

“EXTREME” COLD WEATHER OIL SPILL RESPONSE COURSE



TECHNIQUES & RESPONSE STRATEGIES - ICE & SNOW

by

Carl J. Oskins

DOWCAR Environmental Management, Inc.

- **WHY CONDUCT**

“EXTREME” COLD WEATHER OIL SPILL RESPONSE

- **WHY PLAN for**

“EXTREME” COLD WEATHER OIL SPILL REPNONSE ?

- **WHY TRAIN for**

“EXTREME” COLD WEATHER OIL SPILL RESPONSE ?

- **WHY OBTAIN EQUIPMENT for**

“EXTREME” COLD WEATHER OIL SPILL RESPONSE ?

- **WHY PRACTICE for**

“EXTREME” COLD WEATHER OIL SPILL RESPONSE ?

CONDUCT "EXTREME" COLD WEATHER OIL SPILL REPORT

=====

APPLICABLE GOVERNMENTAL REGULATIONS:

Under EPA, USCG, DOT-RSPA, MMS Oil Pollution Regulations for Facility Response Plans, Final Rule Requires:

Owners or Operators of "Substantial Harm Facilities" Must Prepare Facility Plans to Response to a Worst Case Oil Spill Discharge, and Small and Medium Discharges as Appropriate.

Under Public Law 101-380-August 18, 1990- Oil Pollution Act of 1990.

OPA Section 4201 (b) (CWA Section 311 (a) (24)) Defines a "Worst Case Discharge" for a Facility as the Largest Foreseeable Discharge in the MOST ADVERSE WEATHER CONDITIONS.

“ Adverse Weather Conditions ” is defined as:

The **Weather Conditions** that make it **Difficult** for Response Equipment and Personnel to Cleanup or Remove Spilled Oil, & that will be considered when **Identifying Response Systems** & Equipment in a **Facility Response Plan** for an Applicable Operating Environment.

Factors to Consider Include:

- * *Significant Wave Height,*
- * *Ice Conditions,*
- * *Temperatures,*
- * *Weather-related Visibility,*
- * *and Currents within the Area in which the Systems or Equipment are Intended to Function.*

Y PLAN for "**EXTREME**" COLD WEATHER OIL SPILL REPON



Answer:

If you have FRP and your have an Applicable Operating Environment that has a Winter Season of:

* Ice

* Snow

* Freezing & Sub-Freezing Temperatures,

* Frozen Lakes, Stream, & Rivers,

then you Have Met the Requirement, to Plan for a Worst Case, Medium and Small Spill in Adverse Weather Conditions such as "Extreme" Cold Weather.

* IN "EXTREME" COLD WEATHER OIL SPILL REPNONSE



WHAT DO WE PLAN FOR ?

- * *The Amount of Oil That the Plan Holder Anticipates will Reach Frozen Streams, Lakes, Rivers and Snow Covered Land Environments.*
- * *What Spill Trajectory Does the Plan Holder Think, the Oil Will Take When it is Spilled on the Ice and/or Snow?*
- * *How is the Plan Holder going to Detect Where the Oil Is?*
 - *On the Snow*
 - *On the Ice*
 - *In the Ice*
 - *Under the Ice*
- * *How is the Plan Holder going to Determine How Much Oil is:*
 - *On the Snow*
 - *On the Ice*
 - *In the Ice*
 - *Under the Ice?*

*** IN "EXTREME" COLD WEATHER OIL SPILL RESPONSE - WHAT DO WE PLAN FOR ? (cont.)**

- * What Oil Spill Response Strategy is going to be Selected?*
 - Do Nothing*
 - Wait till Spring*
 - Contain with Ice/Snow Berms & Trenches*
 - Conduct Ice Slotting Containment Operations*

- * Once Contained How are we going to Recover the Oil from the Ice, Snow and/or Ice Slot.*

- * Once we know where the Oil is Going and how Fast it is Traveling, How, When & Where Does the Plan Holder, Plan for locating the Containment and Recovery Sites ?*
 - Are the Containment & Recovery Sites Pre-planned?*

- * What Will the Plan Holder's Responder Personnel Requirements Be and Where is the Plan Holder Going to Get Them?*

*** IN "EXTREME" COLD WEATHER OIL SPILL RESPONSE - WHAT DO WE PLAN FOR ? (cont.)**

** What Extreme Cold Weather Oil Spill Response Equipment will the Plan Holder be Required to Obtain to Successfully Contain, Recover and Cleanup the Potential Discharge of Oil?*

- *Will the Plan Holder Pre-purchase the Required Equipment?*
- *Where will they Obtain It? (Most Not Off the Self)*

** What Personal Protective Equipment & Clothing will be Required?*

- *Will it be Pre-purchased?*
- *Where will it be Obtained from?*

** What Decontamination Procedures will be Determined and Conducted for this Extreme Cold Weather Environment?*

- *What Equipment will be Selected & Purchased?*
- *Where will the Equipment be Obtained from?*
- *Who will Conduct the Decontamination?*
- *What Training will they receive for this type of Decon?*

Y TRAIN for "EXTREME" COLD WEATHER OIL SPILL REPON

=====

Answer:

EPA 40 CFR Part 112:

Oil Pollution Prevention; Non-Transportation-Related Onshore Facilities; Final Rule.

112.21 - Facility Response Training and Drills/Exercises.

- (a) The Owner or Operator of any Facility Required to Prepare a Facility Response Plan under 112.20 Shall Develop & Implement a Facility Response Training Program.*

* WHY TRAIN for "**EXTREME**" COLD WEATHER OIL SPILL RESPONSE ? (cont.)



(b) The Facility Owner or Operator Shall Develop a Facility Response Training Program to Train those Personnel Involved in Oil Spill Response Activities.

(1) The Owner or Operator Shall be Responsible for the Proper Instruction of Facility Personnel in the Procedures to Respond to Discharges of Oil and in Applicable Oil Spill Response Laws, Rules, and Regulations.

(2) Training Shall be Functional in Nature According to Job Tasks for Both Supervisory & Non-Supervisory Operational Personnel.

**If You Have An Extreme Cold Weather Environment
and a Facility Response Plan then**

" IT'S REQUIRED "

EXTREME" COLD WEATHER OIL SPILL RESPONSE TRAINING SHOULD COVER AT A MINIMUM:



