

# Guideline Policy for Snow and Ice Control

By:

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November, 1999

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**INDIANA LTAP**  
LOCAL TECHNICAL  
ASSISTANCE PROGRAM

December 21, 1999

Attn: Local Public Agency (LPA) Official

Dear LPA Official:

Attached is a copy of the "Guideline Policy for Snow and Ice Control". These Guidelines are a compilation of information given by several agencies, such as the National Cooperative Highway Research Program, the Salt Institute, American Public Works Association, AASHTO, and many others. Our goal was to gather all the information that could be useful for the Indiana Counties and Cities, add our own experience and expertise, and place it in one report.

These Guidelines are divided into three sections. The first section is the Guidelines. It gives information and suggestions on all aspects of snow and ice control. The second section is a template for a snow and ice control policy. The intent of this section is to give you a policy that is almost complete. You just need to fill in the blanks and check a few boxes that pertain to your county or city. We encourage you to add any information that is missing from this policy that would make it more specific for your county or city. The third section is a sample Snow and Ice Control Policy for Parke County, Indiana. We worked closely with their Highway Superintendent on this policy. He supplied us with information and maps, and we compiled a policy to give you an example.

It is our hope that your LPA will find this Guidelines useful and informative. We plan to update these Guidelines periodically. If you have any questions or comments, feel free to contact us at the address below or by calling 1-800-428-7639.

Sincerely,

A handwritten signature in black ink that reads "Tom Martin".

Tom Martin  
Program Manager  
Indiana LTAP

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## Table of Contents

Section	Page
<b>1.0.0</b>	<b>CONSIDERATIONS FOR ESTABLISHING A SNOW &amp; ICE CONTROL POLICY ..... 1</b>
1.0.1	Introduction ..... 1
1.0.2	Policy Objectives ..... 1
1.1.0	PREPARATION ..... 1
1.1.1	Training ..... 2
1.1.2	Districts, Routes, Priorities, and Specials Features ..... 2
1.1.3	Equipment ..... 2
1.1.4	Dry Runs ..... 3
1.1.5	Responsibilities ..... 3
1.1.6	Weather Information ..... 4
1.2.0	MATERIALS AND APPLICATIONS ..... 4
1.2.1	Materials Used ..... 4
1.2.2	Material Storage ..... 5
1.2.3	Material Applications ..... 6
1.2.4	Snow Fences ..... 6
1.3.0	SNOW EVENT ..... 7
1.3.1	Procedures ..... 7
1.3.2	Supplemental Agencies ..... 8
1.3.3	Snow Emergency ..... 8
1.3.4	Private Property ..... 8
1.4.0	COLD WEATHER RECOMMENDATIONS ..... 9
1.4.1	Hypothermia ..... 9
1.4.2	Frostbite ..... 10
1.5.0	POST SEASON ..... 10
1.5.1	Equipment Clean-up and Storage ..... 10
1.5.2	Performance Evaluation/Critique ..... 11
APPENDIX 1:	CALIBRATION CHART ..... 12
APPENDIX 2:	OPERATOR'S VEHICLE DAILY PREVENTATIVE MAINTENANCE ..... 12
APPENDIX 3:	APPLICATION RATES ..... 13
APPENDIX 4:	SNOW EVENT RECORD ..... 19
APPENDIX 5:	SAMPLE CONTRACT FOR SUPPLEMENTARY AGENCIES ..... 20
<b>2.0.0</b>	<b>SNOW AND ICE CONTROL POLICY OUTLINE ..... 23</b>
<b>3.0.0</b>	<b>SAMPLE SNOW AND ICE CONTROL POLICY: PARKE COUNTY, INDIANA ..... 28</b>

## **1.0.0 Considerations For Establishing a Snow & Ice Control Policy**

### **1.0.1 Introduction**

Snow and ice control is considered emergency work in that pavement must be cleared as quickly as possible to ensure the safety of the traveling public. Because of the potential hazard to the motoring public and high incidence of overtime involved in this program, careful planning and preparation must be done prior to the snow and ice season. This planning process is made considerably more difficult due to the variable conditions encountered during each storm. Such things as the rate and accumulation of snowfall, moisture content, temperature, time of day or night, wind velocities, direction, and duration are all factors that interact to create a unique aspect for each storm with the result that no two storms are ever identical.

This emergency service is one of many services provided by local agencies to the citizens living within their jurisdiction. Effective snow and ice control is one of the most important services provided during the winter months, since it facilitates the safest possible travel on the public roadways maintained by the local agencies.

Snow and ice control is an expensive service to provide with annual expenses in the range of \$100-200 per centerline mile. It is also a very cost-effective service, since average road users have a 650% return in direct costs on each dollar spent on winter road maintenance. This does not even consider the benefit of avoiding delays, injuries, and even deaths.

### **1.0.2 Policy Objectives**

The mission of local agencies is to foster a safe, efficient, and environmentally sound transportation system by maintaining the roadways to the highest level possible; using all available resources, technology and training. Snow and ice control activities are an important part of the safety aspect of this mission.

This Guideline Policy for Snow and Ice Control (S&IC) has been developed to describe and suggest procedures that will be used to achieve a portion of the mission of the local agencies. The experience of existing personnel makes them very capable of providing effective snow and ice control. A further purpose of this policy is to record and clarify that collective experience for preparing veteran personnel for each new season, guiding the instruction of new personnel, serving as a reference in the case of unusual events, and communicating with the elected officials, administrators, employees, and interested residents. The policy will document why what work will be done, when, and where; what the priorities and desired levels of service are; what personnel will be responsible to initiate, coordinate, and perform the work; and what precedes and succeeds the work being done regarding personnel, equipment, and materials.

In light of the potentially disastrous possibilities of a lack of snow and ice control, the service is considered emergency work. Consequently, the local agency must be vigilant and prepared to respond to any winter weather condition that might arise. It is important to note though that these are goals, not duties, and are not intended to incur greater liability for the agency.

### **1.1.0 Preparation**

Successful snow and ice control practices begin long before the first snow event is even a faint possibility, while the temperature is still well above freezing. Pre-event practices involve planning the procedures to be used, acquiring the necessary equipment and materials, and preparing the equipment and personnel for the challenges that lie ahead.

### 1.1.1 Training

Local agencies consider safety the utmost importance during winter operations as well as through out the year. In keeping with this attitude of safety, in-house training will be provided for all new employees. The training for new employees should occur in early November and through the first snow event. All veteran employees should receive refresher training as a reminder of policy and to be kept informed of innovations in equipment and techniques.

An invitation should be extended to all interested citizens, and especially to the commissioners, Sheriff, and other elected and appointed officials, as well as the media to join in on all or a portion of the snow and ice control training. The department head will notify each group of the date, time, and content of the training activity. Additionally, copies of the Snow and Ice Control Policy should be placed on reserve in public libraries and will be available at the County Courthouse and County Highway Department.

In addition to in-house training, other training resources can be used to prepare the staff to provide the best possible service. These training resources include the American Public Works Association Annual Snow Conference and the Indiana Local Technical Assistance Program's Snow and Ice Control Workshops.

### 1.1.2 Districts, Routes, Priorities, and Specials Features

An efficient way of providing service is to divide the jurisdiction into a number of districts. Combinations of roadways within each district have been identified to produce a number of routes that will allow all roadways to be maintained in the most efficient and effective manner possible. In order to maximize public safety, roadways and routes are grouped according to various levels of priority for providing snow and ice control. For example, the following prioritization scheme may be appropriate for county highway departments:

*Priority (1)* - High volume (> 400 vpd) paved roads serving major cities, towns, and communities within the county.

*Priority (2)* - Low volume (< 400 vpd) paved roads and subdivision streets.

*Priority (3)* - Secondary gravel and side roads throughout the county.

*Priority (4)* - Dead-end roads.

Snow and ice control efforts will concentrate on the higher priority routes until completed. Then control efforts will proceed to the lower levels of priority until conditions have been stabilized to provide reasonably safe travel.

Each district should be mapped, and the street segments should be color coded according to their assigned priority. These maps also indicate where known special features exist within each district. These special features may include, but are not limited to, hills, curves, intersections, bridges, stockpiles, roadside self-help salt/sand piles, and hazards for the dispatcher to warn drivers about, such as overhead lines, manholes, culverts. If a discrepancy is identified, it should be reported and noted on district maps as soon as possible. It is crucial to communicate revisions to district maps for all copies of the Snow and Ice Control Policy until revised maps can be produced. All district maps need to be updated on an annual basis.

### 1.1.3 Equipment

Prior to the snow season, it would be to the operators benefit to do a complete equipment check. This activity should be begin as early as October in case any stored equipment is severely damaged, it can be repaired or replaced before the first snow event. On a set schedule, one truck could be taken out of

service for one day. During this time, the driver will locate, attach, and check all equipment to ensure it is in proper working order. This would be a good time to make sure the spreaders are calibrated to deposit the correct amount of material. An example of a calibration chart is found in Appendix 1.

During fall training sessions, discuss each type and class of equipment which employees will operate. Go over the strengths and weaknesses of each piece of equipment. Describe the performance capabilities, load and weight limits, specifications, safety considerations, attachments and modifications. If possible, assign each operator to a specific spreader, plow, or loader. Man and machine make a better team when they work together regularly. The feeling that a vehicle belongs to an employee also makes an operator show more responsibility for its upkeep.

A truck inspection should be completed before each use. This inspection is a brief walk around inspection and should require a minimum amount of the driver's time. An example of a truck inspection sheet can be found in Appendix 2. This inspection sheet should be placed in a log, and each truck should have a separate log.

After each storm, all equipment must be cleaned, washed and allowed to dry. When dry, components such as chains, sprockets, hinges, spinners, and other moving parts should be coated with motor oil, diesel fuel or kerosene, and grease all bearings. Check the hydraulics and quick disconnects for leakage. All washing and maintenance of the equipment should be done in a specific area to protect the equipment and the environment.

#### 1.1.4 Dry Runs

After completing the annual S&IC training, all personnel will participate in at least one, preferably two, dry run training days. The purpose of the dry runs is to acquaint/reacquaint personnel with the entire preparatory S&IC operations and the routes to be driven. Additionally, routes will be checked for new and special features that are not already documented on the snow route maps.

The first dry run will be announced so all personnel can be as prepared as possible. Personnel are encouraged to review in advance any material necessary to allow them to completely carry out all assigned tasks on the day of the practice run. Subsequent dry runs will be unannounced, to ensure that all personnel have grasped the necessary procedures to the extent that will allow them to readily recall the operations throughout the snow season.

In order to safely provide the necessary snow and ice control operations, a maximum speed limit will be enforced on all activities. The following table indicates the recommended maximum speed for various activities and roadways.

Table 1.1.1	Maximum Speed per Roadway & Activity	
Roadway Classification	Ice Control Activity	Plowing
Priority 1	35 mph	30 mph
Priority 2	30 mph	25 mph
Priority 3 &4	25 mph	20 mph

Excessive speed in order to throw snow higher and farther makes it difficult for drivers to maneuver or avoid hazards, as well as just being generally unsafe and inappropriate.

#### 1.1.5 Responsibilities

In keeping with the attitude of safety, there should be a limit established on the maximum number of work shift of hours. This can be accomplished by two alternatives. The first alternative is having two

12-hour shifts. This provides a continuous service during a snow event. The second alternative is 16-hour shifts with 8-hour breaks where the unit will not be available. Shifts for various units may, or may not, be offset to ensure continuous operation. Under **NO** circumstance should a driver or operator be allowed to work more than 16-hours without an 8-hour break.

### **1.1.6 Weather Information**

Good weather information is essential for successful winter operations. Decisions of whether or when to begin an activity and what applications to make can only be made correctly if good weather information is available. Included in such a forecast would be expected type and time of initial precipitation, type and time of changes in precipitation, air temperatures before, during and after the storm, and wind speed and direction. Each of these elements will factor into the decision making process.

DTN is a satellite relay weather service that may be subscribed to, which provides current radar imaging as well as forecasting. Radar imaging is also available via the Internet at <http://www.weather.com/> as well as other www sites. A cable TV connection will also allow forecasting and radar information to be obtained from the Weather Channel.

All personnel involved in snow and ice control should be aware of each of these services and the information they provide. While only a select few personnel will need to understand the intricacies of the information provided by these services in order to make management decisions, each person will need the information to make personal decisions that will positively effect the success of the operation.

### **1.2.0 Materials and Applications**

The best application of snow and ice control material is the application that provides just enough to achieve the desired results. This approach helps to minimize the harmful effects to the physical facilities and the environment in general. Accordingly, snow and ice control personnel are provided with the most current information and encouraged to use the most appropriate type and amount of snow and ice control material.

Care should be used when handling the snow and ice control materials. Strict policies for handling snow and ice control materials should be posted near material storage and handling areas, presented to all personnel on at least a yearly basis, and filed for easy referencing. Goggles or face shields and rubber gloves should be worn whenever liquid deicing chemicals are handled. Eyewash bottles should be placed near the storage locations and in the first aid kit for each truck.

#### **1.2.1 Materials Used**

There are two basic types of snow and ice control materials used; a deicer and an abrasive. The use of these materials is solely dependant on the preferences of each individual agency. Each material can be used independently, or the materials can be used in combination. Abrasives are used to give added traction on snow and ice. Deicers are used to melt the snow and ice, and in some cases, can be used for added traction.

Salt is a deicer that has been used since the 1940's to remove snow and ice hazards on our nation's streets and highways. Today, a combined 13 million tons are used by nearly every agency responsible for winter roadway maintenance in the United States and Canada. Depending on the level of service desired, the application of salt can vary. Rock salt has been used as a deicer and an abrasive for traction control. It can also be used with an abrasive for added traction, but this will slow the deicing process.

Although salt is the most popular deicing agent in use today, other products are available. Some of these products are Calcium Chloride, Magnesium Chloride, Calcium Magnesium Acetate, Potassium



Chloride, Urea, Ethylene Glycol, and Ice Ban<sup>®</sup>. Costs, applications, and usage of these products will vary. Research of which product that will be most cost effective for the desired level of service is the responsibility of each agency.

