



**ENVIROCHEM
SERVICES INC.**

ENVIRONMENTAL MANAGEMENT AND SYSTEMS SOFTWARE

POLLUTION PREVENTION PLAN FOR A LARGE POULTRY PROCESSING OPERATION: ODOUR MEASUREMENT, DISPERSION MODELING AND CONTROL

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Study Objectives

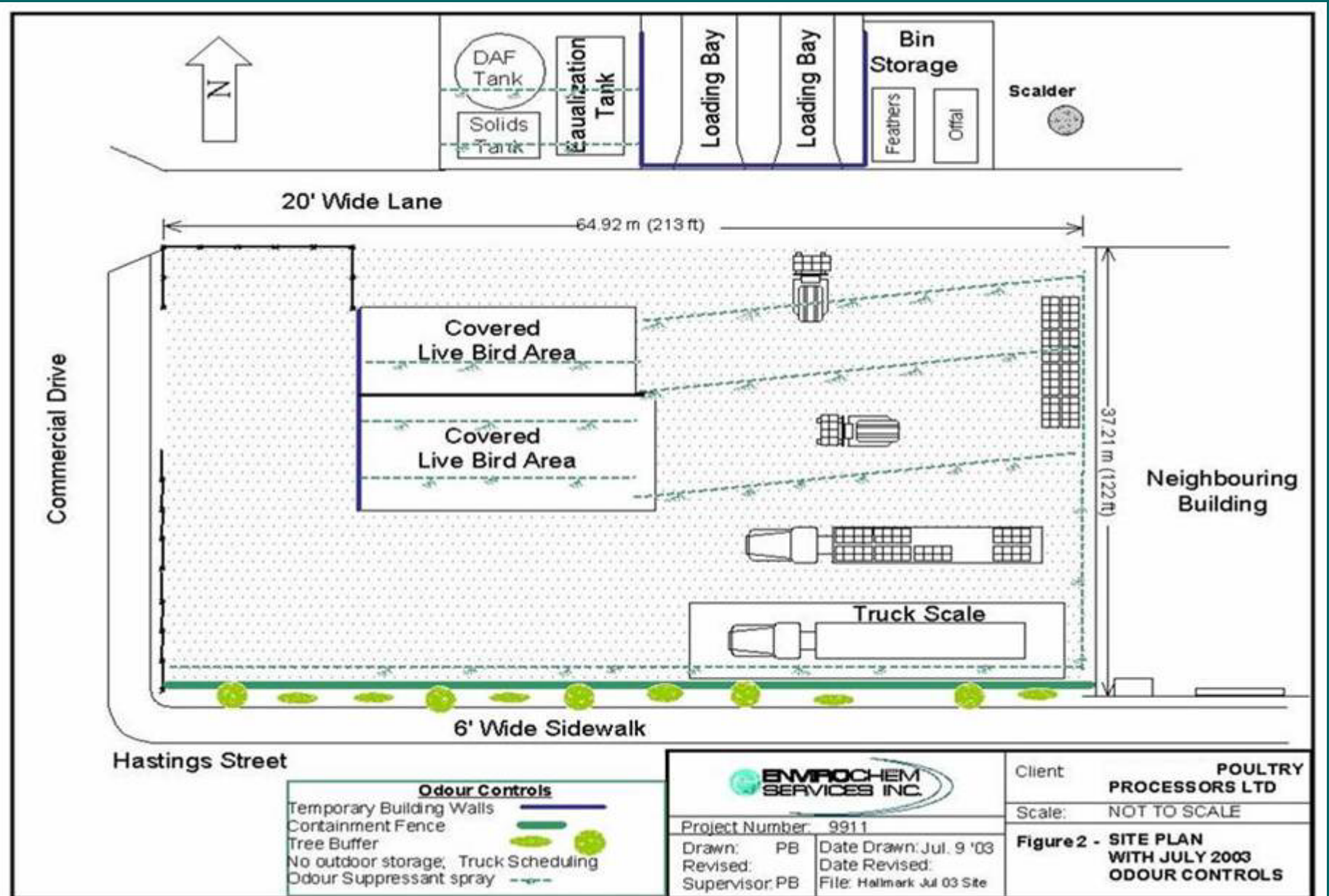
- **A POULTRY PROCESSING FACILITY :
OPERATION AND POLLUTION ISSUES**
- **ODOUR CHARACTERIZATION AND MEASUREMENT**
- **POLLUTION PREVENTION MEASURES**
- **POLLUTION CONTROL DESIGN**



