PN-ABU-156

MCGILL ENVIRONMENTAL SYSTEMS, INC.
CHIANG MAI SOLID WASTE MANAGEMENT

Thailand
September 18-24, 1994

Prepared for:

US - ASIA ENVIRONMENTAL PARTNERSHIP

WEC

WORLD ENVIRONMENT CENTER

DISCLAIMER

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I. EXECUTIVE SUMMARY

An Environmental Business Exchange (EBE) was conducted from September 18 to 24, 1994, bringing two volunteer experts from McGill Environmental Systems, Inc. (MES) to Thailand. Both James H. McGill, President of McGill Environmental Systems, Inc. and M. Noel Lyons, Vice President and General Manager of McGill traveled to Thailand.

The purpose of the exchange was for the participants to assist involved parties reach an agreement for the construction of an integrated solid waste management facility for the Chiang Mai Municipality. As solid waste experts, the two participants on this exchange were to facilitate the completion of the site selection process as well as continue negotiations toward an agreement with a Thai partner to construct and operate the integrated solid waste facility.

Chiang Mai is currently resorting to placing its municipal solid waste (MSW) on publically owned lands in and around the city. This tenuous arrangement is less than desirable, as recently evidenced by the pile-up of MSW on Chaing Mai's streets when the army refused to allow the city to continue using a site on one of its based as an unsecured dump.

McGill Environmental Systems began an evaluation of Chiang Mai's long term MSW management options in early 1993. Its evaluation and subsequent recommendations were based upon environmental, social, economic, and, to a lesser extent, political considerations.

Funding for this project was provided through a Cooperative Agreement between the World Environment Center and the United States-Asia Environmental Partnership (US-AEP).

II. INTRODUCTION

The development of a rational strategy for the proper management of Chiang Mai's municipal solid waste (MSW) remains an elusive goal for the City's politicians. Related efforts on the part of the City to find environmentally suitable, publically acceptable locations for a landfill have proven to be unsuccessful.

Efforts at thermal destruction of its waste in a locally designed incinerator yielded results that forced the abandonment of this idea, and the prospect of reopening the City's old landfill has diminished considerably since it has been established that leachate from this unsecured facility is finding its way into nearby drinking water wells.

Chiang Mai is currently resorting to placing its MSW on publically owned lands in and around the City. This tenuous arrangement is less than desirable, as recently evidenced by the pile-up of MSW on Chiang Mai's streets when the Army refused to allow the City to continue using a site on one of its bases as an unsecured dump.

McGill Environmental Systems began an evaluation of Chiang Mai's long term MSW management options in early 1993. Its evaluation and subsequent recommendations were based upon environmental, social, economic, and, to a lesser extent, political considerations.

A pilot scale composting project, funded by USAID and conducted in association with the University of Chiang Mai, proved to be very successful. Based upon the results of this project and an intimate understanding of the various fractions of the MSW stream, MES developed an integrated separation, recycling, and composting plan.

This was presented to the City of Chiang Mai and a Letter of Intent to physically develop this plan was signed by the Lord Mayor and MES in June of 1994. However, political opponents of the Mayor have sought to politicize Chiang Mai's MSW problem as a means of compromising his re-election prospects.

MES speculates that political indecisiveness will continue to prevail with respect to Chiang Mai's making a decision on its MSW problems until after next year's local elections. Because of this, MES and its Thai partner have decided to develop an integrated solid waste facility on privately owned land and with private funds. In addition to serving the MSW needs of the Municipality of Chiang Mai, this facility will also serve other communities and industrial clients.

III. SUMMARY OF FINDINGS

A. Summary of Solid Waste Situation in Chiang Mai, Thailand

For several years, Chiang Mai Municipality has attempted to find a long-term strategy for solid waste management.

An unsecured landfill was closed three years ago when leachate contaminated nearby drinking water wells, and an incinerator built in the early 1990s failed to work. The Municipality has, of necessity, resorted to placing its solid waste in non-engineered holes excavated on a variety of publically-owned properties, including military bases, prisons, and municipally owned sites. Even this stop-gap system failed, and garbage piled up on the streets of Chiang Mai.

Chiang Mai's garbage has a high moisture content, making it unsuitable for all but the most expensive incineration systems. An informal scavenger system removes some of the recyclables from the waste stream, but the organic portion of the stream contaminates many recyclables, making it impossible to exploit the full recycling potential of the garbage.