### 1.2.2 Material Storage

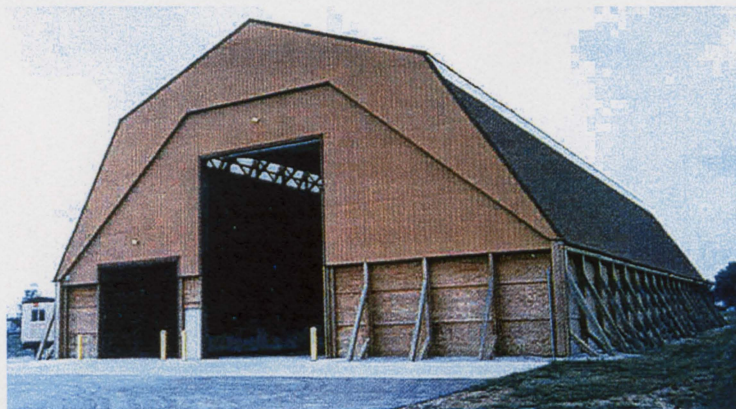
Salt should be ordered by mid-summer for delivery by early fall so that the necessary supply can be available even for an early season storm. Early ordering also reduces the possible detrimental effects of weather on delivery. At the very least, 50% of the estimated winter requirement should be available before the first winter storm is even a possibility. Always be certain to account for changes in the inventory of roadways to be maintained and desired levels of service.

Salt will never lose its melting capacity no matter how long it is stored. Humidity will have little adverse effect, since salt will not absorb moisture until the relative humidity is greater than 76%. The moisture that is absorbed will be lost back into the atmosphere when the air becomes drier. A thin, crusty layer of salt will be left on the surface of the stockpile, but can be easily broken up. It will remain as fresh as the day it was mined or harvested. Stockpiles exposed to precipitation though can have salt washed away to the loss of the agency and detriment of the environment. It is essential that stockpiles are at least covered, and are best protected in a permanent, under-roof storage facility.

When the construction of a storage shed is not economical, a covered storage pad with proper drainage can be constructed. The thickness and base of the storage pads will vary according to subgrade and weight to be supported. Good drainage is a primary issue. Pads should be sloped (minimum of 1-2%) to drain surface water away from the stockpile. Pipes, tiles, swales, or berms should direct water to a collection area, preferably a specially designed sump area. The pad may have an asphalt or concrete surface. Concrete surfaces should be constructed of high-quality, air-entrained material treated with linseed oil, an asphaltic coating, or other treatment. This will prevent the salt from being absorbed by the material and cause the surface to spall. An asphalt material may be constructed of the same material as any roadway.

Salt stored in open or semi-enclosed areas must be covered to prevent loss of material. When choosing the material for the covering, the ease of recovering, durability and waterproofing will need to be considered. Typical materials used for a covering are polyethylene, polypropylene, "hypalon", polyurethane foam, and water-resistant canvas. The exterior of the canvas should be weighted in some fashion to prevent the wind from "peeling" it off the stockpile.

The best method for covering the stored material is the ground level storage shed or building. These structures may be newly constructed, or an existing structure renovated for the new purpose.



Salt Storage Facility, Mt. Clemens, Michigan (*Salt & Highway Deicing*, Vol. 31, No. 2 Fall 1995)

As with the concrete pads, any concrete in the structure should be treated to prevent absorption of the salt. All hardware needs to be galvanized. Adequate access, ventilation and lighting must always be provided. Hinged doors must stay open even in high winds, so as not to hinder operations.

### 1.2.3 Material Applications

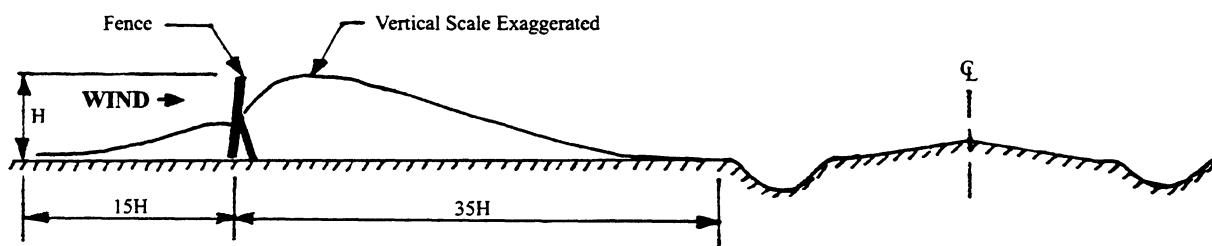
Timing is crucial in applying salt. Ideally, salt should be spread as soon as a storm begins in order to prevent bonding of snow or ice to the pavement. The salt will quickly produce a brine or keep snow mealy, allowing for efficient plowing. Applying salt before the storm actually begins is practiced in Europe and some agencies in North America. Since Mother Nature and storm forecasting are not always precise, this can be difficult. When done correctly, presalting (anti-icing) is the best means to prevent ice-pavement bonding. The best advice would be to prepare to mobilize all forces as soon as a winter storm approaches.

As mentioned before, the amount of material applied can vary depending on the level of service desired. Taking the priorities in Section 1.1.2, a suggested application would be 80/20 (salt/sand) mixture at a rate of 800-lbs/lane mile for the high volume roads, 50/50 at 800-lbs/lane mile for low volume roads, and 0/100 at 800-lbs/lane mile for unpaved roads. Care should be used in determining the applications. Placing too much salt on an unpaved road can actually weaken the road, and cause more harm than good. Different types of storms require different types of applications. A comprehensive set of tables in Appendix 3 are to aid in these decisions for different types of storms.

### 1.2.4 Snow Fences

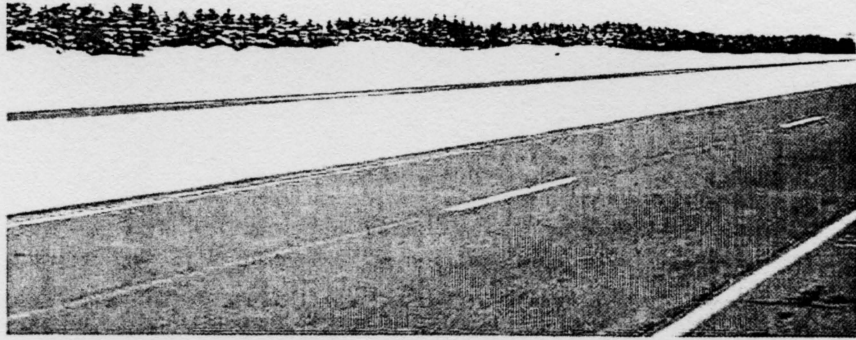
Blowing snow is a maintenance engineer's nightmare. It blinds drivers, causes accidents, and makes clearing snow difficult if not impossible. Drifts can cause runoff water to seep under the pavement, where it can cause cracking and heaving. The construction of a properly placed snow fence will reduce the effects of the wind on the snow, and will reduce the drifting on roadways.

Snow fences too close to the road can increase the amount of snow on the road. The distance between the fence and the road should be at least 35-times the height of the fence as shown in the figure below.



The height of the fence is determined by the distance that unobstructed wind blows over the retained precipitation. To be most effective, the fence should be placed perpendicular to the prevailing winds, but this angle can vary as much as  $25^\circ$  without affecting performance.

Because of the long distances between the road and the fence, agencies will need to work closely with the adjoining landowners. Permission will have to be granted by the landowner in order to build the fence. It is more cost effective to keep the snow fence in place the entire year whenever possible. This needs to be made clear in the discussion with the owner. An alternative to the construction of a fence is a living snow fence. This can be a row of trees planted in the field, or some rows of corn that are left standing after harvest. Explain to the owner that a living fence can create food and habitat for wildlife, as well as effective snow control. Examples of living snow fences are in the following photos.



A tree line as a living snow fence (Snow Fence Guide, SHRP 1991)



Standing cornrows as a living snow fence (Snow Fence Guide, SHRP 1991)

For more information on designing a snow fence, please refer to Snow Fence Guide published by the Strategic Highway Research Program.

### 1.3.0 Snow Event

Each agency should clearly state in their Snow and Ice Control Policy what its objectives are for each priority level. For example, an agency may have as an objective to keep priority 1 & 2 routes clear of snow and ice from edge of pavement to edge of pavement, and priority 3 routes cleared sufficient enough to allow traffic to pass safely. Though actual performance may vary according to the length and severity of each snow event, the intended snow and ice control performance is the same.

### 1.3.1 Procedures

During a snow event, the first responsibility is to contact everyone involved with snow and ice removal. It will be impossible for one person to contact everyone involved and in action in a timely manner. The quickest and easiest way of contacting everyone is by radio or pager. This is quick because one call can be made and everyone is contacted. If the agency does not have the resources for everyone to have a personal radio or pager, contact will be made by telephone. In this case, a phone-tree should be made. Each person on the tree should not be responsible to call more than four or five people. If each person takes five-minutes to complete their calls, 150-people can be contacted within 15-minutes.

Once everyone is contacted, it is time to discuss the goals for snow removal for this particular storm. As mentioned before, no two storms are alike, and activities should be customized for each storm. The

actions taken during a storm that has 6-inches of accumulation is going to be treated differently than a storm with 1-inch of accumulation. This is when application rates and plowing procedures are discussed. This meeting needs to be as short as possible, which means all operators need to be familiar with all plowing procedures, material applications, and priority routes.

A snow event record should be made for each storm during the snow season. The data collected in this report is important when evaluating the improvement of crews, material applications, and operational response procedures. An example of a snow event record is in Appendix 4.

Refreshments should be provided to the operators during an extended snow event to keep them alert and energized. These refreshments should include some type of hot food (i.e. chili, chicken noodle soup) which could be served at the garage. Also, a variety of snacks should be provided for the operators to take along with them while on their route.

### **1.3.2 Supplemental Agencies**

In cases where the local agency will not be able to serve the jurisdiction to the level of service desired, supplemental agencies will need to be contracted to help provide the level of service desired. This could be due to an unexpected large snowstorm, or shortage in personnel due to sickness. A contract for these agencies should be made prior to the snow season. This contract should include details on all expectations of this agency. It is important to specify in this contract that the contractor is responsible for all property damage that occurs while they are under contract. A sample contract is given in Appendix 5.

A list of all contracted agencies should be made and available at all times. Every contractor on the list should attend all of the personnel training sessions to become familiar with the operational procedures. Any contractor that does not attend these training meetings should be used as a last resort. Doing this will ensure there is no deviation in the snow and ice control procedures from one district to another.

### **1.3.3 Snow Emergency**

The worst case weather scenarios include excessive amounts of water or ice as found in blizzard conditions, including intense snowfall, wind, and very cold temperatures. Snow and ice control chemical treatments can be quickly diluted, rendering them virtually ineffective. If pavement temperatures going into and coming out of a blizzard are expected to be low, then plowing is probably the best strategy. If, after a blizzard, the pavement temperatures are still very cold, using abrasives as necessary will allow chemical de-icing to work until warmer temperatures arrive.

Rapidly accumulating freezing rain is another serious snow and ice control problem. The best strategy to deal with freezing rain is to apply a solid deicer at a high rate in very narrow bands along the center wheel path of each lane. This treatment creates the best opportunity to provide a location in each lane that will produce enough friction to allow vehicles to stop and steer.

In the situation where falling or blowing snow make visibility near zero, it is a good idea to keep snow and ice control vehicles well off the road. Operating in these conditions is a risk to everyone involved.

### **1.3.4 Private Property**

While involved in a plowing operation, employees should not use the equipment to push, pull, or tow stranded private vehicles from the roadway or parking lot. The employee should notify dispatch via radio of hazardous conditions. Similarly, under no circumstances should an employee be permitted to use the equipment to perform any snow and ice control operation on private property.

If an incident occurs during snow and ice control operations, drivers are instructed to report the incident immediately. For accidents involving mailboxes and other minor, non-vehicular accidents, the driver is

to inform the supervisor on duty at snow command with information concerning the incident. The incident will be investigated fully following the snow event. For more serious accidents and any accidents involving non-agency vehicles, the dispatcher must also notify the police dispatch so an officer can respond and make an accident report as appropriate. The driver should always stop and assist other motorists if they are involved in an accident

#### **1.4.0 Cold Weather Recommendations**

As temperatures decline, the clothing choices become more vital than at other times of the year. As you prepare your cold weather clothing, use the guidelines that spell the word COLD to help you stay warm and comfortable.

##### **C - Clean**

Effective insulation is achieved when heat is trapped by dead air spaces. In clothing, this can be accomplished by keeping your insulating layers clean and fluffy. Dirt, grime, and perspiration can mat down those air spaces and reduce the warmth of a garment.

##### **O - Overheating**

Avoid overheating by adjusting your layers of clothing to meet the outside temperature and the exertions of your activities. Excessive sweating can dampen your clothing and cause chilling later on.

##### **L - Loose Layers**

Wearing layers of loose fitting clothes is a benefit in several ways. If blood flow is not impeded by tightly fitting clothes, a steady flow of blood is maintained to all parts of your body that is essential to keep them heated. Loose layers of clothes also trap air between, as well as within, layers, thereby increasing the dead air space and insulating factor of the clothes. Multiple layers of clothing also allow you to more easily adjust the amount of clothing worn as the level of exertion and activities change, thereby reducing the chance of overheating.

##### **D - Dry**

Damp clothing and skin can cause your body to cool quickly, possibly leading to frostbite and/or hypothermia. Keep dry by brushing snow from your clothes before it melts, by limiting overheating and the resulting accumulation of sweat, and by avoiding cotton and unbreathable clothing like. Cotton is one of the most prevalent materials in clothing today, and provides effective insulation when it is dry. When it is wet though, it becomes an even better transmitter of heat, thereby draining the body of the warmth it needs. Unbreathable layers, like vinyl jackets and pants provide an inexpensive waterproof layer that works both ways; not only does it not let water in, but it also does not let perspiration out. If the perspiration is trapped inside, it will eventually make the underlying layers damp, ineffective insulators.

##### **Headgear**

In addition to the word COLD, the singly most effective guideline to remember may be to wear headgear. The body loses 80% heat through an uncovered head. Wearing a hat or other head protection will help conserve this heat loss, and provide substantial warming for the other parts of the body.

#### **1.4.1 Hypothermia**

When you hear that someone has "died of exposure", the killer may have actually been hypothermia - from hypo, meaning "low" and thermia, meaning "heat". Hypothermia occurs when the body is losing more heat than it can generate. A victim of hypothermia begins feeling chilly, tired and irritable. If

they do not receive warming, they will progress from common to violent shivering, which is the bodies attempt to generate heat. The victim will begin to lose thinking and motor skills will become cloudy. If the victim continues to lose body heat, the shivering will stop and they will be close to death.