A POULTRY PROCESSING FACILITY

- FACILITY OPERATES IN VANCOUVER, BC
- MIXED RESIDENTIAL, COMMERCIAL AND INDUSTRIAL AREA
- PROCESSES ABOUT 100,000 BIRDS PER DAY

Site Plan, July 2003





ODOUR CHARACTERIZATION AND MEASUREMENT

- ❑ IDENTIFY POTENTIAL ODOUR SOURCES
- ❑ IDENTIFY POTENTIAL ODOROUS COMPOUNDS ASSOCIATED WITH CHICKENS
- ❑ ODOUR THRESHOLD VALUES (OTV)
- ❑ ANALYTHICAL PROTOCOLS



IDENTIFICATION OF SOURCES OF ODOUR

- ❑ LIVE BIRD TRANSFER BUILDING
- ❑ DISOLVED AIR FLOTATION (DAF) WASTE WATER TREATMENT PLANT
- ❑ BIRD IN-FEED AND GENERAL PROCESS AREA
- ❑ OFFAL AND FEATHER LOAD-OUT AREA
- ❑ SCALDER VENT



ODOROUS COMPOUNDS AND ODOUR THRESHOLD VALUES (OTV)

COMPOUNDS (partial list)	OTV range (ppm)
AMMONIA	0.02 - 48
ACETIC ACID	0.016 – 1.0
AMINES	0.0007 – 0.021
BUTYRIC ACID	0.001
PROPIONIC ACID	0.0017 – 0.037
DIMETHYL SULPHIDE (DMS)	0.001
T-BUTYL MERCAPTAN (TBM)	0.001
ALDEHYDES	0.05-1000; 0.8 – 1.0
HYDROGEN SULFIDE	0.0005 – 0.0081

CHEMICAL SAMPLING - ANALYTICAL METHODS

COMPOUND	Method description	
	<i>Sampling</i>	<i>Analysis</i>
AMMONIA	H ₂ SO ₄ treated silica gel	VAS
ACETIC ACID	Charcoal tubes	GC/FID
AMINES	Carbotrap tubes	GS/MS
BUTYRIC ACID	Silica gel tubes	GS/FID
PROPIONIC ACID	Silica gel tubes	GS/FID
DIMETHYL SULPHIDE (DMS)	Carbotrap tubes	GS/MS
T-BUTYL MERCAPTAN (TBM)	Glass fiber filters	
ALDEHYDES	DNPH silica gel tubes	HPLC
HYDROGEN SULFIDE	Filter + sorbent tube	Ion chromatography



Chemical Sampling Findings

- MORE THAN 70 SAMPLES = 20 DIFFERENT CHEMICALS
- AMMONIA, ACETIC ACID, AMINES EXCEEDED THE OTV IN THE BIRD RECEIVING BUILDING
- THE PRESENCE OF THESE CHEMICALS WAS CONSISTENT WITH THE PERCEIVED ODOUR IN THE BIRD RECEIVING BUILDING
- ODOROUS LEVELS OF AMINES DETECTED AT ALL ONSITE LOCATIONS



OLFACTORY MEASUREMENTS

- ODOUR PANEL

- THE ASTM STANDARD PRACTICE FOR ODOUR CONCENTRATION DETERMINATION IS E679-91

“DETERMINATION OF ODOUR AND TASTE THRESHOLDS BY A FORCED-CHOICE ASCENDING CONCENTRATION SERIES OF LIMITS”

- OU/m^3



THE AREAS WITH THE GREATEST ODOUR INTENSITY

- **INSIDE THE LIVE BIRD TRANSFER BUILDING**
 - **THE IN-FEED AREA (PROCESS BUILDING)**
 - **SCALDER ROOF AREA**
 - **DAF AREA**