McGill Environmental Systems has been working for the past 21 months to provide Chiang Mai with an affordable, sustainable, economically sound solution to its solid waste problems. The recommended solution is an integrated facility which combines recycling and composting to effectively reuse almost all of the waste stream. The small quantities remaining, inert and environmentally benign, will be compacted and baled for long-term storage.

Trying unsuccessfully for several months to get the Chiang Mai government to commit to the facility, McGill and a Thai partner have formed a new corporation, McGill S&P International, which will build, own, and operate a facility to serve Chiang Mai, local industry, and surrounding communities.

The site is located about 6 km. from Chiang Mai on property available for purchase.

Expected to open in early 1995, the facility will be able to handle 100% of Chiang Mai's non-hazardous waste stream for a projected tipping fee ranging from $7 to $10 (U.S.) per ton, less than projections developed for either landfilling and substantially less than that for incineration. This facility will also serve other communities and private industry.

B. SUMMARY OF ACTIVITIES

On September 18, 1994, James H. McGill and M. Noel Lyons met in Bangkok with R. J. Gurley, USAID/Thailand; Sopone Pruksananont, McGill's Thai partner; and George Hooker, the Brooker Group Ltd., to discuss the proposal MES had prepared to present to Chiang Mai Municipality. The proposal, as outlined, addressed such issues as volumes, waste characteristics, environmental safeguards, public acceptance and cost. Later, McGill, Lyons, Sopone, and Gurley met with Dr. Vichit, who was described as an advisor to the Central Government. He endorsed the proposal and made a telephone call during the meeting to the Mayor of Chiang Mai, urging him to sign a contract with McGill S&P International. Furthermore, he assured MES that the Mayor had the authority to sign such a contract.

However, the next day, in a meeting with the Mayor of Chiang Mai, Deputy Mayor, and Director of Sanitation for the city, MES was informed that the Mayor did not have authority to sign such a contract and that, in fact, he was continuing to pursue a temporary landfill option even though this route was meeting with considerable public resistance and raised genuine environmental concern. (The cost was also higher than the McGill option, both from a capital investment and user fee point of view.)

During a later meeting with the Governor of Chiang Mai Province, it was revealed that a proposal had been made by the developers of a regional fossil fuel power plant to burn the garbage. This plant is not expected to be in operation for a number of years. The Governor suggested a separation/transfer station near the proposed incineration plant -- about 30-40 kilometers from Chiang Mai. This would, no doubt, prove to be quite expensive for the city due to distance and the high moisture content of the garbage. (Because of the costs of transportation and the questionable nature of such a facility, we are skeptical of its viability.) MES later established that the proponents of the proposed fossil fuel generating stations were, in fact, the transmission arm of the national electric company. As a transmission entity, they are seeking to use garbage incineration as an entry into the electric generation business.

It was learned that the city has been offered a number of high tech options, including anaerobic digestion by liquefying garbage, treating the liquid it in a waste water treatment plant and compacting the biodegradable solid fraction for on-site landfilling. This option would have to include, by necessity, a wastewater treatment plant to ensure discharges to the Ping River would not compromise "in river" environmental conditions.

McGill S&P International had finally concluded that the Municipality would not be in a position to make a decision that would move the transfer station project forward. On Wednesday, McGill, Lyons, and Sopone decided to proceed with the project as a totally private enterprise without a formal agreement with the city.

Evaluation criteria for this decision included the following factors:

1. Chiang Mai's garbage is not going to go away. In fact, population projections anticipate a substantial increase in numbers within a relatively short period of time.

2. The McGill-S&P option is the most publicly acceptable, poses the smallest threat to the environment (both now and in the future), and is the least expensive.

3. A privately owned facility will be able to accept material from industry and other municipalities.

4. It may be easier for Chiang Mai to commit to a tangible facility than to an abstract concept.

5. The Chiang Mai facility can be developed as a model for other cities.

6. McGill-S&P believes it can secure the funds necessary for construction, and start-up.

McGill S&P International proceeded to visit potential sites for the facility. The selected site offers several advantages to the company:

a. It is sited at the intersection of two new highways.
b. It is close to Chiang Mai.
c. There are no neighbors.
d. It is "on the market."