If someone is showing any symptoms of hypothermia, warming **MUST** take place immediately but slowly. Sudden warm-up will place the victim in shock and the shock, not the cold, could kill them. Get the patient warm by moving them indoors or into a warm vehicle. Replace any wet clothes they may be wearing with dry, warm clothes or blankets. Do not place them in a hot bath. Do not give an unconscious patient anything by mouth, but do call for help.

### **1.4.2 Frostbite**

Flesh that is exposed to low temperatures is in danger of freezing. The longer the flesh is exposed, the more damaging the injury becomes. The toes, fingers, cheeks, ears & nose are the most susceptible to frostbite, because they are farthest from the bodies core. As flesh freezes, it may become painful and then numb. If the freezing continues, the area will stiffen and become a grayish or whitish color, although the victim seldom realizes what is happening.

Get the affected area warm and keep it warm by wrapping it in a warm blanket, by holding it beneath your clothes, or by pressing your bare palm over it. **DO NOT** use hot water, hold the injury close to a heat source, or rub with snow. Excessive heat and abrasion can cause serious tissue damage. Above all, this person requires medical attention. **CALL FOR HELP.**

### **1.5.0 Post Season**

The events that occur following a snow season are very important for the next snow season. Having equipment cleaned stored properly in the spring can make preparations in the fall much easier. Also, this is the time when the performance of the entire agency is evaluated.

#### **1.5.1 Equipment Clean-up and Storage**

What makes the end of year clean up and storage difficult is that you can't predict when the last snow fall has occurred. Consequently, many agencies gradually begin spring maintenance activities without putting winter activities "to bed." Plows and spreaders that may have been cast aside in a rush may still be in the same unsettled condition months later when warmer weather is the norm. One way to prevent this is to establish a specific date on which you are going to assume wintertime activities have been concluded. Obviously, you would plan the date late enough in the season so that you won't be surprised by a spring snowstorm, at least very often. In Indiana, everyone knows that one of the worst snow falls of the year will occur during the first week of March, when the Indiana High school basketball sectional tournament begins or the Purdue Road School, both of which have been associated with nasty winter weather.

The date that is established as the end of winter should be similar to the fall date considered in the beginning of the season. Equipment should be tested to be sure it is operational, cleaned, and put away in a location reserved for the unit to which it belongs. An excellent theme for storage of equipment is "A place for everything, and everything in its place." It is very difficult to be organized and efficient in snow and ice control activities when storage facilities are non-existent or inadequate. Hoses, spinners, and other components of the spreader should be clearly identified, bound together, and stored with other equipment belonging to that unit (truck, grader, loader, etc.).

Some counties within Indiana switch from five 8-hour workdays per week during the winter to 10-hour workdays per week during the longer days of summer. The date of this transition might be a good time to schedule the "end of winter" activities. It would also help change the mindset of employees from winter to spring and summer activities.

### **1.5.2 Performance Evaluation/Critique**

An important part of the S&IC is the follow-up after individual events and the entire snow season. This is really the commutation of one year's training and the first preparations for the next snow season. The purpose is to assess the positive and the negative aspects of the recent activities. Revising procedures to improve negative aspects while strengthening the positives. These can be evaluated in subsequent snowstorms and seasons, as well as with personnel from other agencies during the off-season, to determine their relative benefit.

# Appendix 1: Calibration Chart

Date: \_\_\_\_\_  
 Truck #: \_\_\_\_\_  
 Spreader #: \_\_\_\_\_

Agency: \_\_\_\_\_  
 Location: \_\_\_\_\_  
 By: \_\_\_\_\_

Pounds Discharged per Mile														
Gate Opening: _____ in. (Hopper Type Spreaders)			One Mile Travel Times (minutes)											
			Travel Speed (mph)											
Control	Shaft RPM	Discharge per Rev	Discharge Rate	min	12	6	4	3	2.4	2	1.71	1.5	1.33	min
Settings	(Loaded)	(lbs.)	(lbs./min)	mph	5	10	15	20	25	30	35	40	45	mph
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														

### SPREADER CALIBRATION PROCEDURE

Calibration is simply calculating the pounds per mile of material discharged at various truck speeds. This is accomplished by first counting the number of auger or conveyor shaft revolutions per minute, then measuring the salt discharged in one revolution, and multiplying the two to determine the discharge rate. Finally, the discharge rate is multiplied by the minutes it takes to travel one mile to arrive at the pounds of material discharged per mile of travel.

With hopper type or spreaders with an adjustable discharge opening, you must calibrate for specific gate openings. Each spreader must be individually calibrated: even the same model may vary widely at the same control setting.

#### Equipment needed for calibration:

- 1) Watch with second hand
- 2) Marking device
- 3) Salt collection device
- 4) Scale to weigh salt

#### Calibration Steps:

- 1) Remove by-pass or turn off spinner.
- 2) Warm the truck's hydraulic oil to normal operating temperature with spreader system running.
- 3) Put partial load of salt in truck.
- 4) Mark shaft end of auger or conveyor.
- 5) Dump salt into auger.
- 6) Rev truck engine to operating RPM.
- 7) Count & record the number of shaft revolutions per minute at each spreader control setting (column 2).
- 8) Collect salt for one or more revolution and weigh the salt. Be certain to deduct the container weight.
- 9) Divide the weight of the salt by the number of revolutions the salt was collected (Discharge/Rev = column 3).
- 10) Multiply the shaft RPM (column 2) by the Discharge/Rev (column 3) to determine the discharge rate (column 4).
- 11) Multiply the discharge rate by the time to travel one mile (minutes) to determine the pounds discharge per mile.

### CALIBRATION OF AUTOMATIC CONTROLS

Automatic controls can be calibrated using the following steps:

- 1) Remove by-pass or turn off spinner.
- 2) Set control on given number.
- 3) Tie material capture under spreader discharge area.
- 4) Mark specific distance on pavement (?00 ft.)
- 5) Drive the specified distance with spreader operating.
- 6) Weigh the salt that is collected.
- 7) Multiply the weight of the salt by 5,280 and divide by the distance by the distance traveled.

The calculated salt discharged per mile will remain constant regardless of speed, but each control setting must be calibrated. Some automatic control manufactures have "simulators" which eliminate the need for on-road operation for calibration.



## Appendix 2: Operator's Vehicle Daily Preventative Maintenance

Station/Garage \_\_\_\_\_ Unit # \_\_\_\_\_  
 Mileage \_\_\_\_\_ Date \_\_\_\_\_

Each unit, when used, will be checked daily, and this report turned in to immediate supervisor at the end of each pay period or weekly for 3-month file retention. Units classified as commercial vehicles shall retain previous day's checklist or copy as well as current day's checklist.

Pre-Operational Check:	X	Remarks:	R
Pintle hitch or 5 <sup>th</sup> Wheel			
Steering Mechanism			
Horn			
Mirrors			
Windshield Wiper/Washer			
Tires			
Wheel nuts, Rims			
Emergency Equipment			
Service Break (Incl. Trailer Breaks and Connections)			
Parking Break			
Lights and Reflectors Broken or Obscured			
Unit Cleanliness			
Heater/Defroster			
Fluid Leaks			
Visual Inspection (tires, body damage, glass)			
Engine Oil			
Cooling System			
Power Steering Fluid			
Engine Belts			
Battery Cables			
Air Guard Fluid			
Drain Air Tanks			
Grease Spring & Box Pins			
Hydraulic Fluid Level			
Plow & Wing Cutting Edge			
Sander Bearing & Chain			
Body Damage (dents, Scratches, glass):		Describe on Back	

SIGNED:

(Operator) \_\_\_\_\_

Reviewed by Supervisor: \_\_\_\_\_

This list includes the basic items that must be checked daily as a form of habit and in no way restricts or limits checking other items. As this form is to be used for cars, pickups, all classes of trucks, and other mobile equipment, there will be some items that may not apply. "Certain vehicles (agency dependant)" need only be checked when fueling the unit.

Deficiencies that cannot be corrected by the OPERATOR are to be reported to the SHOP SUPERVISOR immediately.

Mark "X" for any item needing repair. Mark "R" for repair if request has been made to shop. Mark "✓" for items in serviceable condition.

Items with an X notation must be deadlined if they meet State Police/Patrol criteria for deadlining a vehicle.

### Appendix 3: Application Rates

Weather Event: Light Snow Storm

PAVEMENT TEMPERATURE RANGE AND TREND	INITIAL OPERATION				SUBSEQUENT OPERATIONS			COMMENTS
	pavement surface at time of initial operation	maintenance action	Dry chemical spread rate, kg/lane-km (lb./lane-mi.)		maintenance action	dry chemical spread rate, kg/lane-km (Lb./lane-mi.)		
			liquid	solid or prewetted solid		liquid	solid or prewetted solid	
<b>Above 0EC (32EF), steady rising</b>	Dry, wet, slush or light snow cover	None, see comments			None, see comments			1) Monitor pavement temperature closely for drops toward 0EC (32EF) and below 2) Treat icy patches if needed with chemical at 28 kg/lane-km (100 lb./lane-mi.); plow if needed
<b>Above 0EC (32EF), 0E (32EF) or below is imminent;</b>  <b>ALSO -7 to 0EC (20 to 32 EF), remaining in range</b>	Dry  Wet, slush, or light snow cover	Apply liquid or prewetted solid chemical  Apply liquid or solid chemical	28 (100)  28 (100)	28 (100)  28 (100)	Plow as needed; reapply liquid or solid chemical when needed	28 (100)  28 (100)		1) Applications will need to be more frequent at lower temperatures and higher snowfalls rates 2) It is not advisable to apply a liquid chemical at the indicated spread rate when the pavement temperature drops below -5 EC (23EF) 3) Do not apply liquid chemical onto heavy snow accumulation or packed snow
<b>-10 to -7EC (15- 20EF), remaining in range</b>	Dry, wet, slush or light snow cover	Apply prewetted solid chemical		55 (200)	Plow as needed; reapply prewetted solid chemical when needed		55 (200)	If sufficient moisture is present, solid chemical without prewetting can be applied
<b>Below -10EC (15EF), steady or falling</b>	Dry or light snow cover	Plow as needed			Plow as needed			1) It is not recommended that chemicals be applied in this temperature range 2) abrasives can be applied to enhance traction

**Notes**

**CHEMICAL APPLICATIONS.** (1) Time initial and subsequent chemical applications to *prevent* deteriorating conditions or development of packed and bonded snow. (2) Apply chemical ahead of traffic rush periods occurring during storm.

**PLOWING.** If needed, *plow before chemical applications* so that excess snow, slush, or ice is removed and pavement is wet, slushy, or lightly snow covered when treated.

**Weather Event: Light Snow Storm with Period(s) of Moderate or Heavy Snow.**

PAVEMENT TEMPERATURE RANGE, AND TREND	INITIAL OPERATION				SUBSEQUENT OPERATIONS				COMMENTS	
	pavement surface at time of initial operation	maintenance action	Dry chemical spread rate, kg/lane-km (lb./lane-mi.)		maintenance action	Dry chemical spread rate, kg/lane-km (lb./lane-mi.)				
			liquid	solid or prewetted solid		liquid		solid or prewetted solid		
						light snow	heavier snow	light snow		heavier snow
<b>Above 0EC (32EF), steady or rising</b>	Dry, wet, slush, or light snow cover	None, see comments			None, see comments					1) Monitor pavement temperature closely for drops toward 0EC (32EF) and below 2) Treat icy patches if needed with chemical at 28 kg/lane-km (100lb./lane-mi; plow if needed
<b>Above 0EC (32EF) , 0EC (32EF), remaining in range</b>  <b>ALSO -4 to 0EC (25 to 32EF) remaining in range</b>	Dry  Wet, slush, or light snow cover	Apply liquid or prewetted solid chemical  Apply liquid or solid chemical	28 (100)  28 (100)	28 (100)  28 (100)	Plow as needed; reapply liquid or solid chemical when needed	28 (100)  28 (100)	55 (100)  55 (100)	28 (100)  28 (100)	55 (200)  55 (200)	1) Applications will need to be more frequent at lower temperatures and higher snowfall rates 2) Don not apply liquid chemical onto heavy snow accumulation or packed snow 3) After heavier snow periods and during light snow fall, reduce chemical rate to 28 kg/lane-km (100 lb./lane-mi.); continue to plow and apply chemicals as needed
<b>-10 to -4EC (15 to 25EF), remaining in range</b>	Dry, wet, slush or light snow cover	Apply prewetted solid chemical		55 (200)	Plow as needed; reapply prewetted solid chemical when needed			55 (200)	70 (200)	1) If sufficient moisture is present, solid chemical without prewetting can be applied 2) Reduce chemical rate to 55 kg/lane-km (200 lb./lane-mi.) after heavier snow periods and during light snow fall; continue to plow and apply chemicals as needed
<b>Below -10EC (15EF), steady or falling</b>	Dry or light snow cover	Plow as needed			Plow as needed					1) It is not recommended that chemicals be applied in this temperature range 2) Abrasives can be applied to enhance traction

**Notes**

**CHEMICAL APPLICATIONS.** (1) Time initial and subsequent chemical applications to prevent deteriorating conditions or development of packed and bonded snow. (2) *Anticipate increases in snowfall intensity. Apply higher rate treatments prior to or at the beginning of heavier snowfall periods to prevent development of packed and bonded snow.* (3) Apply chemical ahead of traffic rush periods occurring during storm.

