virginia, and West Virginia noted ground water protection efforts related to USTs. Virginia reported delays in completion of petroleum storage facility upgrades, costs for soil and ground water remediation, and the need to revert to temporary storage facilities. West Virginia noted the main concern in ground water problems related to USTs is contamination by benzene, a component of gasoline. If benzene contamination has occurred, the West Virginia Department of Environmental Protection usually requests immediate overall site investigation and formulation of remediation plan.

In terms of costs, Indiana noted spending \$1,000,000 to research karst topography. Missouri replied that if groundwater is contaminated, delays and costs associated with remediation are highly variable due to differences in geologic settings. Ohio noted an old maintenance garage has accrued \$1,000,000 in soil contamination testing costs. However, no indication is provided of any problems related to ground water contamination. Virginia did not provide examples of delays or costs due to ground water contamination by USTs. West Virginia reported that maintenance costs have been minimal. However, operational procedure modifications have been necessary.

## **Underground Storage Tanks**

~~9a) The state transportation agencies were asked to describe the impacts of environmental regulations related to USTs encountered in right-of-ways during maintenance work. The agencies were to include costs, delays, and operational procedures.~~

The Kentucky Office of Environmental Affairs has responsibility for that program. It employs five contractors to remove USTs statewide. Kentucky has approximately 145 sites where 500 USTs are located. Those sites have been prioritized and the contractors are removing the tanks as quickly as possible. The OEA is trying to develop a Memorandum of Agreement with the NREPC in regards to the cleanup program. A budget of \$1.5 million was established for cleanup costing about \$22 per cubic yard to remove and dispose of contaminated soils.

Indiana, North Carolina, Tennessee, and West Virginia reported major programs to remove and replace older USTs. Indiana has initiated an aggressive program to remove USTs at 227 locations statewide. North Carolina has scheduled the removal of all USTs at its facilities by December 1993 resulting in 110 new fuel stations statewide. Tennessee presently is replacing its old USTs with new ones after removing the old tanks and conducting soil remediation. Ten above-ground storage tanks (ASTs) have been purchased as temporary replacements for old leaking tanks since soil remediation is necessary. West Virginia has recently upgraded 120 sites representing approximately 314 tanks. Missouri did not report a major UST replacement program. However, data provided in Question 9b) suggests a large-scale program.

Illinois noted that the impact is to register, remove USTs, and provide the appropriate cleanup. Missouri reported that UST removal at maintenance facilities is usually done by maintenance workers although some have been performed by contract. UST removal disrupts normal maintenance operations and causes delays. Ohio reported removing only two to three tanks a year, but dealing with petroleum-contaminated soil on a regular basis from both Ohio facilities and projects.

Illinois reported that an average removal cost of \$22,000 for tanks and \$10,000 for monitoring wells. Tennessee noted that three facilities are being remediated. One at a cost of \$105,600 and two others at a cost of \$807,000. Missouri and West Virginia were unable to provide costs.

**9b)** The state transportation agencies were asked how many USTs have been removed from the agency's facilities in the past two years and how many are to be removed from the agency's facilities in 1993-1994.

Kentucky reported that at its maintenance facilities, 91 USTs have been removed in 1991 and 1992. The number scheduled for removal in 1993-1994 is 150.

In 1991 and 1992, Missouri led the responding benchmark states with 900 USTs



removed. North Carolina has removed 715 in the past three years. West Virginia ranked third with 102 USTs removed. Illinois has removed three USTs and Tennessee removed one.

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For 1993-1994, West Virginia plans to remove 199 tanks at 76 sites; Missouri plans to remove 100 USTs; Virginia will remove 76; North Carolina plans to remove 44; and Tennessee plans to remove six.

10) The state transportation agencies were asked to describe the impacts of environmental regulations to USTs at the state transportation agencies facilities. Those were to include cost, delays, and operational procedures.

Kentucky replied that the UST Removal Program is fully operating. The Program would remove all USTs at Kentucky-owned facilities statewide. Many tanks are old and, during the removal process, contaminated soil is commonly encountered. To date, the average cost for UST removal and clean up at each site has been about \$30,000. Again, KyTC will be going to an off-site automated card system with only the most critical facilities carrying diesel fuel being replaced at the lot.

Illinois noted that all USTs must be upgraded to current standards. Missouri described those efforts in previous questionnaire responses.

North Carolina noted that in 1989, a five-year plan was approved to update all fuel service stations and set up an automated fuel control system. Funds to accomplish those tasks were generated by a 5 cents per gallon surcharge placed on fuel issues and an additional 5 cents per quart surcharge on oil issued. North Carolina built 110 new service stations before removing the old ones to minimize disruptions in operations.

Tennessee reported that environmental regulations related to USTs have had a major impact. Approximately 15 percent of the UST sites have problems with tanks and lines. A few facilities have closed while others remain open on a limited basis.

Virginia has experienced regulatory impacts from soil and ground water contamination associated with leaking USTs including delays in completing petroleum storage facility upgrades, expensive soil and ground water remediation, and installation of temporary facilities. West Virginia reported that two-thirds of the USTs at the state facilities have been replaced. Remediation at several facilities has just begun without disruption to operations because the majority of the newly installed tanks are located in an uncontaminated area at a facility. In cases where they are installed in a contaminated area, a remediation plan has been developed to avoid disruption to operational procedures.

Illinois reported the amount budgeted for UST removal during fiscal year 1992 is \$500,000. The projected budget was \$800,000 and \$1,000,000 for fiscal years 1993 and 1994, respectively. Missouri replied that an estimate of \$2,000,000 has been provided to replace all USTs with ASTs at all facilities. Those costs include soil remediation,

sampling, and personnel and consultant/contractor fees. It did not include the cost of replacement ASTs. North Carolina reported the total estimated cost of the five-year plan was \$11,000,000. Site improvements included 110 new service stations, automated fuel control system, in-tank leak detection monitors, and stage 1 and stage 2 vapor recovery systems. Remediation cost for Tennessee varied between \$80,000 to \$808,000 with project time frames ranging from 30 days to three years. West Virginia reported an average cost for UST removal of \$15,000.

## **Solid and Hazardous Waste**

**11)** The state transportation agencies were asked how many disposal facilities are employed to dispose of maintenance and facilities-related solid waste and hazardous waste.