Later activities of the exchange included a visit to the military base which is, once again, the current disposal site for Chiang Mai's municipal solid waste. In addition to the poor road conditions, the dumping would appear to have a substantial, negative environmental impact as the site is located upstream from the city and waste is being dumped below the groundwater table.

It was obvious from the visit to this temporary dumping site that Chiang Mai's current MSW disposal costs, as evidenced by the expensive equipment in use, may go well beyond the $10/ton tipping fee proposed by McGill Environmental Systems. (Except for labor, MES did not see any indication that operating costs were any cheaper in Thailand than they are in the U.S.)

MES again met with city officials and a representative from the Ministry of the Interior to discuss its decision to move ahead with construction without a formal agreement from the City. Reaction to the plan was favorable.

The MES participants also met in Bangkok to present its development plan to USAID (the agency offered to provide video documentation of construction progress) and to discuss with developer Forest Spraigue the idea of using adobe bricks in the construction of the facility. The bricks offer environmental and aesthetic benefits, but price will be the determining factor. MES also met with USAID contracting to discuss details of a pending grant proposal.

The final meeting of the trip was with Mr. Sopone, to discuss more details about the partnership, how to proceed to work out details of this facility, and expansion to other areas.

CONCLUSIONS AND RECOMMENDATIONS

A. There is a dire need for a facility of McGill S&P International's description in Chiang Mai Province.

B. Chiang Mai is in the position to receive outside expertise in solid waste management.

C. Thailand's rapid growth rate would seem to justify a private venture.

APPENDIX A

PHOTOGRAPHS

CHIANG MAI

SITE FOR LONG-TERM STORAGE FACILITY

SITE OF TRANSFER STATION.
FROM LEFT:

R.J. GURLEY, USAID
FORREST SPRAIGUE, ADOBE BRICK
M. NOEL LYONS, MES
J.H. MCGILL, MES
SOPONE PRUKSANANONT, MCGILL S&P

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■ Garbage continues to pile up in Chiang Mai, despite the efforts of 600 volunteers to carry it away. Meanwhile, the 360 million baht approved by the Public Works Department for a garbage incinerator will be spent instead on a disposal project, a Chiang Mai MP confirms. The trash is going to temporary landfills on military land, in a Chiang Mai graveyard and on deteriorated forest land outside the city while the search goes on for a permanent solution. 'This garbage crisis stinks!' one exasperated tourism operator said last week. 'Surely someone can resolve this mess before the SEA Games '95,' said another.