**PLOWING.** *If needed, plow before chemical applications so that excess snow, slush or ice is removed and pavement is wet, slushy, or light snow covered when treated.*

**Weather Event: Moderate or Heavy Snow Storm.**

PAVEMENT TEMPERATURE RANGE, AND TREND	INITIAL OPERATIONS				SUBSEQUENT OPERATIONS			COMMENTS
	pavement surface or initial operation	maintenance action	Dry chemical spread rate, kg/lane-km (lb./lane-mi.)		maintenance action	Dry chemical spread rate, kg/lane-mi. (Lb./lane-mi.)		
			liquid	solid or prewetted solid		liquid	solid or prewetted solid	
<b>Above 0EC (32EF), steady or rising</b>	Dry, wet, slush or light snow cover	None, see comments			None, see comments			1) Monitor pavement temperature closely for drops toward 0EC (32EF) and below 2) Treat icy patches if needed with chemical at 28 kg/lane-km (100 lb./lane-mi.); plow if needed
<b>Above 0EC (32EF), 0EC (32EF) or below is imminent; ALSO -1 to 0EC (30 to 32EF), remaining in range</b>	Dry	Apply liquid or prewetted solid chemical	28 (100)	28 (100)	Plow accumulation and reapply liquid or solid chemical as needed	28 (100)	28 (100)	1) If the desired plowing/treatment frequency cannot be maintained, the spread rate can not be maintained, the spread rate can be increased to 55kg
	Wet, slush, or light snow cover	Apply liquid or solid chemical	28 (100)	28 (100)				
<b>-4 to -1EC (25 to 30EF), remaining in range</b>	Dry	Apply liquid or prewetted solid chemical	55 (200)	42-55 (150-200)	Plow accumulation and reapply liquid to solid chemical as needed	55 (200)	55 (200)	1) If the desired plowing/treatment frequency cannot be maintained, the spread rate can be increased to 110kg/lane-km (400 lb./lane-mi.) to accommodate longer operational cycles 2) Do not apply liquid chemical onto heavy snow accumulation or packed snow accumulation or packed snow
	Wet, slush or light snow cover	Apply liquid or solid chemical	55 (200)	42-55 (105-200)				
<b>-10 to -4EC (15 to 25EF), remaining in range</b>	Dry, wet, slush or light snow cover	Apply prewetted solid chemical		55 (200)	Plow accumulation and reapply prewetted solid chemical as needed		70 (250)	1) If the desired plowing/treatment frequency cannot be maintained, the spread rate can be increased to 140 kg/lane-km (400 lb./lane-mi.) to accommodate longer operational cycles 2) Do not apply liquid chemical without prewetting can be applied
<b>Below -10EC (15EF), steady or falling</b>	Dry or light snow cover	Plow as needed			Plow accumulation as needed			1) It is not recommended that chemicals be applied in this temperature range 2) Abrasives can be applied to enhance traction

*Notes*

**CHEMICAL APPLICATIONS** (1) Time initial and subsequent chemical applications to prevent deteriorating conditions or development of packed and bonded snow—timing and frequency of subsequent applications will be determined primarily by plowing requirements. (2) Apply chemical ahead of traffic rush periods occurring during storm.

**PLOWING.** Plow before chemical applications so that excess snow, slush, or ice is removed and pavement is wet, slushy, or lightly snow covered when treated.

**Weather Event: Frost or Black Ice.**

PAVEMENT TEMPERATURE RANGE, AND RELATION TO DEW POINT	TRAFFIC CONDITION	INITIAL OPERATION			SUBSEQUENT OPERATIONS			COMMENTS
		maintenance action	Dry chemical spread rate, kg/lane-km (lb./lane-mi.)		maintenance action	Dry chemical spread rate, kg/lane-km (lb./lane-mi.)		
			liquid	solid or pretwetted solid		liquid	solid or pretwetted solid	
Above 0EC (32EF), steady or rising	Any level	None			None, see comments			Monitor pavement temperature closely; begin treatment if temperature starts to fall to 0EC (32EF) or below and is at or below dew point
-2 to 2EC (28 to 35EF) or falling to 0EC (32EF) or below, and equal to or below dew point	Traffic rate less than 100 vehicles per h	Apply pretwetted solid chemical		7-18 (25-65)	Reapply pretwetted solid chemical as needed		7-18 (25-65)	1) Monitor pavement closely; if pavement becomes wet or if this ice forms, reapply chemical at higher indicated rate 2) Do not apply liquid chemical on ice so thick that the pavement can not be seen
	Traffic rate greater than 100 vehicles per h	Apply liquid or pretwetted solid chemical	7-18 (25-65)	7-18 (25-65)	Reapply liquid or pretwetted solid chemical as needed	11-32 (40-115)	7-18 (25-65)	
-7 to -2 EC (20 to 28EF), remaining in range, and equal to or below dew point	Any level	Apply liquid or pretwetted solid chemical	18-36 (65-130)	18-36 (65-130)	Reapply liquid or pretwetted solid chemical when needed	18-36 (65-130)	18-36 (65-130)	1) Monitor pavement closely; if this ice forms, reapply chemical at higher indicated rate 2) Applications will need to be more frequent at higher levels of condensation; if traffic volumes are not enough to disperse condensation, it may be necessary to increase frequency 3) It is not advisable to apply a liquid chemical at the indicated spread rate when the pavement temperature drops below -5EC (23EF)
Below -10 to -7 EC (15 to 20EF) remaining in range and equal to or below dew point	Any level	Apply pretwetted solid chemical		36-55 (130-200)	Reapply pretwetted solid chemical when needed		36-55 (130-200)	1) Monitor pavement closely; if this ice forms, reapply chemical at higher indicated rate 2) Applications will need to be more frequent at higher levels of condensation; if traffic volumes are not enough to disperse condensation, it may be necessary to increase frequency
Below -10EC (15EF), steady or falling	Any level	Apply abrasives			Apply abrasives as needed			It is not recommended that chemicals be applied in this temperature range

**Notes**

**TIMING.** (1) Conduct initial operation in advance of freezing. Apply liquid chemical up to 3 h in advance. Use longer advance times in this range to effect drying when traffic volume is low. Apply pretwetted solid 1 to 2 h in advance. (2) In the absence of precipitation, liquid chemical at 21 kg/lane-km (75 lb./lane-mi.) has been successful in preventing bridge deck icing when placed up to 4 days before freezing on higher volume roads and 7 days before on lower volume roads.

**Weather Event: Freezing Rain Storm.**

PAVEMENT TEMPERATURE RANGE, AND TREND	INITIAL OPERATION		SUBSEQUENT OPERATIONS		COMMENTS
	maintenance action	Chemical spread rate, kg/lane-km (lb./lane-mi.)	maintenance action	Chemical spread rate, kg/lane-km (lb./lane-mi.)	
Above 0EC (32EF), steady rising	None, see comments		None, see comments		1) Monitor pavement temperature closely for drops toward 0EC (32EC) and below 2) Treat icy patches if needed with prewetted solid chemical at 21-28 kg/lane-km (75-100 lb./lane-mi.)
Above 0EC (32EF), 0EC (32EF), below is imminent	Apply prewetted solid chemical	21-28 (75-100)	Reapply prewetted solid chemical as needed	21-28 (75-100)	Monitor pavement temperature and precipitation closely
-7 to 0EC (20 to 32EF), remaining in range	Apply prewetted solid chemical	21-70 (75-250)	Reapply prewetted solid chemical as needed	21-70 (75-250)	1) Monitor pavement temperature and precipitation closely 2) Increase spread rate toward higher indicated rate with decrease in pavement temperature or increase in intensity of freezing rainfall 3) Decrease spread rate toward lower indicated rate toward lower indicated rate with decrease in intensity of freezing rainfall
-10 to -7EC (15 to 20EF), remaining in range	Apply prewetted solid chemical	70-110 (250-400)	Reapply prewetted solid chemical as needed	70-110 (250-400)	1) Monitor precipitation closely 2) Increase spread rate toward higher indicated rate with increase in intensity of freezing rainfall 3) Decrease spread rate toward lower indicated rate with decrease in intensity of freezing rainfall
Below -10EC (15EF), steady or falling	Apply abrasives		Apply abrasives as needed		It is not recommended that chemicals be applied in this temperature range.

Notes

**CHEMICAL APPLICATIONS.** (1) Time initial and subsequent chemical applications to prevent glaze ice conditions. (2) Apply chemical ahead of traffic rush periods occurring during storm.

**Weather Event: Sleet Storm**

PAVEMENT TEMPERATURE RANGE AND TREND	INITIAL OPERATION		SUBSEQUENT OPERATION		COMMENTS
	maintenance action	Chemical spread rate kg/lane-km (lb./lane-mi.)	maintenance action	chemical spread rate, kg/lane-km (Lb./lane-mi.)	
Above 0EC (32EF), steady or rising	None, see comments		None, see comments		1) Monitor pavement temperature closely for drops toward 0EC (32EF) and below 2) Treat icy patches if needed with prewetted solid chemical at 35 kg/lane-km (125 lb./lane-mi.)
0EC (32EF) , or below is imminent	Apply prewetted solid chemical	35 (125)	Plow as needed, reapply prewetted solid chemical when needed	35 (125)	Monitor pavement temperature and precipitation closely
-2 to 0EC (28 to 32EF), remaining in range	Apply prewetted solid chemical	35-90 (125-325)	Plow as needed, reapply prewetted solid chemical when needed	35-90 (125-325)	1) Monitor pavement temperature and precipitation closely 2) Increase spread rate toward higher indicated rate with increase in sleet intensity 3) Decrease spread rate toward lower indicated rate with increase in pavement temperature or decrease in sleet intensity
-10 to -2EC (15 to 28EF), remaining in range	Apply prewetted solid chemical	70-110 (250-400)	Plow as needed, reapply prewetted solid chemical when needed	70-110 (250-400)	1) Monitor precipitation closely 2) Increase spread rate toward <i>higher indicated</i> rate with decrease in pavement temperature or increase in sleet intensity 3) Decrease spread rate toward <i>lower indicated</i> rate with increase in pavement temperature or decrease in sleet intensity
Below -10EC (15EF), steady or falling	Plow as needed		Plow as needed		1) It is not recommended that chemicals be applied in this temperature range 2) Abrasives can be applied to enhance traction

**Notes**

**CHEMICAL APPLICATIONS.** (1) Time initial and subsequent chemical applications to *prevent* the sleet from bonding to the pavement. (2) Apply chemical ahead of traffic rush periods occurring during storm.





## Appendix 5: Sample Contract for Supplementary Agencies

Specifications for one year contract for supplemental snow removal and related services. This bid is submitted to \_\_\_\_\_ to provide snow removal and related services on an hourly basis for the winter of \_\_\_\_\_ - \_\_\_\_\_.

**Equipment-** All equipment and vehicles used by the contractor will be maintained in good mechanical condition. All equipment submitted for service to the \_\_\_\_\_ will be inspected for fitness by the \_\_\_\_\_ prior to execution of contract. The \_\_\_\_\_ reserves the right to determine the capabilities of the equipment offered for snow removal and related services, and to refuse or terminate the contract for improper or deficient equipment. The contractor in each district will equip each of his vehicles with a radio attuned to the \_\_\_\_\_ frequency or will rent a radio from the \_\_\_\_\_ at a cost of \$5.00/hr/radio. Approval in advance must be received from the \_\_\_\_\_.

**Safety-** All equipment to be used for public street plowing will be equipped with an amber revolving warning light mounted on top of the cab or at a location clearly visible from all sides of the unit. The contractor will also install a warning sign (provided by \_\_\_\_\_) on the rear of each snowplowing unit at a location clearly visible to approaching traffic. During plowing operations, this sign will be periodically cleaned to be readable by traffic approaching from the rear. The sign will be removed prior to any non-\_\_\_\_\_ work being done by the contractor.

As a further safety measure, the contractor will provide only experienced snowplow operators. A brief resume for the past three (3) winters of snowplowing will be submitted for each driver. This resume will show employer, number of individual plowing operations, and total number of accumulated hours plowing. Any operator that is deficient in plowing expertise will be required to undergo a minimum of four (4) hours of training operating the contractor's equipment. This will be under the guidance of \_\_\_\_\_, at no expense to \_\_\_\_\_.

**Response Time-** The contractor will, upon notification from the \_\_\_\_\_, be capable of being snowplowing or related services within \_\_\_ hours of notification. The contractor will report to \_\_\_\_\_ for plowing instructions. The contractor will submit the name and telephone number of the person or persons that the \_\_\_\_\_ is to contract when snowplowing or related snow removal services are to done.

**Insurance-** The contractor will secure and maintain in effect at all times at their own expense insurance of the following kinds and limits to cover \_\_\_\_\_ projects.

The contractor understands and agrees that any performance bond or insurance protection required by this contract or otherwise provided by the contractor, will in no way limit the responsibility to indemnify keep and save harmless and defend the \_\_\_\_\_ as provided herein.

The contractor will furnish certificates of insurance to \_\_\_\_\_ before starting snowplowing or related snow removal services, or within ten (10) days of the execution of the contract, whichever date is reached first. All insurance will include non-cancellation clause provision preventing cancellation without fifteen (15) days of written prior notice to the \_\_\_\_\_, but will remain in effect through the life of this project. The \_\_\_\_\_ will be named as an additional insured in all insurance policies.

Public liability Insurance covering the contractor's legal liability for bodily injuries in limits of not less than \$500,000 per person and \$1,000,000 per occurrence, and for property damage in limits of not less than \$300,000 per occurrence and \$500,000 aggregate, and covering all claims arising out of the contractor's operations or premises, sub-contractor's operations or premises, anyone directly or indirectly employed by the contractor or sub-contractor, and the contractor's obligations under indemnification's under this contract.

Public Liability and Property Damage Insurance issued to \_\_\_\_\_ to protect \_\_\_\_\_, the engineer and other officials, their employees, and their agents acting in

the scope and course of their employment. It shall protect them from all other claims for personal injury including deaths and all claims for destruction of or damage to property arising out of or in connection with any operations under this contract whether such operations be by the contractor or by any subcontractor under him or anyone directly or indirectly employed by the contractor or the subcontractor. All such insurance will have the minimum limits of liability specified in the preceding paragraph.

Workmen's Compensation Insurance in accordance with the provision of the laws of the State of Indiana, including occupational disease provisions, for all employees at the site of the project and in case work is sublet. The contractor will require each subcontractor similarly to provide Workmen's Compensation Insurance. In case of employees engaged in hazardous work under this contract at the site of the project, it is not protected Workmen's Compensation statute the contractor will provide and will cause each subcontractor to provide adequate and suitable insurance for the protection of the employees not otherwise provided.

Automobile Liability Insurance covering bodily injuries in limits not less than \$500,000 per person and \$1,000,000 per accident, and for property damage in limits of not less than \$300,000 per accident providing coverage for accidents arising out of or resulting from operations, maintenance or use by the contractor of any owned, non-owned, or hired automobile, trailers, or other equipment required to be licensed.