- **EXTREME COLD WEATHER OIL SPILL RESPONSE**

- **GENERAL BACKGROUND**

- **COLD WEATHER OILSPILL RESPONSE**

- **PPE & SAFETY REQUIREMENTS**

- **SOURCE CONTAINMENT STRATEGIES & TECHNIQUES**

- **RECOVERY ON and IN ICE & SNOW**

- **RECOVERY UNDER ICE – SLOTTING**

- **IN-SITU BURNING**

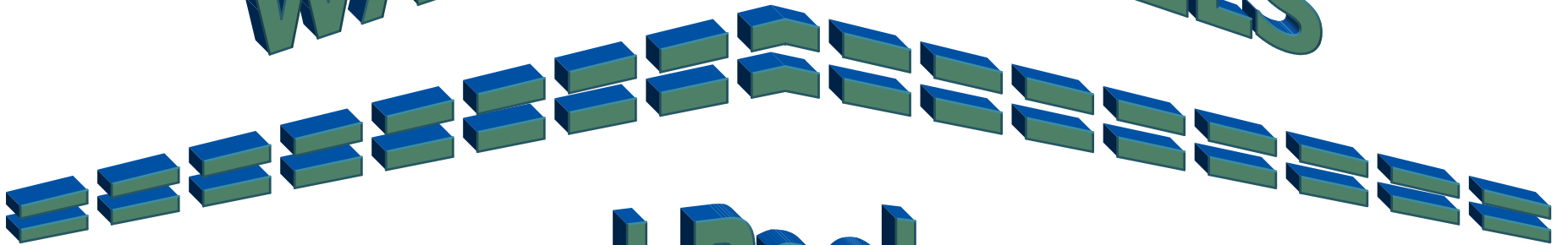
- **DECONTAMINATION PROCEDURES**

- **COLD WEATHER OPERATIONS**



The Hard Way

COLD & FROZEN WATER OIL SPILLS



General Background

GENERAL BACKGROUND

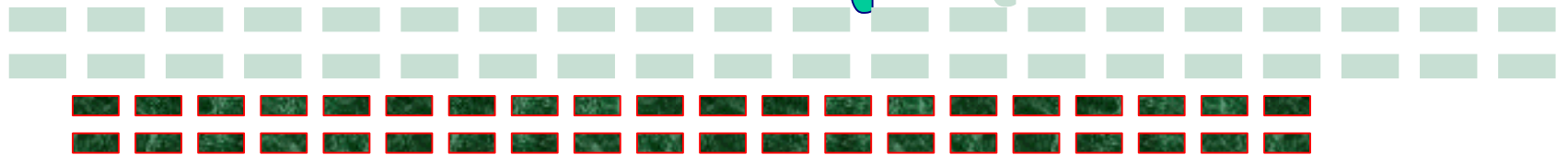
- **Difficult to Find Oil**
- **Difficult to Contain Oil**
- **Difficult to Recover Oil**
- **Safety Concerns with Temperatures, Weather & Cold Water**
 - **Few Properly Trained Responder Personnel**
 - **Equipment Difficult to Obtain & Maintain**
- **Little Research into Extreme Cold Weather Oil Spill Response**
 - **Most Companies Ignore**

WHERE TO FIND THE SPILLED OIL



- *Oil in Extremely Cold Water*
 - *Oil in Slush*
(Freeze Up)
 - *Oil in Snow*
- *Oil Encapsulated in Solid Ice*
 - *Oil Under Solid Ice*
 - *Oil in Melting Pools*
(Over Rotting Ice)
 - *Oil in Broken Ice*
(Breakup)

COLD WEATHER
PERSONAL PROTECTIVE EQUIPMENT



Cold Weather Safety

COLD WEATHER INJURIES

3 Factors Involved in a Cold Challenge To the Human Body

* TEMPERATURE

* WIND

* WET CONDITIONS

All 3 Effect the Rate of
Heat Loss from A
Person's Body

CONSERVING BODY HEAT

3 WAYS TO LOOSE BODY HEAR

- RADIATION

(EMISSION of BODY HEAT)

- CONDUCTION

(ABSORPTION of COLD)

- CONVECTION

(LOSS of BODY HEAT DUE TO WIND CHILL)

“ LIMIT the AMOUNT of BARE SKIN “

The LAYERING

Layering Represents an Individual's
PERSONAL THERMOSTAT.

- As you COOL, you put on
ANOTHER LAYER.
- As your body begins to SWEAT, you
REMOVE a LAYER.

LAYERED APPROACH to CLOTHING in **EXTREME COLD WEATHER**

- **BASE LAYER**
(Underwear)
- **MIDWEAR LAYER**
(Pants & Shirts – Fleece)
- **WATERPROOF OUTERWEAR**
(Lightweight & Storm Jackets,
Parkas, & Insulated Overalls)
- **FOOT WEAR**
- **FACE, HAND & HEAD PROTECTIVE**

CLOTHING in the Field

**A System of 3 Layers &
Hand, Head and Foot Protection**

- **BASE (Inner) LAYER**

(Wicks Moisture Away from Skin)

- **MIDDLE WEAR (Insulating) LAYER**

(Possibly Several Layers)

- **WATERPROOF OUTER LAYER**

(Protection from Wind, Rain, Snow)

OTHER CONCERNS in
"EXTREME" COLD
~~WEATHER~~

- **WATER CONSUMPTION**
- **BUDDY SYSTEM**
- **SAFETY & EQUIPMENT CHECKLISTS**

Harness, Hard Hat, Life Jackets & Layered Cold Weather PPE



Safety Lines on Harness



Boot Safety Chains for Work on Ice



Personal Protective Equipment & Clothing for Field

- **Insulated Underwear**
 - **Midwear Layer**
 - **Insulated Overalls**
- **Protective/Insulated Footwear**
- **Face, Hand & Head Protection**
 - **Hard Hat**
 - **Life Jacket**
 - **Harness**

ICE CHARACTERISTICS & OIL BEHAVIOR

ICE CHARACTERISTICS

** Water is a Chemical Compound Consisting of Hydrogen & Oxygen Molecules, with Unique Chemical Properties.*

Unlike Most Compounds, as the Temperature of Water Drops, the Water Density Decreases.

** Water is Densest at 4 degrees C*

** Water Cooler than 4 degrees C Floats to the Surface and Forms Ice Crystals.*

ICE CHARACTERISTICS (cont.)

** Strong Winds & Currents Agitate the Water, Slowing the Freezing Process. Light Winds & Calm Conditions Accelerate the Process.*

** As Freezing Continues, the Water Continues to Lose Heat at the Surface, & the Ice Begins to Thicken Downwards.*

New Ice is Normally Stronger than Old Ice.

** Ice Formed on Top of Deeper Lakes & Rivers Acts as an Insulator, Preventing Freezing to the Bottom.*

ICE

- * Ice Rarely Forms in a Uniform Thickness as the Water Normally Freezes at Different Rates.*
- * Fast Running Water Can Continue to Flow at Temperatures Well Below Freezing.*
- * River Ice is Normally Weaker than Lake Ice, Due to Current Movement.*
- * Water Containing Salts & Minerals can Remain Fluid to -4 degrees C.*

ICE CHARACTERISTICS (cont.)

ICE STRENGTH:

A Number of Factors Affect Ice Strength:

- * *Ice Type*
- * *Ice Thickness*
- * *Characteristics of the Water Body*
- * *Ice Temperature*
- * *Ice Condition*
- * *Rate and Application of Stress*
- * *Weight Bearing Capacity*

ICE CHARACTERISTICS (cont.)

ICE TYPE:

Ice Profiles can be Very Complex & Depend to a Large Extent on the Mechanism of the Ice Formation. Generally Two (2) Types are Formed.

* Clear Ice (Blue Ice)

* White Ice (Snow Ice)

Blue Ice is Clear, Well Compressed & Does Not Contain Air Pockets. This Ice is Very Strong & has a High Load-Bearing Capacity.

White Ice (or Snow Ice) has many Air Pockets, & has a much Lower Load-Bearing Capacity.

ICE THICKNESS:

* *Ice Thickness can be Variable.*



8 to 10 ft. Clear (Lake) Ice Blocks with Bucks Cut



8 to 10 ft. Clear (Lake) Ice Blocks with Bucks Cut



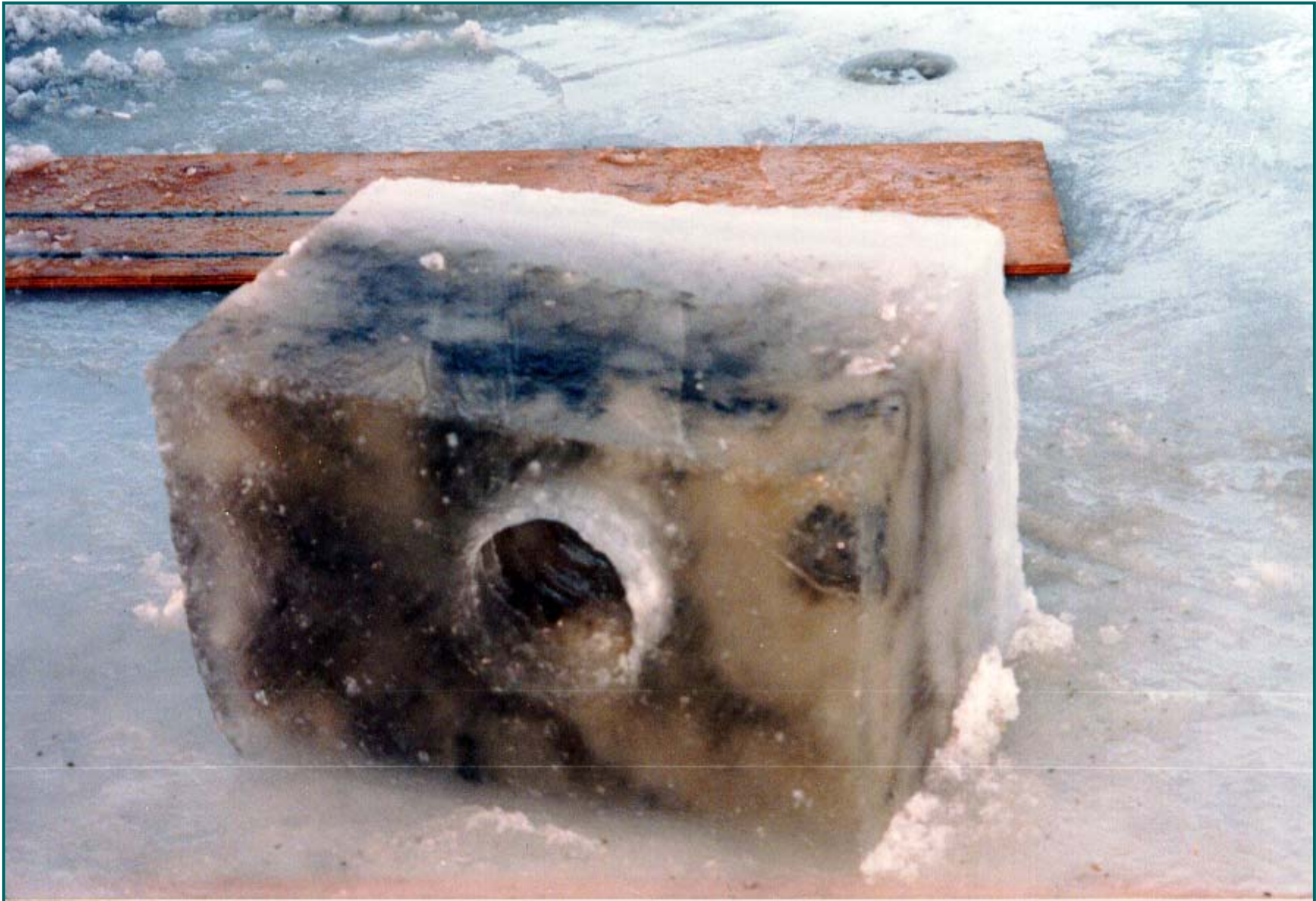
Clear River Ice with Layer of Blue River Ice



