Annotated Bibliography:

Upland Beneficial Use of Dredged Material Testing and Evaluation

September, 2004

Second Edition

A Companion to:

Testing and Evaluating Dredged Material for Upland Beneficial Uses: A Regional Framework for the Great Lakes

This bibliography is also available online via the Great Lakes Dredging Team website at
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Introduction

This bibliography was prepared as a companion to *A Regional Framework for Testing and Evaluating Dredged Material for Upland Beneficial Uses*. Both the bibliography and the *Framework* document were compiled by the Beneficial Use Upland Testing and Evaluation Project Management Team (PMT). This team was established by the Great Lakes Commission to establish a regional approach to testing and evaluating dredged material for upland beneficial uses of dredged material. The *Framework* document is the team's product and offers that approach. This bibliography, also a product of the PMT, contains references cited in the *Framework* and many additional references that will be useful in the process of evaluating upland beneficial uses of dredged material.

The lack of pre-existing documentation on this specific topic led the PMT to compile virtually all documents that could be or had been used in evaluating dredged material for upland uses – from official rules and regulations to draft policies and internal memoranda. With more than 240 references, the bibliography is organized into two sections. The first section of the bibliography lists references according to the following categories:

A. Rules and Regulations
B. Planning Guidance
C. Testing and Evaluation
D. Upland Site Monitoring and Management
E. Applications

The second section lists the references in numerical order and provides full citation information and descriptions of the documents.

Although all references were reviewed by members of the PMT, the team has no guarantee of the accuracy of the information and data presented in the documents referenced. Again, the lack of information availability within the region on this topic resulted in a desire to include as much information as possible without specific regard to the quality of the source. References were excluded based relevance to the topical area only. The user is advised to make an evaluation of each information source independently.

A. Rules and Regulations

All Great Lakes States:

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4: Water Resources Development Act of 1992, Section 204–Beneficial Use of Dredged Material

Illinois:

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Indiana:

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Michigan:

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12: Natural Resources and Environmental Protection Act, Part 111–Hazardous Waste Management. (1995)

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211: General Permit for Dredged Material in Road Applications Bureau of Land Recycling and Waste Management

209: General Permitting Procedure. (1993) Bureau of Land Recycling and Waste Management

198: Municipal Waste Management Regulations

206: The Noncoal Surface Mining Conservation and Reclamation Act

210: Policy and Procedure Establishing Criteria for Use of Uncontaminated Soils, Rock, Stone, Unused Brick and Block, Concrete and Used Asphalt as Clean Fill. (1996) Bureau of Land Recycling and Waste Management

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180: Residual Waste Management Regulations

207: The Surface Mining Conservation and Reclamation Act

27: Water Quality Toxics Management Strategy Pennsylvania Department of Environmental Protection

Wisconsin:

28: Authorization for Hearing on Revision of Chapters NR 204, NR 214, NR 219, and NR 518 of the Wisconsin Administrative Code, Pertaining to PCB Soil Criteria Rule Amendments. (2003)

29: Beneficial Use of Industrial Byproducts. (1997) Wisconsin Department of Natural Resources

30: General Solid Waste Management Requirements Wisconsin Department of Natural Resources

31: Landfill Location, Performance, Design and Construction Criteria Wisconsin Department of Natural Resources

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33: Sediment Sampling and Analysis, Monitoring Protocol and Disposal Criteria for Dredging Projects. (1989) Wisconsin Department of Natural Resources

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B. Planning Guidance

All Great Lakes States:

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C. Sediment Testing and Evaluation Guidance

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Michigan:

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81: Part 201 Generic Soil Saturation Concentrations. (1998) Michigan Department of Environmental Quality: Environmental Response Division

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Year: 1994

Secondary Title: 33 USC 1341

Public Law: 92-500

Application to Upland Testing: Clean Water Act section 401 establishes regulatory guidance (federal rules) as applied to permitting requirements for upland beneficial uses of dredged material. Section 401 requires facilities of any kind (including proposed beneficial upland uses of dredged material) to comply with applicable water quality standard requirements. It provides the states with the authority to issue certification that proposed activities will not violate applicable state water quality standards. In summary, Section 401 requires that potential discharges from upland sites meet applicable state water quality criteria.

URL: http://www.usace.army.mil/inet/functions/cw/cecwo/reg/sec401.htm

2: Clean Water Act, Section 404

Year: 1994

Secondary Title: 33 USC 320-330

Public Law: 92-500

Application to Upland Testing: Clean Water Act section 404 serves as guidance for regulation of leachates from upland sites of beneficial uses of dredged material. Section 404 is the primary federal statute regulating the discharge of dredged or fill material into waters of the United States. Section 404 applies to the disposal of dredged or fill material into lakes, rivers and wetlands. It also applies to any "return water" from the upland disposal of dredged material, such as the effluent from a CDF. Section 404 does not apply to the placement of dredged material at upland sites, unless that site is a fill created in waters of the U.S.

Section 404 designates the USACE as the lead permitting agency and the use of guidelines developed by the USEPA in conjunction with the USACE. Section 404 guidelines require consideration of potential impacts of the disposal on the public interest. Generally this requires that a proposed discharge does not cause any significantly adverse effects (e.g. by contaminants) on 1) human health and welfare (e.g. water supply, fish consumption); 2) aquatic life; 3) ecosystem characteristics and functions, and 4) recreational, aesthetic and economic values. The guidelines are considered to be met meet if a proposed discharge or fill complies with state water quality standards for Section 401 certification. In summary, Section 404 applies to the regulation of upland uses such that it requires that potential effluents or "return waters" must meet state water quality criteria for 401 certification.

URL: http://www.usace.army.mil/inet/functions/cw/cecwo/reg/sec404.htm

3: Standards for the Use or Disposal of Sewage Sludge

Author: U.S. Environmental Protection Agency

Secondary Title: Metals Limits

Public Law: 40 CFR 503

Application to Upland Testing: 40 CFR 503 is an EPA regulation passed under the authority of the Clean Water Act, section 405, D and E. It governs uses, including land disposal, of "biosolids." It could potentially be used as guidance for similar applications of dredged material or especially mixes of biosolids and dredged material. Contaminant criteria are included, which could apply to evaluating beneficial uses of dredged material.

URL:
http://a257.g.akamaitech.net/7/257/2422/14mar20010800/edocket.access.gpo.gov/cfr_2002/julqtr/40cfr503.11.htm

4: Water Resources Development Act of 1992, Section 204–Beneficial Use of Dredged Material

Secondary Title: Section 204, WRDA 1992

Public Law: 102-580

Application to Upland Testing: WRDA Section 204 established USACE authority for implementing aquatic ecosystem restoration projects in connection with dredging. This is where beneficial uses of dredged material in the Great Lakes basin are delineated. Authority is limited to aquatic ecosystem restoration and therefore has limited applicability for uses in upland environments.

URL: http://216.161.14.72/docs/wrda92.pdf

5: 35 Illinois Administrative Code, Subtitle C

Public Law: 35 IAC

Application to Upland Testing: Many of the Articles in Title 35 of the Illinois Administrative Code, though not directly related to sediment disposal per se, could have some bearing on sediment disposal operations. In particular:

- 35 IAC 302 - Water Quality Standards, can serve as a comparison gauge for sediment dewatering liquid and elutriate results
- 35 IAC 395, Chapter II: Preliminary Assessment, outlines basic provisions for using dredged materials for beach nourishment. These rules require particle size analysis and supernatant testing if the material is >20 percent fines
- 35 IAC 742 contains the procedures for risk-based assessments that could be applied to beneficial uses of dredged material
- 35 IAC 830, subpart E, "Quality of End Use Compost" could serve as a guideline for compost mixture specifications

URL: http://www.ipcb.state.il.us/SLR/IPCBandIEPAEnvironmentalRegulations-Title35.asp

6: 327 Indiana Administrative Code

Secondary Title: Water Pollution Control Board

Public Law: 327 IAC

Application to Upland Testing: 327 IAC serves as Indiana regulatory guidance. Many of the articles in title 327 of the IAC, though not directly related to sediment disposal per se, could have some bearing on sediment disposal operations. In particular, Article 2 - Water Quality Standards, can serve as a comparison gauge for sediment dewatering liquid and elutriate results.

Article 6.1-2-6 defines "beneficial use" as the land application of biosolids and industrial waste. Indiana has no regulatory definition for beneficial use of dredged material.

URL: http://www.in.gov/legislative/iac/title327.html

7: 329 Indiana Administrative Code 10-2-174(a)(6)(B)

Public Law: 329 IAC 10-2-174(a)(6)(B)

Application to Upland Testing: 329 IAC serves as Indiana regulatory guidance for solid waste land disposal facilities. Section 10-2-174 defines "solid waste" to include contaminated sediments. Section 10-2-41 defines "contaminant" to include any pollutant listed under the Federal Water Pollution Control Act, radioactive

material under the Atomic Energy Act, RCRA solid waste, CERCLA hazardous substance, or a TSCA toxic substance. Sediments that are determined to be contaminated under this rule will be subject to solid waste regulations and may be required to be placed in a landfill.

URL: http://www.in.gov/legislative/iac/title329.html

8: Michigan Administrative Code R 92

Year: 1973

Public Law: MAC R 92

Application to Upland Testing: MAC R 92 is the Michigan code for 404 permitting and 401 certification for proposed dredging and fill disposal activities. Michigan 401 certification requires testing for physico-chemical characteristics, elutriate, toxicity, and bioaccumulation.

9: Natural Resources and Environmental Protection Act, Part 4–Administrative Rules for Part 31–Water Resources Protection

Year: 1994

Public Law: Michigan Public Act 451, Part 4, as amended

Application to Upland Testing: This regulation may be considered with respect to upland use of dredged material.

URL: http://www.michiganlegislature.org/mileg.asp?page=getObject&objName=mcl-Act-451-of-1994

10: Natural Resources and Environmental Protection Act, Part 7 (Proposed)–Administrative Rules for Part 201–Environmental Remediation

Year: 1994

Public Law: Michigan Public Act 451, Part 4, as amended

Application to Upland Testing: This regulation went into effect in December 2002. It may be considered with respect to upland use of dredged material, as it includes general cleanup criteria.

URL: http://www.michiganlegislature.org/mileg.asp?page=getObject&objName=mcl-Act-451-of-1994

11: Natural Resources and Environmental Protection Act, Part 55–Air Quality

Year: 1995

Public Law: Michigan Public Act 451, Part 55

Application to Upland Testing: This regulation may be considered with respect to upland use of dredged material.

URL: http://www.michiganlegislature.org/mileg.asp?page=getObject&objName=mcl-Act-451-of-1994

12: Natural Resources and Environmental Protection Act, Part 111–Hazardous Waste Management

Year: 1995

Public Law: Michigan Public Act 451, Part 111

Application to Upland Testing: Dredged material is considered a solid waste under Part 115 (Solid Waste Management) of Public Act 451. Both, Part 111 and Part 115 of Public Act 451, are used to evaluate the dredged material. Both laws indicate acceptable contaminant levels for determination of whether the material is hazardous. The contaminant criteria are based on Part 201. All dredged material must be evaluated pursuant to Part 111 to determine if it is hazardous. If the dredged material is hazardous, the proposed beneficial use may not be allowed and the material becomes subject to Part 111 and federal hazardous waste regulations.

It appears that in Michigan, an evaluation pursuant to Part 111 is a prerequisite for determining whether dredged material is suitable for upland use.

URL: http://www.michiganlegislature.org/mileg.asp?page=getObject&objName=mcl-Act-451-of-1994

13: Natural Resources and Environmental Protection Act, Part 115–Solid Waste Management

Author: State of Michigan

Year: 1995

Public Law: Michigan Public Act 451, Part 115

Application to Upland Testing: Dredged material is considered to be a solid waste under Part 115 (Solid Waste Management) of Public Act 451. Both, Part 111 and Part 115 of Public Act 451, are used to evaluate the dredged material. Both laws indicate the acceptable contaminant levels for upland use. The contaminant criteria are based on Part 201. All dredged material must be evaluated pursuant to Part 111 to determine if it is hazardous. If the dredged material is hazardous, the proposed beneficial use may not be allowed and the material becomes subject to Part 111 and federal hazardous waste regulations. If the material is not hazardous, it then becomes subject to Part 115 requirements and placement outside of a landfill may be approved. Beneficial uses for some dredged materials exceeding standards can be considered as long as such uses limit certain routes of exposure.

Rules 4111-4119 of Part 115 contain the references for the contaminant criteria that must be met for upland placement outside of a landfill.

Operational Memorandum 115-10 contains sample contaminant criteria that are established to be protective from harmful inhalation exposures

URL: http://www.michiganlegislature.org/mileg.asp?page=getObject&objName=mcl-Act-451-of-1994

14: Natural Resources and Environmental Protection Act, Part 201–Remediation

Year: 1995

Public Law: Michigan Public Act 451, Part 201–State Environmental Response Program

Application to Upland Testing: NREPA part 201 sets forth standards by using a risk-based process for all dredging projects, regardless of their disposal or use option. Following the risk-based process, it takes into account all applicable exposure pathways. The allowable end use depends on the exposure pathways and on which Michigan contaminant criteria are met. The allowable end use can also vary depending on the proposed management.

URL: http://www.michiganlegislature.org/mileg.asp?page=getObject&objName=mcl-Act-451-of-1994

15: Minnesota Rules Chapter 7001 & 7050

Author: Minnesota Pollution Control Agency

Application to Upland Testing: Chapters 7001 and 7050 contain the Minnesota code for 404 permitting and 401 certification for proposed dredging and fill disposal activities. Minnesota 401 certification requirements are project-specific.

URL: http://www.revisor.leg.state.mn.us/arule/7001/

http://www.revisor.leg.state.mn.us/arule/7050/

16: 6 NYCRR Part 360

Author: New York State Department of Environmental Conservation

Year: 1997

Secondary Title: Solid Waste Management Facilities

Public Law: 6 NYCRR Part 360

Application to Upland Testing: These regulations govern the management of a broad array of solid wastes, not just dredged material. They establish criteria used by the New York State Department of Environmental Conservation (NYSDEC) to determine whether a proposed use of a dredged material is considered beneficial. Under Part 360, a beneficial use must constitute a reuse rather than disposal. It must also be consistent with New York State Solid Waste Management Policy to reduce, reuse, and recover energy and landfill. The material must serve as an effective substitute for an analogous raw material, whether used in a manufacturing process or as a direct commercial product. There must be demonstrated markets for the material/product. Finally, the beneficial use must not adversely affect human health and safety, the environment, or natural resources.

If a proposed use of dredged material meets the criteria for beneficial use of a solid waste set forth in Part 360, a Beneficial Use Determination (BUD) may be granted, at which point the dredged material ceases to be considered a solid waste. Part 360 -1.15(b) establishes 3 pre-determined BUDs that are potentially applicable to upland uses of dredged material: (1) uncontaminated soil which has been excavated as part of a construction project, and which is being used as a fill material, in place of soil native to the site of disposition 360-1.15(b)(7); (2) solid wastes which are approved in advance in writing by the department for use as daily cover material or other landfill liner for final cover system components (360-1.15(b)(10); and (3) recognizable, uncontaminated soil...when placed in commerce for service as a substitute for conventional aggregate. Part 360-1.15(d) provides guidance to evaluate those beneficial use project proposals that don't fit into one of the pre-determined BUDs (case-specific BUD). Applications for such uses need to be submitted to and approved by the NYSDEC on an individual basis. In addition to pre-determined and case-specific BUDs, proposed beneficial use projects may be evaluated as a Research, Development and Demonstration (RD&D) project under Part 360-1.13. Requirements for RD&D projects are intentionally very flexible to encourage the development of innovative technologies and processes.

URL: http://www.dec.state.ny.us/website/regs/360.htm

17: Petroleum-Contaminated Soil Guidance Policy

Author: New York State Department of Environmental Conservation: Division of Environmental Remediation

Year: 1992

Secondary Title: Spills Technology and Remediation Series (STARS) Memo No.1

Application to Upland Testing: STARS Memo 1 outlines New York's policy for determining sufficient cleanup of petroleum spill sites, based on groundwater protection and human health risk. The approach is based on comparison of toxicity characteristic leaching procedure (TCLP) results to groundwater quality standards is recommended for determining the extent of soil remediation to protect groundwater. This guidance is intended to address only petroleum-related contaminants at spill sites, principally volatile and semi-volatile organic compounds. Some discussion of remedial technologies and beneficial reuse of petroleum-contaminated soils is included at the end of the memorandum.

This document may provide relevant guidance for dredge material testing and evaluation where petroleum organic contaminants are of concern.