Kentucky reported employing approximately 67 in-state facilities to dispose of solid wastes. No response was provided concerning the other types of facilities. One out-of-state contractor was used for disposing of hazardous waste. That contractor has a choice of 2 or 3 parent company facilities where the hazardous waste can be properly treated.

Most of the benchmark states did provide data for disposal facilities. Illinois stated that waste haulers are responsible for waste disposal. Indiana reported sending solid waste to 17 in-state facilities and hazardous waste to one in-state facility. Missouri noted that there are no commercial hazardous waste landfills in the state. Tennessee used 95 in-state facilities for disposing of solid waste. West Virginia employed four in-state facilities for disposing of hazardous waste.

In follow-up comments, Indiana stated that as many as 37 solid waste disposal facilities may be used by the various subdistricts. Virginia noted that non-hazardous solid wastes are disposed of at local county and municipal landfills.

Illinois, Indiana, Missouri, Virginia, and West Virginia disposed of hazardous waste by contract. Missouri's hazardous wastes are shipped both in- and out-of-state to treatment facilities by contract. Virginia's and West Virginia's hazardous wastes are transported to licensed out-of-state facilities by contract.

**12)** The state transportation agencies were asked to identify the types of maintenance and facilities-generated waste (and quantities) the agency commonly sends to disposal facilities.

Kentucky responded that maintenance waste generally includes roadside litter, animal carcasses, empty containers, some unlabeled full drums of unknown liquids, woody debris, street sweepings, and other municipal waste. Oils, antifreeze, batteries, and oil filters are recycled.

Illinois reported disposing 4,000 to 6,000 gallons of waste petroleum products per year. There is no data available on scrap, rubber, or waste tires.

Indiana replied that the subdistricts dispose of waste materials picked up from the roadway and ordinary municipal type waste. Shop wastes such as used oil, antifreeze, and floor dryer material, and operational wastes such as waste paint and waste cleaning compounds are disposed by contract. Approximately 150 drums of hazardous waste from traffic paint are generated annually. Vehicle paint related blast wastes are a special waste and approximately 25 drums are generated annually. Asphalt abstraction testing generates 50 drums which are manifested as a hazardous waste. Street sweepings are presently landfilled. Materials related to vehicle maintenance such as waste oil, antifreeze, and cleaning fluid from parts washers are generally recycled.

Missouri reported that solid wastes include trash, UST-contaminated media, debris, and tires. Hazardous waste include paint material, waste oils, and solvents. Ohio reported common waste materials included paint-related waste, solvents, and automobile waste. Virginia noted that typical solid wastes are trash and scrap building materials. Typical hazardous waste are solvents, traffic paint, herbicides, and pesticides. Hazardous wastes reported by West Virginia include blast media containing lead and solvents used for cleaning equipment parts. Approximately two 55-gallon drums of waste paint material are generated each year. Three drums of waste solvents, one drum containing flammable liquid, and 10 drums of used motor oil are generated annually.

13) The state transportation agencies were asked to describe the agency's permitting process for generation and disposal of hazardous waste for maintenance projects and facilities. The agency was asked whether it received a blanket permit for all maintenance projects and facilities. The agency was asked to describe the conditions and process involved.

The Kentucky responder stated that no hazardous wastes are generated by the maintenance units. Traffic units operate independently and obtain their own registrations for EPA ID numbers. A KyTC contract was obtained for statewide disposal. Contractors are responsible for profiling and manifesting materials.

Illinois and Tennessee reported that contractors obtain hazardous waste permits. In Illinois, contractors name the state as the generator. Contractors are responsible for manifesting material from the facilities to the disposal site. Indiana and Tennessee have exclusive hazardous waste contracts.

Indiana noted that each facility that generates and disposes of hazardous waste is given an EPA identification number. Depending on the amount of waste generated, the facility is either designated as a large quantity generator or a small quantity generator. Missouri has numerous maintenance lots that are small quantity generators. They store hazardous waste under applicable regulations. Missouri is centralizing a main garage, a laboratory, and one district office at a location which will be required to be a large quantity generator. Ohio reported that each waste generation site obtains an EPA identification number and manifests each hazardous waste shipment. Virginia noted provisional waste generation numbers are issued to maintenance sites by the Virginia Department of Waste Management in case hazardous wastes are generated. In such

cases, EPA protocol is followed for removal, storage, and disposal. West Virginia reported the disposing agency contacts the Department of Environmental Protection and requests a disposal number. ~~That agency supplies a number and form to be completed and returned.~~

14) The state transportation agencies were asked to describe their policy for waste reduction or mandatory reuse related to solid waste generated in maintenance or at facilities. The agency was asked what wastes are covered by that policy.

Kentucky responded that there is no policy enforced in the maintenance area. KyTC has adopted a statewide policy to perform in an environmentally sound manner. Specific goals will be forthcoming soon. The one large registered hazardous waste generator is required to develop and follow a waste minimization plan. A Cabinet wide effort is in place to eliminate all waste paints and solvents.

Illinois, Indiana, and Ohio reported that there is no policy on waste reduction or mandatory reuse. Illinois noted that maintenance facilities have been advised to reduce inventories to meet anticipated needs. That is based on how much material is disposed per year. Indiana is establishing a pollution prevention program that address waste reduction. Ohio reported following Ohio EPA guidelines for waste reduction.

Missouri, Tennessee, Virginia, and West Virginia all reported efforts aimed at waste reduction or mandatory reuse. Missouri reported that it is actively attempting to both reduce wastes and reuse materials. Tennessee recycles antifreeze, batteries, used oils, guardrails, all scrap metals, paper, oil filters, etc. Virginia noted that waste reduction is in the start-up phase at their maintenance facilities. Steps currently taken include solvent recovery, anti-freeze and oil recycling, reuse of sign panels, and paper work reduction. West Virginia reported recycling of trichloroethane. That amount has been reduced by using a nuclear density gage.

15) The state transportation agencies were asked what costs are incurred by the agency due to maintenance and facilities-related generation and disposal of solid and hazardous wastes. The agency was asked to include costs for recycling. The agency was also asked to provide unit costs for disposal or specific examples of wastes generated (types and amounts) and corresponding typical disposal costs. The agency was asked to indicate whether those wastes were disposed of in-state or out-of-state.

Kentucky's solid waste disposal is not tracked but the costs are incorporated into overhead for maintenance activities. The division of traffic reported (in calendar years) \$1,423,580 spent for the disposal of hazardous waste in 1991, \$625,445 in 1992, \$496,811 in 1993, and \$196,435 for 1994.