**Injury and Damage Indemnification-** The contractor shall be solely responsible for all physical injuries to persons or damage to property arising out of the performance of the contract obligations and shall assume the defense of indemnify, and save harmless the \_\_\_\_\_, their officers, agents, and employees from loss or liability upon any and all claims on account of such injuries to persons or damage to property due to negligence (including omissions) by the contractor or his subcontractors.

**Performance-** The contractor agrees to perform snow removal and related services to the acceptance of \_\_\_\_\_. All streets shall be completely cleared from curb to curb or shoulder to shoulder, down to bare pavement. Work not complete in a satisfactory manner will be redone by the contractor at no expense to \_\_\_\_\_.

**Extent of Work-** It is the intent of \_\_\_\_\_ to establish contract snow removal and related services such that all contracted equipment will be used for each agency-wide snow removal effort in an efficient and effective manner. Should the extent of a given snowfall not require use of all contracted equipment as determined by the \_\_\_\_\_, the \_\_\_\_\_ reserves the right to authorize for the number of contract units. The contractor shall begin plowing in his district within (\_\_\_\_) hours of being notified and continue until notified to stop.

**Non-authorized Work-** At no time while working for the \_\_\_\_\_ shall the contractor perform any work other than as directed by \_\_\_\_\_. The contractor shall not drive on driveways or leave the public right-of-way without authorization. Further, it is understood that snowplowing for the \_\_\_\_\_ shall be given first priority over other contracts with any person, firm or corporation held by the contractor.

**Payment-** In consideration of the above services, the \_\_\_\_\_ agrees to compensate the contractor in accordance with the following schedule of hourly rates for each piece of equipment. Only one rate will be submitted for each piece of equipment. The contractor will merge his straight time and overtime expenses into one price.

**Proposal Evaluation-** The \_\_\_\_\_ will inspect the contractor's submitted equipment and plows for serviceability within two weeks of the submittal date. This will be performed during normal working hours. Serviceability will be at the sole determination of the \_\_\_\_\_. Units found to be unsuitable will be rejected. The contractor will have the equipment ready to plow by November 15.

**Termination of Contract-** The \_\_\_\_\_ may terminate the contract of any contractor for non-performance of the aforesaid item(s), or if it is determined that contracted services are no longer needed by the \_\_\_\_\_.

**Mobilization Fee-** The contractor will be paid for fifteen (15) hours of equipment unit service as a mobilization fee upon verification of the equipment being fully prepared for service. This payment will then be deducted from future invoices submitted by the contractor.

The \_\_\_\_\_ intends to contract for (\_\_\_\_) units of category A, (\_\_\_\_) units from category B, and (\_\_\_\_) units from category C for a total of (\_\_\_\_) units.

***Category A***

Tandem Axle Dump Truck with Ballast

50,000 lbs. GVWR Class; 11 foot wide power reversible plow minimum; Salt spreader: Additional cost as used.

Motor Grader

80 HP SAE Net minimum; 12 foot Moldboard minimum; 'V' Plow attachment: Additional cost as needed; Wing Plow, 8 foot wide: Additional cost as needed.

Single Rear Alex Dump Truck with Ballast

20,000 lbs. GVWR Class minimum; 10 foot wide power reversible snow plow minimum; Salt Spreader: Additional cost as needed.

***Category B***

Pickup Truck with Ballast

8200 lbs. GVWR Class; 4X4 wheel drive; 8 foot wide power reversible plow minimum.

Small Dump Truck

9500 lbs. GVWR Class; 4X4 wheel drive; 8 foot wide power reversible plow minimum.

Articulated Front End Loader

2 Cubic Yard Class minimum; 80 HP SAE Net minimum; 11 foot wide power reversible snow plow minimum; 'V' Plow attachment: Additional cost as needed; Wing Plow, 8 foot wide: Additional cost as needed.

***Category C***

Intermediate Tractor

50 HP SAE Net minimum; 10 foot wide snow plow or snow bucket minimum.

### **2.0.0 Snow and Ice Control Policy Outline**

The following section is an outline of a snow and ice control policy. The idea behind this outline is that each agency can fill in the blanks and check the appropriate boxes that apply to their agency. This form then can be sent to the Board of Commissioners for approval to become policy. If an electronic copy of this outline is desired, contact the Indiana LTAP Center and a copy will be sent. All agencies who plan to use this outline are encouraged to make any revisions that will apply to their specific needs.

## Snow and Ice Control Policy \_\_\_\_\_ County, Indiana

Snow and ice control is considered emergency work in that pavement must be cleared as quickly as possible to ensure the safety of the traveling public. Because of the potential hazard to the motoring public and high incidence of overtime involved in this program, careful planning and preparation must be done prior to the snow and ice season. This planning process is made considerably more difficult due to the variable conditions encountered during each storm. Such things as the rate and accumulation of snowfall, moisture content, temperature, time of day or night, wind velocities, direction, and duration are all factors that interact to create a unique aspect for each storm with the result that no two storms are ever identical.

This emergency service is one of many services provided by \_\_\_\_\_ County on the \_\_\_\_\_ centerline miles of \_\_\_\_\_ roads for the citizens living within their jurisdiction. Effective snow and ice control is one of the most important services provided during the winter months, since it facilitates the safest possible travel on the public roadways maintained by \_\_\_\_\_ County.

### Goals and Objectives

\_\_\_\_\_ roads are divided into \_\_\_\_\_ levels of priority during the winter season. These priorities are (1) \_\_\_\_\_, (2) \_\_\_\_\_, and (3) \_\_\_\_\_. It is the goal of \_\_\_\_\_ to

- Maintain bare pavement on priority \_\_\_\_\_ roads throughout the county.
- Maintain passable roads on priority \_\_\_\_\_ roads throughout the county
- Increase the traction on priority \_\_\_\_\_ roads throughout the county
- Other \_\_\_\_\_.

Also, when facilities such as hospitals, fire departments, and schools call and report slippery roads or entrances, they are placed as priority \_\_\_\_\_ and will be cleared accordingly.

\_\_\_\_\_ is divided into \_\_\_\_\_ sections, and while these sections are divided into a total \_\_\_\_\_ districts. Each truck will patrol their district until all roads are at the desired level of service, then it will radio to dispatch and will be assigned to assist in another district. A copy of all the districts separated by sections can be found in Appendix 1. Areas that are considered dangerous or places where a driver should be aware of obstacles are marked on these maps.

Snow and ice control activities will begin when

- Roadways are determined to be too slippery.
- Roadways are covered with \_\_\_\_\_ inches of accumulation.
- Other \_\_\_\_\_.

During the night hours, \_\_\_\_\_ will telephone dispatch when it is determined snow and ice removal activities are necessary. Once the snow and ice removal activities begin,

- Drivers/employees will work until the desired level of service is reached throughout \_\_\_\_\_ during light storms, or work in \_\_\_\_ hour shifts until the desired level of service is reached during heavy storms.
- Drivers/employees will work or work in \_\_\_\_ hour shifts until the desired level of service is reached throughout \_\_\_\_\_.
- Maintain bare pavement on hills, curves, bridges, and intersections while keeping all other sections of roads at least passable by passenger vehicles.
- Other \_\_\_\_\_.

Under no circumstances is a driver/employee allowed to work a \_\_\_\_ hour shift without a \_\_\_\_ hour break. Drivers/employees will radio dispatch once every \_\_\_\_ hour(s) to report road conditions and progress in their district.

Weather forecasting is a crucial part of planning for a snow and ice control event. \_\_\_\_\_ uses a \_\_\_\_\_ weather forecasting system. (**NOTE: information about the weather forecasting system should be stated here. This should include types of imagery, coverage area, and special features of the system.**)

### Preparations

Preseason preparation is a critical part of the snow and ice control activities. This is when all equipment is determined to be in working order, or to be fixed when not working properly. In \_\_\_\_\_ County, winter weather preparations begin in \_\_\_\_\_ to complete all its equipment checks. This equipment check includes

- Spreader calibrations,
- Lubrication of all moving parts,
- Checking for cracks in hydraulic hoses,
- Lights,
- Plow and spreader location and condition,
- Other \_\_\_\_\_.

This spans a \_\_\_\_\_ week period, which is ample time to dress all trucks and check all equipment. This also gives the drivers/employees a chance to become familiar with the location of all the equipment. It is a goal of the County to

- Be able to have all trucks dressed in one-hour before a storm event.
- Have all trucks dressed throughout the season
- Other \_\_\_\_\_.

Safety training is also a necessary part of the snow and ice control preparations. \_\_\_\_\_ uses the monthly safety training meeting in \_\_\_\_\_ to discuss safety procedures during the winter months. This training includes

- The Indiana LTAP video, "The New Generation of Snow and Ice Control"
- Other \_\_\_\_\_.

**Materials**

The anti-icing material used in \_\_\_\_\_ is a \_\_\_\_:\_\_\_\_ ratio of \_\_\_\_\_ and \_\_\_\_\_. This material is spread at a continuous rate of \_\_\_\_ lbs./lane-mi. The mixture is spread on all roads when temperatures are very low, but is limited on gravel roads due to the fact that salt weakens the road bed. When temperatures rise, only sand is spread on the gravel roads to help increase traction. The materials are stored at \_\_\_\_\_, which is owned by the County.

**Private Property**

During the winter season, there is always a chance for private property to be damaged by the \_\_\_\_\_ County's vehicles. In most cases, the damage is to mailboxes. This damage can occur in two ways. When a plow drives by, the snow from the plow can knock the mailbox over. Damage can also occur when a vehicle runs over a mailbox.

- The County will take responsibility for their own vehicle running over a mailbox. If the damage is brought to the attention of the County and is determined to be run over by a County's vehicle, they will replace the mailbox.
- The County will take responsibility for their own vehicle causing any damage to a mailbox. If the damage is brought to the attention of the County, they will replace the mailbox.
- Other \_\_\_\_\_.

Although it is not \_\_\_\_\_ County's policy to leave the county right-of-way, there are instances where a vehicle will use a private drive to turn around. If there is damage to the drive or grass surrounding the drive, the County will take responsibility for the damage and repair any damage when the weather permits.

There is always a chance of a vehicular accident when there are vehicles traveling on \_\_\_\_ miles of slippery roadways. The County's policy in a vehicular accident is to call dispatch, and dispatch will immediately inform the County Sheriff of the accident.

**Equipment**

The vehicles used in \_\_\_\_\_ for snow and ice control are

- \_\_\_\_\_ graders.
- \_\_\_\_\_ tandem-axle dump trucks.
- \_\_\_\_\_ single-axle dump trucks..
- Other \_\_\_\_\_.

Each vehicle is assigned a number corresponding to the district that it has its responsibilities.

- Graders are assigned a number from \_\_\_\_ to \_\_\_\_.

- Tandem-axle trucks are assigned a number from \_\_\_ to \_\_\_.
- Single-axle trucks are assigned a number from \_\_\_ to \_\_\_.
- Other \_\_\_\_\_.

These numbers correspond to the section and district numbers in Appendix 1.

A routine vehicle check is performed daily before each vehicle is used. Engine oil, tires, radiator, washer fluid, and hydraulic fluid are among some of the items checked. If any problems arise, they are reported to the garage and are fixed immediately.

- There is no set date considered as the end of the snow season due to the unpredictable weather in Indiana. When the weather begins to warm up and the season appears to be over, the vehicles are "put to bed."
- The end of the winter season in \_\_\_\_\_ is considered to be on \_\_\_\_\_. At this time all snow and ice control vehicles will be "put to bed."

This consists of removing all plows and spreaders, and putting them in their place. Also, all vehicles and components are cleaned and all moving parts are lubricated to prevent rusting. If a snowstorm is predicted after the equipment is put away for the season, preparations are made the day before the storm.

**No Duty or Right Created**

The purpose of this policy is to establish goals for the \_\_\_\_\_ County employees during the winter season. It is not to be construed to create any duty to any individual, person or entity. This policy does not provide any special protection or service to any particular individual or group of individuals. No additional rights shall be granted any individual or entity simply by adoption and enforcement of this policy. This policy may be effected in total or in part, as a result of acts of God, strikes, equipment breakdown, weather conditions, inadequacy of equipment, state or federal regulations, shortage of personnel, and any other unforeseen, uncontrollable or unanticipated events.

This policy is adopted by the Board of Commissioner's of \_\_\_\_\_ County, Indiana on \_\_\_\_\_ (date)

Board of Commissioner's \_\_\_\_\_

\_\_\_\_\_

Attest:

\_\_\_\_\_

\_\_\_\_\_

County Auditor



### **3.0.0 Sample Snow and Ice Control Policy: Parke County, Indiana**

## **Parke County's Snow and Ice Control Policy**

Snow and ice control is considered emergency work in that pavement must be cleared as quickly as possible to ensure the safety of the traveling public. Because of the potential hazard to the motoring public and high incidence of overtime involved in this program, careful planning and preparation must be done prior to the snow and ice season. This planning process is made considerably more difficult due to the variable conditions encountered during each storm. Such things as the rate and accumulation of snowfall, moisture content, temperature, time of day or night, wind velocities, direction, and duration are all factors that interact to create a unique aspect for each storm with the result that no two storms are ever identical.

This emergency service is one of many services provided by the Parke County Highway Department on the 746-centerline miles of Parke County roads for the citizens living within their jurisdiction. Effective snow and ice control is one of the most important services provided during the winter months, since it facilitates the safest possible travel on the public roadways maintained by Parke County's Highway Department.

### **Goals and Objectives**

It is the goal of Parke County Highway Department to maintain open roadways throughout Parke County during winter weather. The actions taken by the Highway Department will continue until all roadways are considered passable. The roads are divided into three priorities: (1) Black-top roads, (2) Gravel Roads, and (3) Bus turn-arounds. Also, when facilities such as hospitals, fire departments, and schools call and report slippery roads or entrances, they are placed as (1) on the priority list. It is not necessarily the goal to clear the roads to bear pavement, but keeping all roads clear enough that vehicles can travel safely.

Parke County is divided into four (4) sections, and while these sections are divided into thirteen (13) districts. One grader is assigned to each section one truck is assigned to each district. Each truck will patrol their district until all roads are open, then it will radio to dispatch and will be assigned to assist in another district. The graders are assigned to clear gravel roads only. Drivers are assigned to the same district that they patrol during the summer months. A copy of all the districts separated by sections can be found in Appendix 1. Areas that are considered dangerous or places where a driver should be aware of obstacles are marked on these maps.