URL: http://www.dec.state.ny.us/website/der/stars/pr6star1.html

18: 3734 Ohio Revised Code

Secondary Title: Ohio Hazardous Waste Facility Board

Public Law: 3734 ORC

Application to Upland Testing: This chapter of the Ohio Revised Code outlines the rules for governing the operation of hazardous waste facilities.

URL: http://onlinedocs.andersonpublishing.com/oh/lpExt.dll?f=templates&fn=ln-searchnav-simple.htm&2.0

19: 3745 Ohio Administrative Code 27

Secondary Title: Solid Waste and Infectious Waste Regulations

Public Law: 3745 OAC 27

Application to Upland Testing: This chapter of the Ohio Administrative Code contains regulations pertaining to solid waste. Part 19 contains regulations for operation of a sanitary landfill. For daily cover use at a landfill, the appropriate section is 19(F). Final cover regualtions are contained in 19(H)

URL: http://onlinedocs.andersonpublishing.com/oh/lpExt.dll?f=templates&fn=ln-searchnav-simple.htm&2.0

20: 3745 Ohio Administrative Code 51

Secondary Title: Identification and Listing of Hazardous Wastes

Public Law: 3745 OAC 51

Application to Upland Testing: This chapter of the administrative code identifies those wastes which are subject to regulation as hazardous wastes. If there is reason to suspect that the area where the dredged material is obtained may be contaminated with hazardous waste, the material may be subjected to characterization under this rule prior to approval for beneficial use.

URL: http://onlinedocs.andersonpublishing.com/oh/lpExt.dll?f=templates&fn=ln-searchnav-simple.htm&2.0

21: Beneficial Uses of Nontoxic Bottom Ash, Fly Ash and Spent Foundry Sand, and Other Exempt Wastes

Author: Ohio Environmental Protection Agency: Division of Surface Water

Year: 1998

Number: DSW-0400.007

Application to Upland Testing: This document contains siting criteria for beneficial uses. The rule has often been used as guidance for materials other than those for which it was written and has potential applications for governing beneficial use of dredged material. However, no documented applications to evaluating beneficial (upland) uses of dredged material have yet been brought forward.

Ohio EPA has removed this document from the Division of Surface Water Policy Manual as of April 30, 2003 and is considering addressing this topic in a future rulemaking. This policy does not meet the definition of policy contained in Section 3745.30 of the Ohio Revised Code. The document no longer carries the weight of law.

URL: http://web.epa.state.oh.us/dsw/policy/04_07r.pdf

22: 3745 Ohio Administrative Code 40

Author: Ohio Environmental Protection Agency: Division of Surface Water

Year: 2002

Secondary Title: Ohio's Sewage Sludge Rules

Number: DSW Policy 0100.028

Public Law: 3745 OAC 40

Application to Upland Testing: The document contains both a reprint of the Ohio sewage sludge rules and OEPA policy regarding those rules. The policy is a written clarification or explanation of the rules, and is identified by the FAQ heading and/or is printed in italics. Unlike rules, policy does not have the force of law. The information in this policy may be used as guidance when land application of dredged material is

considered. Nonsludge materials, including dredged material, are subjected to consideration on an individual basis under the Integrated Alternative Waste Management Program (IAWMP).

OAC 3745-40-5(F) parts 1 and 3 contain the metal limits for ceiling concentrations and monthly average concentrations that cannot be exceeded. 3745-40-01(A)(20) specifies that these concentrations cannot be exceeded for a sludge to be considered "exceptional quality," which excludes it from nearly all regulations, as specified under 3745-40-04(C). The additional requirements of an "exceptional quality" sludge are related to biological contamination and disease vectors. If these regulations were applied to dredged material, these requirements would likely not be used unless mixed with a sludge.

URL: http://web.epa.state.oh.us/dsw/policy/01_28u.pdf

23: Policy 17 (D) Dredging and Dredged Material Disposal

Author: Ohio Department of Natural Resources

Year: 1999

Application to Upland Testing: This document is a policy recommendation. While Policy 17 (D) does not specifically use the term "beneficial use," reference is made to the benefits of returning dredged sand and gravel-sized sediments to the littoral system. The cited benefits include mitigation for the long term degradation to beaches, natural shoreline protection and erosion prevention.

URL: http://www.dnr.state.oh.us/coastal/document/Chapter5b.pdf

24: State of Ohio Section 401 Water Quality Certifications

Author: Ohio Department of Natural Resources

Year: 1982

Secondary Title: Ohio Administrative Code, Chapter 3742-32

Public Law: 3745 OAC 32

Application to Upland Testing: OAC 3745-32 contains the Ohio code for 404 permitting and 401 certification for proposed dredging and fill disposal activities. Ohio 401 certification requires testing for physico-chemical characteristics, elutriate, and toxicity.

URL: http://www.epa.state.oh.us/dsw/rules/32-00.pdf

25: Water Pollution Control

Author: Ohio Environmental Protection Agency

Secondary Title: Ohio Revised Code, Chapter 6111

Public Law: 6111 ORC

Application to Upland Testing: Contains Ohio regulations regarding pollution of the state's waters.

URL: http://onlinedocs.andersonpublishing.com/oh/lpExt.dll?f=templates&fn=main-h.htm&cp=OAC

26: Water Quality Standards

Author: Ohio Department of Natural Resources

Secondary Title: 3745 OAC 1

Public Law: 3745 OAC 1

Application to Upland Testing: This chapter of the Ohio Administrative Code contains regulations regarding quality of the surface waters within the states.

URL: http://www.epa.state.oh.us/dsw/rules/3745-1.html

27: Water Quality Toxics Management Strategy

Author: Pennsylvania Department of Environmental Protection

Secondary Title: Delaware Estuary Coastal Zone Title 25, Chapter 16

Application to Upland Testing: This policy covers chemical parameters and dredged material management requirements. It outlines the procedure to be used by PDEP in developing contaminant criteria, including evaluation of cancer and noncancer health effects and effects on aquatic wildlife. Guidance for establishing Whole Effluent Toxicity Testing (WETT) is also given. Subchapter B contains a discussion of analytical methods and detection limits.

URL: http://www.dep.state.pa.us/dep/subject/draft_policies/5star.htm

28: Authorization for Hearing on Revision of Chapters NR 204, NR 214, NR 219, and NR 518 of the Wisconsin Administrative Code, Pertaining to PCB Soil Criteria Rule Amendments

Year: 2003

Application to Upland Testing: The "greensheet" is an agenda item for the Wisconsin Natural Resources Board (NRB). It includes a cover "greensheet," a background memo from the Secretary to the NRB, the fiscal note, and the proposed Wisconsin rules for PCB soil criteria. This package was presented to the NRB at their March 26th, 2003 meeting in Madison with a request for hearing authorization. It has been signed by the Wisconsin Department of Natural Resources Secretary and is in the mail to the NRB members.

The proposed rules are intended to contain the same provisions as "PCB Guidance for Land Application of Industrial Wastewater Sludge and Municipal Biosolids" and "PCB Guidance for Land Application of Solid Wastes", which were distributed to the PCB Soil Criteria Advisory Committee except in a mandatory rule format. The background memo is a summary of the proposed rules and the associated issues.

The rules will apply to industrial and municipal sludges as well as solid wastes that are spread on the land. These rules establish maximum annual application rates, requirements for PCB testing, and pollution prevention requirements. The proposed rules contain an opener clause stating that once U.S. EPA has adopted its sludge regulations for dioxin and dioxin-like compounds, the rule provisions will be examined to determine whether they should be amended. If approved, these rules are likely to also be applied to evaluate upland uses of dredged material. This is a concern because the PCB exposure pathways and risks associated with upland uses may be quite different from those associated with landspreading sewage sludge.

29: Beneficial Use of Industrial Byproducts

Author: Wisconsin Department of Natural Resources

Year: 1997

Secondary Title: Wisconsin Administrative Code, Natural Resources chapter 538

Public Law: WAC NR 538

Publisher: State of Wisconsin Department of Natural Resources

Application to Upland Testing: WAC NR 538 contains regulatory code on the beneficial reuse of industrial byproducts. It establishes criteria for the beneficial reuse of certain types of high volume industrial solid wastes, listing but not exclusive to coal ash and slag, foundry wastes, papermill sludges, and other nonhazardous solid wastes with similar characteristics. Wastes can be allowed to be used in several scenarios, with eligibility for scenarios dependent on leaching behavior and solids concentrations for several parameters. Land application is not addressed, as land application of solid wastes is regulated under another regulatory code (WAC NR 518). Parameter lists are limited to indicator compounds, metallic elements, and polycyclic aromatic hydrocarbons.

URL: http://www.legis.state.wi.us/rsb/code/nr/nr538.pdf

30: General Solid Waste Management Requirements

Author: Wisconsin Department of Natural Resources

Secondary Title: Wisconsin Administrative Code, Natural Resources Chapter 500

Public Law: WAC NR 500

Application to Upland Testing: WAC NR 500 contains Wisconsin code regarding definitions, submittal requirements, and exemptions relating to solid waste regulations. 500.08 contains language allowing exemptions from solid waste regulations. In 500.08(3), "facilities for the disposal of non-hazardous dredged material" from the Great Lakes and a number of other major waterbodies are exempted from many waste regulations. Section 500.08(5) allows the Department of Natural Resources to issue case-specific exemptions from regulations for the purpose of facilitating beneficial reuse or recycling.

URL: http://www.legis.state.wi.us/rsb/code/nr/nr500.pdf

31: Landfill Location, Performance, Design and Construction Criteria

Author: Wisconsin Department of Natural Resources

Secondary Title: Wisconsin Administrative Code, Natural Resources Chapter 504

Public Law: WAC NR 504

Application to Upland Testing: WAC NR 504 sets forth Wisconsin locational criteria and performance standards for landfills, which, by reference to exemptions in Chapter NR 500.08(3), apply to dredged material disposal projects which are exempted from the landfill siting process. The design requirements for licensed solid waste landfills can be used as necessary by reference for the design of dredged material disposal facilities. 504.04(3) lists siting criteria, including distances to waterways and water sources, roadways, and goelogic faults. 504.04(4) lists performance criteria including air and water quality, and effects on wetlands and wildlife.

URL: http://www.legis.state.wi.us/rsb/code/nr/nr500.html

32: Landfill Operational Criteria

Author: Wisconsin Department of Natural Resources

Year: 1996

Secondary Title: Wisconsin Administrative Code, Natural Resources Chapter 506

Public Law: WAC NR 506

Application to Upland Testing: WAC NR 506 contains Wisconsin code for landfill operations. Section 506.05 contains regulations mandating the use of daily cover at MSW landfills. 506.055 discusses the approval of alternate materials, potentially dredged material, for use as a daily cover. 506.13 prohibits disposal of liquid wastes unless the facility receives approval based on the existence of leachate and gas controls. Therefore, thorough dewatering may be mandated prior to use of dredged material for daily, intermediate, or final cover at a MSW landfill.

URL: http://www.legis.state.wi.us/rsb/code/nr/nr506.pdf

33: Sediment Sampling and Analysis, Monitoring Protocol and Disposal Criteria for Dredging Projects

Author: Wisconsin Department of Natural Resources

Year: 1989

Secondary Title: Wisconsin Administrative Code, Natural Resources Chapter 347

Public Law: WAC NR 347

Application to Upland Testing: WAC NR 347 covers sediment sampling and analysis methodologies, monitoring protocols and disposal criteria for dredging projects. Dredged material is considered as a solid waste under Wisconsin law. Therefore, beneficial use, including upland uses, qualifies as disposal. Section

347.07(4) contains rules regarding beach nourishment specifying that the amount of material passing a #200 sieve cannot be more than 15 percent above the background, color cannot differ significantly, and wastewater discharge permits cannot be violated.

URL: http://www.legis.state.wi.us/rsb/code/nr/nr347.html

34: Solid Waste Facilities

Secondary Title: Wisconsin Statutory Code, Chapter 289

Public Law: Wisconsin Statute 289

Application to Upland Testing: Wisconsin Statute 289 Wisconsin code regarding solid waste facilities. Under the exemptions listed in 289.43, section 289.43(8) allows for the DNR to make specific exemptions for low-hazard wastes.

URL: http://www.legis.state.wi.us/statutes/01Stat0289.pdf

35: Solid Waste Storage, Transportation, Transfer, Incineration, Air Curtain Destructors, Processing, Wood Burning, Composting and Municipal Solid Waste Combustors

Author: Wisconsin Department of Natural Resources

Secondary Title: Wisconsin Administrative Code, Natural Resources Chapter 502

Public Law: WAC NR 502

Application to Upland Testing: WAC NR 502.12 contains Wisconsin code regarding composting facilities. This section states that facilities composting materials other than yard waste, clean chipped wood, crop residue, animal manure or carcasses, and vegetable food waste are regulated under Section 502.08, "Solid Waste Processing Facilities." Operations producing compost or topsoil from dredged material would therefore be governed by this section.

URL: http://www.legis.state.wi.us/rsb/code/nr/nr502.pdf

36: Water Quality Certification

Author: Wisconsin Department of Natural Resources

Secondary Title: Wisconsin Administrative Code, Natural Resources Chapter 299

Public Law: WAC NR 299

Application to Upland Testing: WAC NR 299 contains Wisconsin code for 404 permitting and 401 certification for proposed dredging and fill disposal activities. Wisconsin 401 certification requires testing for physico-chemical characteristics, elutriate, toxicity, and bioaccumulation.

URL: http://www.legis.state.wi.us/rsb/code/nr/nr200.html

37: Beneficial Uses of Great Lakes Dredged Material: A Report of the Great Lakes Beneficial Use Task Force

Author: Great Lakes Beneficial Use Task Force

Year: 2001

Publisher: Great Lakes Commission

Application to Upland Testing: The Great Lakes Dredging Team (GLDT) was formed in 1996 as a partnership of federal and state agencies created to assure that the navigational dredging of U.S. harbors and channels throughout the Great Lakes, connecting channels and tributaries is conducted in a timely and cost-effective manner while meeting environmental protection, restoration and enhancement goals. In September 1998, the GLDT sponsored a regional workshop on the beneficial use of dredged material. An outcome of the workshop was the GLDT's establishment of a Working Group on Beneficial Use. Subsequent work by the GLDT Working Group on Beneficial Use identified the need to increase public understanding of and develop

national guidance for the beneficial use of dredged materials. Great Lakes Beneficial Use Task Force has identified many obstacles to beneficial use and suggested ways to overcome them, which are included in this document.

Section I identifies and confirms the specific obstacles, gaps and needs, which the recommendations are intended to address. Section II of this report contains the final findings and recommendations of the Great Lakes Beneficial Use Task Force. In Section III the Great Lakes Dredging Team has identified a strategy that prioritizes several recommendations and proposes actions for their implementation. Section IV of the report contains examples of beneficial use projects throughout the Great Lakes basin organized into six categories: beach/littoral nourishment, habitat restoration, topsoil creation/enhancement, capping, landscaping and construction materials. These examples are listed alphabetically by state under each category. Section V provides an overview of selected innovative technologies for treating contaminated dredged material for beneficial use. Section VI includes profiles of the regulatory framework for beneficial use of dredged material for each of the Great Lakes states. Appendix A is a Great Lakes Commission resolution titled "Making Beneficial Use of Dredged Material a Policy Priority," as adopted in May 2001.

URL: http://www.glc.org/benuse/Finalreport.pdf

38: Cleaning up Contaminated Sediments: A Citizens Guide

Author: Lake Michigan Federation

Year: 1995

Number: EPA 905-K-95-001

Publisher: U.S. Environmental Protection Agency: Great Lakes National Program Office (GLNPO) - Assessment and Remediation of Contaminated Sediment (ARCS) Program

Application to Upland Testing: The specific aims of the ARCS Program are to measure concentrations of contaminants at chosen sites on the Great Lakes, to determine ways of gauging the effects of these concentrations on aquatic life, to recommend ways to measure risks to wildlife and to human health posed by the contaminants, and to test technologies that might be used to clean up the sediments. This guide describes the work the ARCS Program has done and how the knowledge that has been gained can be applied to areas where contaminated sediments are causing environmental degradation. Among information that may apply to upland beneficial use projects are discussions on different dredging methods and treatment technologies

URL: http://www.epa.gov/glnpo/arcs/citizen/citizen.html

39: Dredging and the Great Lakes

Author: Great Lakes Dredging Team

Year: 1999

Publisher: Great Lakes Commission

Application to Upland Testing: This booklet provides a brief overview of the issues surrounding dredging in the Great Lakes basin. Sections focus on the importance of dredging operations, commercial navigation and recreational boating, dredging operations and equipment, environmental dredging, environmental windows, disposal, and beneficial use.