Illinois referenced its response to Question 15) in the **Construction Section**. Indiana stated that disposal costs for fiscal year 1992-1993 were approximately \$60,000 for contracted service. For in-state hazardous waste transportation from facilities, Indiana is charged \$150 per trip with a total cost of \$2,700. Ohio, Virginia, and West Virginia

reported that information is not available.

~~16) The state transportation agencies were asked to provide any additional comments not covered in the previous questions.~~

Kentucky has adopted a spot paint and "washing only" policy on its bridges and other metal structures. The cost of taking such structures to bare-metal is prohibitive.

Missouri noted that bridge maintenance generates significant quantities of sandblast residue. Recycling is used to recover the abrasive with precautions taken to retain all residue.

## SUMMARY OF STATE ENVIRONMENTAL AGENCY SURVEYS

This section of the report summarizes responses contained in the state environmental agencies survey. For brevity, most responses from the various environmental agencies will be referred to by state.

### General Information

1) The state environmental agencies were asked to provide organizational charts showing the chain of authority.

2) The state environmental agencies were asked to provide a description of divisions within the agency including the areas of responsibility and/or authority related to promulgating regulations permitting and compliance in the five areas of concern: 1) storm water permits, 2) wetlands, 3) USTs, 4) ground water, and 5) solid and hazardous waste. The agencies were asked to indicate their staff sizes in each of those divisions and to attach the responses separately.

Kentucky replied there are 134 personnel in the Division for Air Quality, 262 in the Division for Water, 220 in the Division of Waste Management, and 40 in the Division of Environmental Services. The total staffing in those divisions is 656 personnel. The total staffing for the entire Natural Resources and Environmental Protection Cabinet is 1,673 personnel.

The benchmark states have similar divisions or programs that are either combined with other agencies or subdivided into other related areas. The average staffing of the responding benchmark states is approximately 1,340 personnel. Of those, Tennessee has the largest staff with 3,062 personnel while Illinois has the fewest staff with 127 personnel.

3) The state environmental agencies were asked to indicate their annual budgets for the last two fiscal years. If the budgets were determined in part by fees, those were to be included in the budgets.

Kentucky reported annual budgets of \$38,118,500 and \$37,712,900 in fiscal years 1992 and 1993, respectively.

The average budgets of the responding benchmark states (excluding Illinois) were \$77,500,710 and \$77,640,294 for fiscal years 1992 and 1993, respectively. Of those states, Ohio had the highest budgets of \$73,555,533 and \$89,446,964 in fiscal years 1992 and 1993, respectively. The North Carolina Department of Environmental Protection had the lowest budgets of \$53,300,000 and \$56,600,000 in fiscal years 1992 and 1993, respectively. Illinois budgets for those fiscal years are inflated by several unique expenditures that may not be relevant to this report.

## **Storm Water NPDES**

~~4) The state environmental agencies were asked whether the agency currently administers a storm water NPDES program. Also, each agency was asked whether the promulgated regulations were substantially equivalent or more stringent than federal regulations. If not, the agencies were asked how they differed and in what respects are they more stringent.~~

Kentucky reported using federal storm water regulations. Those regulations do not conflict with or supersede the federal regulations. Therefore, they are neither more or less stringent. Kentucky intends to formally adopt federal regulations in the future. Those will be substantially equivalent with the federal regulations.

Indiana and West Virginia reported having NPDES programs more stringent than federal regulations. The Indiana program differs in that its requirements for monitoring and developing a storm water pollution prevention plan apply equally to all facilities regulated by the rule. It does not provide for different sampling or monitoring procedures based upon the type of industry from which the discharge occurs. All facilities are required to develop one of the plans within a year after submitting a notice of intent letter and must perform additional sampling events one year later. Thereafter, they must perform biannual inspections unless asked to perform additional sampling. West Virginia did not provide details as to how its regulations are more stringent.

All other benchmark states have or are adopting the federal regulations or promulgating equivalent regulations.

5) The state environmental agencies were asked whether permits are required for construction-related activities relating to point discharge and storm water runoff (NPDES) regulations.

Kentucky replied yes for activities disturbing five or more acres of land.

All responding benchmark states answered yes. Illinois, Indiana, and Tennessee noted the five acre or greater regulatory threshold. Virginia reported permitting storm water discharge from construction sites through the general permit process. West Virginia stated that permits would only be required for storm water runoff. No point source permits would be required for construction activities.

6) The state environmental agencies were asked if permits are required for fixed facilities such as garages and material storage.

Kentucky replied yes depending on the Standard Industrial Classification (SIC) Code as detailed in the federal storm water regulations.

All of the other states answered yes except North Carolina which responded no for those categories. Indiana, Missouri, Ohio, Tennessee, and Virginia noted adherence with the

SIC "industrial activity" definition in determining when those permits are necessary. Tennessee reported that all garages at transportation industry facilities require water discharge permits. ~~Tennessee also stated that outside material storage facilities in a manufacturing industry will usually require a permit.~~

7) The state environmental agencies were asked what steps the agency takes to enforce the compliance of regulations related to NPDES.

Kentucky replied that field office inspections and enforcement checks are made by the enforcement branch. Violations typically result in agreed orders for corrective action.

Illinois and Missouri commented that NPDES permits are enforced similarly to other permits. Missouri stated that storm water violations are handled like other operating permit violations. Initially, conference, conciliation, and persuasion are employed in an attempt to resolve a violation. Should that fail, a notice of violation will be issued, and if necessary, the Water Pollution Control Program will issue an abatement order, administrative penalty order, or make a referral for litigation and pursue the matter with the Attorney General's Office.

Indiana reported the first step in an enforcement action is to send a facility a warning of non-compliance letter. The second step would be to send a notice of violation followed by an agreed order or a commissioner's order.

North Carolina stated that, in regard to enforcement of storm water NPDES permitting, adequate state and federal authority is in place. No enforcement actions have been issued except where water quality problems are detected.

Ohio reported that activities related to storm water regulations are limited. Ohio responds to complaints received regarding construction sites. In October 1993, five positions were created for compliance and enforcement activities for construction sites. Ohio will also employ seasonal people for inspections.

Tennessee noted that the first step is a letter of violation sent to the qualifying industries or organizations that have not applied for a permit or who are not complying with the permit. If the problem is not corrected in a specific time period, enforcement is used.