Snow removal will begin when roadways are determined to be too slippery, or a significant amount of accumulation is covering the roads. During the night hours, the Sheriff's department will telephone dispatch when roads are in need of clearing. The employees/driver's shifts are determined by the forecasted snowstorm. On light storms, the employees/drivers will work in one shift until the roads are all cleared. When a large storm is forecasted, the drivers will work in two (2) 12-hour shifts. Since there are only enough drivers to use all the equipment for one shift, the drivers are split into two groups and only the single- and tandem-axle trucks are used during a shift. Shift work will continue until all roads are cleared. Drivers will radio dispatch once every hour to report road conditions and progress in their district.

Weather forecasting is a crucial part of planning for a snow and ice control event. Parke County uses a DTN weather forecasting system. This system displays a satellite image of the entire Ohio Valley, or it can be narrowed down to include Parke County exclusively. The DTN system has proven to be more reliable than listening to the radio or TV forecasts. This system gives accurate, up-to-date information about the storm, such as temperature, wind speed and direction, and more importantly, how the storm is tracking. It also has Storm Watch Boxes, which will give alerts of storm warnings.

**Preparations**

Preseason preparation is a critical part of the snow and ice control activities. This is when all equipment is determined to be in working order, or to be fixed when not working properly. In Parke County, the Highway department uses the time during the Covered Bridge Festival in October to complete all its equipment checks. This is an ideal time because the department's activities are held to a minimum during the festival. This spans a one-week period, which is ample time to dress all trucks and check all equipment, such as spreaders and plows. This also gives the drivers a chance to become familiar with the location of all the equipment. It is a goal of the Highway Department to be able to have all trucks dressed in one-hour before a storm event. When a storm is forecast during the night, the trucks are dressed before the end of the workday. When a storm is forecast during a weekend, the trucks are dressed on Friday before the end of the day.

Safety training is also a necessary part of the snow and ice control preparations. Parke County uses the monthly safety training meeting in November to discuss safety procedures during the winter months. This training includes watching a video distributed by HERPICC: The Indiana LTAP Center called The New Generation of Snow and Ice Control, and also watching an insurance video distributed by IPEP on the issue of Workmen's Compensation.

**Materials**

The anti-icing material used in Parke County is a 4:1 ratio of fill-sand and rock salt. This material is spread at a continuous rate of 400 lbs./lane-mi. The mixture is spread on all roads when temperatures are very low, but is limited on gravel roads due to the fact that salt weakens the road bed. When temperatures rise, only sand is spread on the gravel roads to help increase traction. The materials are stored at the gravel pit owned by the Highway Department. Also, it was determined by economics that snow fences would not be necessary in Parke County.

**Private Property**

During the winter season, there is always a chance for private property to be damaged by the Parke County Highway Department's vehicles. In most cases, the damage is to mailboxes. This damage can occur in two ways. When a plow drives by, the snow from the plow can knock the mailbox over. Damage can also occur when a vehicle runs over a mailbox. The Highway Department will take responsibility for the later of the two types of damage. If the damage is brought to the attention of the Highway Department and is determined to be run over by a Highway Department's vehicle, they will replace the mailbox.

Although it is not the Parke County Highway Department's policy to leave the county right-of-way, there are instances where a vehicle will use a private drive to turn around. If there is damage to the drive or grass surrounding the drive, the Highway Department will take responsibility for the damage and repair any damage when the weather permits.

There is always a chance of a vehicular accident when there are thirteen vehicles traveling on 746 miles of slippery roadways. The Highway Department's policy in a vehicular accident is to call dispatch, and dispatch will immediately inform the County Sheriff of the accident.

**Equipment**

The vehicles used in Parke County for snow and ice control are four (4) graders, eight (8) tandem-axle dump trucks, and five (5) single-axle dump trucks. As mentioned before one grader is assigned to a section. Graders are assigned a number from 50 to 53. Tandem-axle trucks are assigned a number from 30 to 39, and the single-axle trucks are assigned a number from 20-24,29. These numbers correspond to the section and district numbers in Appendix 1.

A routine vehicle check is performed daily before each vehicle is used. Engine oil, tires, radiator, washer fluid, and hydraulic fluid are among some of the items checked. If any problems arise, they are reported to the garage and are fixed immediately.

There is no set date considered as the end of the snow season due to the unpredictable weather in Indiana. When the weather begins to warm up and the season appears to be over, the vehicles are “put to bed.” This consists of removing all plows and spreaders, and putting them in their place. Also, all vehicles and components are cleaned and all moving parts are lubricated to prevent rusting. If a snowstorm is predicted after the equipment is put away for the season, preparations are made the day before the storm. As mentioned before, all vehicles can be dressed and ready to go in one-hour.

**No Duty or Right Created**

The purpose of this policy is to establish goals for the Parke County Highway Department employees during the winter season. It is not to be construed to create any duty to any individual, person or entity. This policy does not provide any special protection or service to any particular individual or group of individuals. No additional rights shall be granted any individual or entity simply by adoption and enforcement of this policy. This policy may be effected in total or in part, as a result of acts of God, strikes, equipment breakdown, weather conditions, inadequacy of equipment, state or federal regulations, shortage of personnel, and any other unforeseen, uncontrollable or unanticipated events.

This policy is adopted by the Board of Commissioner’s from Parke County, Indiana on \_\_\_\_\_ (date)

Board of Commissioner’s

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

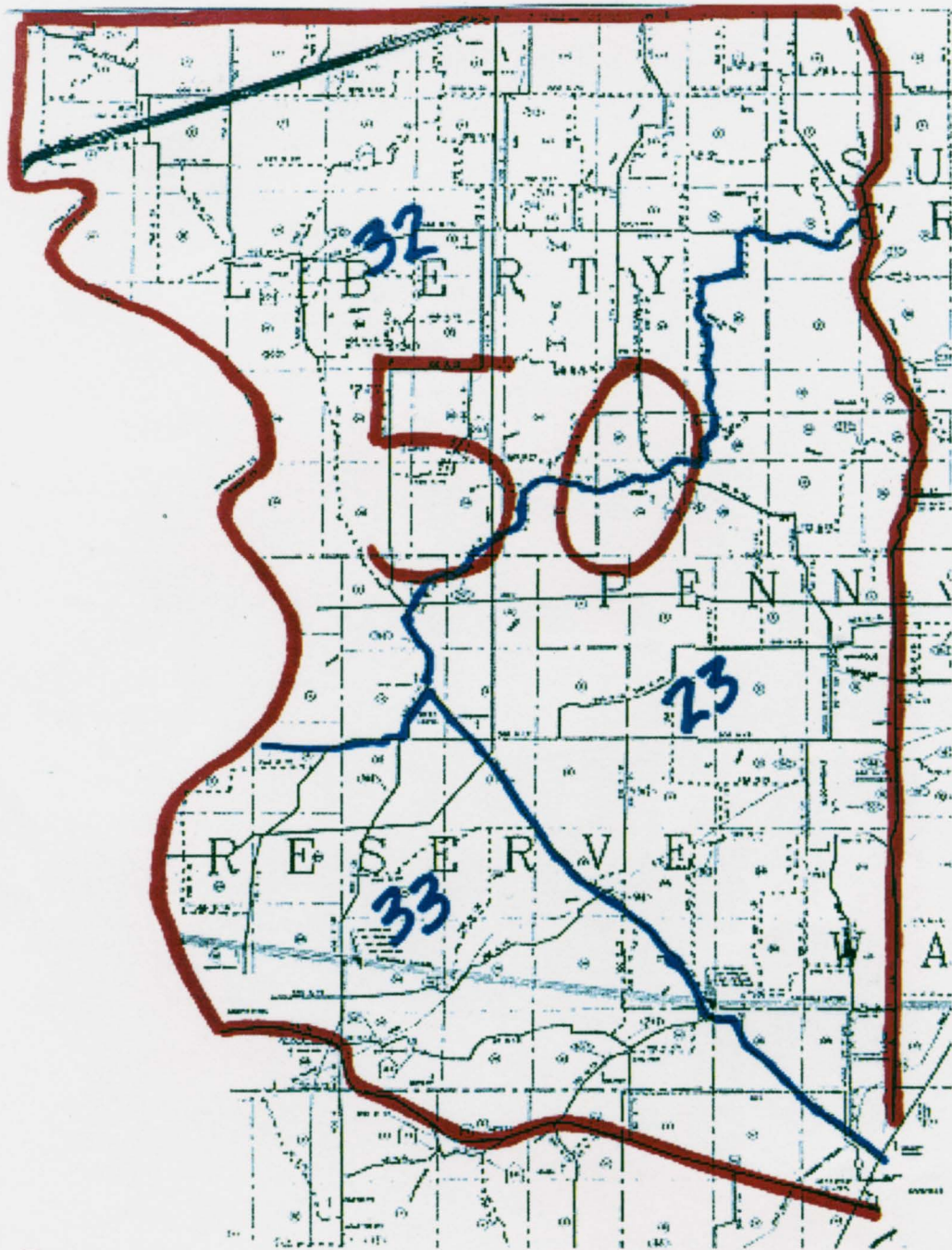
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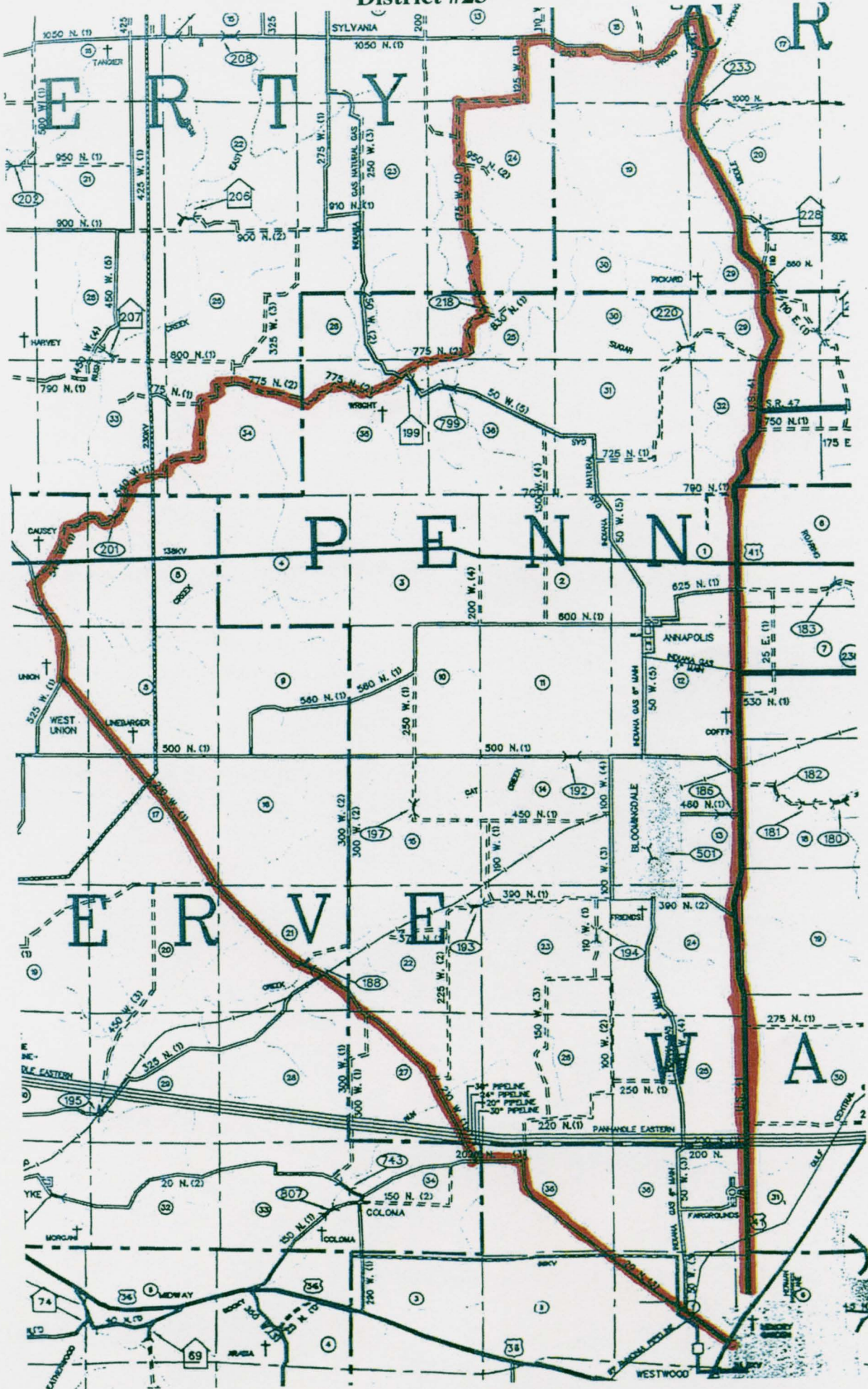
County Auditor