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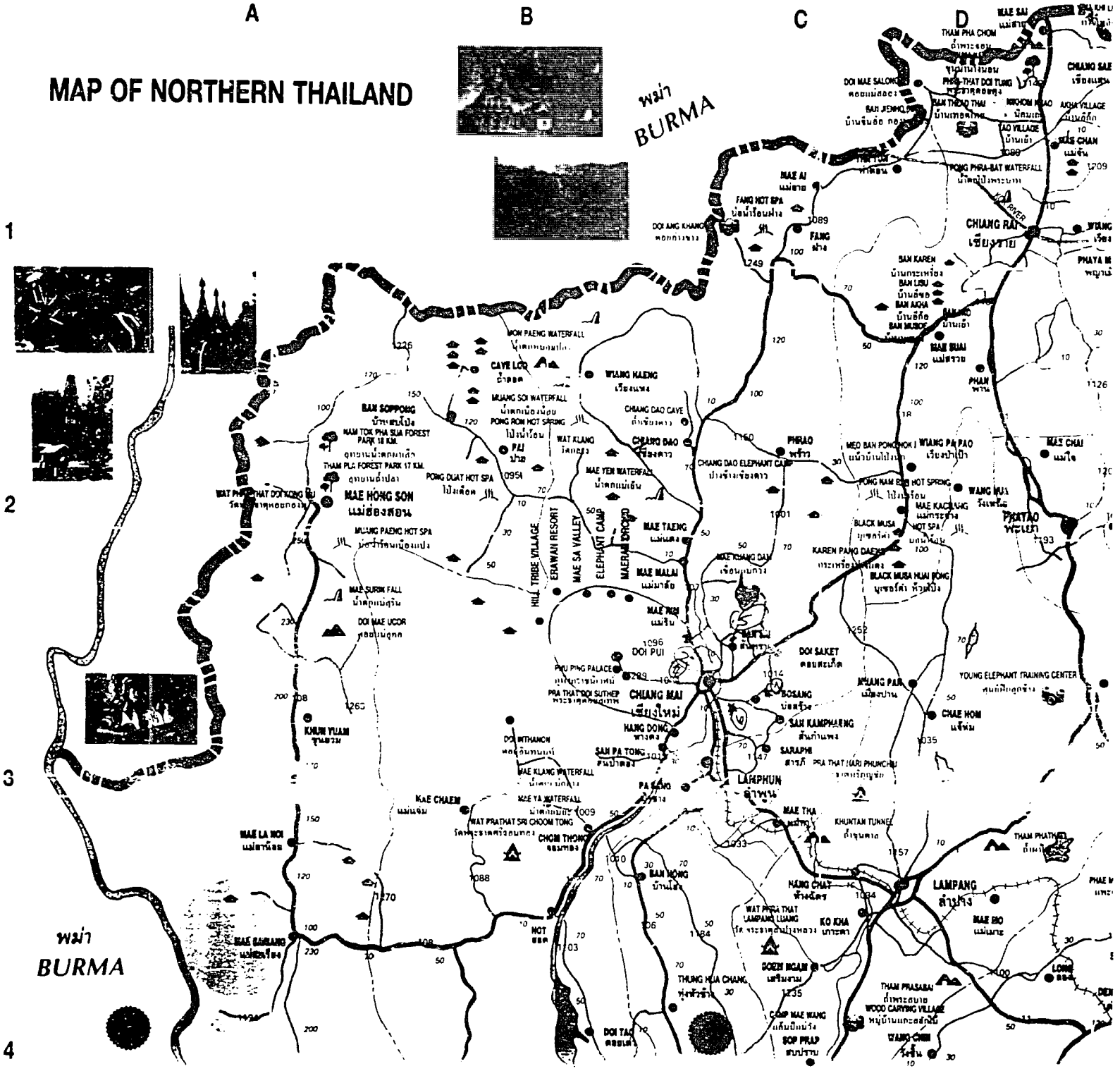
MAP OF NORTHERN THAILAND



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APPENDIX B

BUSINESS CARDS OF PERSONS CONTACTED

บริษัท ไทยนิจิ เซบิ จำกัด
THAI NICHI SEIBI CO.,LTD.

KWON OHCHAN
VICE PRESIDENT

226/4-5 BANGNA-TRAD RD. BANGNA
PRAKANONG BANGKOK 10260
TEL : 398-6059
FAX : 398-6059

VIRATANA OPASNIPUTH
Ph.D. (Anal., Chem.)
Dept. of Chemistry
Chiangmai University

Factory	Home
K.V.Technology Co.,Ltd.	330/19 Chiangmai Land,
Northern Region Industrial Estate,	Changklan Rd., Chiangmai,
Lumphoon, Thailand.	Thailand.
Tel. (053) 581-430-1	Tel. (053) 272796

United States Agency for International Development
Regional Support Mission / East Asia

THOMAS M. STEPHENS
Regional Contracting Officer

Melvin Friday

37 Petchburi Soi 15
Petchburi Road
Bangkok 10400

Phone : 255-3651-9
Fax : 255-3730

THE BROOKER GROUP LTD
Integrating the Resources of IMRS and
SEAMICO Business Information & Research

สันติ จาเตอร์ยี
Santi Chatterjee
Executive Director

2nd Floor, Zone D, Room 201/2
Queen Sirikit National Convention Center
60 New Rachadapisek Road
Klongtoey, Bangkok 10110, Thailand

Tel: (662) 229-3111
Fax: (662) 229-3127

USAID/Thailand

นรินทร์ ทิมา
NARINTR TIMA
MANAGEMENT SPECIALIST

U.S. Agency for International Development
37 Soi Phetchaburi 15
Phetchaburi Road
Bangkok 10400

255-1287

Tel: 255-3651
Fax: (662) 255-373.