Virginia reported specific enforcement actions including audit discharge monitoring reports, inspections and monitoring, timely and appropriate enforcement actions, notice of violations, directives, special orders, attorney general referrals, and penalties.

West Virginia reported that enforcement activities are conducted by the Environmental Enforcement Section. Due to the recentness of storm water regulations, West Virginia has adopted an educational posture rather than one of enforcement. For two years, West Virginia will educate the public about the program. However, if an entity is uncooperative, appropriate enforcement measures will be applied.



## **Wetlands**

~~8) The state environmental agencies were asked if the agency regulates activity near wetlands.~~

Kentucky answered yes.

Illinois and Indiana answered yes. Illinois stated only through Section 401 (water quality) certification. The other benchmark states answered no, but regulated activities in wetlands.

9) The state environmental agencies were asked what state laws enable those regulations. The agencies were asked to provide copies of those laws.

Kentucky responded that it has no specific wetlands regulations but that wetlands are protected by Kentucky Revised Statutes 224 and Section 401 of the Kentucky Amended Regulations, Chapter 5, Sections 26, 29, and 31 (water quality standards).

Of the responding states, only the Ohio stated it is authorized through Section 401 of the Clean Water Act. Ohio noted it did not have separate state regulations.

Indiana, Missouri, Tennessee, Virginia, and West Virginia referenced state codes and laws related to wetlands. Typically, those are water control laws.

10) The state environmental agencies were asked how the agency's program supplements administration of wetlands by the Corps of Engineers and the EPA.

Kentucky responded that the Division of Water reviews Corps of Engineers Section 404 permits and issues, denies, or conditions Section 401 Water Quality Certification for projects which may impact waters of the Commonwealth, including wetlands.

Indiana, Missouri, Tennessee, and West Virginia provide Section 401 certification in a manner similar to Kentucky.

Ohio did not supplement the Corps of Engineers administration of wetlands.

Virginia has a Water Protection Program that provides for an enhanced review of activities affecting wetlands. Specifically, those activities listed under the Corps of Engineers nationwide, nos. 7, 16, and 17 permits, require individual review. Number 26 permits are further restricted to activities involving under an acre of wetlands, unless an individual permit is granted. The federal programs are further supplemented by requiring a seven to one ratio for all wetlands impacts as well as long-term monitoring of mitigation sites. State water quality standards can be applied to permits issued by Virginia.

11) The state environmental agencies were asked what steps the agency takes to enforce

the compliance of regulations related to wetlands.

~~Kentucky noted the Corps of Engineers has primary authority concerning Section 404 permits. However, the Division of Water can take enforcement action for violation for water quality standards.~~

Of the responding benchmark states, Indiana and Ohio reported that enforcement would be specified under the Clean Water Act. Indiana replied that apparent violations are called to the attention of the appropriate Corps of Engineers District office. Missouri reported lacking sufficient personnel to enforce state water quality standards. Violations of the water quality standards are enforced under the Clean Water Act.

Tennessee reported that conditions for enforcement are in Section 401 certifications and Aquatic Resource Alteration Permits. Those conditions require monitoring, success rates, and limit certain activities. All the conditions are enforceable. The permittee, when deemed in violation, would receive a notice of violation outlining corrective measures and enforcement actions.

Virginia stated that enforcement provisions are provided in state regulations governing water quality standards.

West Virginia noted that most enforcement is left to the Corps of Engineers. Waters Resources can issue compliance orders and is considering civil administrative penalties.

**12) The state environmental agencies were asked how many acres of wetlands remain in the state today?**

Kentucky responded that 637,000 acres of wetlands remained according to a 1992 report.

The average wetlands acreage for benchmark states is approximately 1,938,000 acres. The wetlands acreage ranged from about 624,000 acres in Missouri (as of 1980) to 10,307,000 acres in Virginia.

## **Ground Water**

**13) The state environmental agencies were asked whether their departments currently administer regulations specifically effecting ground water?**

Kentucky answered yes and provided proposed regulations.

All of the responding state environmental agencies responded yes. Illinois reported applicable regulations which included RCRA, ground water standards, CERCLA, Leaking Underground Storage Tank (LUST) Technology Control Regulations, and minimal hazardous certification.

**14) The state environmental agencies were asked what laws enable those regulations.**

The agency was asked to provide copies of those laws.

~~Kentucky replied that ground water regulations are currently covered under Kentucky Revised Statue 224.~~

All of the benchmark states reported the applicable state laws.

**15)** The state environmental agencies were asked whether those regulations require any construction- or facility-related permitting.

Kentucky answered no, but construction may be required to prevent ground water contamination.

All of the benchmark states responded that the regulations required permitting for construction and/or facilities.

Tennessee and Missouri noted that discharges to ground water are prohibited except for groundwater heat pumps and two underground injection control permits. Tennessee also noted that the underground injection control program requires permitting for various classes of injection wells. North Carolina replied that permitting is required if waste treatment systems are being constructed. Ohio noted that permits and licenses are required for solid and hazardous waste disposal treatment, transfer, and storage facilities. That includes site criteria for solid waste landfills more stringent than RCRA subtitle D. Ohio stated that engineering is not sufficient to protect ground water relative to a poor site. Virginia also has regulations related to water withdrawal permits that are required for water withdrawals greater than 300,000 gallons per month in a designated Ground Water Management Area.

**16)** The state environmental agencies were asked what steps the agency takes to enforce compliance of regulations related to groundwater.

Kentucky replied inspections.

Missouri noted that permits are not issued for discharges to ground water. Water quality standards of the state including standards for ground water are considered applicable for the various Superfund, RCRA, and other clean-ups. North Carolina replied that inspections and enforcement actions are taken which might result in assessment of civil penalties. Ohio noted enforcement of permit and license requirements, compliance in monitoring, and prosecution of criminal cases by the Attorney General's Office when administrative remedies are exhausted. Tennessee reported authority to pursue a Commissioners Order for ground water pollution violations such as underground injection control programs. Virginia replied the inspection of UST facilities with referral of violations. Notices of violations are sent to violators with accumulation of points for violation of leaking UST regulations. Monthly and quarterly reports are made of ground water withdrawals and notices of violations are sent for violators. Illinois noted that standards are enforced in the same manner as other violations of the Illinois

Environmental Protection Act. This includes field inspections and evaluations of groundwater monitoring data.

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### **Underground Storage Tanks**

**17)** The state environmental agencies were asked if they had a UST program.

Kentucky answered yes.

All of the benchmark states said answered except for Illinois and Ohio.