White & Clear River Ice with Layer of Sedimentation



White Ice Layer/White Ice with Sedimentation Layer/Clear Ice Layer

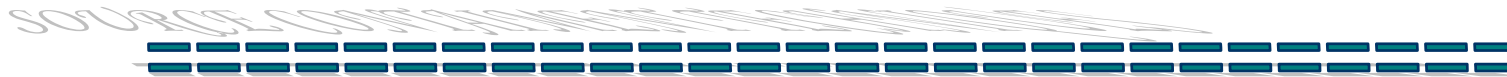


River White Ice with Large Layer of White Ice with Sedimentation



White Ice with Clear Irregular Ice Bottom

SOURCE CONTAINMENT TECHNIQUES



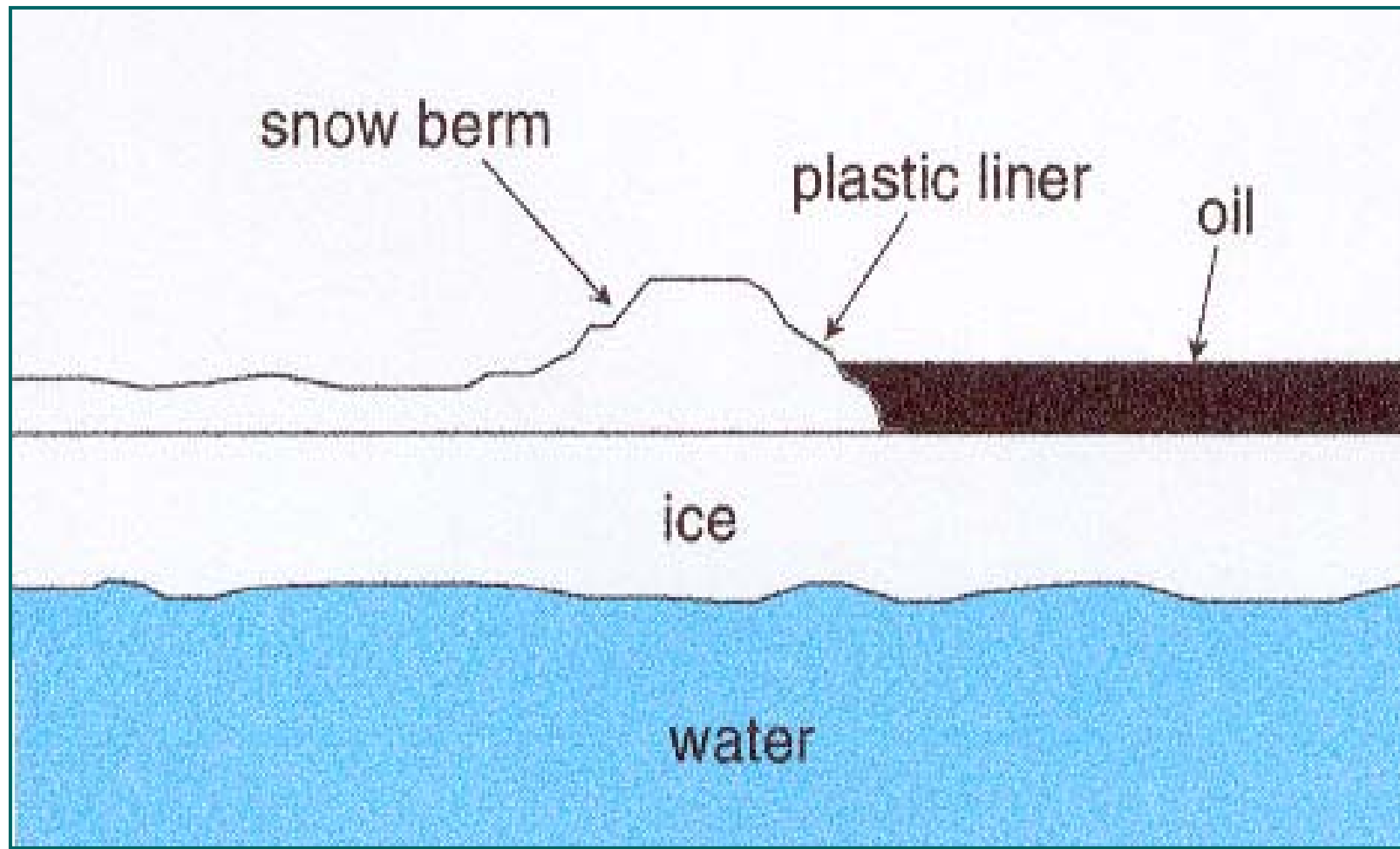
BERMS, TRENCHES

&

ICE SLOTTING TECHNIQUES

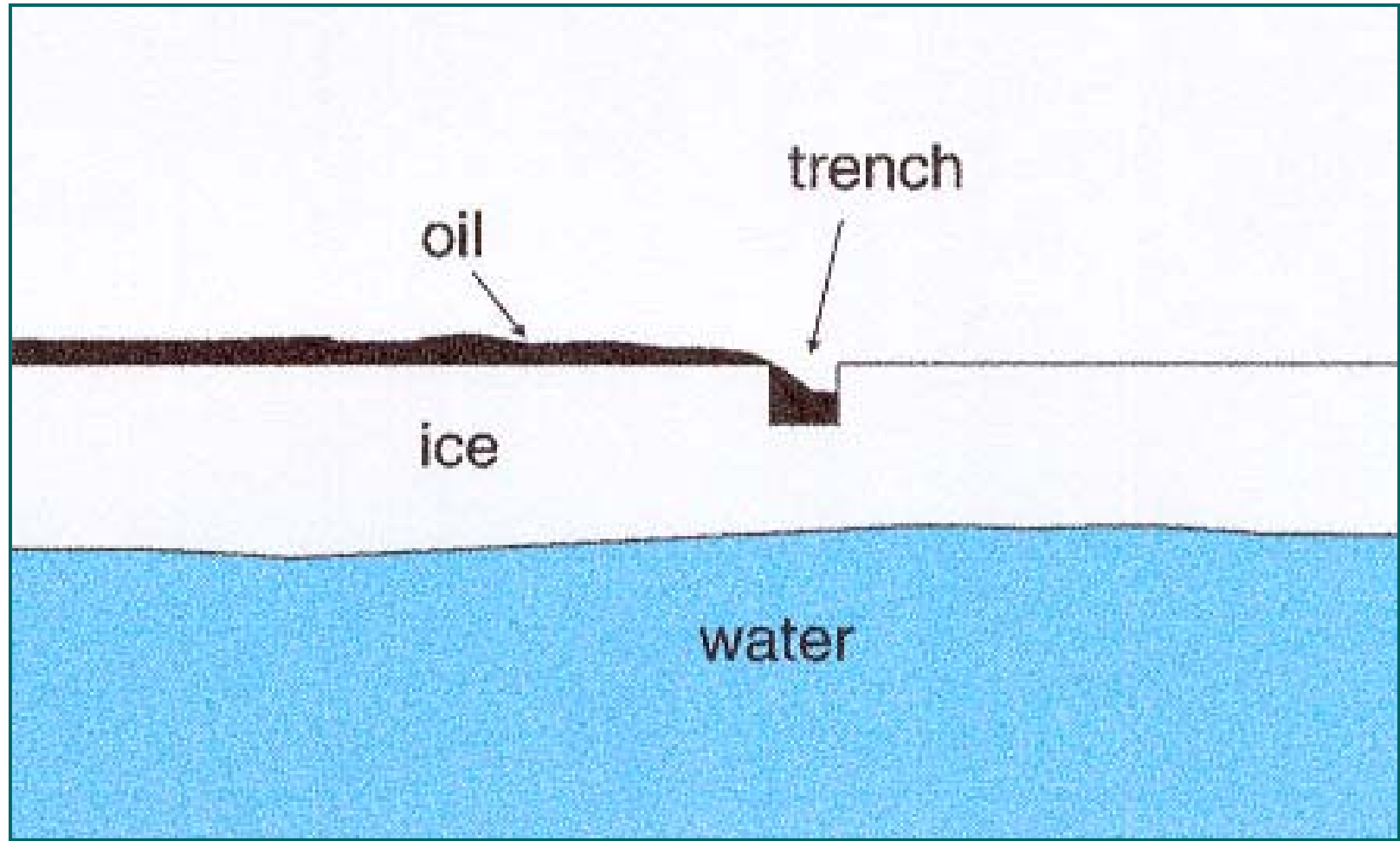
SNOW BERMS

SNOW BERMS



ICE TRENCH

ICE TRENCH



ICE SLOTTING TECHNIQUES

- **STANDARD ICE SLOT** with **HOIST PULL**
 - **BUCKS CUT ICE SLOT** with **Z Rig Pull**
- **DIVERSIONARY PLYWOOD SHEET BARRIER**
with **COLLECTION SUMP**
 - **RODNEY'S ROLL**
- **JANICKE SLOTTING GUIDE - ICE MITER BOX**

STANDARD ICE SLOT TECHNIQUES

Slots in the River, Creek & Lake Ice can be Cut at an Up River Diagonal Angle from the Bank into the Water Current below the Ice.

Oil Moving Below the Ice by the Water Current Can be Concentrated in the Open Slots in the Ice, as the Oil Passes Underneath the Open Slot and Rises to the Surface while being Contained Within the Ice Slot.

Oil Contained in the Ice Slots can be Recovered by Using a Variety of Oil Skimmers.

When Water Currents are Greater Than 1/2 MPH the Slots should be Cut at a 20 to 30 degree Angle to the Current, thus Allowing the Oil to Rise within the Cut Ice Slots Rather than Flow Underneath.

Test Ice Thickness to Determine Loading Bearing Capacity Prior to Ice Cutting.

ICE SLOTTING EQUIPMENT

- *Ditch Witch,*
- *Back Hoe,*
- *Chain Saw,*
- *Ice Auger,*
- *A Frame Hoist,*
- *Fred Miter Chain Saw Box*
- *Hand Ice Saw &*
- *Hand Tools*

Use of Ditch Witch:

A ditch witch can be used provided you have sufficient weight-bearing capacity.

It is a good idea to use the ditch witch to cut one-side of the slot only, and finish construction with chain saws. The ditch witch will provide some flexibility in moving the ice blocks in the slot.

Use of Back Hoe:

A hoe with ice-cleats can be very effective for constructing an ice slot, provided a sufficient quantity of ice is available to support its weight.

Note: Ensure that ice blocks are removed from the slot area, and move equipment off of the ice if it is not required.