ปลายอ้อ ทองสวัสดิ์
PLAI-AUW THONGSAWAT
Economic & Commercial Assistant

สถานกงสุลใหญ่อเมริกา เชียงใหม่
ถนนวิชยานนท์ อ.เมือง เชียงใหม่ 50000
AMERICAN CONSULATE GENERAL, CHIANG MAI
Wichayanont Road, Chiang Mai 50000
Tel : (053) 252629-31 Ext. 123 Fax: (053) 252633

UNITED STATES
AGENCY FOR INTERNATIONAL DEVELOPMENT

R. J. GURLEY
U.S. BUSINESS ADVISOR

37 PHETCHABURI SOI 15
PHETCHABURI ROAD
BANGKOK 10400

TEL : (662) 255-3650-9
EXT. : 328
FAX : (662) 255-3730

BEST AVAILABLE COPY

JUDITH A. STROTZ
CONSUL GENERAL OF THE
UNITED STATES OF AMERICA

CONSULATE GENERAL
387 WICHAYANOND RD.
CHIANG MAI, THAILAND

TEL : (66) (53) 252-629
FAX : (66) (53) 252-633

APPENDIX C

RESUMES

RESUME

JAMES H. McGILL

PRESIDENT/CEO
McGill Environmental Systems of N.C. Inc.
Rt. 1 Box 212
Rose Hill, NC 28458

GENERAL

Specialist in environmental research and management, predominately in solid waste (hazardous and non-hazardous). A 20-year work history in the field has been devoted to the characterization of solid waste problems and devising/implementing management solutions. Particular emphasis has focused on developing and applying appropriate technologies to these problems. These technologies include anaerobic digestion, aerobic biological treatment methods (including composting and bioremediation), chemical treatment, and physical treatment through incineration.

EDUCATION

Masters of Science in Environmental Science from Cook College, Rutgers University. New Brunswick, NJ, in 1979

Bachelor of Science in Zoology from Rutgers University, Newark, NJ, in 1975

Bachelor of Arts in History and Archaeology from Dublin University, Dublin, Ireland, in 1966

EXPERIENCE

1985 TO PRESENT

Design and construction of bioremediation and composting facilities for the treatment of solid and liquid wastes

Chief Executive Officer, McGill Environmental Systems; responsible for research/development and all aspects of environmental management

Consultant to public and private entities on matters pertaining to the evaluation, characterization and management of various waste materials, specializing in resource and recovery and reuse with emphasis on the feasibility of composting, landfilling, and incineration

Direct laboratory and bench scale feasibilities studies on the biological treatment of a variety of municipal and industrial wastes

Vice President (Environmental and Community Affairs) of a $2 billion (U.S.) energy project (1989 to present)

1979 TO 1985

Advisor to municipality on environmental consequences of reactivation of a waste paper incinerator

Consultant to engineering company on environmentally sensitive issues and public concerns associated with sewage treatment plant construction

Advisor to industrial company on potential environmental impacts of air pollution discharged to environment in ecologically sensitive areas

Consultant to public body on the distribution and concentrations of carcinogenic compounds in potable water sources

Consultant to citizens advisory group on the environmental significance of land rezoning

1978 TO 1985

Lecturer in solid waste management and environmental impact statement writing and analysis, Cook College, Rutgers University

1966 TO 1971

Educator, cultural and environmental studies

SCIENTIFIC RESEARCH

Impacts of residential and industrial wastes on environmental quality

Quantification and identification of air pollutants resulting from industrial sources

Study of the physical, chemical and biological changes in a commercial shell fishery subjected to sludge dumping

The isolation and quantification of synthetic organic compounds in drinking water

In-situ study of the rate of uptake on heavy metals by various crops impacted by pollutants

Changes in the constituents of a macroinvertebrate population subjected to inorganic pollutants

RESUME

M. Noel Lyons

VICE PRESIDENT/GENERAL MANAGER
McGill Environmental Systems of N.C., Inc.
Rt. 1 Box 212
Rose Hill, NC 28458

EDUCATION

Advanced degree in Supervisory Management (with Distinction) from the Irish Management Institute, Tralee, County Kerry, Ireland, 1986

Bachelors degree in Agricultural Science from the Waterford Regional Technical College, Waterford, Ireland, 1982

EXPERIENCE

1990 to PRESENT -- McGill Environmental Systems of N.C. Inc., Rose Hill, North Carolina

Assisted in the design of the state's first fully contained treatment facility for the bioremediation of petroleum contaminated soils and other organic waste streams

Responsible for implementation of the "McGill Process" for environmentally-safe treatment and reuse of organic contaminants and wastes

General Manager of North Carolina operations responsible for all facets, including regulatory compliance

1983-1990 -- Fealebridge and Headley Bridge Cooperative Dairy Society Ltd., Abbeyfeale, County Limerick, Ireland

Director, Environmental Division, 1988-1990. Developed biological waste treatment systems; researched and developed waste treatment strategies necessary to comply with environmental regulations.