DETECTED ODOUR VALUES RANGE: 249 – 2008 OU/m³

BACKGROUND UPWIND: 88 OU/m³



ODOUR CONTROL TECHNOLOGIES AND MANAGEMENT OPTIONS

□ CONTAINMENT

□ REDUCE ODOUR GENERATION:

- CHANGE BIRD FEED

- REDUCE NUMBER OF BIRDS ON SITE

□ YARD CLEANUP AND OPERATION PRACTICES





ODOUR CONTROL TECHNOLOGIES AND MANAGEMENT OPTIONS cont'd

□ TREATMENT OPTIONS:

- AREA MISTING OR FOG SYSTEM** ✓
- COLLECTION AND ELEVATED STACK DISPERSION**
- AIR COLLECTION AND INCINERATION**
- INSTALL SCRUBBERS**
- INSTALL PARTICULATE FILTERS**
- ULTRAVIOLET TECHNOLOGY**
- DIRECT OZONE TREATMENT OF THE AIR**
- ADSORPTION ONTO ACTIVATED SOLIDS**



POLLUTION CONTROL DESIGN: NEW LIVE BIRD TRANSFER BUILDING (NLBTB)

□ NLBTB TO BE ENCLOSED – 303,696 ft³

□ VENTILATION RATE – AIR FLOW

0.4 – 1.1 scfm/bird (University of Minnesota)

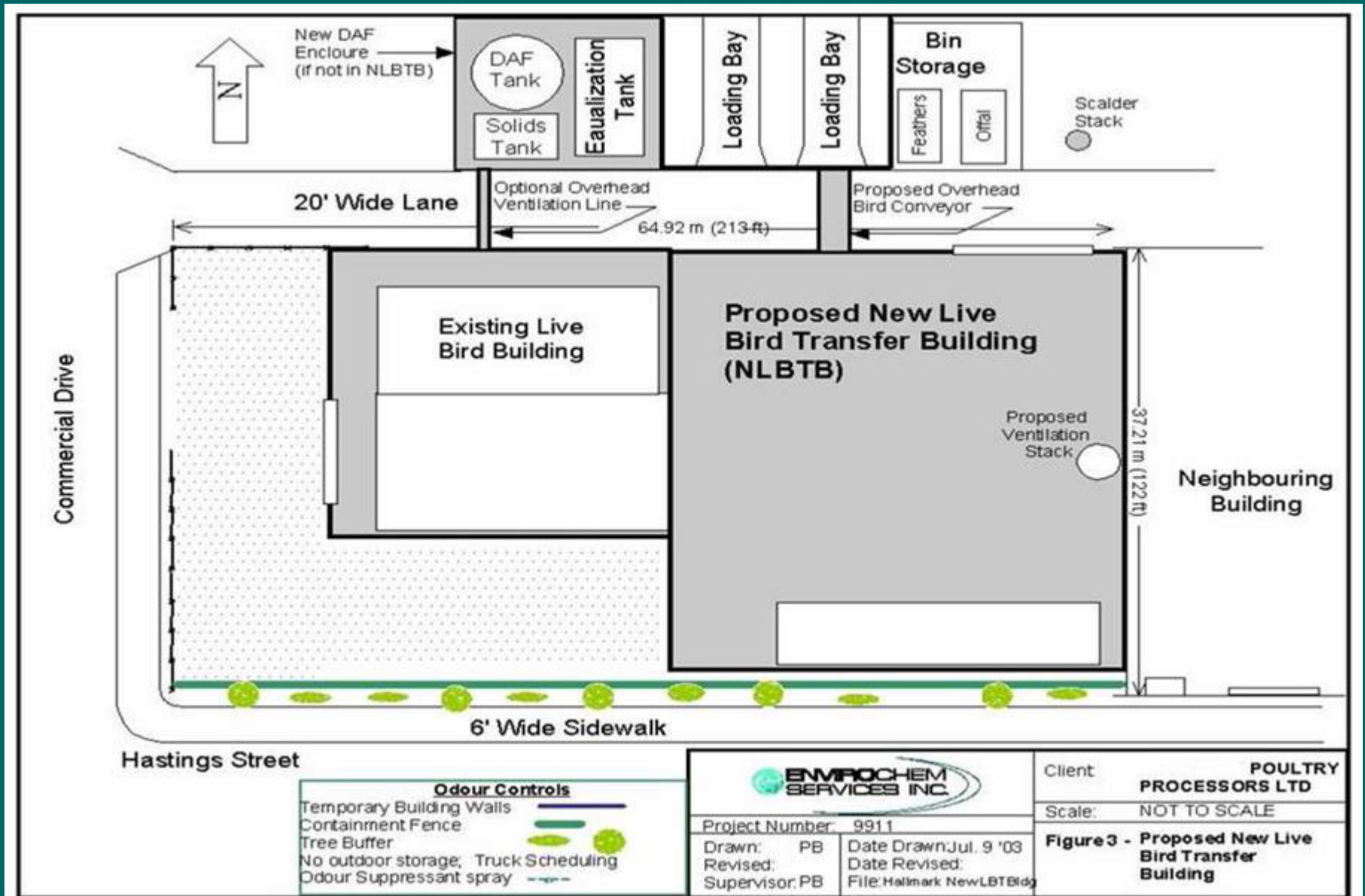
0.09 scfm/bird (Canadian studies)