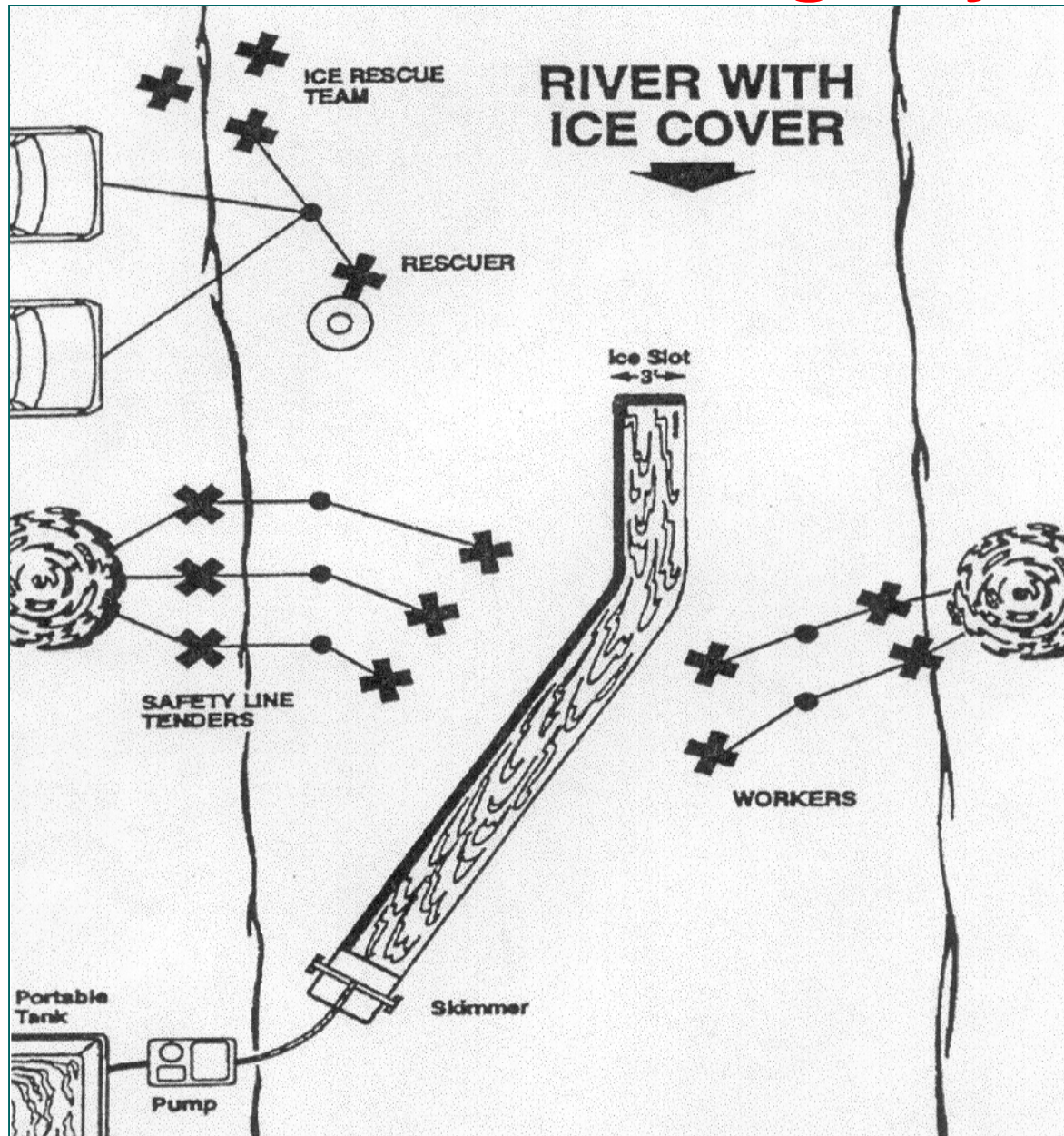
Use of Ditch Witch:



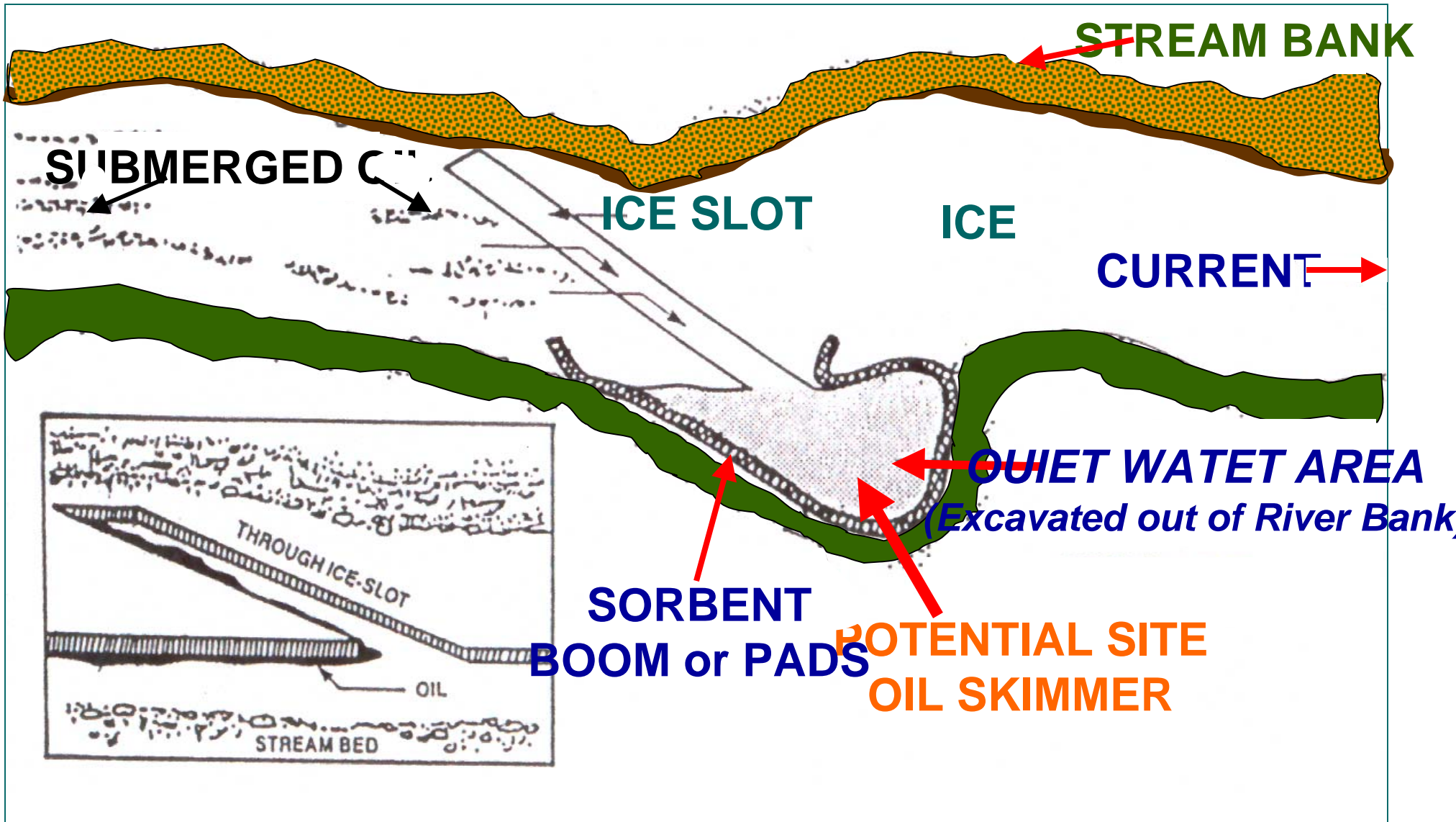
Back Hoe:



Standard Ice Slotting Layout



Conversion & Containment of Oil Moving Beneath



Finished Ice Slot with “J” End, Using “Bucks Cut” and “Z” Rig to Pull Ice Blocks.



Step. 1. – Inspect Ice for Cracks & Determine Ice Slot Position



Step 2. – Drill Auger Holes to Determine Ice Thickness & Water Depth Below Ice.



Step 3. – Layout Ice Slot Design with Paint, Caulk. or Itch



Step 4. – Ice Slot Outlined with Square Pattern & Auger Holes Drilled in Each Square, Prior to Cutting Sides



Step 5. – Constant Clearing of Ice & Snow from Ice Slot



Step 6. – Cutting of Sides of Ice Slot Design



Step 7. – Lifting of 1st Ice Block with A Frame & Hoist, Neare



Step 8. – Lifting of 1st Ice Block with A Frame & Hoist & Pus

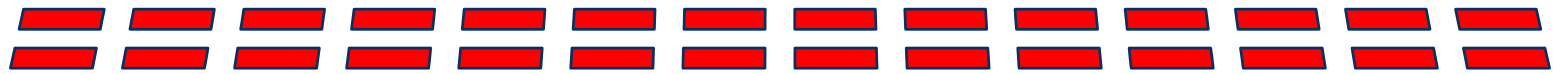


Step 9. – Lifting of 2nd Ice Block with A Frame & Hoist & “



" BUCK'S CUT "

ICE SLOT TECHNIQUES



with "Z" Rig Pull

Drilling 1st Auger Hole to Determine, Ice Thickness Water Depth & Load Bearing Capacity



Horizontal Lines being Etched on Ice with Plywood Safety Walk Sheets



Vertical Lines being Etched on Ice with Plywood Safety Walk Sheets



Laying Out the Ice Slot Pattern with Chain Saw



Drilling Auger Holes & Cutting 1st Block



Ice Block Being Cut with Chain Saws in Opposite Directions



2nd Ice Block being Cut with Chain & Hand Saws



Attaching "T" Bar in Reverse Method



2nd Ice Block being Pulled Out with "Z" Rig



4" x 4" x 6' used as Anchor Post for "Z" Rig to Haul 8 to 10" Ice Block from Ice Slot.