Environmental specialist, 1983-1988. Functioned as an advisor to individual society members on matters related to agricultural pollution. Responsibilities included field monitoring, laboratory analysis and regulatory compliance.

1982-1983 -- McGill Environmental Systems, County Limerick, Ireland

Engaged in research of high rate anaerobic digestion of a variety of agricultural wastes involving the monitoring and evaluating of the biological breakdown of swine and bovine wastes from environmental and energy recovery standpoints.

July 1994

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ENVIRONMENTAL SYSTEMS

McGill Environmental Systems
Easton, Pennsylvania (USA)

McGill Environmental Systems
Rose Hill, North Carolina (USA)

Hanson-McGill
Gotenborg, Sweden

McGill S&P Intl.
Chiang Mai, Thailand

McGill Environmental Systems (MES) is an environmental management firm specializing in the microbiological stabilization and remediation of solid and liquid waste streams from various industries (petroleum, food, textile, plastics, chemical, agriculture, etc.), as well as municipalities.

MES designs, builds, and operates facilities to recycle these waste streams through cost-effective, environmentally sound, aerobic and anaerobic systems.

This scientific, microbiological approach creates and sustains specialized processing environments specific to individual waste stream characteristics. Microprocessor control of temperature and moisture conditions enhance biodegradation through the management and subsequent proliferation of specially-selected, microbial populations.

The resulting marriage of microbe to contaminant accelerates biodegradation, but keeps the process safely within the purview of nature's own decomposition system.

The McGill systems are flexible and applicable to both hazardous and non-hazardous waste streams, can be designed as permanent MES-owned or client-owned facilities, or may be structured as temporary facilities for on-site clean-up operations.

Process overview

The McGill process works with natural decomposition systems and does not rely on genetic engineering. Because of this natural approach, the McGill process carries none of the public relations and liability risks associated with land farming, incineration, and other remediation/disposal methods.

Additionally, the MES system places little demand on the infrastructure of the host community, produces no waste, and makes use of the skills and expertise common to a rural labor force.

Finished composts are fertilizers and soil amendments to be used in agriculture, horticulture, silviculture, and land reclamation. Recycling organic and other compatible wastes in this manner provides an economical, environmentally safe alternative to disposal for as much as 70% of the world's solid waste stream, effectively recovering valuable resources and conserving landfill space.

TELEPHONE:

1-800-728-4130 (U.S.)
or
INT+910-532-2704

FAX:

910-532-2542

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Materials handling

Every waste stream is unique. Its biological, chemical, and physical properties dictate the specific handling and processing methods required to efficiently stabilize and remediate the waste. Bench scale studies on each source material, conducted in MES laboratories, determine the specific moisture, temperature, oxygen, and porosity requirements for processing.

Materials are processed in a controlled, contained environment with continuous monitoring and maintenance of temperature and moisture conditions. Blending, storage, and processing buildings are constructed with concrete floors to safeguard groundwater and to accommodate an air handling system integral to the McGill forced aeration composting system.

End of treatment analyses, process monitoring, and regular sampling/analyses programs are required for regulatory and facility protocol compliance.

Once treatment/processing is complete, the source materials cease to be wastes and are no longer regulated. The McGill process optimizes the beneficial attributes of each source material, resulting in finished composts developed to satisfy nutritional, pH, and other production demands for specific crops.

Protocol

Depending upon the regulatory requirements of the governing agency, processing may be authorized and permitted either by a blanket permit, by source specific permits, or by a combination of both permitting systems.

Regulatory authorization to accept and process waste materials involves submittal of appropriate laboratory analyses and other relevant information. Transportation of contaminated soils can be authorized immediately upon receipt of required analyticals. The permitting process for biosolids typically takes about 60 days.