Illinois responded that they manage the Leaking Underground Storage Trust Fund (LUST) only. The UST portion is managed by the Illinois Office of the State Fire Marshall. Ohio responded that their program is under the jurisdiction of the State Department of Commerce. However, Ohio is involved relative to discharges to surface waters (permits-to-install, NPDES permits) and for landfilling or incineration of contaminated soils.

**18)** The state environmental agencies were asked if the regulations promulgated by their state agency were substantially equivalent with federal regulations. They were also asked how they differed and in what respect were they more stringent.

Kentucky responded that it has adopted 40 CFR (Code of Federal Regulations) Chapter 280 by reference in 41 KAR Chapter 42. Only 401 KAR:42:200 which set an annual tank fee is not based on federal requirements.

All benchmark states noted that their programs are substantially equivalent with those of the code of federal regulations.

Missouri reported a requirement for advanced notice of UST installation. Ohio replied it only regulates leaking USTs. The UST program is located in the Department of Commerce. Tennessee commented that regulations have specified clean-up levels for certain groundwater contaminants. Tennessee has established a fund to assist tank owners with clean up costs and to help meet federal financial responsibility requirements. All petroleum UST facilities must have certificates posted to receive products. Virginia reported that its regulations are substantially equivalent to federal regulations. Financial responsibility is based on the number of gallons pumped rather than on the number of tanks. Minimum financial responsibility is \$200,000. State funding is used for demonstrating the remaining federal requirements.

**19)** The state environmental agencies were asked what steps were taken by the agency to enforce compliance of regulations related to USTs?

Kentucky replied that the steps taken include written requests for documentation, physical on-site inspections, issuance of notice of violation, agreed orders, court actions, etc.

Missouri, North Carolina, Tennessee, and Virginia noted that inspections are an important part of the enforcement process. Tennessee also reported responding to ~~complaints from citizens~~.

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Missouri noted attempts to educate facility owners using outreach guidance documents and seminars.

Indiana, Missouri, Tennessee, North Carolina, and Indiana reported providing violators with warning letters, notices of violation, and/or issuance of orders for corrective action.

Indiana, Missouri, North Carolina, Tennessee, and Virginia noted that violators would be penalized if they did not take action. North Carolina noted that non-compliance might result in denial of access to the state operated cleanup fund.

Ohio reported that compliance was under the jurisdiction of the Department of Commerce.

### **Solid and Hazardous Waste**

**20a)** The state environmental agencies were asked if the agency has a program that regulates solid waste disposal?

Kentucky answered yes.

All of the benchmark states also answered yes.

**20b)** The state environmental agencies were asked if the agency has a program that regulates hazardous waste generation and disposal.

Kentucky answered yes.

All of the benchmark states also answered yes.

**21)** The state environmental agencies were asked if the regulations promulgated by the agency were substantially equivalent with federal regulations. They were also asked how they differed and in what respect were they more stringent.

Kentucky responded yes. Kentucky has an authorization check list that compares line-for-line state and federal regulations. In most respects, Kentucky's requirements for landfill design are more stringent. In determining the type of waste for waste disposal (solid or hazardous), the solid waste branch uses the same procedures as the federal government.

Illinois, Virginia, Tennessee, and West Virginia also answered yes. Tennessee stated that it has adopted federal regulations by reference. West Virginia further stated that its Title 47 - Series 38 Solid Waste Management Regulations are close to Federal Subtitle

D regulations except in financial areas.

~~Missouri, Indiana, and Ohio responded that in some areas their regulations are more stringent.~~ Indiana stated that solid waste regulations have not yet been adopted to address equivalence with federal regulations in some areas. Ohio stated its program also covers incinerators, transfer stations, composting facilities, tire facilities, and infectious waste. Ohio's landfill regulations are currently being revised to coincide with new federal RCRA subtitle D regulations. The primary differences are in the areas of ground water, monitoring, financial assurance, and siting criteria.

**22a)** The state environmental agencies were asked how many treatment/storage/disposal (TSD) facilities which process solid construction wastes are located in their state.

Kentucky reported that it has 13 TSD facilities in the state that process solid construction waste.

Tennessee reported the most facilities (131) and North Carolina the least (two). Missouri responded that it has 12 demolition landfills, 75 permitted sanitary landfills, 30 transfer stations, four incinerators, three infectious waste facilities, 15 special waste facilities, and six resource recovery facilities. Illinois, Indiana, Virginia, and West Virginia reported 45, nine, 52, and 80 facilities respectively.

Ohio responded that this information is not known due to a new regulatory program.

**22b)** The state environmental agencies were asked how many treatment/storage/disposal facilities that accept solid waste from outside sources are located in their state.

Kentucky replied that all of facilities accepted outside solid waste (with NRPEC approval).

Indiana reported the most facilities (114) and North Carolina the least (two). Illinois reported 70 facilities. Missouri responded that there are no restrictions on receiving solid waste from outside sources. Most facilities which do accept out-of-state sources of solid waste are located near the state border. Ohio responded that it had 69 publicly owned landfills in 1992, 23 of which accepted out-of-state waste. Tennessee reported three facilities. Virginia responded that it has 11 construction waste/debris facilities and seven municipal solid waste (private) facilities. West Virginia reported 38 facilities.

**23a)** The state environmental agencies were asked how many treatment/storage/disposal facilities in their state process hazardous waste.

Kentucky reported 90 TSD facilities.

Illinois reported the most TSD facilities (140) and North Carolina the least (11). Indiana responded that it has 43 TSD facilities, 41 of which have been issued permits. Missouri, Tennessee, and Virginia reported 21, 19, and 71 facilities respectively. West Virginia

reported 24 permitted facilities and 42 short-term storage facilities.

~~Ohio responded that this information is not available.~~

**23b)** The state environmental agencies were asked how many treatment/storage/disposal facilities in their state accept hazardous waste from out of state.

Kentucky responded that the number varies. Presently it is about 20.

Illinois reported the most facilities (33) and Virginia the least (0). Missouri responded that there are 28 sites which accept out-of-state hazardous waste, nine are resource recovery sites, and 19 are permitted TSD facilities. Tennessee responded that it has 19 permitted facilities (four facilities receive up to 10 percent of permitted capacities from sister companies or facilities out of state). Indiana and West Virginia reported 18 and four facilities respectively.

Ohio responded that this information is not available.

**24)** The state environmental agencies were asked if they have an active program to promote or require recycling of solid waste.