URL: http://www.glc.org/dredging/dredgingBooklet.pdf

40: Dredging Is for the Birds

Author: U.S. Army Corps of Engineers Water Resources Support Center

Year: 1991

Application to Upland Testing: This color brochure outlines the advantages of using dredged material to conserve wildlife.

41: Engineering and Design - Beneficial Uses of Dredged Material

Author: U.S. Army Corps of Engineers

Year: 1987

Number: EM 1110-2-5026

Application to Upland Testing: This document contains project engineering and design guidance for dredging projects and dredged material management. This manual provides guidance for planning, designing, developing, and managing dredged material for beneficial uses, incorporating ecological concepts and engineering designs with biological, economical, and social feasibility.

The manual contains a very general discussion of different beneficial uses of dredged material (including upland uses) as well as the range of factors that need to be taken into consideration for planning a project. It includes a very broad and general discussions on the methods of evaluation used to identify potential uses and sites for dredged materials as well as a section on monitoring and baseline studies.

URL: http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-5026/c-16.pdf

42: Engineering and Design - Dredging and Dredged Material Disposal

Author: U.S. Army Corps of Engineers

Year: 1983

Number: EM 1110-2-5025

Application to Upland Testing: This document provides project engineering and design guidance for dredging projects and dredged material management. The manual provides an inventory of dredging equipment and disposal techniques used in the U.S. It was intended as a guidance for dredging projects in the preliminary design stages and during the authorization phase.

The manual covers the evaluation of habitat creation (including upland habitat) as a disposal alternative. A checklist for required studies is included as an appendix. The document may have some marginal relevance for cross-referencing, when upland evaluation and testing of dredged material is considered in the larger context of dredged material management. However, the manual is from 1983 and the information may be somewhat out-dated.

URL: http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-5025/toc.htm

43: Final Summary Report: Assessment and Remediation of Contaminated Sediments Program

Author: U.S. Environmental Protection Agency

Year: 1994

Number: EPA-905-S-94-001

Publisher: U.S. EPA: Great Lakes National Program Office (GLNPO) - Assessment and Remediation of Contaminated Sediments (ARCS) Program

Application to Upland Testing: In support of the United States commitment to the Great Lakes Water Quality Agreement, section 118(c)(3) of the Clean Water Act, added by the Water Quality Act of 1987, authorized the U.S. EPA, through the Great Lakes National Program Office (GLNPO), to "... carry out a five-year study and demonstration projects relating to the control and removal of toxic pollutants in the Great Lakes, with emphasis on the removal of toxic pollutants from bottom sediments." To fulfill the requirements of section 118(c)(3) of the Clean Water Act, GLNPO initiated the ARCS Program. At the outset, U.S. EPA recognized that active participation by numerous and diverse interests would be required to successfully complete activities initiated under the ARCS Program. A primary goal of the ARCS Program was to develop an integrated, comprehensive approach to assessing the extent and severity of sediment contamination, assessing the risks associated with that contamination, and selecting appropriate remedial responses. This

information was developed to help support implementation of RAPs at the Great Lakes AOCs. The major findings and recommendations of the ARCS Program include the following:

(1) Use of an integrated sediment assessment approach, incorporating chemical analyses, toxicity testing, and benthic community surveys, is essential to define the magnitude and extent of sediment contamination at a site.

(2) Risk assessment and modeling activities are valuable techniques for evaluating the potential impacts associated with contaminated sediments.

(3) A number of treatment technologies are effective in removing or destroying sediment contaminants.

(4) Broad public involvement and education are critical in any sediment assessment and remedy selection study in order to develop a common understanding of the problem and the environmental and economic impacts of alternative remedial actions.

Each of these major conclusions is discussed in further detail in later sections of this report.

URL: http://www.epa.gov/glnpo/arcs/EPA-905-S94-001/EPA-905-S94-001-TOC.html

44: Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material

Authors: U.S. Environmental Protection Agency and U.S. Army Corps of Engineers

Year: 2002

Number: EPA842-B-98-001

45: PCB Removal from Contaminated Dredged Material

Authors: N. H. Tang and T. E. Myers

Year: 2002

Journal: Chemosphere

Volume: 46

Number: 3

Pages: 477-484

Application to Upland Testing: The purpose of this study was to evaluate the feasibility of decontaminating PCB contaminated sediment using land treatment technology. Five glass aquariums were set up to test the disappearance of polychlorinated biphenyls (PCBs) in dredged sediment under laboratory conditions that simulated photodegradation, biological transformation, and volatilization in dredged material confined disposal facilities (CDFs). A 40 percent decline in PCB concentration was achieved over a period of five months. Analysis of the variance in the data showed that periodic tilling produced a tangible effect on the disappearance of PCBs. However, the process or processes responsible for PCB disappearance could not be determined. PCB disappearance from the sediment was most likely caused by a combination of photolysis, volatilization, and biodegradation mechanisms rather than by any single process [ABSTRACT].

46: Reclamation and Beneficial Use of Contaminated Dredged Material: Implementation Guidance for Select Options

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 2000

Number: Technical Note ERDC TN-DOER-C12

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This document provides implementation guidance for select options for the reclamation and beneficial use of contaminated dredged material. It builds on previous technical notes and gives perspective to their implementation.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc12.pdf

47: Remediation Guidance Document

Author: U.S. Environmental Protection Agency

Year: 1994

Number: EPA 905-R94-003

Publisher: U.S. EPA, Great Lakes National Program Office (GLNPO), Assessment and Remediation of Contaminated Sediments Program

Application to Upland Testing: The evaluation of sediment remedial alternatives should consider their technical feasibility, contaminant losses and overall environmental impacts, and total project costs. This document provides brief descriptions of available technologies, examines factors for selecting technologies, discusses available methods to estimate contaminant losses during remediation, and provides information about project costs. The level of detail in the guidance provided here reflects the state of development and use of the various technologies.

URL: http://www.epa.gov/grtlakes/arcs/EPA-905-B94-003/EPA-905-B94-003-toc.html

48: Review of Removal, Containment, and Treatment Technologies for Remediation of Contaminated Sediment in the Great Lakes

Authors: D. E. Averett, B. D. Perry, E. J. Torrey and J. A. Miller

Year: 1990

Number: Miscellaneous Paper EL 90 25

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This study is a screening-level assessment of technologies for remediation of contaminated sediments. An extensive list of technologies that have broad applicability for controlling, removing, or destroying contaminants in water, soils, sludges, or sediments was developed. Commonly reported process options for each technology type were considered. Because of the endless variations of process options and the large number of proprietary process options continually under development, an all-inclusive list was not within the scope of this study. Options were selected primarily from the technical literature in lieu of vendor advertisements. The available literature includes an ample number of process options for demonstrations that could be implemented as innovative applications for contaminated sediment and that could be completed within the time and budget of the ARCS program. A brief description of each technology or process option is provided. Technologies were evaluated on the basis of the following factors: a. State of development; b. Availability; c. Effectiveness; d. Implementability; e. Cost.

URL: http://www.epa.gov/glnpo/arcs/EL-90-25/EL-90-25.html

49: Treatment of Dredged Material to Create Topsoil

Author: U.S. Army Corps of Engineers Detroit District

Year: 2001

50: Waste to Resource: Beneficial Use of Great Lakes Dredged Material

Author: Great Lakes Dredging Team

Year: 2001

Publisher: Great Lakes Commission

Application to Upland Testing: This document serves as an overview of beneficial use operations for dredged material in the Great Lakes region. Sections cover topics such as: "Why Do We Dredge?";

"What Is Beneficial Use?"; "Why Do We Need Beneficial Use?"; "Who is Involved in Beneficial Use?"; "Obstacles and Opportunities: Whether, When, and How Dredged Material Gets Used Beneficially"; "What About Contaminated Dredged Material?"; and "How Can My Community be Involved with Beneficial Use?"

URL: http://www.glc.org/dredging/publications/benuse.pdf

51: Dredge Material Beneficial Use Handbook (Draft)

Author: New York State Department of Environmental Conservation Division of Solid and Hazardous Materials

Year: 2001

Application to Upland Testing: This draft handbook is intended to provide guidance to those who wish to petition for beneficial use determinations for dredge material under 6 NYCRR Part 360. As of June 2003, it was still an internal document and not releasable to the public. The handbook incorporates various aids for development of sampling plans and interpretation of data. Numerical contaminant thresholds and corresponding reuse categories are NOT included.

The dredge handbook contains the following sections that are currently distributed to members of the public inquiring about BUDs:

- a checklist of items required in BUD petitions, as discussed in Part 360
- a section concerning NYSDEC policy on the use of dredge at solid waste landfills
- a section concerning NYSDEC policy on the use of dredge at hazardous waste cleanup sites, e.g., for capping
- a table of recommended sample parameters, methods, and contract required quantitation limits
- an appendix explaining Balduck's Method for determining an adequate frequency of sediment sampling at a potential dredge site
- an appendix explaining statistical analysis of dredge sample data.

52: Interim Guidance for Freshwater Navigational Dredging

Author: New York State Department of Environmental Conservation

Year: 1994

Application to Upland Testing: Contains three contaminant threshold-based categories for the on-land management of dredged sediments

53: Guidance for Applying Chapter NR 347 Wisconsin Administrative Code to Dredging Projects in Surface Waters (Draft)

Author: Wisconsin Department of Natural Resources

Year: 2003

Application to Upland Testing: This is a draft guidance on application of NR 347 of the Wisconsin Administrative Code, "Sediment Sampling and Analysis, Monitoring Protocol and Disposal Criteria for Dredging Products." Its jurisdiction is the waters of the state of Wisconsin.

The draft guidance is intended primarily for department staff charged with the responsibility of reviewing dredging projects under Wisconsin rules and statutes. This includes assessing the contamination status of sediment and potential sampling and analyses. The guidance contains a short section toward the end of the text that provides generic guidance on preferred upland disposal scenarios.

54: Dredged Material Characterization Tests for Beneficial Use Suitability

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 1999

Number: Technical Note DOER-C2

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: Provides guidance on the nature and types of physical, engineering, chemical, and biological characterization tests appropriate for determining the potential for beneficial uses of dredged material in aquatic, wetland, and upland environments.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc2.pdf

55: Evaluating Environmental Effects of Dredged Material Management Alternatives - a Technical Framework

Authors: U.S. Environmental Protection Agency and U.S. Army Corps of Engineers

Year: 1992

Number: EPA842-B-92-008

Application to Upland Testing: This document is intended to serve as a consistent roadmap for U.S. Army Corps of Engineers and U.S. Environmental Protection Agency personnel in evaluating the environmental acceptability of dredged material management alternatives. Some of the major objectives are to provide a general technical framework for evaluating the environmental acceptability of dredged material management alternatives (including beneficial uses) and to enhance consistency and coordination in U.S. ACE / U.S. EPA decision making in accordance with Federal environmental statutes regulating dredged material management. A very broad and general discussion of the various options for sediment management and the considerations going into the decision-making process is included. This could be a useful reference for a general decision-making framework regarding the evaluation of upland uses.

URL: http://libweb.wes.army.mil/uhtbin/hyperion/EL-TR-03-1.pdf

56: Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities – Testing Manual

Author: U.S. Army Corps of Engineers

Year: 2003

Number: ERDC/EL TR-03-1

Publisher: U.S. Army Corps of Engineers: Research and Development Center

Application to Upland Testing: This manual is a resource document providing technical guidance for evaluation of potential contaminant migration pathways from confined disposal facilities (CDFs). Disposal of dredged material in CDFs is one of the most commonly considered alternatives for material deemed unsuitable for conventional open water disposal because of potential contaminant impacts and is also an option commonly considered for disposal of contaminated sediments dredged for purposes of sediment remediation. If contaminated sediments are placed in a CDF, consideration of pathways for migration of contaminants from the site and potential contaminant impacts may be required. A suite of evaluation procedures and laboratory test procedures has been developed to evaluate CDF contaminant pathways and is presented in detail in this manual. A tiered testing and evaluation approach is used. The Tier I evaluation determines the need for pathway evaluations, pathways of concern, contaminants of concern, and which pathways require more detailed evaluations based on existing information. Tier II evaluations consist of determining the need for management actions derived from very conservative techniques that use the chemical, physical, and biological characteristics of the dredged material and basic information about the CDF.

Tier III focuses primarily on definitive evaluations, including pathway testing. Tier IV, which should rarely be needed for navigation projects, includes formal quantitative risk assessment designed to answer specific, well-defined questions. This manual is intended for use by the U.S. Army Corps of Engineers (USACE), Federal, and state regulatory and resource agencies, dredging permit applicants, and others (e.g., scientists and engineers, managers, and other involved or concerned individuals). It can facilitate decision-making with regard to the management of dredged material. Because this manual is national in scope, the guidance provided is generic and may be applied within various regulatory settings. Application of this guidance in some site-specific situations will require best professional judgment, appropriately documented. Users of the manual are strongly encouraged to consult with their appropriate USACE District experts for additional guidance.

The Corps' Upland Testing Manual is focused on confined disposal rather than upland beneficial use. Nevertheless, it has some useful information for the Dredging Team's effort to develop a regional testing and evaluation manual for beneficial use.

URL: http://libweb.wes.army.mil/uhtbin/hyperion/EL-TR-03-1.pdf

57: Evaluation of Material Proposed for Discharge to Waters of the U.S. - Testing Manual (Inland Testing Manual)

Authors: U.S. Environmental Protection Agency and U.S. Army Corps of Engineers

Year: 1998

Number: EPA 823-B-94-002

Publisher: U.S. EPA, Office of Water

Application to Upland Testing: This is a formal guidance document for decision making under section 404 of the Clean Water Act. The procedures are used to determine if dredged materials are suitable for open water disposal or beach nourishment. The procedures would also be used to determine suitability of effluent discharges from a CDF or upland disposal site.

58: Great Lakes Dredged Material Testing and Evaluation Manual

Authors: U.S. Environmental Protection Agency and U.S. Army Corps of Engineers

Year: 1998

Number: ERDC/EL TR-03-1

Publisher: U.S. EPA Regions 2, 3, 5, and Great Lakes National Program Office (GLNPO) and U.S. ACE, Great Lakes & Ohio River Division

Application to Upland Testing: A regional testing manual for evaluating potential impacts of contaminants from dredged material proposed for discharge to the Great Lakes, connecting channels, and tributaries. It is intended to be used as a decision making tool for dredge and fill permits issued by the Army Corps of Engineers, or states or tribes where delegated, under Section 404 of the Clean Water Act. Upland uses or beneficial uses in general are not covered in this manual.

The bulk of the main text is dedicated to an explanation of the tiered approach for testing dredged material, points at which decisions can be made, and examples of how to apply the manual. Appendices provide guidance on sampling and handling procedures, quality assurance, analytical procedures for physical and chemical analysis, as well as procedures for biological-effects testing.

URL: http://www.epa.gov/glnpo/sediment/gltem/manual.htm

59: Guidance Manuals to Support the Assessment of Contaminated Sediments in Freshwater Ecosystems: Volume II

Author: Sustainable Fisheries Foundation

Year: 2002

Secondary Title: Design and Implementation of Sediment Quality Investigations

Number: EPA-905-B02-001-B

Publisher: U.S. Environmental Protection Agency

Application to Upland Testing: These guidance manuals present an ecosystem-based approach for assessing and managing sediments, evaluate specific tests available for evaluating sediments, provide recommended procedures for designing and implementing sediment quality investigations, and present procedures for interpreting the results of sediment quality investigations. The manuals are an important resource for those involved in the assessment of sediments in the Great Lakes basin.

URL: http://www.cerc.usgs.gov/pubs/sedtox/VolumeII.pdf

60: Guidance Manuals to Support the Assessment of Contaminated Sediments in Freshwater Ecosystems: Volume III

Author: Sustainable Fisheries Foundation

Year: 2002

Secondary Title: Interpretation of the Results of Sediment Quality Investigations

Number: EPA-905-B02-001-C

Publisher: U.S. Environmental Protection Agency

Application to Upland Testing: These guidance manuals present an ecosystem-based approach for assessing and managing sediments, evaluate specific tests available for evaluating sediments, provide recommended procedures for designing and implementing sediment quality investigations, and present procedures for interpreting the results of sediment quality investigations. These manuals are an important resource for those involved in the assessment of sediments in the Great Lakes basin.

URL: http://www.cerc.usgs.gov/pubs/sedtox/VolumeIII.pdf

61: Interim Report: Long-Term Evaluation of Plants and Animals Colonizing Contaminated Estuarine Dredged Material Placed in Both Upland and Wetland Environments

Authors: D. L. Brandon, C. R. Lee and J. W. Simmers

Year: 1991

Number: NTIS No. AD A249 016 ; Miscellaneous Paper D-91-5

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: A relevant technical reference for testing and evaluating dredged material placement at an upland site.