Once transport and processing is permitted, soils and biosolids are transported (secured) to a McGill facility accompanied by a Non-Hazardous Waste Manifest and Chain of Custody documents.

With receipt of the signed Chain of Custody document, McGill Environmental Systems assumes full responsbility for all materials to be processed.

Drivers must present empty and loaded weigh tickets from a certified scale prior to off-loading material. Each ticket must be signed and dated by the weighmaster and include vehicle and project identification.

The McGill Group

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MES/Pennsylvania, founded in the late 1970s, is an environmental management firm specializing in strategic planning and systems design. Its client base is generated, primarily, from consulting work in the New York/New Jersey/Pennsylvania area. However, it also manages projects in Ireland and the Philippines and is the primary research and development arm of the McGill Group.

MES/North Carolina, has operated a bioremediation/composting facility near Delway in rural Sampson County since 1990. The site consists of approximately 22 acres, where 150 tons of non-hazardous, non-toxic wastes are processed each day. Its modular design will enable MES/North Carolina to expand to 500 tons per day at its present location. Also attached to the Delway operation is the McGill Model Farm, a

research/demonstration project, designed to show how recycled organic wastes can be effectively and safely used in agriculture.

Hanson-McGill, formed in 1993, develops and manages remediation projects in Scandinavia. Its primary focus is on-site bioremediation systems for large-scale clean-up projects, including hazardous waste sites.

McGill S&P International, the newest member of the McGill Group, will construct and manage integrated facilities for municipal solid waste in Thailand. The first McGill S&P operation, a 350 tons/day transfer/recycling/composting facility for Chiang Mai Municipality in northern Thailand, is expected to break ground in late 1994 or early 1995. Chiang Mai, a growing urban center, has exhausted all available landfill space. The McGill solution for the municipality includes recycling and composting (which will eliminate about 70% of the total waste stream), augmented by compaction and storage of the remaining inert material until the landfill dilemma can be resolved.

The McGill Model Farm

Reclamation of about 200 acres of marginal cropland near the McGill Delway facility in North Carolina was begun in 1994. Approximately 10,000 cubic yards of composts and enriched topsoils were incorporated into the existing sandy soils of the Carolina Coastal Plain both prior to and during the 1994 crop season.

Purpose of the Model Farm project is to demonstrate how regional sustainability can be achieved by utilizing composts manufactured from the area's non-hazardous municipal, agricultural, and industrial waste streams to "close the loop" in southeastern North Carolina.

The composts produced by the McGill process are able to retain moisture, add tilth, and improve the soil's capacity to hold nutrients at the root zone. These qualities are particularly valuable on the Coastal Plain, where exhaustive use of agricultural chemicals (fertilizers, herbicides, and pesticides) over the years on the region's thin, sandy soils have resulted in high production costs for farmers and negative impact to area ground and surface waters.

Through the addition of its organic fertilizers and soil conditioners, MES expects to meet or exceed conventional crop yields within three years without the addition of chemical supplements.

The Advisory Group for the project includes the North Carolina Cooperative Extension Service, the North Carolina Recycling Association, the North Carolina Department of Agriculture, the North Carolina Office of Waste Reduction, and the Carolina Farm Stewardship Association.

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Analytical requirements

SOURCE MATERIAL	TEST
Gasoline, aviation fuel	EPA Method 5030
Leaded gasoline	EPA Method 5030 and TCLP/lead
Kerosene, diesel, #2 fuel	EPA Methods 5030 and 3550
Grease, hydraulic fluid, #6 fuel	EPA Method 9071
Waste oil	EPA Method 9071 and TCLP/metals
Biosolids	TCLP (complete), Priority Pollutant (full library scan), Fecal coliform, % Total solids, Volatile solids, Total metals, Macro/micro nutrients, Reactivity, Ignitability, Corrosivity pH
Fly ash and other processed wastes	TCLP (complete)
Manures	Waste analysis
Food processing wastes	Waste analysis

TESTS MAY BE ADDED OR WAIVED TO MEET FACILITY AND REGULATORY REQUIREMENTS.

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McGILL

McGILL ENVIRONMENTAL SYSTEMS OF NORTH CAROLINA, INC.
Rt. 1 Box 212, (SR 1128 near Delway), Rose Hill, NC 28458-9614
TEL: 910-532-2539 FAX: 910-532-2542

1-800-728-4130

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