Kentucky responded that KRS 224.830 directs the Commonwealth to encourage solid waste management practices that will achieve a 25 percent reduction in the amount of municipal solid waste disposed in landfills by 1997. Kentucky promotes solid waste recycling by 1) providing technical assistance to local communities to help find markets, 2) determining infrastructure needs and promote public participation and public recycling, 3) coordinating efforts with the Economic Development Cabinet's recycling brokerage authority to find users for recyclables, 4) promoting regional planning for recycling to ensure a volume needed for marketing and to share scarce resources in a predominately rural state, 5) allocating low interest loans giving highest priority to those counties who set up regional recycling, and 6) coordinating the establishment of recycling and used oil collection centers as well as tire processing facilities.

All of the benchmark states have recycling programs.

Indiana replied that the state has established waste reduction goals of 35 percent by 1996 and 50 percent by the year 2000. These goals are being pursued through development of solid waste district plans. In addition, Indiana has a grants program for recycling activities.

North Carolina reported that since 1989, its regulations have specific recycling goals under a solid waste management hierarchy of management methods - 25 percent by 1993 and 40 percent by the year 2001. Local and state solid waste management plans are required.

Ohio replied that there is a statewide goal to reduce/recycle 25 percent of the generated

solid waste by 1994. Enforcement will be through approval of a local 10-year solid waste management plan. Recycling currently is at 24 percent not including yard waste. Ohio will provide financial assistance to recycling programs.

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Virginia reported that local governments are required to meet recycling rates of 15 percent in 1993 and 25 percent in 1995; they were required to recycle 10 percent in 1992 (19 percent was achieved).

West Virginia replied its code establishes goals for recycling including reductions of 20 percent by 1994 and 30 percent by the year 2000. West Virginia also provides grants for recycling projects.

**25)** The state environmental agencies were asked what steps the agency takes to enforce compliance of regulations related to monitoring of treatment/storage/disposal facilities?

Kentucky replied that it enforces its solid waste regulations through inspections, notices of violations, penalties, agreed orders, and courts of law.

All of the benchmark states used inspection as a fundamental means for assessing regulation compliance. Indiana noted monthly inspections while Virginia reported annual or biannual inspections based upon past compliance. Indiana also employs ground water monitoring. Illinois evaluated field reports submitted by permittees. Follow-up actions reported by the states include conferences, conciliation and persuasion, notices of violation, revoking of permits, and civil and criminal actions.

North Carolina responded by stating that it has a strong enforcement and compliance program for solid waste. Administrative penalties of up to \$5,000 per day per violation can be levied. Routine inspections are made quarterly, semi-annually, and annually.

**26)** The state environmental agencies were asked what steps the agency takes to enforce compliance of regulations related to monitoring of hazardous waste generation, storage, transport, and disposal?

Kentucky replied it issues permits, reviews closure plans, notification applications, assessment returns, and requests for regulation interpretation.

Most of the state responses were similar to those for Question **25)**.

Indiana and North Carolina reported inspecting TSD waste facilities at least once a year. Indiana inspects generators at a rate of eight percent per year.

West Virginia noted that its hazardous waste regulations parallel federal regulations.

**27)** The state environmental agencies were asked to provide comments not covered in previous questions.



Ohio stated that the Division of Emergency and Remedial Response or (DERR). DERR is similar to the federal Super Fund Program. DERR maintains a Master Sites List for uncontrolled or unregulated waste, works with the EPA on Super Fund sites, conducts investigations related to possible criminal prosecutions, and runs the SARA Title III program.

## **CONCLUSIONS**

### **Demographic, Geographic and Economic Considerations**

Compared to the benchmark states, Kentucky is relatively unpopulated and less affluent. Kentucky's population is about one-half the average of those states. Kentucky ranks low compared to them in total annual personal income, per capita income, and annual gross product. Those factors indicate that Kentucky has fewer economic resources for generating government (and transportation) revenues than most benchmark states.

In terms of total area (land and water), Kentucky compares favorably with the benchmark states. The large number of stream miles in Kentucky results in more interactions with roadways than in the benchmark states. That may result in more situations where environmental impacts occur (e.g. wetlands, UST cleanups, and storm water regulations). Kentucky's topography varies, but is capable of supporting a relatively large agricultural industry. The combination of low population and relatively large state size result in a low population density compared to the other benchmark states.

Environmental impacts affecting KyTC are of special concern as they divert vital funds from more economically beneficial activities such as road building and maintenance. When all factors are considered, it is more costly to maintain the Kentucky transportation system than those in the benchmark states. That expense is necessitated by the low population, the relatively large state size, and the need to support industries dependant on transportation (e.g. mining, timber operations, farming, wholesale and retail trade, and manufacturing). That information suggests the cost for providing the necessary Transportation infrastructure is higher than in the benchmark states. Therefore, equivalent diversions of transportation funds for environmental purposes may also result in a disproportionate loss in benefits to Kentucky businesses and residents.

### **Environmental Impacts on the Kentucky Transportation Cabinet**

The primary KyTC units for addressing environmental impacts are the OEA, DEA, the Permit Section in the Division of Design, and a small unit within the Division of Real Property. The KyTC survey indicated that other personnel addressed environmental issues, but not on a full-time basis. Costs for the two primary KyTC units are about \$1,300,000 per year. That represents only about 0.08 percent of the annual KyTC total budget. Costs for KyTC personnel addressing environmental issues on a part-time basis were not provided.

The KyTC survey suggests that the areas of major environmental impact are wetlands related to construction and USTs primarily related to maintenance and facilities. The survey does not provide comprehensive information concerning specific environmental impacts (e.g. costs and delays) related to KyTC construction and maintenance and facilities operations. Under the most recent storm water compliance requirements, state highway agencies have not been able to assess costs since compliance has not been implemented. Ground water regulations have not been promulgated and, as a result, there have been no related impacts on state highway agencies. Together however, these two issues could become the major issues of the next biennium or so.

Relevant environmental impact information, primarily related to construction, was provided in a report of the Kentucky State Legislature Interim Joint Committee on Transportation (52). In a recent Committee meeting, KyTC officials provided a detailed review of several environmental impacts on specific projects and a summary of annual environmental costs related to construction. Those officials discussed problems, primarily related to wetlands and UST/contaminated soil encountered on right of ways.