→ MAX. FLOW RATE OF 40,000 cfm WAS CHOSEN

- provides a minimum of 0.67 scfm/bird at maximum bird loading and 6 building air exchanges per hour

POULTRY PROCESSING OPERATIONS

Proposed Enclosure



Odour Controls	
Temporary Building Walls	
Containment Fence	
Tree Buffer	
No outdoor storage; Truck Scheduling	
Odour Suppressant spray	

Project Number: 9911	
Drawn: PB	Date Drawn: Jul. 9 '03
Revised:	Date Revised:
Supervisor: PB	File: Halmark NewLBTBldg

Client	POULTRY PROCESSORS LTD
Scale:	NOT TO SCALE
Figure 3 - Proposed New Live Bird Transfer Building	



DISPERSION MODELING

- TO ESTIMATE LEVELS OF ODOUR AND CHEMICALS IN AMBIENT AIR, IMPACT ON RECEPTORS

ACCEPTABLE ODOUR STANDARDS
IN DIFFERENT JURISDICTIONS

chosen 5 – 10 OU/m³ for 1-hour

- FOR DESIGN BASIS – ELEVATED STACK ON (NLBTB)



DISPERSION MODELING SCREEN 3

□ INPUT DATA

➤ Emission data:

- calculated based on the odour panel results &
- chemical sampling

□ SPECIAL CONSIDERATIONS:

➤ BUILDING DOWNWASH

Cavity region increases odour concentrations or dilutes odours ?

➤ PEAK-TO-MEAN-CONCENTRATIONS

Factor 2.3 was used to estimate 10-min odour levels



SUMMARY OF MODELING RESULTS

- (NLBTB) stack 15.8 m & diameter 1 m
controls with 90 % efficiency
→ acceptable ambient odour levels (5 – 10 OU/m³)
- Other sources: ground level, cavity region, elevated
receptors = concentrations within the
suggested range
- In reality even lower concentrations could be expected as
emission rates were overestimated!



ODOUR CONTROL

staged approach

- (NLBTB): - barriers, maintain cleanliness, odour suppressants
 - construction of a new building- containment
 - increased air circulation and collection
 - treatment of all gases with a system consisting of a vertical packed bed scrubber 90% eff.
 - dispersion through an elevated stack



ODOUR CONTROL

staged approach

- OTHER SOURCES: DAF,
SCALDER ,
BIRD IF-FEED AREA,
FEATHER AND OFFAL AREA**

- will be enclosed**
- improvement of inside air circulation with blowers**
- new air collection system**
- dispersion though elevated stack**



Conclusions

❑ ODOURS

- subjective character,
- need for development of odour standards in BC
- odour panel vs chemical sampling – level of confidence