62: Issues in Sediment Toxicity and Ecological Risk Assessment

Authors: P. M. Chapman, K. T. Ho, W. R. Munns, K. Solomon and M. P. Weinstein

Year: 2002

Journal: Marine Pollution Bulletin

Volume: 44

Number: 4

Pages: 271-278

Application to Upland Testing: This paper is based on a facilitated Workshop and Roundtable Discussion of key issues in sediment toxicology and ecological risk assessment (ERA) as applied to sediments that was held at the Conference on Dredged Material Management: Options and Environmental Considerations. The issues addressed included how toxicity is defined and perceived, how it is measured, and how it should be used within the context of ERA to support management decisions. The following conclusions were reached regarding scientific considerations of these issues. Toxicity is a measure of hazard and not a risk per se. Thus, toxicity testing is a means but not the end to understand risks of sediments. Toxicity testing cannot presently be replaced by chemical analyses to define hazard. Toxicity test organisms need to be appropriate to the problem being addressed, and the results put into context relative to both reference and baseline comparisons to understand hazard. Use of toxicity tests in sediment ERAs requires appropriate endpoints and risk hypotheses, considering ecological not just statistical significance, and recognizing that hazard does not equate to risk. Toxicity should be linked to population and community response to support decision making, assessing possible genotypic adaptations that can influence risk estimates, and addressing uncertainty. Additionally, several key scientific issues were identified to improve future sediment ERAs, including the need to improve basic understanding of ecological mechanisms and processes, recognition of variability in the assessment process, and an improved focus and ability to assess risks to populations and communities [ABSTRACT].

63: Leachate Testing and Evaluation for Freshwater Sediments

Authors: J. M. Brannon, T. E. Myers and B. A. Tardy

Year: 1994

Number: NTIS No. AD A278 643; Miscellaneous Paper D-94-1

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station

Application to Upland Testing: The objective of this report is to provide recommended procedures for conducting batch and column leachate evaluations for freshwater sediments. Guidance for use of results in site-specific leachate evaluations is also provided. Researchers at the U.S. Army Engineer Waterways Experiment Station have investigated two types of laboratory leach tests, batch and column. A sequential batch leach test (SBLT) has been developed to provide a short-term laboratory test that describes the distribution of contaminants between aqueous and solid phases as sediment solids are exposed to increasing amounts of water. Column leach tests have been developed as laboratory-scale physical models of contaminant leaching in a CDF. SBLTs are recommended for leachate evaluations of freshwater sediments. Column leach tests, while not recommended for routine use, may be conducted when the contamination potential of the dredged material is very high and independent confirmation of batch test results is desired. Guidance is provided on interpretation of test results from batch testing. Use of leachate test results in conjunction with the hydrologic evaluation of landfill performance (HELP) model is recommended for preproject evaluation of leachate control options. Guidance is also provided on methods for comparing the results of batch and column tests.

URL: http://www.wes.army.mil/el/dots/pdfs/mpd94-1.pdf

64: Management Strategy for Disposal of Dredged Material: Contaminant Testing and Controls

Authors: N. R. Francingues, M. R. Palermo, L. C.R. and R. K. Peddicord

Year: 1985

Secondary Title: International Workshop on Beneficial Use of Dredged Material

Number: Miscellaneous Paper D 85 1.

Publisher: U.S. Army Corps of Engineers: Dredging Operations Technical Support Program

Application to Upland Testing: The diversity of disposal alternatives and techniques for management of contaminated dredged material requires the development of an overall long-term management strategy for disposal. The selection of an appropriate strategy is dependent on nature of the dredged material, nature and level of contamination, available dredging alternatives, project size, and site-specific physical and chemical conditions, all of which influence the potential for environmental impacts. Technical feasibility, economics, and other socioeconomic factors must also be considered in the decisionmaking process. The management strategy presented mainly considers the nature and degree of contamination, potential environmental impacts , and related technical factors. The technical strategy is based on findings of research conducted by the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and others over the past 10 years and experiences gained while actively managing dredged material disposal. Approaches for evaluating potential for contaminant-related problem and the applicability of various disposal alternatives are discussed. Detailed procedures for conducting tests or for design and implementation of management strategies are not presented, but are the topics of other papers to follow. A technically feasible and environmentally sound strategy for the disposal of dredged material is presented, and it is recommended that this strategy be implemented for future dredged material disposal operations.

URL: http://www.wes.army.mil/el/dots/pdfs/mpd85-1.pdf

65: Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual

Author: U.S. Environmental Protection Agency Office of Water

Year: 2001

Number: EPA 823-B-01-002.

Application to Upland Testing: This manual contains U.S. EPA recommendations for collecting, handling and manipulating sediment samples for physicochemical characterization and biological testing. There is ubiquitous technical information which applies to upland uses as well as any others.

URL: http://www.epa.gov/waterscience/cs/factsheet.pdf

66: Monitoring Freshwater Sediments

Authors: S. Alcock, D. Barcelo and P. D. Hansen

Year: 2003

Journal: Biosensors and Bioelectronics

Volume: 18

Number: 8

Pages: 1077-1083

Application to Upland Testing: The objectives of the SENSPOL Expert Meeting on "Monitoring Freshwater Sediments" held in Antwerp, Belgium, September 12-13, 2001, were firstly to identify and define problems and secondly to develop a realistic strategy to solve these problems. Both of the stakeholder groups (governmental authorities and the dredging industry) present at the workshop participated in detailed discussions to elucidate the role of sensors in the field of sediments and sediment/water interfaces. The 19 invited experts were agreed that in situ monitoring systems are needed to monitor freshwater sediments. New recognized tools for sediment monitoring would help industry to meet the governmental sediment quality criteria and to handle the data concerning historic river contamination and geological background data. The need to monitor by effect-related studies together with chemical monitoring was stressed. The main focus for development of new sensor tools should be for on site determination of certain priority pollutants where there would be an advantage over existing methods or where no suitable method exists, and to monitor biological effects (alarm systems and effect-related on site tests). Sensing technologies would also be useful to monitor bioavailability in sediments in situ to provide information for risk assessment. In addition, they could be of use to monitor bioremediation in situ. A useful role was forseen in dredging sediments, for in situ sediment screening and to guide treatment of dredged material. The new sensing tools presented, included determination of metal concentrations in sediments using the diffuse gradients in thin films (DGT) technique (Lancaster University, UK), an analytical protocol for determination of metal speciation in sediments (Universitat Autonoma de Barcelona, Spain), microbiotests for determination of sediment toxicity (University of Ghent, Belgium), a portable whole cell sensors device for heavy metal bioavailability (VITO, Belgium) and a microfabricated sensor array system for Pb concentration profile measurement in the mM range at the liquid/solid interface (University of Geneva, Switzerland) [ABSTRACT].

The technologies applied here could potentially be applied to get earlier indicators of sediment contamination and expedite the process of identifying and approving upland sites for beneficial use.

67: Soil Screening Guidance

Author: U.S. Environmental Protection Agency

Year: 1996

Number: EPA540/F-95/041

Application to Upland Testing: This document is a starting point for assessment to ensure that beneficial use of dredged material doesn't create a site requiring cleanup. Criteria are risk-based and based on exposure pathways. The document consists of a brief fact sheet, a user's guide, a technical guide, and a number of attachments. U.S. EPA issued the Soil Screening Guidance (SSG) as a tool to help standardize and accelerate the evaluation and cleanup of contaminated soils at sites on the National Priorities List (NPL). The SSG provides site managers with a tiered framework for developing risk-based, site-specific soil screening levels (SSLs) for the protection of human health.

The 1996 SSG quantitatively addressed the following pathways of exposure in a residential setting: Direct contact with contaminated soils; Inhalation of volatiles and fugitive dusts from undisturbed soils; and, ingestion of groundwater contaminated by the migration of chemicals through site soils.

In addition, the 1996 SSG discussed the potential for dermal exposure to certain contaminants in site soils and for migration of volatile contaminants from the subsurface into indoor air. However, data limitations prevented the program from fully addressing these pathways.

URL: http://www.epa.gov/superfund/resources/soil/

68: Standard Test Method for Leaching Solid Waste in a Column Apparatus

Author: American Society for the Testing of Materials

Year: 2001

Number: ASTM D 4874-95

Application to Upland Testing: This is the American Society for the Testing of Materials standard for Column Leaching Procedure (CLP). The test method is a procedure for generating an aqueous leachate from solid waste materials using a column apparatus. It provides a leachate suitable for organic analyses of volatile and nonvolatile organic compounds as well as inorganic substances. Analysis of column effluent provides information on the leaching characteristics of the material under the conditions used in the test.

URL: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/D4874.htm?L+mystore+vkhu6909+1058317380

69: Standard Test Method for Shake Extraction of Solid Waste with Water

Author: American Society for the Testing of Materials

Year: 1999

Number: ASTM D 3987-85 (Reproved 1999)

Application to Upland Testing: This is the American Society for the Testing of Materials standard for Batch Leaching Procedure with Water. The test method covers a procedure for leaching of solid waste to obtain an aqueous solution that can be used to determine relative likelihood of release of parameters, under the specified testing conditions. The test method provides for the shaking of a known weight of waste with water of specified composition and the separation of the aqueous phase for analysis. This test method is specifically referenced in chapter NR 538 of the Wisconsin Administrative Code.

URL: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/D3987.htm?L+mystore+vkhu6909+1058317377

70: Upland Animal Bioassays of Dredged Material

Authors: J. W. Simmers, R. G. Rhett and C. R. Lee

Year: 1986

Number: Environmental Effects of Dredging Program Technical Note EEDP-02-2

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station

Application to Upland Testing: This note introduces the concept of using an upland animal as an indicator of the contaminants in dredged material (1) proposed for disposal in an upland environment or (2) already placed in an upland disposal facility. Examples of the applications of an animal bioassay procedure to estuarine and freshwater dredged material placed in an upland environment have been published in several recent papers. Animal bioassay test procedures are being evaluated, field tested, and verified under the "Interagency Field Verification of Testing and Predictive Methodologies for Dredged Material Disposal Alternatives," called the Field Verification Program (FVP). The FVP research is being conducted in conjunction with a scheduled dredging project in Black Rock Harbor (BRH) near Bridgeport, Connecticut. The bioassay test procedures are relatively simple and can provide information that may be required in the ecological evaluation and environmental assessment of dredged material disposal. Based on laboratory results and limited field testing,

the procedures can be applied to contaminated sediment (dredged material) that requires placement in an upland environment. The concept presented in this note is the result of ongoing research under the FVP.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-2.pdf

71: Use of Sediment Quality Guidelines (SQGs) in Dredged Material Management

Author: Long-Term Effects of Dredging Operations Program (LEDO)

Year: 1998

Number: Dredging Research Technical Note EEDP-04-29

Publisher: U.S. Army Corps of Engineers, Washington District

Application to Upland Testing: This memo is a very general guidance for Corps engineers on the use of SQGs in dredged material management decision-making. It applies to all sediment management options including upland uses. The note describes features that limit the utility of SQGs in dredged material management. In light of these limitations, this technical note specifies circumstances in dredged material assessments where SQGs may be technically appropriate and helpful, and describes conditions in which SQGs are not technically appropriate, for dredged material management decision making.

URL: www.sediments.org/eedp04-29.pdf

72: An Assessment of Laboratory Leaching Tests for Predicting the Impacts of Fill Material on Ground Water and Surface Water Quality

Author: Washington State Department of Ecology

Year: 2003

Secondary Title: A report to the legislature

Number: Pub. no. 03-09-107

Application to Upland Testing: This document presents a thorough summary of leachate test procedures.

URL: www.ecy.wa.gov/biblio/0309107.htm

73: Tiered Approach to Corrective Action Objectives (TACO)

Author: Illinois Environmental Protection Agency

Year: 2003

Secondary Title: Fact Sheet 1: Introduction

Application to Upland Testing: TACO is the Illinois EPA's method for developing corrective action objectives for contaminated soil and groundwater. TACO provides information on exposure route evaluations and on the use of area background concentrations as a screening tool for whether contaminant criteria are met.

TACO does not directly address beneficial use of dredge material. There are currently no regulations that specifically address the upland beneficial use of dredge material in Illinois. As a result each decision would have to be made on a case-by-case basis as part of a remediation project, permit decision or enforcement case. The Illinois EPA may not be able to offer any determination in situations that fall outside of these specific situations. Parameters of concern would need to be identified and limits set based on risk, similar to the procedures in 35 Ill. Admin. Code 742 (TACO). It should be noted that additional parameters beyond those identified in 35 Ill. Admin. Code 742 may need to be investigated if it is suspected that the constituent may be present in the dredge material.

URL: http://www.epa.state.il.us/land/taco/1-introduction.html

74: Risk Integrated System of Closure

Author: Indiana Department of Environmental Management

Year: 2002

Application to Upland Testing: Risk Integrated Systems of Closure (RISC) is a guidance manual that describes how to achieve consistent closure of contaminated soil and groundwater using existing Indiana Department of Environmental Management programs. RISC is a nonrule policy document, which means that it does not have the full force and effect of law. Currently, it is the only evaluation protocol used by the State of Indiana to assess the suitability of dredged materials for upland applications. With regard to upland applications, RISC provides guidance on 1) determining contaminant levels and 2) assessing exposure and other contamination risks at a potential site.

URL: http://www.in.gov/idem/land/risc/

http://www.in.gov/idem/land/risc/techguide/riscapp1.pdf

75: Alternate Soil Leaching Procedures

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1995

Number: Operational Memorandum #12

Application to Upland Testing: This memorandum is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201.

URL: http://www.michigan.gov/deq/0,1607,7-135-3311_4109_9846-20498–,00.html

76: Mixing Zone Determinations and GSI Compliance Monitoring

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1998

Number: Operational Memorandum #17

Application to Upland Testing: This memorandum is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201.

URL: http://www.deq.state.mi.us/documents/deq-erd-opmemo17r698.pdf

77: Part 201 Generic Groundwater and Soil Volatilization to Indoor Air Inhalation Criteria

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1998

Secondary Title: Technical Support Document

Application to Upland Testing: This is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. The document describes the technical development of generic groundwater and soil volatilization to indoor air inhalation criteria (GVIIC and SVIIC, respectively) for residential and commercial/industrial land use categories. The generic GVIIC and SVIIC are presented in Operational Memorandum #18: Part 201 Generic Cleanup Criteria Tables.

URL: http://www.deq.state.mi.us/documents/deq-erd-tsd5.pdf

78: Part 201 Generic Groundwater Contact Criteria

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 2001

Secondary Title: Technical Support Document

Application to Upland Testing: This is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. This document presents the technical methodology and basis for development of Part 201 generic groundwater contact criteria (GCC). It also provides guidance on the application and implementation of the GCC. The generic GCC are presented in the Environmental Response Division (ERD) Operational Memorandum #18 Revision 1 dated June 7, 2000: Part 201 Generic Cleanup Criteria Tables (Op Memo 18) and the Part 201 Cleanup Criteria Training Material. They are located in column #6 of the Groundwater table.

URL: http://www.deq.state.mi.us/documents/deq-erd-tsd4.pdf

79: Part 201 Generic Soil Direct Contact Criteria

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 2001

Secondary Title: Technical Support Document

Application to Upland Testing: This is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. This technical support document (TSD) presents the methodology for development of the Part 201 generic soil direct contact criteria (DCC). It also provides information about the implementation of the soil DCC. The soil DCC as represented in this TSD are presented in the Environmental Response Division Operational Memorandum #18: Part 201 Generic Cleanup Criteria Tables, Revision 1 dated June 7, 2000.

URL: http://www.deq.state.mi.us/documents/deq-erd-tsd2.pdf

80: Part 201 Generic Soil Inhalation Criteria for Ambient Air

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1998

Secondary Title: Technical Support Document

Application to Upland Testing: This is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. The document provides the technical basis for the development of generic soil inhalation criteria (SIC) for ambient air that may be used to address inhalation exposures to soil contaminants under residential, industrial, and commercial land use scenarios. The generic SIC are presented in the Environmental Response Division Interim Operational Memorandum #18: Part 201 Generic Cleanup Criteria Tables. They are located in columns 15-18 of the Soil: Residential and Commercial I Table and columns 23-26 of the Soil: Industrial and Commercial II: Preliminary Assessment, III, and IV Table.