Projected costs of wetlands mitigation at a proposed site near Paducah were about \$200,000. A second wetlands mitigation project already completed involving about four acres of wetlands cost about \$210,000. Another road construction project involving wetlands was delayed for several years and the project cost increased by \$350,000. A fourth project using one site to mitigate four construction projects is anticipated to cost about \$2,270,000.

A major contaminated soil remediation effort by another party is delaying progress of a KyTC bypass project at Russellville. On another project in Robertson County, previously undetected USTs and contaminated soil were discovered. The project has been delayed four months due to remedial work and a \$140,000 increase in project costs is anticipated. A third project in Greenup County has been delayed at least six months due to efforts to determine the extent of soil contamination in the proposed right of way. The cost of soil remediation for that project has not been determined.

Maintenance painting operations on the I 75 Brent Spence Bridge at Covington were impacted due to removal of existing lead-based paint by abrasive blasting. The bridge had to be contained to prevent widespread contamination from airborne debris generated by the abrasive blasting process. Also, the spent abrasives were contaminated with lead-paint debris. That waste had to be shipped to a TSD facility for disposal. The containment procedure added \$2,100,000 to the project cost. Disposal of the hazardous waste increased project costs \$320,000. Lack of understanding proper protocol accounted for about one-third of the total costs.

KyTC officials reported environmental costs for construction of \$11,363,000 and \$8,784,000 for fiscal years 1991 and 1992 respectively. Those costs defer funds from road projects that provide needed economic benefits for Kentucky. Additionally, resulting delays prevent the timely attainment of economic benefits from new roads and add thousands of dollars in additional reviews, contract changes, and so forth.

## Comparisons with Benchmark State Transportation Agencies

~~General Information Section - The KyTC inventory of roads, and bridges is comparable~~ to those of the benchmark state transportation agencies. New road construction in Kentucky over the past two years has varied, but on average, it ranks favorably with the benchmark states. KyTC annual budgetary data (i.e. total new road construction and maintenance) exceed, or are within the range of budgetary data provided by the benchmark state transportation agencies. KyTC total manpower is lower than that for most benchmark state transportation agencies. However, that may reflect a KyTC emphasis on contracting for services. Kentucky data for yearly miles driven are lower than that for most benchmark states.

The KyTC units addressing environmental issues are generally comparable in organizational structure, function, and staffing levels to similar units in most of the benchmark state transportation agencies. Kentucky however, has a two tier approach to environmental concerns where the Division of Environmental Affairs oversees the construction section and the Office of Environmental Affairs is responsible for maintenance and facilities. This creates two separate units with different costs, operations, and functions. The annual KyTC expenditures for those units is within the range of similar cost data provided by the responding benchmark state transportation agencies.

Construction Section - Most of the comparative responses in the Construction Section relate specifically to the five areas of concern for environmental impacts. KyTC and the all of the benchmark state transportation agencies reported no major problems resulting from storm water regulations. KyTC provided data indicating the amount of wetlands mitigated and the number of projects impacted. However, environmental impact data (e.g. costs and delays) was not provided. Some of the benchmark state transportation agencies including Kentucky noted problems related to delays and high costs for wetlands mitigation. The total area of wetlands mitigated by KyTC appears to be comparable with the total areas mitigated by the benchmark state transportation agencies. KyTC and the benchmark state transportation agencies did not experience any significant problems related to ground water although Kentucky does have regulations nearly finalized. KyTC provided data on the number of USTs removed over the past two years and the resulting total cost. KyTC noted the potential for lengthy project delays or cancellation resulting from minor contamination and the letting process. The letting process by itself adds several months and delays right-of-way acquisition. For the same period, most of the benchmark state transportation agencies reported removing as many or more USTs, experiencing greater remediation costs, and encountering significant delays (one or more years). KyTC provided limited cost data on solid and hazardous waste disposal as did most of the benchmark state transportation agencies. As a result, no comparisons of waste disposal were possible.

Maintenance and Facilities - KyTC reported permitting actions comparable to most benchmark state transportation agencies. Some of those agencies reported unique permit actions particular to their states. KyTC did not furnish permitting costs. Only one

benchmark state provided costs for maintenance and facilities permitting. KyTC now has a full-time unit dedicated to addressing environmental issues applying to maintenance and facilities operations. Districts utilize a coordinator to track certain compliance activities. Several other state highway agencies employ full-time district personnel to address those issues.

As with the Construction Section, most comparative responses in the Maintenance and Facilities Section relate to the five areas of concern for environmental impacts. At the time of the survey, KyTC had not received storm water permits. Since then however, permits have been issued. This has created a very challenging transition period for KyTC. Compliance is expected to be expensive based on the types of modification needed.

Several of the benchmark state transportation agencies also had not obtained permits at the time of this survey. Others receiving permits had not experienced significant problems. Neither KyTC nor any of the benchmark state transportation maintenance agencies noted major problems related to wetlands. KyTC reported no environmental impacts related to ground water, although maintenance operations are experiencing prevention planning requirements due to new programs. Several benchmark state transportation agencies noted random environmental impacts related to ground water, but no widespread problems. KyTC was engaged in an extensive UST removal program at its facilities. Some of the benchmark state transportation agencies had similar UST replacement programs. Those programs are either comparable to or larger than the KyTC program. KyTC reported unit costs for tank removal on a per site basis. Though most of the data furnished by other state transportation agencies was on an annual or per tank basis, the KyTC and benchmark transportation agency costs were comparable. KyTC reported having a large number of disposal facilities available to accept solid wastes. None of the benchmark state transportation agencies reported problems related to solid waste disposal. KyTC and most of the benchmark state transportation agencies did not provide detail disposal costs for either solid or hazardous wastes preventing comparisons.

Based upon review of the state transportation agency survey responses, it appears that KyTC is subject to environmental regulations comparable to the benchmark state transportation agencies, although some of the eminent new regulations or programs appear to be just now coming into effect.

### **Survey of State Environmental Agencies**

A review of the responses to questionnaires sent to the NREPC and environmental agencies of the benchmark states did not provide any information suggesting that KyTC is subject to excessive or burdensome environmental regulation. NREPC regulations impacting KyTC are typically based on federal regulations which are minimums that must be enforced by all state environmental agencies. The size, budget, and staffing of the NREPC divisions involved with regulations impacting KyTC are comparable to those of the benchmark state environmental agencies.