"Z" Rig being used to Haul Ice Blocks



Last Ice Block being Removed



to 10' Ice Block being Hauled Out with "Z" Rig



8 - 10' Ice Block Cut at Angles



Completed Ice Slot



Completed Ice Slot



“Rodney’s Roll”

**Use of Pry Bars to Lift &
Move Ice Blocks to Side**

“Rodney’s Roll”

Using Pry Bars to Lift & Move Ice Blocks to Side



"Rodney's Roll" in Use



"Rodney's Roll" in Use



1,600 Lbs. Success with "Rodney's R



Completed Ice Slot



ANICKE SLOTTING GUID

- Ice Miter Chain Saw Box

Janicke Slotting Guide – Ice Miter Chain Saw Box



CKE SLOTTING GUIDE (JSG) – Ice Miter Chain Saw Box Cutting



CKE SLOTTING GUIDE (JSG) – Ice Miter Chain Saw Box Cutting



JSG – Ice Miter Chain Saw Box Cutting Ice



Completed Ice Slot using JSG



" DIVERSIONARY "

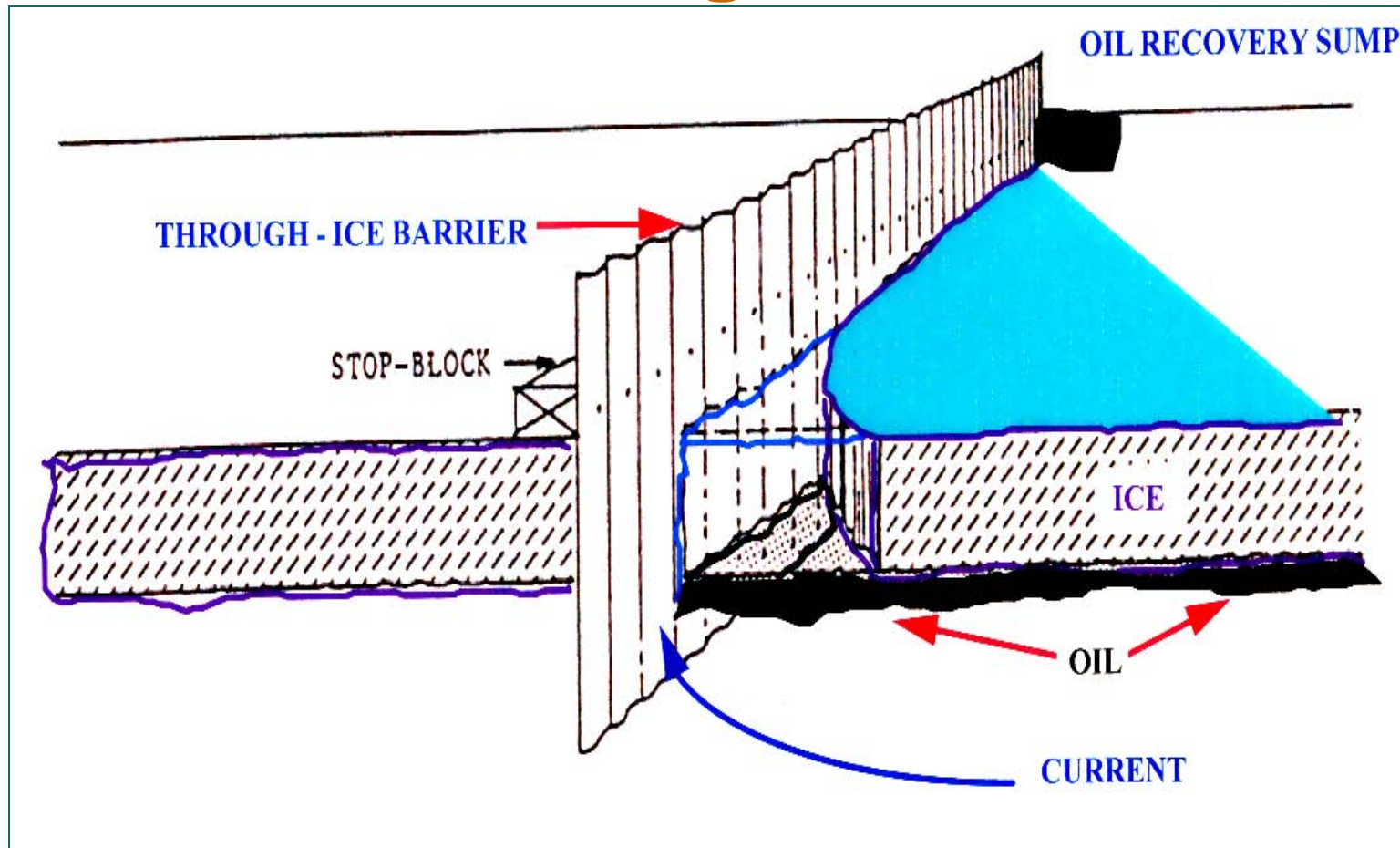
" DIVERSIONARY "