URL: http://www.deq.state.mi.us/documents/deq-erd-tsd6.pdf

81: Part 201 Generic Soil Saturation Concentrations

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1998

Secondary Title: Technical Support Document

Application to Upland Testing: This is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. Describes the technical basis for the development of generic soil saturation (Csat) concentrations and provides guidance for their application within the Part 201 generic cleanup criteria framework. The generic Csat concentrations are presented in Operational Memorandum #18: Part 201 Generic Cleanup Criteria Tables.

URL: http://www.deq.state.mi.us/documents/deq-erd-tsd1.pdf

82: Part 201 Generic Soil/Water Partitioning Criteria

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1999

Secondary Title: Technical Support Document

Application to Upland Testing: This is used as a reference document for assessing compliance of a beneficial use of a dredged material at a certain site with the contaminant criteria set forth by Part 201. The document describes a quantitative method that is used to develop generic soil cleanup criteria protective of groundwater. The method can be used to demonstrate compliance with the relevant and applicable Part 201 generic groundwater criteria, which include the generic drinking water criteria, generic groundwater surface water interface (GSI) criteria and generic groundwater contact criteria (GCC). The final generic soil criteria protective of groundwater for each soil leaching pathway are presented in the Environmental Response Division Interim Operational Memorandum #18: Part 201 Generic Cleanup Criteria Tables.

URL: http://www.deq.state.mi.us/documents/deq-erd-tsd7.pdf

83: Sampling Strategies and Statistics Training Material for Part 201 Cleanup Criteria

Author: Michigan Department of Environmental Quality Remediation and Redevelopment Division

Year: 2002

Application to Upland Testing: This document provides technical guidance for use in connection with the evaluation of beneficial uses of dredged material. It is relevant for both upland and aquatic uses. It provides recommendations on 1) sampling of environmental media for various sampling objectives under Part 201, and 2) determining when it is appropriate to use statistics and which statistical methods to use for comparing data to Part 201 cleanup criteria.

URL: http://www.deq.state.mi.us/documents/deq-erd-stats-s3tm.pdf

84: Training Material for Part 201 Cleanup Criteria

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1998

Application to Upland Testing: This series of documents serves as guidance for Michigan DEQ staff for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. The following technical support documents have relevance to upland testing and evaluation:

1. Alternate Soil Leaching Procedures, Operational Memorandum #12
2. Generic Drinking Water Criteria, Technical Support Document
3. Generic Groundwater and Soil Volatilization to Indoor Air Inhalation Criteria, TechnicalSupport Document
4. Generic Groundwater Contact Criteria, Technical Support Document
5. Generic Soil Direct Contact Criteria, Technical Support Document
6. Generic Soil Inhalation Criteria for Ambient Air, Technical Support Document
7. Generic Soil Saturation Concentrations, Technical Support Document
8. Generic Soil/Water Partitioning Criteria, Technical Support Document
9. Michigan Background Soils Survey, DEQ Waste Management Division
10. Mixing Zone Determinations and GSI Compliance Monitoring, Operational Memorandum #17
11. Part 4 Administrative Rules for Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act (NREPA), 1994 Public Act 451, as amended
12. Part 201 Generic Cleanup Criteria Tables, Operational Memorandum #18
13. Proposed Part 7 Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act (NREPA), 1994 Public Act 451, as amended
14. Verification of Soil Remediation Guidance Document, DEQ Environmental Response and Waste Management Divisions

The technical support documents explain how the generic contaminant criteria were developed that are in the Part 201 rules. These documents would be used by Michigan DEQ to develop site specific criteria for upland uses of dredged material. The training manual lays out Michigan DEQ procedures for conducting sampling and statistical evaluation of results. It is an attempt to standardize so the regulated community and the Michigan DEQ have a common ground for reviewing projects. Other methods (SW-846, ASTM, etc.) would be acceptable to Michigan DEQ but would be more difficult to review, since Michigan DEQ personnel has been trained on the Part 201 methods.

URL: http://www.michigan.gov/deq/0,1607,7-135-3311_4109_9846-20672–,00.html

85: Site Screening Evaluation Guidelines

Author: Minnesota Pollution Control Agency: Site Response Section

Year: 1996

Secondary Title: Working Draft

Application to Upland Testing: Although labeled as a draft, these guidelines are used and treated as a final document by the agency. The document describes a risk-based decision-making approach. The evaluation process described in this document is used by agency staff dealing with Superfund- and similar type site cleanup issues. Although the guidance doesn't specifically address how to determine the appropriateness of beneficial uses of dredged material, MPCA is currently considering its use as a guidance for such evaluations. The document describes the purpose of screening evaluation and also provides guidance on collection of site information, identification of chemicals of potential concern, media-based screening criteria for contaminants, and short-term hazard evaluation.

URL: http://www.pca.state.mn.us/cleanup/riskbasedoc.html#sitescreening

86: PCB Guidance for Land Application of Industrial Wastewater Sludge and Municipal Biosolids

Author: Wisconsin Department of Natural Resources

Year: 2003

Application to Upland Testing: This guidance covers the land application of wastes containing PCBs. It is applicable to chapters NR 204, NR 214, and NR 518, of the Wisconsin Administrative Code. Its jurisdiction is land application within Wisconsin of wastewater treatment plant sludges and solid wastes, which contain detectable concentrations of PCBs

The document includes suggested contaminant criteria, analytical methods, as well as recommendations for monitoring and pollution prevention/source reduction. These criteria, methods, and recommendations are identical to those in #83.

The guidance document establishes limits on the mass of total PCBs which can be applied to individual parcels of land. The application limits are based on previously performed risk assessments, as modified by risk management considerations. Testing and reporting requirements are recommended, as well as an investigative program if PCB concentrations exceed 1 ppm. Recommended application limits are 1,200 mg/acre/year for crop lands used for direct grazing or for food crops used for human food consumption, and 2,500 mg/acre/year for all other lands.

URL: http://www.dnr.state.wi.us/org/es/science/lc/download/PCB_Guide.pdf

87: PCB Guidance for Land Application of Solid Wastes

Author: Wisconsin Department of Natural Resources

Year: 2003

Application to Upland Testing: This guidance covers the land application of wastes containing PCBs. It is applicable to chapters NR 204, NR 214, and NR 518, Wisconsin Administrative Code. Its jurisdiction is land

application within Wisconsin of wastewater treatment plant sludges and solid wastes, which contain detectable concentrations of PCBs. The document includes suggested contaminant criteria, analytical methods, as well as recommendations for monitoring and pollution prevention/source reduction.

The guidance document establishes limits on the mass of total PCBs which can be applied to individual parcels of land. The application limits are based on previously performed risk assessments, as modified by risk management considerations. Testing and reporting requirements are recommended, as well as an investigative program if PCB concentrations exceed 1 ppm. Recommended application limits are 1200 mg/acre/year for crop lands used for direct grazing or for food crops used for human food consumption, and 2500 mg/acre/year for all other lands.

URL: http://www.dnr.state.wi.us/org/aw/wm/publications/solid/pcb%20guidance.pdf

88: An Evaluation of Sources of Uncertainty in a Dredged Material Assessment

Authors: D. J. Vorhees, S. B. K. Driscoll, K. von Stackelberg, J. J. Cura and T. S. Bridges

Year: 2002

Journal: Human and Ecological Risk Assessment

Volume: 8

Number: 2

Pages: 369-389

Application to Upland Testing: The U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency use a four tiered evaluation process to assess the potential for significant impacts from open water disposal of dredged material to the aquatic environment. This tiered approach requires only the appropriate level of analysis to estimate potential chemical and biological effects. Uncertainty is inherent in each tier and can lead to delayed, costly, and potentially inappropriate decisions. This paper discusses sources of uncertainty in the tiered approach with the goal of improving dredged material management decisions. These potential uncertainty sources are common to many dredging projects but might not be applicable to all projects. Although not all uncertainty sources can be quantified, even using the simple scoring procedure described here, they can still contribute significantly to uncertainty in predictions of adverse effects. Of the sources that could be scored and ranked, those identified as most uncertain include trophic transfer, chronic bioassay interpretation, fate and transport model parameter uncertainty, toxicity endpoints based on body burdens, human dose-response models, toxicity of complex mixtures, and estimation of population-level effects. Research directed at these sources of uncertainty will result in improved decision making [ABSTRACT].

89: The Challenge of Describing a Contaminated Sediment Site

Author: P. Keillor

Year: 1993

Secondary Title: A paper presented at a University of Wisconsin short sourse

Application to Upland Testing: The author discusses the impact of characterization of in-situ sediment on accurate time and material estimates for dredging projects. The paper provides examples of methods from the Netherlands, Belgium, and Canada for determination of a representative number of sediment samples. This paper is the original source for the Balduck Method of gridded sampling that has appeared in NYSDEC dredge management guidance. The Balduck Method can provide a means for determining an appropriate number of samples to characterize sediments prior to dredging.

90: Quality Assurance/Quality Control (QA/QC) Guidance for Laboratory Dredged Material Bioassays

Authors: D. W. Moore, T. M. Dillon, J. Q. Word and J. A. Ward

Year: 1994

Secondary Title: Results of QA/QC workshop held May 26-27, 1993, in Seattle, Washington

Number: NTIS No. AD A282 327

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: Generic guidance is given for using sound evaluation and testing procedures and protocols as the basis for developing a decision-making framework. This may be a relevant reference for upland use evaluation and testing. Topics covered are data quality objectives; biological procedures; sample handling, storage, and shipment; data reporting, reduction, validation, and reporting; internal quality control checks; and corrective action.

URL: http://www.wes.army.mil/el/dots/pdfs/mpd94-3.pdf

91: Guidelines for the Pollution Classification of Great Lakes Sediment

Author: U.S. Environmental Protection Agency

Year: 1977

Secondary Title: The Jensen Criteria

Application to Upland Testing: The Jensen Criteria were developed by the EPA in 1977 as interim guidelines for classifying sediments in the Great Lakes. These guidelines are based on practical experience with dredged sediments in the Great Lakes and are not based on scientific studies. These guidelines are not used today to classify sediments since they generally represent concentrations that are overly conservative. Though the data in the guide would be considered out of date, it is interesting as a reference for charting changes in attitudes towards sediment contamination.

URL: http://www.epa.gov/waterscience/cs/factsheet.pdf

92: Screening Quick Reference Tables (SQRTs)

Author: National Oceanic and Atmospheric Administration

Year: 1999

Application to Upland Testing: The SQRTs were developed for internal use by the Coastal Protection & Restoration division of NOAA and are culled from a variety of sources. SQRTs are established for a variety of different references including fresh and marine sediments, water, and groundwater. These values were derived from a compilation of sources but come primarily from the International Joint Commission - Sediment Subcommittee of 1988, which deals with sediment issues surrounding the waters that separate the United States and Canada, primarily the Great Lakes.

URL: http://www.epa.gov/waterscience/cs/factsheet.pdf

93: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites

Author: U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response

Year: 2001

Secondary Title: Peer Review Draft

Number: OSWER 9355.4-24

Application to Upland Testing: This document is intended as companion guidance to the 1996 SSG for residential use scenarios at NPL sites. It builds upon the soil screening framework established in the original guidance, adding new scenarios or soil screening evaluations. It also updates the residential scenario in the 1996 SSG, adding exposure pathways and incorporating new modeling data. The following specific changes included in this document supersede the 1996 SSG: New methods for developing SSLs based on nonresidential land use and construction activities; New SSL equations for combined exposures via ingestion and dermal absorption; Updated dispersion modeling data for the residential air exposure model; and New methods to develop SSLs for the migration of volatiles from subsurface sources into indoor air.

Except for these new equations and updated modeling data, the soil screening process remains the same as the one presented in the 1996 SSG. Therefore, this document presents the process in less detail than the original

guidance, and focuses instead on specific elements of soil screening evaluation that differ for residential, nonresidential, and construction scenarios. Users of this guidance should refer to the SSG User's Guide and Technical Background Document (U.S. EPA, 1996) for additional information on modeling approaches, data sources, and other important details of conducting soil screening evaluations at NPL sites.

URL: http://www.epa.gov/superfund/resources/soil/ssgmarch01.pdf

94: Part 201 Generic Drinking Water Criteria

Author: Michigan Department of Environmental Quality: Environmental Response Division

Year: 1998

Secondary Title: Technical Support Document

Application to Upland Testing: This document is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. This Technical Support Document (TSD) presents the methodology for development of the Part 201 generic drinking water criteria (DWC) pursuant to sections 20120a(1)(a), (b) and (d) and 20120(a)(3) and (5) of Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended. It also provides general information about the implementation of the criteria. The DWC are presented in the first and second columns of the Environmental Response Division Interim Operational Memorandum #18: Part 201 Generic Cleanup Criteria Tables.

URL: http://www.deq.state.mi.us/documents/deq-erd-tsd3.pdf

95: Technical Support Document–Michigan Background Soil Survey

Author: Michigan Department of Environmental Quality: Waste Management Division

Application to Upland Testing: This document is used as a reference document for assessing compliance of a beneficial use of dredged material at a certain site with the contaminant criteria set forth by Part 201. Michigan Technical Support Documents (TSDs) explain how the generic contaminant criteria were developed that are in the Part 201 rules. These documents would be used to develop site specific criteria.

96: Risk-Based Guidance for the Soil - Human Health Pathway User's Guide

Author: Minnesota Pollution Control Agency: Site Remediation Section

Year: 1998

Secondary Title: Draft Guidelines

Application to Upland Testing: These documents describe a tiered approach to evaluating potential human health impact from contaminated soil. Although they were not designed for use with dredged material, they have been determined to be appropriate for application to dredged material. The process involves comparison with site-specific measurement with Soil Reference Values (SRV). Tier 1 evaluation assumes long-term residential conditions and is the most conservative. Situations failing to meet Tier 1 standards may qualify for Tier 2 approach, which may be less conservative, depending on the use of the material (such as recreational or industrial). Tier 3 involves a complete site-specific risk assessment and may be applied if both Tier 1 and Tier 2 fail.

These criteria have been established solely for the protection of human health through a variety of pathways. The pathways considered include ingestion, dermal contact, and inhalation. They are not intended to be protective of any ecological endpoints. Separate ecological analysis may be required on a case-specific basis.

There are three separate documents available. The Executive Summary is a brief overview of the tiered approach to SRV evaluation. The User's Guide goes into more detail about how this system is applied. Volume 2 of the User's Guide is a technical description of how the SRVs are determined and has the complete

Tier 1 and 2 SRV tables appended. MS Excel worksheets are also available to help conduct the evaluation process

URL: http://www.pca.state.mn.us/cleanup/riskbasedoc.html#pathway

97: Attachment- Suggested Metals Limits for General Reuse Options

Author: New York State Department of Environmental Conservation: Division of Solid and Hazardous Materials

Year: 2001

Application to Upland Testing: This is a one-page attachment stating recommended limits for heavy metals for contaminated waste soils, dredge, or any granular material proposed for use as commercial fill, road subbase, landfill daily cover, or concrete aggregate. Two tiers of numerical reuse criteria are tabulated, the less stringent tier for encapsulated or stabilized materials. Reuse in residential or environmentally sensitive settings is prohibited. These criteria were originally published as special conditions to a soil thermal treatment permit in upstate New York for beneficial use of contaminated soil treated under the permit.

This document has never been formally adopted as dredge reuse guidance. In view of their prior inclusion in a permit, however, DEC has provided these reuse criteria to the public as the basis for several BUDs.

98: Determination of Soil Cleanup Objectives and Cleanup Levels

Author: New York State Department of Environmental Conservation: Division of Environmental Remediation

Year: 1994

Secondary Title: Technical and Administrative Guidance Memorandum (TAGM) No. 4046

Application to Upland Testing: This TAGM provides a basis and procedure to determine soil cleanup levels at individual Federal Superfund, State Superfund, and Responsible Party sites, when the Division determines that cleanup of a site to predisposal conditions is not possible or feasible. The tables include recommended numerical soil cleanup objectives for numerous Target Compound and Target Analyte List contaminants, based on human health risk analysis, groundwater partitioning and regional or site background.

This guidance has found relevance in New York for screening dredge material for human and environmental risk with a view to beneficial use.

URL: http://www.dec.state.ny.us/website/der/tagms/prtg4046.html

99: Human Health Impacts of the Land Application of PCB-Contaminated Materials

Author: Wisconsin Department of Health and Family Services: Division of Public Health: Bureau of Environmental Health

Year: 2001

Application to Upland Testing: This document contains a risk assessment to support rule development limiting PCB concentrations in soils, based on human health. It is a support document for draft Department of Natural Resources Rule placing limits on the total PCB concentrations in soils used for land application of wastewater treatment plant sludges and solid wastes. It contains recommendations for soil criteria to represent the maximum acceptable concentration of PCBs resulting from the land application of dredged sediment and other materials containing PCBs on agricultural land.