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## **TABLES**

Table 1. Nine State Demographic and Geographic Comparison Data

State	Population	Pop. Density (per sq. mi.)	Total Area (sq. mi.)	Total Land Area (sq. mi.)	Total Water Area (sq. mi.)	Topography	Principal Industries	Climate
1. Kentucky	3,713,475	93.5	40,410	39,732	678	Mountainous E.; rounded hills (knobs) in N.; the fertile purchase of SW. W. coal fields; Bluegrass central region; wooded rocky hillsides in Pennyrival.	Manufacturing, coal mining, construction, and agriculture	Moderate with plentiful rainfall.
2. Illinois	11,542,841	207.6	56,345	55,593	752	Prairie and fertile plains throughout; open hills in the southern region.	Services, manuf., travel, gov., wholesale and retail trade, real estate, constr., finance, insurance, health care, and agriculture.	Temperate; typically cold, snowy winters, hot summers.
3. Indiana	5,609,616	152.1	36,185	35,870	315	Hilly southern region; fertile rolling plains of central region; flat heavily glaciated N. dunes along Lake Michigan shore.	Manufacturing, wholesale and retail trade, services, gov. and agriculture.	Four distinct seasons, with temperate climate.
4. Missouri	5,157,751	74.9	69,697	68,896	799	Rolling hills, open, fertile plains, and well-watered prairie N. of the Missouri River; S. of the river land is rough and hilly with deep, narrow valleys; low elevation in W.; alluvial plain in SE.	Agriculture, tourism, manufacturing, and aerospace.	Continental, susceptible to cold Canadian air, moist warm Gulf air, and drier SW. air.
5. North Carolina	6,796,827	188.3	52,669	48,718	3,915	Coastal plain and tidewater extending to fall line of rivers; piedmont plateau consists of 200 mi. wide of gentle to rugged hills; S. Appalachian Mtns.	Manufacturing, agriculture, tobacco, and tourism.	Subtropical in SE, medium continental in mountain region; tempered by Gulf stream and mtns. in W.
6. Ohio	10,998,650	267.1	41,330	40,953	377	Generally rolling plain; Allegheny plateau in E.; central plains in W.; Lake (Erie) plains extend S.	Manufacturing, trade, and services.	Temperate but variable; weather subject to much precipitation.
7. Tennessee	4,952,726	120.2	42,144	41,220	924	Great Smokey Mtns. low ridges in Appalachian Valley, and the flat Cumberland Plateau in the E.; slightly rolling terrain and knobs of the Interior Low Plateau, the largest region; E. Gulf Coastal Plain, leaved with meandering streams to the W.; Mississippi Alluvial Plain, a narrow strip of swamp and flood plain in the extreme W.	Trade, services, transp., construction, public utilities, finance, ins., communication, and real estate.	Humid continental in the N.; humid sub-tropical to the S.
8. Virginia	6,285,931	153.7	40,767	39,598	1,169	Mtn. and valley region in W. including Blue Ridge Mountains; rolling piedmont plateau; tidewater or coastal plain, including the eastern shore.	Services, trade, gov., tourism manufacturing, and agriculture.	Mild and equable.
9. West Virginia	1,800,935	74.8	24,232	24,087	145	Ranging from hilly to mountainous; Allegheny Plateau in W. covers two-thirds of the state with highest mountains in the state, over 4,000 ft.	Manufacturing, services, mining, and tourism.	Humid continental climate except for marine modification in lower peninsula.

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**Table 2. Nine State Employment and Personal Income Comparison Data**

State	Total Employment	Total Personal Income (Thousands of dollars)	Per Capita Personal Income (\$)	Employment Distribution							
				Manufacturing - Durable and Nondurable Goods %	Services %	Wholesale and Retail Trade %	Transportation and Public Utilities %	Farm %	Mining % (coal, gas, and oil)	Government and Government Enterprises %	* Other %
1. Kentucky	1,944,858	58,027,444	15,626	14.9	23.5	21	5	6	1.8	15.6	12.2
2. Illinois	6,358,875	239,293,413	20,731	15	28.3	22	5	1.7	.48	13	14.5
3. Indiana	3,077,543	96,365,353	17,179	20.5	23.4	22	5	2.7	.35	13	13
4. Missouri	2,985,383	92,470,247	17,928	14.3	27.2	21	6	4.1	.22	14	13.2
5. North Carolina	3,883,589	113,535,590	16,853	21.8	21.5	21	4	2.5	.16	15.7	13.3
6. Ohio	5,836,028	194,383,818	17,770	18.6	27.1	23	4	1.7	.43	13.3	12
7. Tennessee	2,776,273	81,650,946	16,486	18.6	24.8	22	5	3.7	.23	14	11.7
8. Virginia	3,670,673	126,237,096	20,082	11.5	26.4	20	5	1.7	.43	21	14
9. West Virginia	774,756	25,754,407	14,301	11.3	24.7	22	5.5	2.9	4.5	18	11

\* Other category includes Construction, Finance, and nonfarm areas such as Agricultural Services, Forestry, and Fisheries. U.S. Department of Commerce, Bureau of Economic Analysis, August 1992 (1991 data).

**Table 3. Nine State Gross State Product Comparison Data**

State	Gross State Product (Millions of dollars)	Gross State Product by Industry (Millions of dollars)							
		Manufacturing - Durable and Nondurable Goods	Services	Wholesale and Retail Trade	Transportation and Public Utilities	Farm	Mining (Coal, oil, and gas)	Government and Government Enterprises	* Other
1. Kentucky	65,858	15,460	8,883	9,108	5,852	2,085	2,958	7,698	13,814
2. Illinois	256,478	50,914	49,710	43,837	25,842	3,991	1,502	23,207	57,475
3. Indiana	105,314	30,474	14,918	16,217	10,044	2,323	601	9,486	21,251
4. Missouri	100,081	22,708	17,953	16,748	10,981	1,966	285	10,013	19,427
5. North Carolina	130,085	38,970	17,107	20,607	11,042	2,868	359	15,716	23,416
6. Ohio	211,545	58,244	35,889	32,895	18,643	2,027	1,130	20,192	42,525
7. Tennessee	92,267	22,161	14,494	16,174	7,326	1,426	354	11,025	19,307
8. Virginia	136,497	21,894	24,182	19,477	12,091	1,302	1,187	24,757	31,607
9. West Virginia	27,922	4,352	3,788	3,665	3,625	184	3,397	2,987	5,924

\* Other category includes Construction, Finance, and nonfarm areas such as Agricultural Services, Forestry, and Fisheries.  
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