THRU ICE

PLYWOOD SHEET BARRIER

with Oil Collection Sump

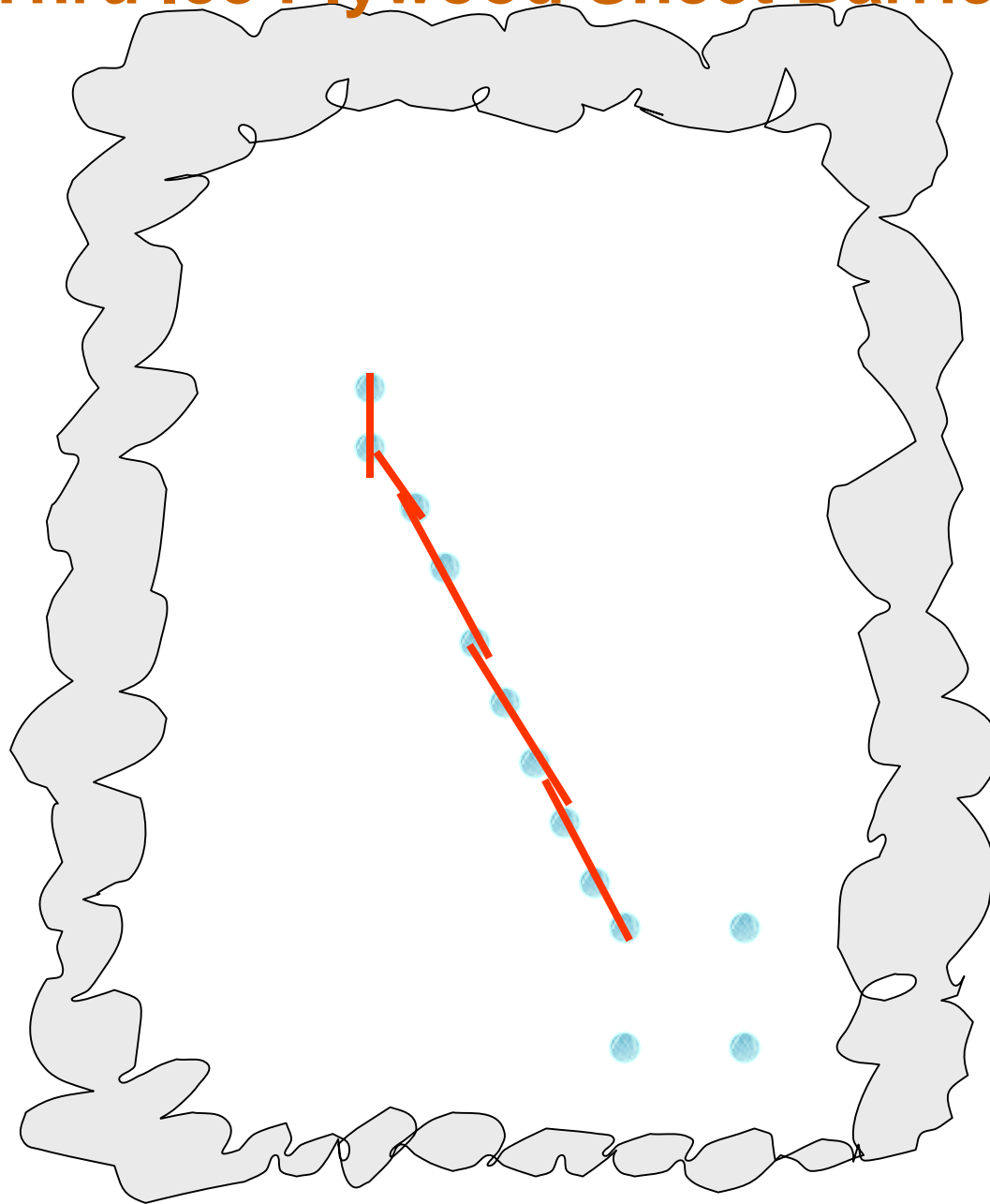
Through Ice Barrier



“Diversiory” Thru Ice Plywood Sheet Barrier



“Diversiónary” Thru Ice Plywood Sheet Barrier



Laying Out “Diversionsary” Plywood Sheet Barrier



Etching Barrier Pattern with Chain Saw



Drilling Auger Holes Along Layout Guide Line



er Holes Completed on Plywood Sheet Barrier Guide



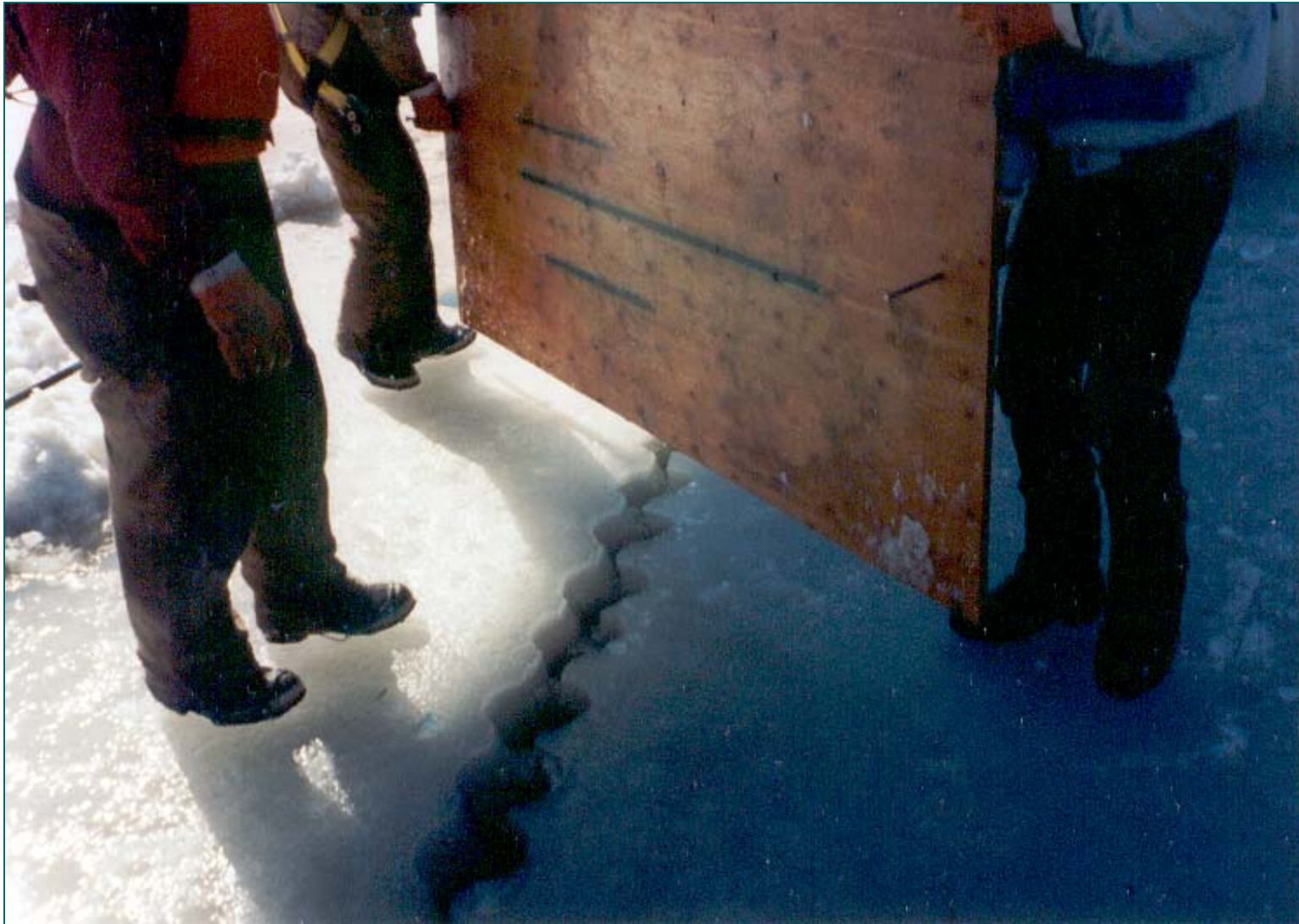
Attaching Auger Holes



Attaching Auger Holes using Hand S



Plywood Sheet with Spikes to Stabilize it on Ice



2nd Plywood Sheet Placed in Ice with Overlap



Plywood Sheet being placed in "J" Portion of Thru Ice Barrier



Plywood Sheet being placed in "J" Portion of Thru Ice Barrier



IN SITU BURNING

on **POND ICE**

Snow Berm Created on Frozen Pond **5' x 6' – 50 gallons Diesel Fuel Red Dye No. 2**