The Division of Public Health of the DHFS prepared a risk assessment, at the request of the Department of Natural Resources, on the uptake of PCBs from soil into food chain crops, based on toxicological data. The division recommended soil criteria for the maximum acceptable concentration of PCBs which would limit human cancer risk to 1 in 1 million. Recommended soil criteria were further reduced to account for cumulative

risks due to intact from sport fish and other sources. Based on these risk assessments, the division recommended a maximum total PCB concentration in the plow layer of 0.1 ppm for land used for grazing beef and dairy cattle 0.3 ppm for land on which grazing does not occur.

100: Wildlife Soil Criterion for Polychlorinated Biphenyls (PCBs)

Author: Wisconsin Department of Natural Resources

Year: 2001

Application to Upland Testing: This document contains a risk assessment to support rule development limiting PCB concentrations in soils, based on adverse effects on wildlife. It is a support document for draft Department of Natural Resources Rule placing limits on the total PCB concentrations in soils used for land application of wastewater treatment plant sludges and solid wastes.

The Department of Natural Resources prepared a risk assessment on the uptake of PCBs from soil into selected sensitive wildlife species, based on toxicological data. The department recommended soil criteria for the maximum acceptable concentration of PCBs which would limit to a No Observed Adverse Effect Level (NOAEL). Based on this risk assessment, the department recommended a maximum total PCB concentration in the plow layer of 1.9 ppm.

101: Determining Recovery Potential of Dredged Material for Beneficial Use: Site Characterization - Prescriptive Approach

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 2000

Number: Technical Note DOER-C14

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This is one of three DOER technical notes providing guidance on evaluating the potential for recovery of dredged material for beneficial use (BU), either as is or using physical separation (soil washing) to meet BU specifications. This technical note describes a prescriptive approach to estimating volumes meeting BU requirements. The prescriptive approach uses available information or information obtained from limited sampling to evaluate the feasibility of material reuse, available volumes, and the need for and feasibility of physical separation.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc14.pdf

102: Determining Recovery Potential of Dredged Material for Beneficial Use: Site Characterization - Statistical Approach

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 2000

Number: Technical Note DOER-C15

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This is one of three DOER technical notes providing guidance on evaluating the potential for recovery of dredged material for beneficial use (BU), either as is or using physical separation (soil washing) to meet BU specifications. This technical note introduces statistical methods for developing a sampling plan and interpreting and extrapolating the resulting data.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc15.pdf

103: Determining Recovery Potential of Dredged Material for Beneficial Use: Soil Separation Concepts

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 2000

Number: Technical Note DOER-C13

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This is the first of three technical notes providing guidance in evaluating dredged material recovery potential. This technical note provides an overview of physical separation (soil washing) concepts, and presents mathematical relationships for estimating material recovery potential (MRP) for meeting beneficial use (BU) requirements.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc13.pdf

104: Manufactured Soil Screening Test

Author: C. R. Lee

Year: 1999

Number: DOER-C6

Publisher: U.S. Army Environmental Research and Development Center, U.S. Army Engineer Waterways Experiment Station (WES)

Application to Upland Testing: This provides a screening test that can be used to evaluate the potential for manufacturing artificial soil using dredged material, cellulose waste materials (e.g., yard waste compost, sawdust, wastepaper), and biosolids (e.g., N-Viro-reconditioned sewage sludge, BIONSOIL-reconstituted cow manure). The procedure is intended to allow the most productive blend of any dredged material (uncontaminated or contaminated), cellulose, and biosolids to be determined and recommended for use in an environmentally productive and beneficial manner.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc6.pdf

105: Air Emissions from Contaminated Sediments and Dredged Materials: 1. Experimental Data in Laboratory Microcosms and Mathematical Modeling

Authors: K. T. Valsaraj, B. Choy, R. Ravikrishna, L. J. Thibodeaux, D. D. Reible, C. B. Price, J. M. Brannon and T. Myers

Year: 1997

Journal: Journal of Hazardous Materials

Volume: 54

Number: 1-2

Pages: 65-87

Application to Upland Testing: The air emissions of two polycyclic aromatic hydrocarbons (pyrene and phenanthrene) and one heterocyclic compound (dibenzofuran) from an "aged" contaminated sediment (Rouge River, Michigan) were studied in an experimental microcosm. The sediment-to-air flux of the above semivolatile organic compounds (SOCs) was obtained from an initially water-saturated sediment. The magnitude of flux varied as dibenzofuran > phenanthrene > pyrene. At a low air flow rate (10 ml / min) the flux was low and stable and air-phase resistance controlled. At a larger flow rate (100 ml / min) the flux was high initially and then declined, indicating the effects of sediment-side diffusion on mass transfer to air. The flux was also sensitive to the relative humidity (RH) of the air flowing above the sediment. It was observed that the flux, though high initially, declined rapidly as dry air (zero percent RH) was passed over the wet sediment. Loss of sediment moisture which increased the sorptive capacity of the sediment for the contaminants was also noted. Subsequent exposure of the dry sediment to humid air increased the flux. The steady state flux was consistently high when humid air was passed over dry sediment. The experimental data were analyzed using a mathematical model which estimated the air emission from an exposed sediment layer under both sediment-side and air-side resistance controlled conditions. The model incorporated an advancing "drying front" in the direction of airflow for water evaporation in accordance with our observations. The sharp decrease in contaminant flux was attributed to the drying-out of the sediment and a consequent increase in its sorptive capacity for the contaminant. The framework of the theory underlying the air emission modelling from exposed sediment, dredged and placed in a confined disposal facility (CDF) is summarized [ABSTRACT].

This paper provides some guidance on estimating possible risks through volatlization of volatile or semivolatile contaminants in dredged material, which may be of concern in some upland uses.

106: Air Emissions from Exposed Contaminated Sediments and Dredged Materials

Authors: K. T. Valsaraj, R. Ravikrishna, B. Choy, D. D. Reible, L. J. Thibodeaux, C. B. Price, S. Yost, J. M. Brannon and T. E. Myers

Year: 1999

Journal: Environmental Science and Technology

Volume: 33

Number: 1

Pages: 142-149

Application to Upland Testing: The sediment-to-air fluxes of two polycyclic aromatic hydrocarbons (phenanthrene and pyrene) and a heterocyclic aromatic hydrocarbon (dibenzofuran) from a laboratory-contaminated sediment and those of three polycyclic aromatic hydrocarbons (naphthalene, phenanthrene, and pyrene) from three field sediments were investigated in experimental microcosms. The flux was dependent on the sediment moisture content, air-filled porosity, and the relative humidity of the air flowing over the sediment surface. The mathematical model predictions of flux from the laboratory-spiked sediment agreed with observed values. The fluxes of compounds with higher hydrophobicity were more air-side resistance controlled. Conspicuous differences were observed between the fluxes from the laboratory-spiked and two of the three field sediments. Two field sediments showed dramatic increases in mass-transfer resistances with increasing exposure time and had significant fractions of oil and grease. The proposed mathematical model was inadequate for predicting the flux from the latter field sediments. Sediment reworking enhanced the fluxes from the field sediments due to exposure of fresh solids to the air. Variations in flux from the lab-spiked sediment as a result of change in air relative humidity were due to differences in retardation of chemicals on a dry or wet surface sediment. High moisture in the air over the dry sediment increased the competition for sorption sites between water and contaminant and increased the contaminant flux [ABSTRACT].

107: Air Emissions from Exposed, Contaminated Sediment and Dredged Materials: 2. Diffusion from Laboratory-Spiked and Aged Field Sediment

Authors: R. Ravikrishna, K. T. Valsaraj, S. Yost, C. B. Price and J. M. Brannon

Year: 1998

Journal: Journal of Hazardous Materials

Volume: 60

Number: 1

Pages: 89-104

Application to Upland Testing: The mass transfer of three polycyclic aromatic hydrocarbons (naphthalene, phenanthrene and pyrene) and a heterocyclic aromatic hydrocarbon (dibenzofuran) from sediment to air was studied in a large-area flux chamber. A laboratory-spiked local (University Lake, or UL) sediment and an aged contaminated field (Indiana Harbor Canal, or IHC) sediment was used. The effects of initial sediment moisture content, and changing air relative humidity were investigated. For high moisture conditions in the UL sediment, the flux remained large whereas for low moisture conditions, there was a sharp decrease in flux as a result of surface drying of the sediment. Under similar air velocities and moisture conditions, the flux from the aged IHC sediment was considerably smaller than from the laboratory-spiked UL sediment. Whereas, the flux from laboratory-spiked UL sediment was predicted satisfactorily by a conceptual mathematical model, that from the aged IHC sediment did not agree with the model predictions. It was concluded that only a portion of the contaminant was available for desorption from the aged sediment due to the differences in the sorption characteristics of relatively fresh and aged contaminated sediments [ABSTRACT].

108: Availability and Bioslurry Treatment of PAHs in Contaminated Dredged Materials

Authors: I. W. Talley, U. Ghosh and R. G. Luthy

Year: 2001

Secondary Title: Sixth International In Situ and On-site Bioremediation Symposium

109: Biomarker-Based Analysis for Contaminants in Sediments/Soil: Review of Cell-Based Assays and cDNA Arrays

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 2000

Number: Technical Note DOER-C19

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This is a review of the existing technology for cell-based biomarker assays and cDNA arrays and explores their potential as rapid, sensitive, and low-cost tools for sediment/soil toxicity screening. The current project extends the application of biomarker-based assays initiated in Technical Note DOER-C1 for dioxins and related compounds to additional sediment/soil contaminants and contaminant modes of action.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc19.pdf

110: Bioremediation of PAH-Contaminated Dredged Material at the Jones Island CDF: Materials, Equipment, and Initial Operations

Authors: T. E. Myers and D. W. Bowman

Year: 2000

Number: TN-DOER-C5

Publisher: U.S. Army Corps of Engineers: Environmental Research and Development Center

Application to Upland Testing: The U.S. Army Corps of Engineers, Detroit District, is conducting (as of 1999) a bioremediation demonstration project at the Jones Island confined disposal facility (CDF), Milwaukee, Wis. Dredged material contaminated with polycyclic aromatic hydrocarbons (PAHs) is being bioremediated using composting technology. This technical note describes the materials, equipment, and initial operations at the Jones Island CDF bioremediation project. The purpose of the Jones Island bioremediation project is to test the feasibility of using low-cost and relatively passive biotechnology to reduce PAH concentrations and convert the dredged sediment to material suitable for offsite beneficial uses.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc5.pdf

111: A Comparative Screening-Level Ecological and Human Health Risk Assessment for Dredged Material Management Alternatives in New York/New Jersey Harbor

Authors: S. B. K. Driscoll, W. T. Wickwire, J. J. Cura, D. J. Vorhees, C. L. Butler, D. W. Moore and T. S. Bridges

Year: 2002

Journal: Human and Ecological Risk Assessment

Volume: 8

Number: 3

Pages: 603-626

Application to Upland Testing: Managers of New York and New Jersey Harbor dredging projects are developing strategies to dispose and manage the large volumes of sediment that must be dredged to maintain

passable waterways. The various management alternatives include aquatic containment facilities, upland containment, and treatment with beneficial reuse. An important consideration in the selection of an appropriate alternative is the evaluation of potential risks to ecological and human receptors. This study presents a framework for a screening-level ecological and human health risk assessment that compares risks associated with management alternatives for contaminated dredged materials. The major objectives of the work were to identify exposure routes that show the potential for risk and develop a framework that can be used to compare relative potential risks among eight management alternatives. Managers can use this framework to: identify, characteristics of the placement/treatment alternatives that contribute to potential risk; Choose one alternative over another for sediments with high concentrations of contaminants; implement controls that mitigate risk; or, identify, the need for a more comprehensive site-specific risk assessment [ABSTRACT].

112: A Comparison of the Ames Assay and Mutatox in Assessing the Mutagenic Potential of Contaminated Dredged Material

Author: A. S. Jarvis

Year: 1995

Number: Technical Report D-95-1 ; NTIS No. AD A294 644

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: Technical reference for upland evaluation and monitoring regarding mutagenic potential.

113: The Concept of Manufacturing Soil from Dredged Material Blended with Organic Waste Materials and Biosolids

Authors: P. T. Adam and C. R. Lee.

Year: 1997

Secondary Title: International Workshop on Beneficial Use of Dredged Material

Application to Upland Testing: Fertile soil can be manufactured from recycled materials that can include dredged material, organic waste materials and biosolids. All dredged material can be used to manufacture soil, however, some dredged material may require reconditioning to some extent, depending on the circumstances. Organic waste materials could include just about anything, such as sawdust from lumber processing, bagasse from sugar cane processing, yard waste, paper processing cellulose mud, waste paper, hurricane debris, phragmites, or melaleuca compost. Biosolids can be derived from reconditioned municipal sewage sludge, reconditioned cow manure, chicken manure, or reconditioned pig manure. The ingredients will depend on what is available in close proximity. These ingredients can be blended according to a patented formulation, tested in greenhouse screening experiments and demonstrated at field locations. The development of this technology has been possible through cooperative research and development agreements between the U.S. Army Corps of Engineers (Corps), Waterways Experiment Station (WES) and commercial entities such as Terraforms, N-Viro International, Bion Technologies, Inc. and Scotts Company. Together, each participant contributes to the demonstration of manufactured soil technology and eventually to the commercialization of the process. Specific examples will be discussed in detail in other companion papers at this workshop [ABSTRACT].

URL: http://www.wes.army.mil/el/dots/budm/pdf/techsess1-7.pdf

114: Degradation of Polychlorinated Biphenyl Mixtures (Aroclor 1242, 1254, 1260) by the White Rot Fungus *Phanerochaete Chrysosporium* as Evidenced by Congener-Specific Analysis

Authors: J. S. Yadav, J. F. Q. III, J. M. Tiedje and C. A. Reddy.

Year: 1995

Journal: Applied Environmental Microbiology

Volume: 61

Pages: 2560-2565

Application to Upland Testing: Evidence for substantial degradation of polychlorinated biphenyl mixtures Aroclor 1242, 1254, and 1260 by the white rot fungus Phanerochaete chrysosporium, based on congener-specific gas chromatographic analysis, is presented. Maximal degradation (percent by weight) of Aroclors 1242, 1254, and 1260 was 60.9, 30.5, and 17.6 percent, respectively. Most of the congeners in Aroclors 1242 and 1254 were degraded extensively both in low-N (ligninolytic) as well as high-N (nonligninolytic) defined media. Even more extensive degradation of the congeners was observed in malt extract medium. Congeners with varying numbers of ortho, meta, and para chlorines were extensively degraded, indicating relative nonspecificity for the position of chlorine substitutions on the biphenyl ring. Aroclor 1260, which has not been conclusively shown to undergo aerobic microbial degradation, was shown to undergo substantial net degradation by *P. chrysosporium*. Maximal degradation of Aroclor 1260 was observed in malt extract medium (18.4 percent on a molar basis), in which most of the individual congeners were degraded [ABSTRACT].

115: Development of Laboratory Procedures to Predict Volatile Losses from Contaminated Sediments

Authors: C. Price, J. Brannon, T. Myers, K. T. Valsaraj, L. Thibodeaux and D. Reible

Year: 1997

Secondary Title: Environmental Effects of Dredging Technical Notes

Volume: 61

Number: TN EEDP-02-23

Publisher: U.S. Army Corps of Engineers: Research and Development Center

Application to Upland Testing: This technical note describes the development of laboratory procedures to obtain experimental data on the mission of volatile organic chemicals (VOCs) from exposed sediment. These data are being used to develop and validate predictive volatile emissions models. The information presented herein includes laboratory techniques and some preliminary results obtained during these investigations.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-23.pdf

116: Distribution of PCB and Pesticide Contaminants in the Vicinity of Times Beach Confined Disposal Facility, Buffalo, New York

Authors: J. M. Marquenie, J. W. Simmers, R. G. Rhett and D. L. Brandon

Year: 1990

Number: Miscellaneous Paper EL-90-24

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

117: Dredged Material Composting at Milwaukee and Green Bay, Wisconsin Confined Disposal Facilities

Authors: T. E. Myers, D. W. Bowman and K. F. Myers

Year: 2002

Number: ERDC TN-DOER-C33

Publisher: U.S. Army Corps of Engineers: Environmental Research and Development Center

Application to Upland Testing: This paper presents a thorough discussion of efforts in Wisconsin to remove PCBs and PAH from dredged material by composting with an organic material. Because of the addition of organics, soil manufacture is a desirable beneficial use of materials successfully remediated in this way.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc33.pdf

118: Dredging and Water Quality Problems in the Great Lakes

Author: U.S. Army Corps of Engineers Buffalo District

Year: 1969

Volume: 1-12

Application to Upland Testing: This document presents the results of a two-year study and demonstration program that evaluated the impacts of open water disposal on Great Lakes water quality. Demonstrations were made at confined disposal facilities (CDFs) at selected harbors. In addition, some treatment technologies were evaluated.