**Appendix 1**  
**Sections, Districts and Route Maps**

Section #50  
Districts 23, 32, 33



District #23



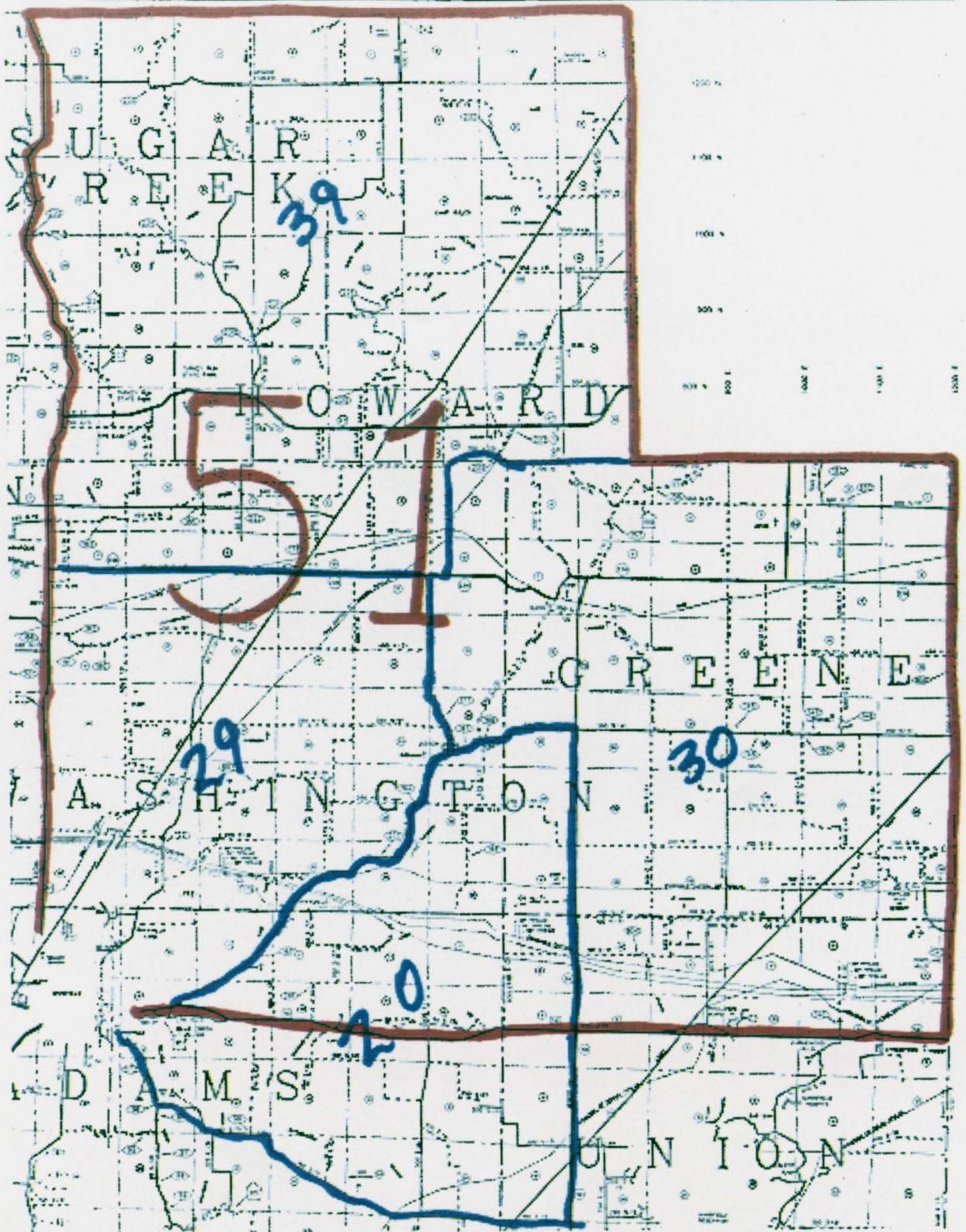


# District #33

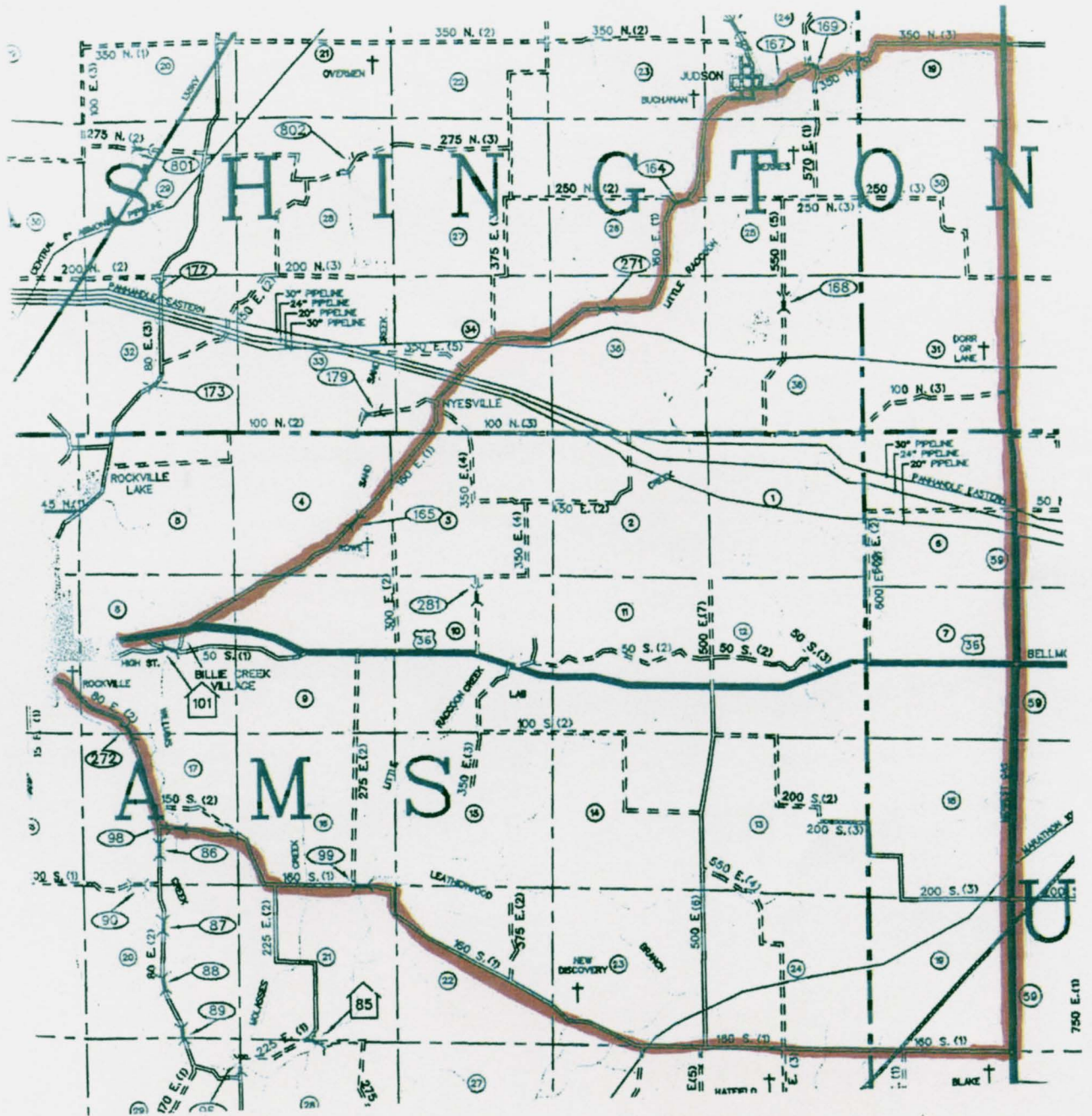




Section #51  
Districts 20, 29, 30, 39



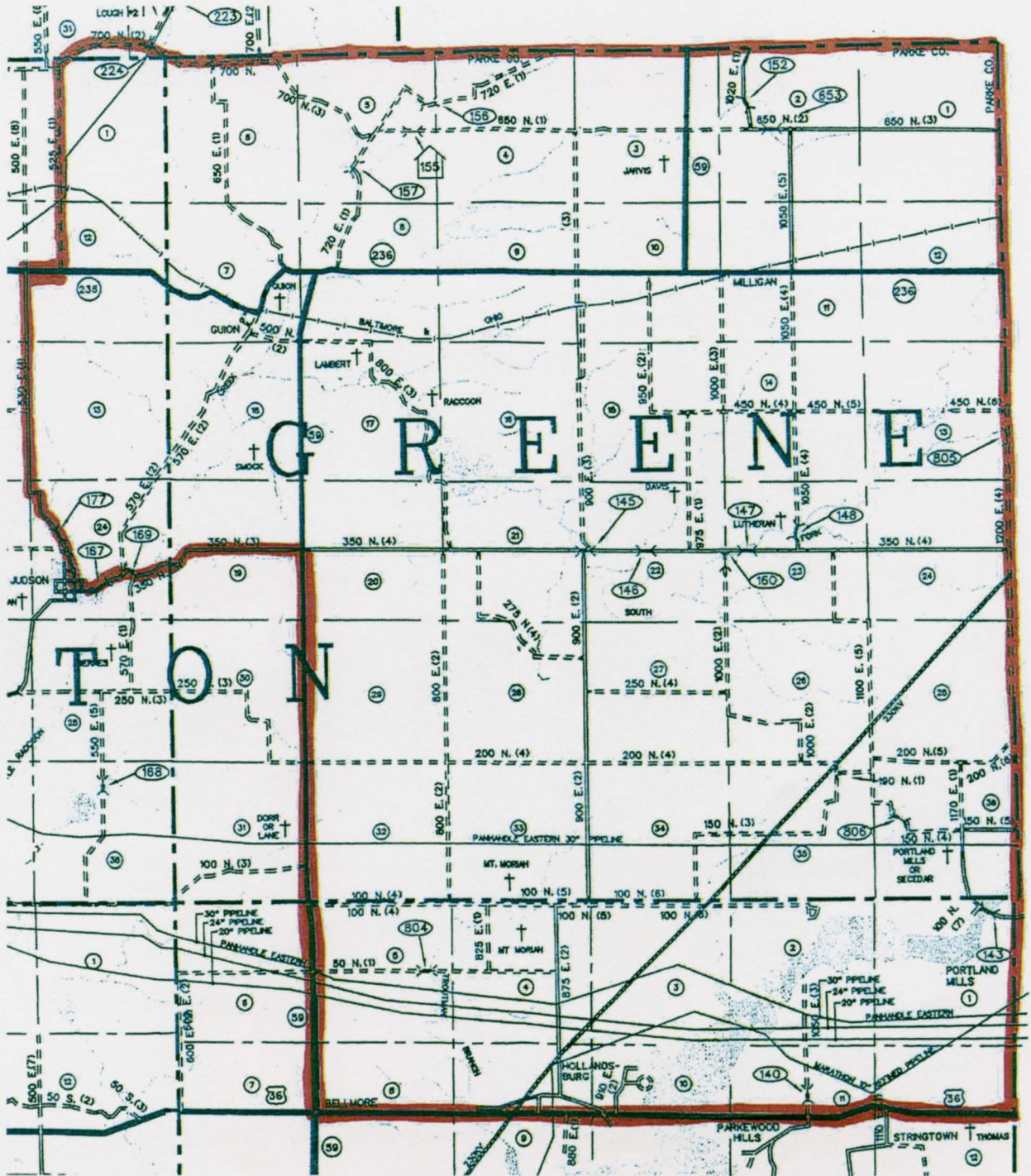
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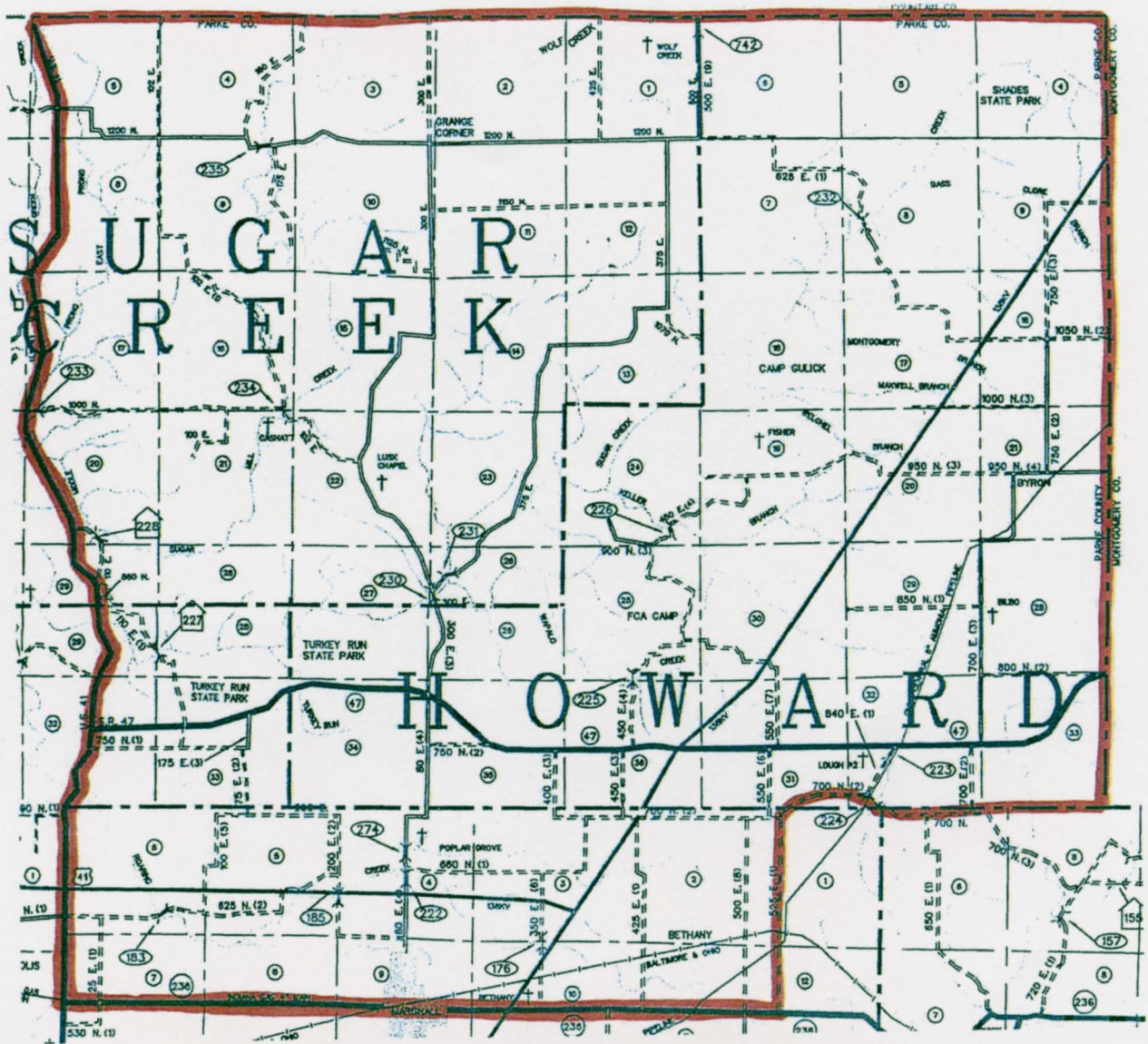
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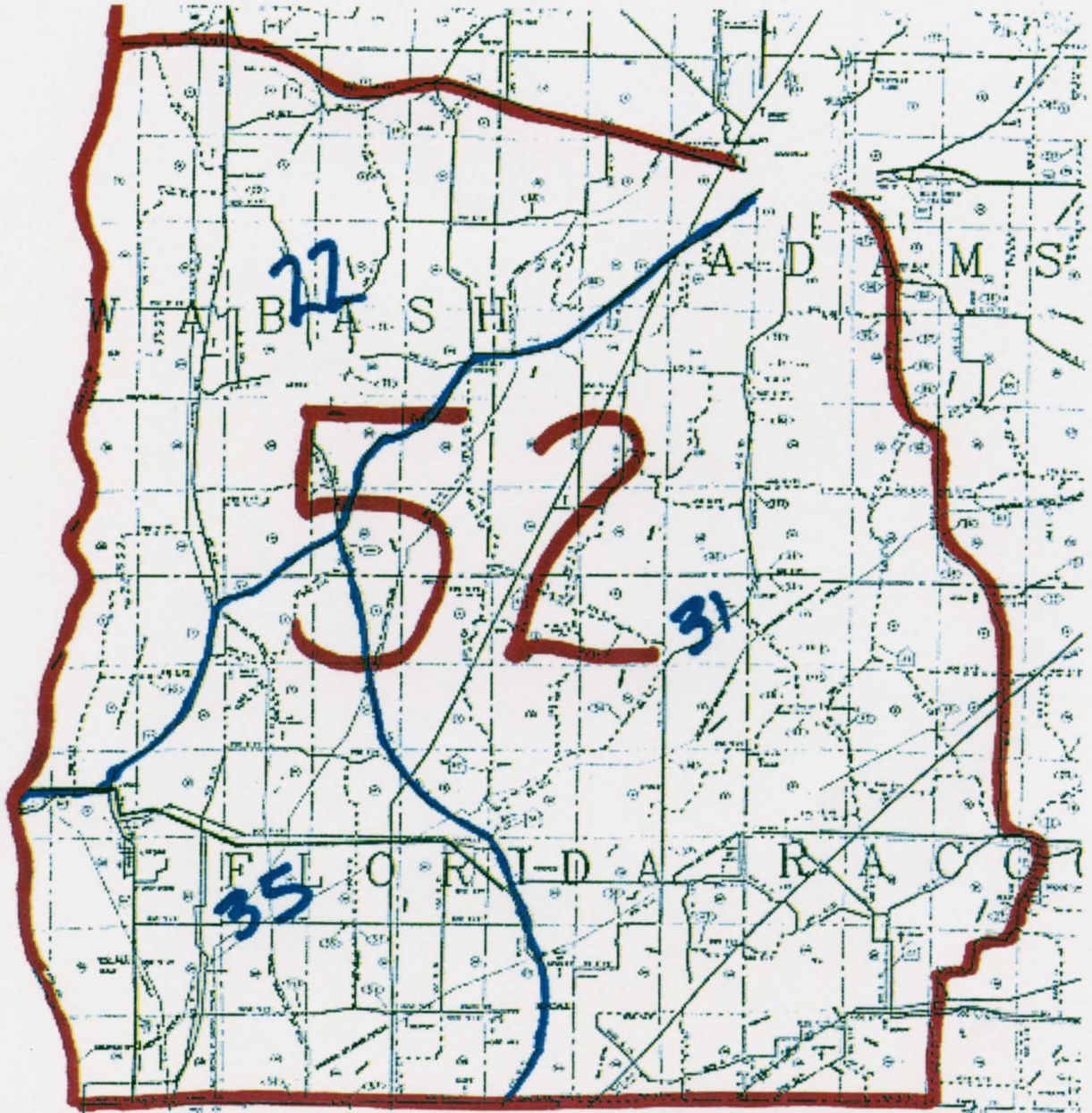
# District #30