Diesel Fuel being Lit within Snow Berm



Diesel Fuel on Fire within Snow Berm



Diesel Fuel Beginning to Leaking under Snow E



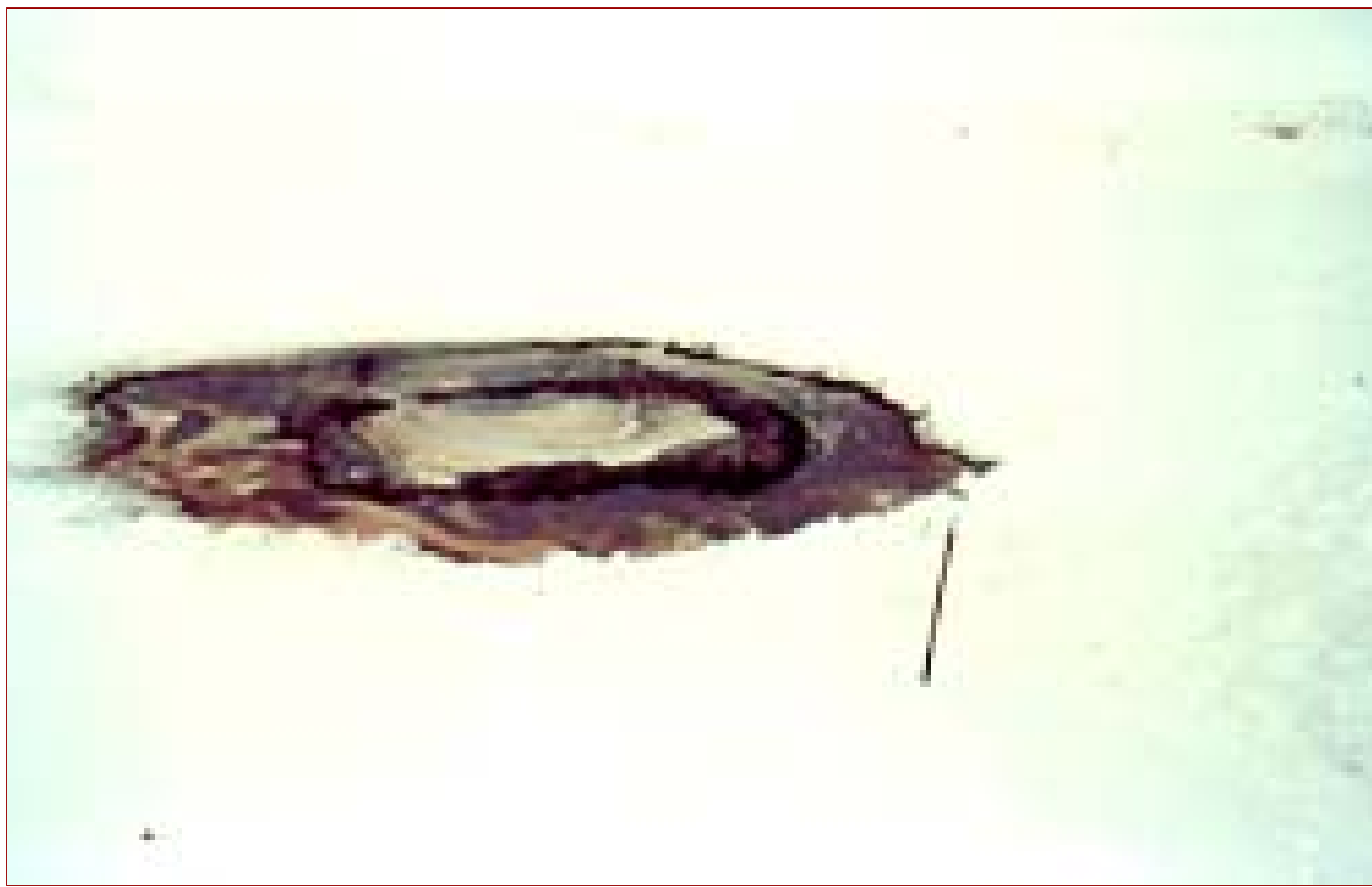
Diesel Fuel Leaking under Snow Berm



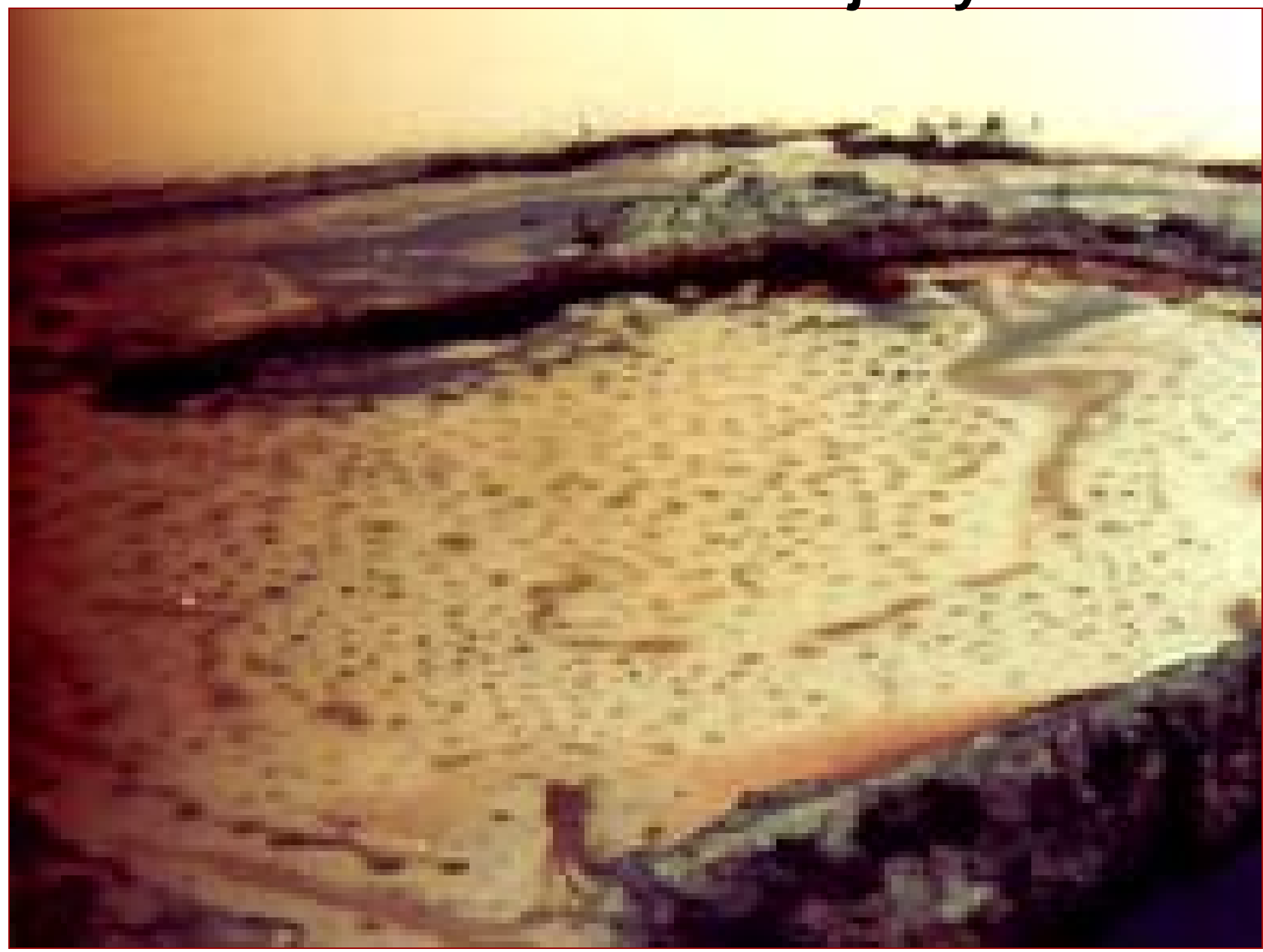
Berm is Floating on Water
– Diesel Fuel on Fire Surrounding Outside of Snow Berm



Diesel Fuel is Out and Snow Berm is Intact



Fuel Residue Embedded in Ice – Majority of Snow Berm In



Diesel Fuel Cleanup - \$7,500.



DECONTAMINATION

"EXTREME" COLD WEATHER

Site Entry Team – Extreme Cold Weather Oil Spill Response



Open Decontamination Line – Cold Weather Oil Spill Response



Covered Decontamination Line – Cold Weather Oil Spill Response



“EXTREME” COLD WEATHER OIL SPILL RESPONSE



CONCLUSIONS:

** Do We Need to Plan for “Extreme” Cold Weather Oil Spill Response?*

- YES, YES, YES !!!

** What Do We Need to Plan For?*

- Plan for Training Needs;*
- Establish for Manpower & Equipment Needs;*
- Plan for and Establish Predesignated Containment & Recovery Sites on Inland Waterways in Question;*
- Plan for & Establish Recovery Methods from Ice & Snow;*
 - Plan for and Establish a Disposal Plan for Recovered Oil and Debris;*
 - Plan for and Establish Decontamination Plans;*

- Plan for & Practice, Practice & Practice!!!