119: Efforts to Develop Beneficial Uses for Dredged Material from the Milwaukee and Green Bay Confined Disposal Facilities

Author: U.S. Army Corps of Engineers Detroit District

Year: 1999

120: Guidance for Performance of the H4IIE Dioxin Screening Assay

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 1998

Number: Technical Note DOER-C1

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This guidance contains protocols for the maintenance of cell cultures and for the conduct of a biomarker-based screening assay for dioxin toxic equivalents (TCDD TEQs) in sediments and other environmental samples using the H4IIE rat hepatoma cell line as performed at WES.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc1.pdf

121: Guidance Manuals to Support the Assessment of Contaminated Sediments in Freshwater Ecosystems: Volume I

Author: Sustainable Fisheries Foundation

Year: 2002

Secondary Title: An Ecosystem-Based Framework for Assessing and Managing Contaminated Sediments

Number: EPA-905-B02-001-A

Publisher: U.S. Environmental Protection Agency

Application to Upland Testing: These guidance manuals present an ecosystem-based approach for assessing and managing sediments, evaluate specific tests available for evaluating sediments, provide recommended procedures for designing and implementing sediment quality investigations, and present procedures for interpreting the results of sediment quality investigations. The manuals are an important resource for those involved in the assessment of sediments in the Great Lakes basin.

URL: http://www.cerc.usgs.gov/pubs/sedtox/VolumeI.pdf

122: Inventory of Marine Biotest Methods for the Evaluation of Dredged Material and Sediments

Author: M. Nendza

Year: 2002

Journal: Chemosphere

Volume: 48

Number: 8

Pages: 865-883

Application to Upland Testing: An inventory of marine biotest methods for the evaluation of dredged material and sediments was compiled on behalf of the Federal Environmental Agency of Germany. Relevant assays were identified from the literature and experts from several countries contributed to a questionnaire survey on established and developing procedures. The biotest methods are applicable to whole sediment, sediment suspension, sediment elutriate, porewater and/or sediment extract. The endpoints cover acute and long-term toxicity, bioaccumulation, endocrine effects, toxic effects on reproduction, carcinogenicity and mutagenicity.

Comparative analyses and evaluation of the biotest methods were conducted with regard to their sensitivity, specificity, applicability (regional specificity, availability and suitability of the test organisms), variability (physico-chemical factors, natural factors and factors related to sampling and testing), cost-effectiveness, aspects of animal ethics, standardization (guidelines, intercalibration) and application for monitoring purposes in the areas of the OSPAR and Helsinki Conventions. The available information was integrated to rate the validity of the methods, their relevance for assessing impacts on ecosystems and the suitability of the methods for the evaluation of marine sediments and dredged material.

Based on the rating of the individual bioassays, a tiered testing is suggested in a hierarchical approach representing a variety in taxa, biological processes and exposure routes, thereby covering the cellular, species, population and community level with a wide discriminatory and sensitivity range. The toxicological significance and complexity increases with the tiers: (1) screening and detection of impacts, (2) characterization of toxic effects, (3) verification of in situ alterations [ABSTRACT].

123: Land Treatment of Milwaukee Harbor Sediments Contaminated with PAHs and PCBs

Authors: G. Sayles, D. Acheson, M. Rahman, A. Zaffiro, A. Koeniger, J. Mansfield, D. Macke and D. Bowman

Year: 2001

Secondary Title: Sixth International In Situ and On-site Bioremediation Symposium

Application to Upland Testing: This study provides a background for bioremediation of sediments prior to potential upland placement projects. The authors present a lab-scale study examining the land treatment of Milwaukee Harbor sediments contaminated with 150 mg/kg PAHs and 1.4 mg/kg PCBs in 1-ft3 pan reactors. In this study, the reactors were amended with varying levels anaerobic digester biosolids and subjected to active treatment for 31 weeks, followed by 29 weeks of passive treatment. During the active phase of remediation, they observed a 33 percent reduction in PAHs, a 55 percent reduction of diesel-range organics (DRO), and up to a 64 percent of total PCBs from homologs mono- to hexachlorobiphenyl. PAH and DRO removal varied little with differing biosolids amendment levels, but PCB reduction was inversely related, with 64 percent removal occurring at the no biosolids level and 0 percent PCB removal observed at the 20 percent level. Little if any further reductions were seen in PAH and PCB levels during passive treatment. The complete results from this study, including toxicity assessments (earthworm survival, solid phase Microtox, seed germination, and root elongation), have yet to be submitted for formal publication.

124: Leachate Testing and Evaluation for Estuarine Sediments

Authors: T. E. Myers, J. M. Brannon and B. A. Tardy

Year: 1996

Number: Technical Report D-96-1 ; NTIS No. AD A306 421

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

125: Measurement and Prediction of Volatile Emissions from Contaminated Sediments in Confined Disposal Facilities

Author: C. Price

Year: 2000

Journal: Dredging Research Information Exchange Bulletin

Volume: 3

Number: 2

126: Mineral Processing Pretreatment of Contaminated Sediment

Author: J. P. Allen

Year: 1994

Number: EPA 905-R94-022

Publisher: U.S. Department of Interior: Bureau of Mines, Salt Lake City Research Center

Application to Upland Testing: The U.S. Bureau of Mines (USBM), Department of the Interior, was requested by the Great Lakes National Program Office, U.S. Environmental Protection Agency, to evaluate various mineral processing techniques for their effectiveness in assisting with remediation of contaminated sediments in rivers and harbors around the Great Lakes. Samples from the Ashtabula River, Buffalo River, Indiana Harbor/Grand Calumet River, and Saginaw River and Saginaw Bay Areas of Concern were received by USBM and evaluated in this study. USBM used grain size analysis, surface area, and electron microscopy techniques to characterize the sediments and their contaminants. Grain size separation, magnetic separation, gravity separation, attrition scrubbing, and froth flotation were evaluated for their effectiveness in concentrating contaminants from sediment samples representing each of the four sites.

The conceptfound to show promise in assisting remediation has been called pretreatment and involves using mineral processing technology such as size separation to separate a contaminant-laden portion from the bulk of the sediment. The result of this is that the size and cost of the final treatment or disposal effort can be reduced. Other potential benefits include improved effectiveness of any treatment process to follow and possible beneficial use of cleaner sediment fractions. This report shows that grain size separation applied to a coarse-grained sediment such as that from the Saginaw River has potential to concentrate metallic and organic contaminants in approximately 20 percent of the sediment mass. Potential applications of magnetic separation at Indiana Harbor, and froth flotation at Saginaw River, are also deemed to show limited application.

URL: http://www.epa.gov/glnpo/arcs/EPA-905-R94-022/EPA-905-R94-022.html

127: New Bedford Harbor Superfund Project, Acushnet River Estuary Engineering Feasibility Study of Dredging and Dredged Material Disposal Alternatives

Authors: J. G. Skogerboe, R. A. Price and D. L. Brandon

Year: 1988

Secondary Title: Report 4: Surface Runoff Quality Evaluation for Confined Disposal

Number: Technical Report EL-88-15

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This testing protocol for surface runoff water quality; has been successfully applied to dredged material at several locations, including Indiana Harbor. It uses the Rainfall Simulator Lysimeter System (RSLS). Even though RSLS was considered an effective tool, it was also found to be expensive, time-consuming, and dependent on use of the existing facilities at WES. Hence, another method was being developed in 1999 called Simplified Laboratory Runoff Procedure (SLRP),

URL: http://www.wes.army.mil/el/elpubs/pdf/trel88-15-4.pdf

128: Particle-Scale Understanding of the Bioavailability of PAHs in Sediment

Authors: J. W. Talley, U. Ghosh, S. G. Tucker, J. S. Furey and R. G. Luthy

Year: 2002

Journal: Environmental Science and Technology

Volume: 36

Number: 3

Pages: 477-483

Application to Upland Testing: This study reports results of sediment bioslurry treatment and earthworm bioaccumulation for polycyclic aromatic hydrocarbon (PAH) contaminants found in sediment dredged from Milwaukee Harbor. A significant finding was that bioslurry treatment reduced PAHs on the sediment clay/silt fraction but not on the sediment coal-derived fraction and that PAH reduction in the clay/silt fraction correlated with substantial reduction in earthworm PAH bioaccumulation. These findings are used to infer PAH bioavailability from characterization of particle-scale PAH distribution, association, and binding among the principal particle fractions in the sediment. The results are consistent with work showing that the sediment comprised two principal particle classes for PAHs, coal-derived and clay/silt, each having much different PAH levels, release rates, and desorption activation energies. PAH sorption on coal-derived particles is associated with minimal biodegradation, slow release rates, and high desorption activation energies, while PAH sorption on clay/silt particles is associated with significant potential biodegradability, relatively fast release rates, and lower desorption activation energies. These characteristics are attributed to fundamental differences in the organic matter to which the PAHs are sorbed. Although the majority of the PAHs are found preferentially on coal-derived particles, the PAHs on the clay/silt sediment fraction are more mobile and available, and thus potentially of greater concern. This study demonstrates that a suite of tests comprising both bioassays and particle-scale investigations provide a basis to assess larger-scale phenomena of biotreatment of PAH-impacted sediments and bioavailability and potential toxicity of PAH contaminants in sediments. Improved understanding of contaminant bioavailability aids decision-making on the effectiveness of biotreatment of PAH-impacted sediments and the likelihood for possible reuse of dredged sediments as reclaimed soil or fill [ABSTRACT].

The results described have potential implications for bioremediation of dredged material prior to placement, suggesting improved removal for some contaminants based on the potion of sand/silt in the dredged material. The implications for availability could also impact risk assessments for approval of upland uses.

129: Physical Separation (Soil Washing) for Volume Reduction of Contaminated Soils and Sediments - Processes and Equipment

Authors: T. J. Olin, S. E. Bailey, M. A. Mann, C. C. Lutes, C. A. Seward and C. F. Singer

Year: 1999

Number: EPA-905-R-99-006

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES) and U.S Environmental Protection Agency: Great Lakes National Program Office (GLNPO)

Application to Upland Testing: Among the simplest of treatment technologies are physical separation technologies, those processes capable of separating distinct sediment or dredged material fractions based on size or density differences. Because contaminants tend to associate with specific sediment fractions preferentially, separation processes can be utilized to recover an uncontaminated portion, which may then be suitable for beneficial use. The useful life of facilities used for storage of contaminated sediments can be extended, with potential long term cost savings, in addition to the benefits that may be realized in conjunction with the identified beneficial use of the recovered material. This document describes the principles of separation, general operating parameters, typical treatment trains, available equipment, and cost estimating procedures. The document also contains a number of case studies.

130: Predicting Surface Runoff Water Quality from Upland Disposal of Contaminated Dredged Material

Author: Long-Term Effects of Dredging Operations Program (LEDO)

Year: 1998

Number: Dredging Research Technical Note EEDP-02-25

Publisher: U.S. Army Corps of Engineers: Washington District

Application to Upland Testing: This describes the Simplified Laboratory Runoff Procedure (SLRP), a simple lab bench-scale water dilution/extraction procedure. There is a comparison of SLRP and the Rainfall Simulator Lysimeter System (RSLS) in the lab and in the field by application to several sites. SLRP was shown to be effective as a screening tool to determine potential water quality problems but requires additional evaluation with the RSLS. SLRP may be relevant as a potential screening procedure for evaluation of upland uses for dredged material.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-25.pdf

131: Prediction of Volatile Losses from Contaminated Exposed Sediments

Authors: C. Price, J. Brannon, S. Yost, R. Ravikrishna and K. T. Valsaraj

Year: 1999

Secondary Title: Environmental Effects of Dredging Technical Notes

Volume: 61

Number: TN EEDP-02-25

Publisher: U.S. Army Corps of Engineers: Research and Development Center

Application to Upland Testing: This technical note describes laboratory and field investigations conducted to obtain flux data from contaminated dredged materials for the emission of volatile organic chemicals (VOCs) from sediment exposed to the atmosphere. These data have been used to develop and validate predictive volatile emissions models. Laboratory and field results and predictive equations are presented.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-28.pdf

132: Program Documentation and Users Guide: PCDDF89, Primary Consolidation and Desiccation of Dredged Fill

Author: T. D. Stark

Year: 1991

Number: DOTS Miscellaneous Paper D-91-1

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES) Environmental Laboratory,

Application to Upland Testing: This technical note describes a modified and updated version of the computer program Primary Consolidation and Desiccation of Dredged Fill (PCDDF). PCDDF was developed under the Dredging Operations Technical Support Program for use in evaluating the long-term storage capacity of confined dredged material disposal areas. The program accounts for both the consolidation and desiccation of compressible materials and has recently been modified to more accurately simulate layered field conditions which often exist in disposal sites. The modified computer program is called PCDDF89. Although PCDDF was originally developed to assess settlement of very soft layers of dredged material in confined disposal facilities, it is also applicable to other compressible soil deposits. The finite strain consolidation theory used in PCDDF89 is applicable to soils ranging in compressibility from soft to firm and can be used for a variety of consolidation analyses including conventional one-dimensional analyses.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-10.pdf

133: Recent Developments in Leachate Testing and Evaluation

Authors: T. E. Myers, J. M. Brannon and C. B. Price

Year: 1992

Number: Miscellaneous Paper D-92-2 ; NTIS No. AD A255 043

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

134: Reclaiming Soil from Dredged Material Disposal Areas

Authors: J. A. Miller, C. R. Lee and T. J. Olin

Year: 1997

Secondary Title: U.S.-Japan Experts Meeting of Management of Bottom Sediments Containing Toxic Substances

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This paper presents a description of the obstacles to beneficial use of dredged material reclaimed from CDFs and case studies from Great Lakes CDFs.

135: Review of Field Verification Studies of Sediment Bioassays for the Regulatory Evaluation of Dredged Material

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 2001

Number: Technical Note DOER-C23

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This is a review of published field validation studies of sediment bioassays to recommend the design and conduct of such studies in the future. The primary impetus for this review is to develop an approach for the validation of emerging chronic sublethal sediment toxicity tests for the regulatory evaluation of dredged material.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc23.pdf

136: Risk-Cost Trade Off Considerations for Contaminated Sediment Disposal

Authors: S. P. Pavlou and J. S. Stansbury

Year: 1998

Journal: Human and Ecological Risk Assessment

Volume: 4

Number: 4

Pages: 991-1002

Application to Upland Testing: Delays in dredging and inability to dredge the nation's harbors, due to the presence of contaminated sediments and the lack of environmentally acceptable disposal sites are interfering with shipping activities and hampering trade growth. The United States government is committed to provide continuing support to the port industry's goals for enhancing economic growth while protecting, conserving and restoring natural resources within coastal aquatic lands. The government's commitment has resulted in the articulation of a national dredging policy in the Action Plan for Improvement of the Dredging Process in the United States. This national challenge calls for a systematic and consistent decision making approach to dredging and disposal including contaminated sediment management. In building an effective decision making framework for costs, risk reduction and potential beneficial uses of the disposal material must be considered in identifying and evaluating environmentally acceptable and cost-effective disposal alternatives. A conceptual framework for applying a risk-cost trade off approach in making decisions regarding contaminated sediment disposal is presented and applied to a hypothetical disposal scenario involving three alternatives: deepwater confined disposal, nearshore fill or capping and, upland disposal. The approach entails the performance of sequential evaluations consisting of risk analysis, estimation of costs, integration of the results into a computational framework for trade-off analysis, and the application of decision analytical tools to build consensus among stakeholders and the general public in selecting a preferred alternative [ABSTRACT].

137: Soil Washing Potential at Confined Disposal Facilities

Authors: T. J. Olin and D. W. Bowman

Year: 1996

Number: Environmental Effects of Dredging Technical Report D-96-3

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: The diminishing capacity of existing confined disposal facilities (CDFs) is a significant operational concern as land development and acquisition costs continue to rise. Alternatives such as capacity expansion and restricted use (that is, storage of only the most contaminated sediments or sediment fractions) have been considered for extending the life of CDFs. Some U.S. Army Corps of Engineers' facilities are evaluating the reclamation of clean dredged material fractions from existing CDFs to recover storage capacity. This clean material has potential market value as fill, soil amendment, landfill cover and other beneficial uses. Because contaminants often associate with a particular sediment fraction, volume reduction can be achieved using physical separation. Physical separation technologies have long been employed in the mining industry for selective mineral separation, which is effected by taking advantage of differences in the size, density or surface chemistry of the particles being separated.