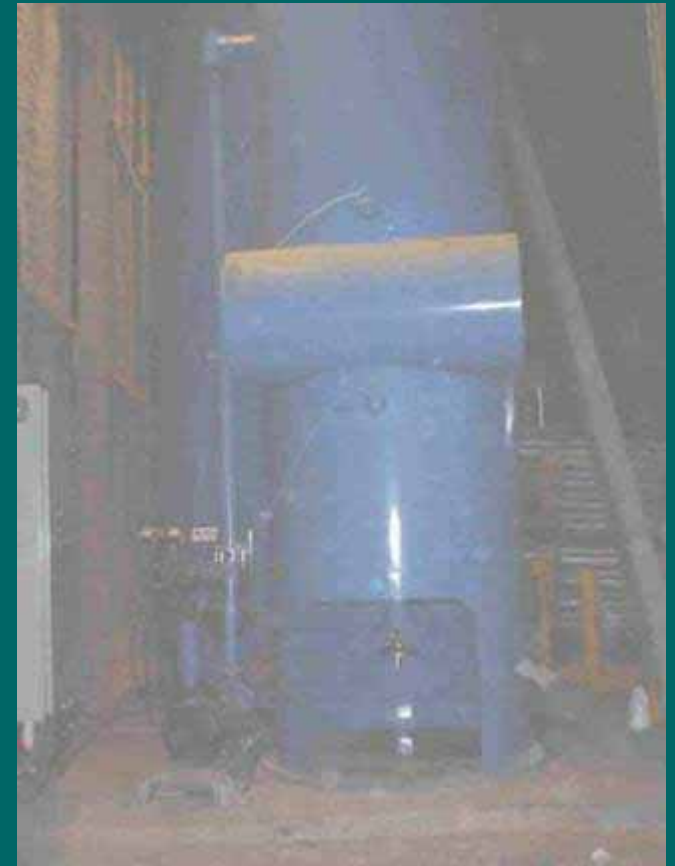
❑ DISPERSION

- efficient means of odour dilution in the ambient air
- modeling useful in assessment of ambient odour concentrations from existing and new sources

❑ ODOUR CONTROL TECHNOLOGIES AND MANAGEMENT PRACTICES

- staged approach that includes containment, collection, treatment, dispersion and on-going monitoring

Photos Oct 2004



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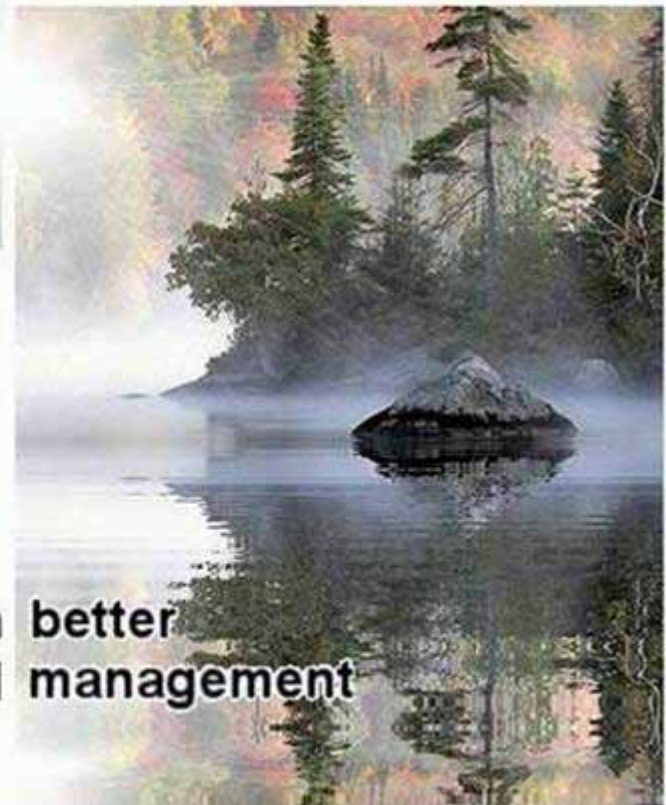
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