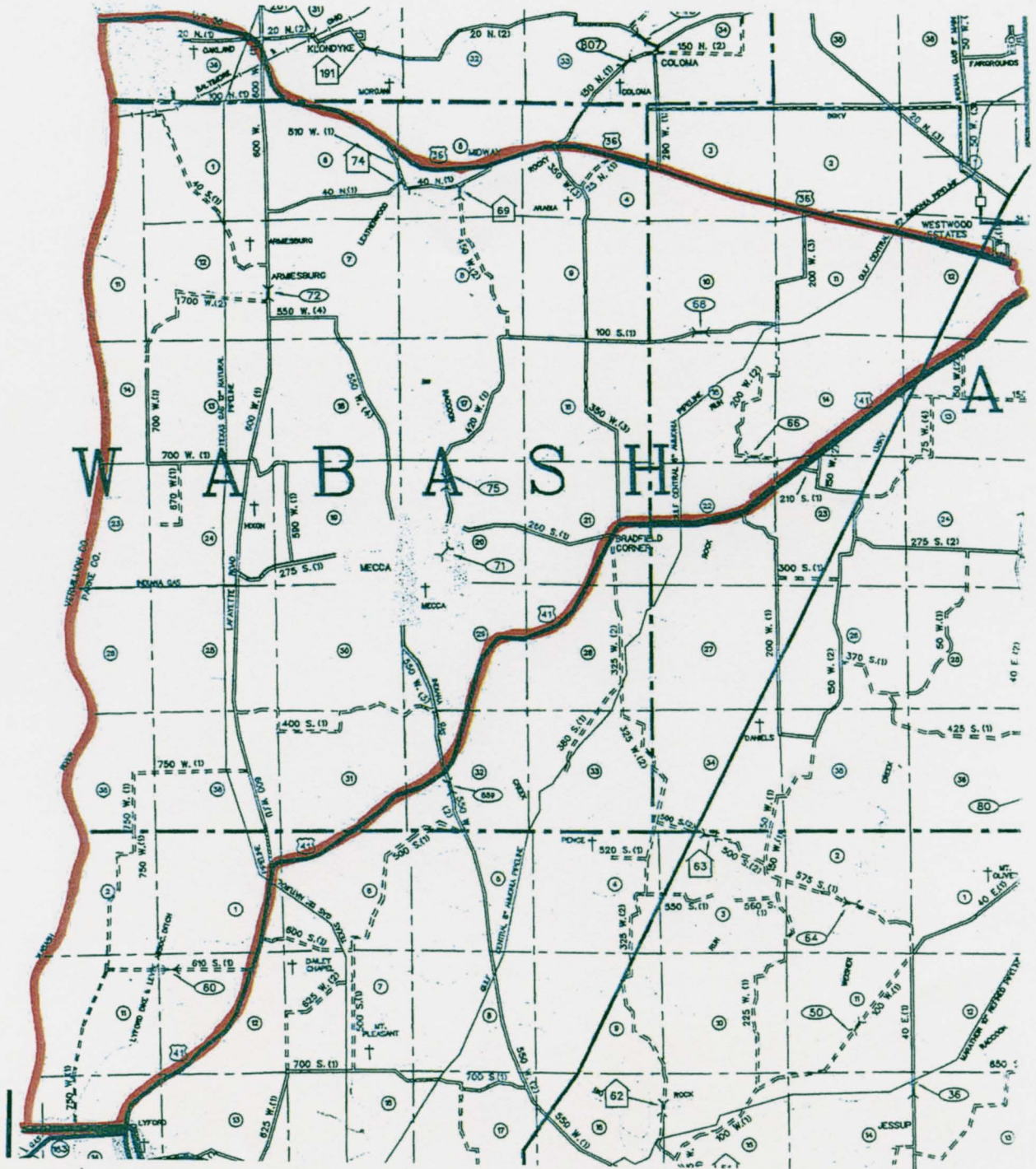
# District #39



Section #52  
Districts 22, 31, 35



District #22

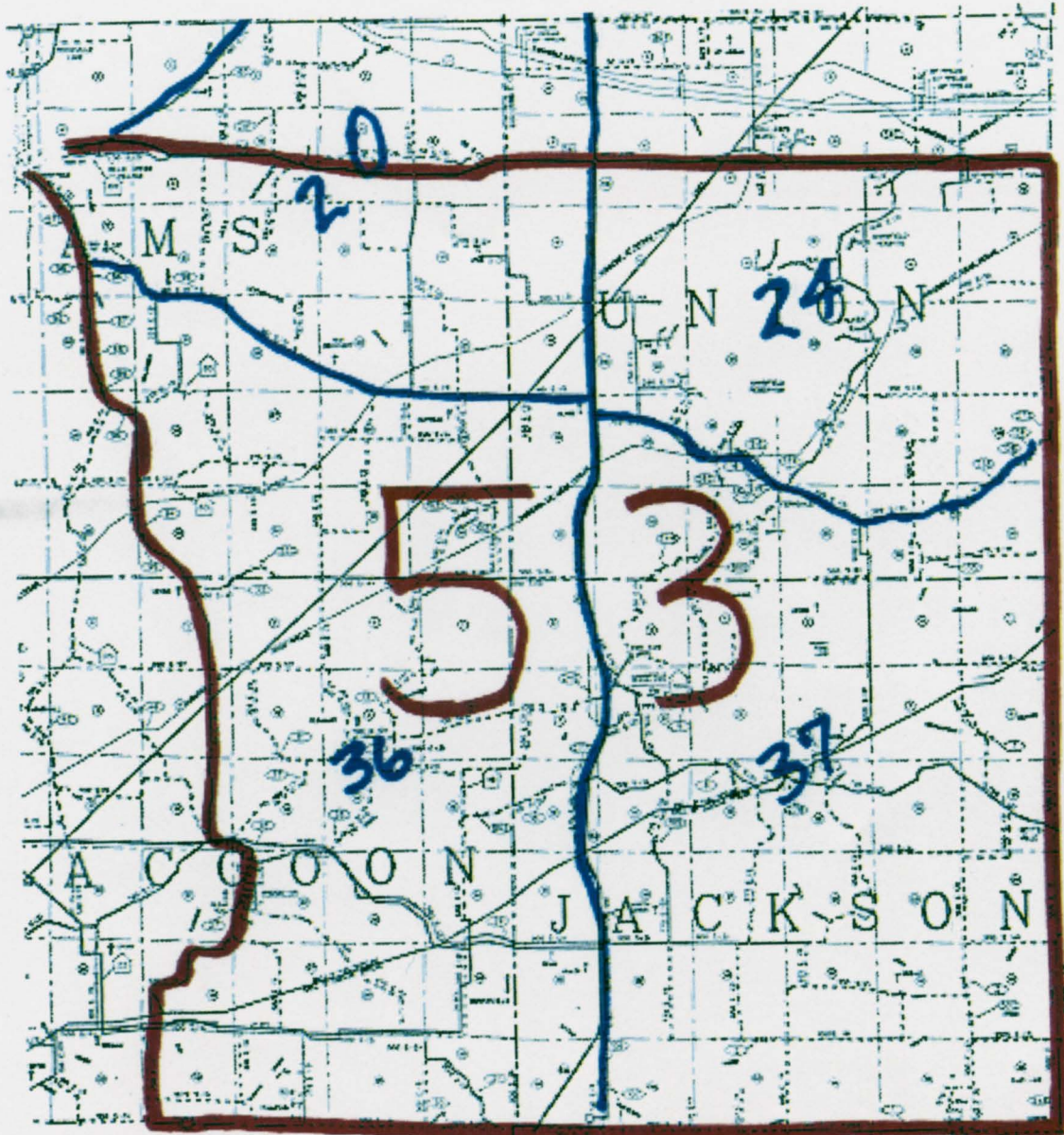




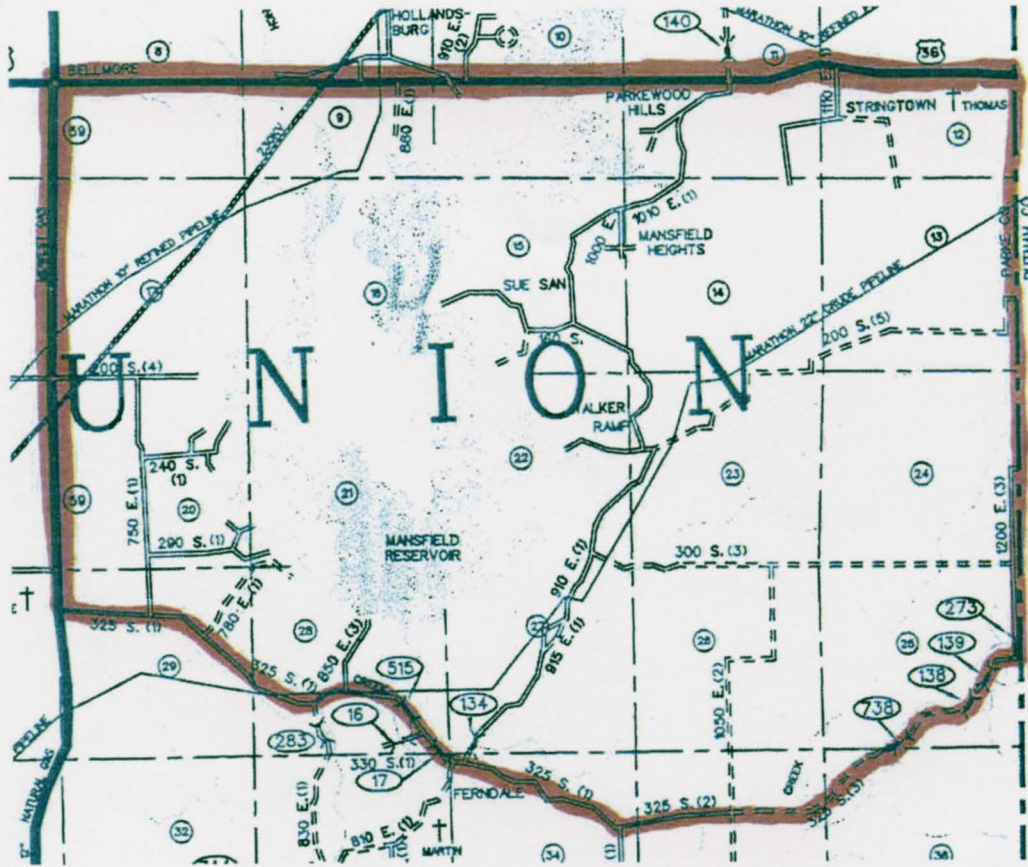




Section #53  
Districts 24, 36, 37



# District #24



District #36