Demonstration projects have been conducted at Erie Pier and Saginaw Bay. The Erie Pier CDF is a 332,000 square meter facility in Duluth receiving mechanically dredged material from the Duluth-Superior Harbor. Erie Pier sediments contain low levels of PCBs, low to moderate levels of metals, and other organics. A simple soil washing technology has been employed there since 1988 to recover the clean coarse materials as construction fill. Approximately 20-25 percent of the Erie Pier dredged material is removed annually. Saginaw Bay has been identified as an Area of Concern, and sediments from this area are also contaminated with PCBs, organics and metals. A demonstration project was conducted at the Saginaw Bay CDF employing various pieces of physical separation equipment. Approximately 80 percent of the dredged material was recoverable as a washed product. Research is currently underway to develop standardized procedures for conducting physical separation feasibility evaluations on sediments and to evaluate the potential for capacity recovery at existing CDFs [ABSTRACT].

URL: http://www.stormingmedia.us/cgi-bin/65/6546/A654613-266-24t.php

138: Technical Considerations for Application of Leach Tests to Sediments and Dredged Material

Authors: T. E. Myers and J. M. Brannon

Year: 1991

Number: Environmental Effects of Dredging Program Technical Note EEDP-02-15

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This note summarizes the characteristics of and differences among laboratory leach tests used for preproject evaluation of leachate quality in confined disposal facilities (CDFS) for dredged material. The US Army Corps of Engineers (USACE) has initiated a laboratory program of CDF Ieachate investigations by developing a theoretical framework for prediction of Ieachate quality based on contaminant transport theory. The laboratory tests and theoretical framework under development by the USACE provide estimates of leachate quality in CDFS as elution histories related to the amount of water percolating through dredged material. The US Environmental Protection Agency (EPA) Toxicity Characteristic Leach Procedure (TCLP) is also sometimes used to provide predictions of dredged material leachate quality. The USACE Ieachate tests under development and the TCLP are reviewed in this technical note.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-15.pdf

139: Topsoil Creation from Dredged Materials from Milwaukee and Green Bay, Wisconsin

Authors: T. R. Naik and R. N. Kraus.

Year: 2000

Number: CBU-2000-06

Publisher: The University of Wisconsin-Milwaukee. Department of Civil Engineering and Mechanics. College of Engineering and Applied Science. Center for By-Product Utilization.

140: A Toxicity Identification Evaluation of Silty Marine Harbor Sediments to Characterize Persistent and Non-Persistent Constituents

Authors: J. Stronkhorst, M. E. Schot, M. C. Dubbeldam and K. T. Ho

Year: 2003

Journal: Marine Pollution Bulletin

Volume: 46

Number: 1

Pages: 56-64

Application to Upland Testing: Sediment toxicity in silty marine harbor sediments is frequently dominated by ammonia or sulfide, leaving the adverse effects of persistent toxic substances unnoticed. To investigate the latter, we subjected interstitial water from three contaminated silty sediments to toxicity identification evaluation (TIE) phase I manipulations and tested for toxicity with four bioassays: the amphipod Corophium volutator (survival as an endpoint), the sea urchin Psammechinus miliaris (fertilization, embryo development) and the bacterium Vibrio fischeri (bioluminescence inhibition).

The graduated pH manipulations identified the prominent toxicity of ammonia in the amphipod and sea urchin embryo tests, and also sulfide toxicity in the bacterium test. In two of the three samples tested with the amphipods, sea urchin embryos and bacteria, a small but significant reduction in interstitial water toxicity was achieved by removing persistent compounds through C18 solid phase extraction. EDTA chelation resulted in a slight detoxification of the interstitial water for the amphipods and sea urchin embryos, but this was not related to any measured trace metals. Despite the presence of toxic levels of ammonia and sulfide in the harbor sediments, we established the adverse biological effects of persistent constituents by means of the TIE manipulations and in vivo interstitial water bioassays [ABSTRACT].

As ammonia and sulfide toxicity can confound efforts to conduct whole organism toxicity tests for persistent contaminants in dredged material, the methods described here are relevent to such toxicity tests where this may be a factor.

141: Toxicity Testing, Risk Assessment, and Options for Dredged Material Management

Authors: J. Munns, Wayne R., W. J. Berry and T. H. Dewitt

Year: 2002

Journal: Marine Pollution Bulletin

Volume: 44

Number: 4

Pages: 294-302

Application to Upland Testing: Programs for evaluating proposed discharges of dredged material into waters of the United States specify a tiered testing and evaluation protocol that includes performance of acute and chronic bioassays to assess toxicity of the dredged sediments. Although these evaluations reflect the toxicological risks associated with disposal activities to some degree, analysis activities are limited to the sediments of each dredging project separately. Cumulative risks to water column and benthic organisms at and near the designated disposal site are therefore difficult to assess. An alternate approach is to focus attention on the disposal site, with the goal of understanding more directly the risks of multiple disposal events to receiving ecosystems. Here we review current U.S. toxicity testing and evaluation protocols, and describe an application of ecological risk assessment that allows consideration of the temporal and spatial components of risk to receiving aquatic ecosystems. When expanded to include other disposal options, this approach can provide the basis for holistic management of dredged material disposal [ABSTRACT].

142: Volatile Losses from Aged Field Sediments

Authors: C. Price, J. Brannon, S. Yost, K. T. Valsaraj and R. Ravikrishna

Year: 1998

Volume: 61

Number: TN EEDP-02-26

Publisher: U.S. Army Corps of Engineers Research and Development Center

Application to Upland Testing: This technical note describes laboratory investigations conducted to obtain flux data from contaminated aged field sediments and a laboratory spiked sediment for the emission of volatile organic chemicals (VOCs) from sediment exposed to the atmosphere. These data are being used to develop and validate predictive volatile emissions models. Laboratory experimental techniques and results obtained are presented.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-26.pdf

143: Application of Organic Amendments to Reduce Volatile Pesticide Emissions from Soil

Authors: J. Gan, S. R. Yates, S. Papiernik and D. Crowley

Year: 1998

Journal: Environmental Science and Technology

Volume: 32

Number: 20

Pages: 3094-3098

Application to Upland Testing: Atmospheric emission of volatile pesticides such as soil fumigants contributes to air pollution, and feasible strategies to reduce their emission are urgently needed. In this study, we investigated the potential of applying organic wastes to reduce the emission of two important fumigants, methyl bromide (MeBr) and methyl isothiocyanate (MITC), by enhancing their degradation in surface soil. The degradation of both compounds was significantly accelerated in composted manure or biosolid-manure amended soils, and the enhancement was greater for MITC than for MeBr. The difference in degradation kinetics between sterile and nonsterile amended soils indicates that degradation of MeBr in amended soils was chemically mediated, while that of MITC was mainly a result of stimulated microbial degradation. Applying five percent of composted manure to the five cm surface soil in packed columns reduced MeBr emission by 12 percent, and almost completely eliminated the volatilization of MITC. As certain organic amendments can suppress soil pathogens on their own, integrating fumigation with organic waste application may potentially provide complementary pest control activity. The applicability and benefits of such integrations should be further evaluated under field conditions [ABSTRACT].

144: Upland Disposal Site Management for Surface Runoff Water Quality

Authors: C. R. Lee and J. G. Skogerboe

Year: 1987

Number: Environmental Effects of Dredging Technical Notes EEDP-02-3

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station,

Application to Upland Testing: This document contains a description of surface runoff testing and monitoring method using the Rainfall Simulator Lysimeter System (RSLS) in the lab and in the field. It is potentially relevant as a technical reference for methods assessment and development for upland testing and evaluation.

It describes how the results of the surface runoff water quality test can be used to predict the water quality of surface runoff from confined upland disposal sites and to develop appropriate management plans before dredging. This procedure was developed as part of the Field Verification Program (FVP) and is based on (a) test data collected from Black Rock Harbor, Corm., dredged material using the surface runoff water quality test

(Rainfall Simulator Lysimeter System [RSLS]) in a laboratory environment and (b) the results of field studies that tested techniques for controlling surface runoff water quality from an upland disposal site that contained the same contaminated dredged material from Black Rock Harbor used in the laboratory study (portable RSLS).

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-3.pdf

146: Agricultural Use of Sediments from the Albufera Lake (Eastern Spain)

Authors: R. Canet, C. Chaves, F. Pomares and R. Albiach

Year: 2003

Journal: Agriculture, Ecosystems & Environment

Volume: 95

Number: 1

Pages: 29-36

Application to Upland Testing: Dredging of the Albufera Lake, a very important natural area of eastern Spain, has been proposed to remediate the silting process, but a very large amount of sediments would be generated. To assess the feasibility of applying these to the sandy agricultural soils surrounding the lake, three rates (180, 360 and 720 t/ha) of four different sediments, corresponding to different degrees and sources of contamination, were tested by mixing with a soil obtained from the area of potential application. The effects on the soil properties and yield and nutrient contents of lettuce (Lactuca sativa L.) and tomato (Lycopersicon esculentum Mill.) were studied. As the most relevant changes, sediments improved the soil water-retention and cation exchange capacity of the mixture, but increased its salinity and heavy metal contents. Yield of lettuce increased with parallel to the sediment applications whereas tomato growth and yield remained unaffected. Significant effects were also found on the nutrient contents of the plant tissues, depending on the sediment and application rate used, but no heavy metal accumulation in plants could be detected. According to the results, the application of appropriate rates of sediments to the agricultural soils surrounding the lake seems to be a sound practice to avoid problems arising from the disposal of large amounts of dredged material, and to improve the properties of the sandy soils of the area [ABSTRACT].

This study lends support to use of relatively clean dredged material for agronomic purposes.

147: Airport Construction: Materials Use and Geomorphic Change

Authors: I. Douglas and N. Lawson

Year: 2003

Journal: Journal of Air Transport Management

Volume: 9

Number: 3

Pages: 177-185

Application to Upland Testing: As airport construction competes for land, more and more new developments involve major landform changes, from the channel modifications on the River Bollin at Manchester Airport to the seaward expansion of runways at Sydney and Beirut and the enlargement or total creation of islands at Chek Lap Kok Airport, Hong Kong and Kansai International Airport in Osaka Bay, Japan. The quantities of material involved are large, 307 million cubic meters of material being moved for Chep Lap Kok Airport and 13 Mm3 will be needed to fill the area required for a new runway at Seattle-Tacoma International Airport. Both the landform changes and the excavation and filling of materials produce profound geomorphic changes. In some cases the new configurations are unstable and may need to be rectified by further engineering work. Greater sustainability is achieved when recycled material is used for filling, such as the use of some two million cubic meters of material dredged as a part of normal navigation channel maintenance from the Delaware River in the construction of a new commuter airline runway at Philadelphia International Airport [ABSTRACT].

This article presents a number of applications of alternative material use in airport construction, many involving dredged material. Notable is the description of the use of more than two million cubic meters of material from the Delaware River channel in the construction of a new runway at Philadelphia's airport. This amounted to a cost savings of $7 million and a number of environmental benefits, such as offsetting of mining and transportation burdens and avoiding other sediment disposal routes. Also mentioned are the use of dredged sand in constructing an island airport in Osaka, Japan, a similar project in Singapore, and the use of a sub-base consisting of dredged material, coal ash and lime kiln dust at an airport in Boston.

148: Beneficial Use of Dredged Material to Enhance the Restoration Trajectories of Formerly Diked Lands

Authors: M. P. Weinstein and L. L. Weishar

Year: 2002

Journal: Ecological Engineering

Volume: 19

Number: 3

Pages: 187-201

Application to Upland Testing: Throughout the United States, coastal wetlands are being restored from formerly diked lands drained for agriculture. One such site, the 1620 ha Commercial Township Salt Hay Farm (CTSHF) is located on the southern Delaware Bay, USA. A common problem with these sites is their low elevation associated with long-term lack of tidal inundation and sediment accretion, compaction by heavy equipment, and oxidation associated with exposure to the atmosphere. With the reintroduction of tide, these areas, which have subsided by several meters or more, may become open water and tidal flats for extended periods before they return to wetland habitat. Different levels of subsidence also result in a wide range of marsh planforms including flats with little or no vegetation and/or semblance to the geomorphology of natural systems. The potential use of dredged materials for several aspects of the marsh restoration process-enhancing the sediment budget at low elevations, accelerating the restoration trajectories toward acceptable endpoints, improving the geomorphology of the marsh planform, providing high marsh refugia for species that depend on this habitat type for survival, reestablishing upland dike elevations for off-site protection of people and property, and stabilizing shorelines to reduce erosion rates-are the subjects of this paper. The abundance of dredged materials from channel deepening projects that will occur nation-wide, the maintenance dredging of major ports, on-site construction and other projects provide a wealth of opportunities to combine dredging needs with coastal marsh rehabilitation and restoration [ABSTRACT].

149: Bioaccumulation of Metals and Organic Contaminants at the Times Beach Confined Disposal Site, Buffalo, New York

Authors: J. M. Marquenie, J. W. Simmers and S. H. Kay

Year: 1987

Number: Miscellaneous Paper EL-87-6

Publisher: Technology for Society, Netherlands Organization for Applied Scientific Research and U.S. Army Corps of Engineers: Waterways Experiment Station

150: Brick Manufacture from Dredged Material, a Reality!

Authors: L. Cousins, F. Beason and J. Shuman

Year: 1997

Secondary Title: International Workshop on Dredged Material Beneficial Uses

Application to Upland Testing: Fine clay size dredged material was collected from the confined disposal site at Savannah, Ga. Pilot studies indicated a high quality brick could be manufactured from certain dredged material types. A sorting process was established on the CDF and appropriate size material was collected and

removed for the manufacture of brick. This material replaced expensive raw clay material that had been transported from long distances to Savannah.

URL: http://www.wes.army.mil/el/dots/budm/pdf/techsess22-28.pdf

151: Brick Production with Dredged Harbour Sediments. An Industrial-Scale Experiment

Authors: K. Hamer and V. Karius

Year: 2002

Journal: Waste Management

Volume: 22

Number: 5

Pages: 521-530

Application to Upland Testing: A volume of 600,000 m3 of harbour sediments is annually dredged out of the harbour basin of Bremen to maintain a certain water depth. Because of its perpetual availability, homogeneity and mineralogical, petrographic and chemical composition, the sediment is regarded as a suitable raw material for brick production. A pilot experiment was conducted at a full-scale industrial brickworks. During production, the environmental standards concerning waste-water treatment and the quality of exhausted gas were sufficiently fulfilled. Bricks specified as "building bricks" were produced according to German industrial standards. The parameters pH-value and grain size were varied in leaching tests performed on the bricks as both parameters are likely to change in the course of the brick's life cycle. The leaching data showed that Arsenic was stabilised and heavy metals were immobilised in a way that the bricks were not (hazardous to soil or groundwater) neither by their use, for example, in masonry, nor afterwards, when they will be deposited as mineral demolition mass [ABSTRACT].

152: Codisposal of Municipal Refuse, Sewage Sludge and Marine Dredgings for Methane Production

Authors: Y. S. G. Chan, L. M. Chu and M. H. Wong

Year: 1999

Journal: Environmental Pollution

Volume: 106

Number: 1

Pages: 123-128

Application to Upland Testing: As marine disposal of sewage sludge and dredged sediments may impose serious adverse effects to marine ecosystems, landfilling seems to be the most feasible method for the final disposal of these wastes. A batch experiment was conducted to study waste degradation and gas production after sewage sludge and marine dredgings were mixed with municipal refuse at 13 different ratios for 36 days. The addition of sludge and dredgings to municipal refuse enhanced gas production, compared with the degradation of refuse or sludge alone. A proper mixing ratio of wastes can also shorten the time to reach the final phase of anaerobiosis. The highest gas production was obtained from the ratio of 75-20-5 (refuse-sludge-dredgings) (wet weight basis). Its average daily gas production rate was 1.42 1 kg(-1) waste mixture; methane content was 68.3 percent. The results indicated that codisposal of the three wastes would be beneficial for energy recovery from landfill gas [ABSTRACT].

This atricle suggests a number of possibilities for increasing the environmental and cost-saving potential of beneficial uses. It suggests potential benefits for using sludge as a daily cover material in landfills with methane recovery systems. It also suggests that methane recovery from operations mixing sludge, sediements, and municipal waste may be a profitable activity.

153: The Delaware River Deepening Project: Management of Upland Confined Disposal Facilities as Wetland/Wildlife Habitats

Authors: A. J. DePasquale, J. T. Brady, M. C. Landin and M. R. Palermo

Year: 1997

Secondary Title: International Workshop on Dredged Material Beneficial Uses

Application to Upland Testing: The proposed Delaware River Deepening Project provides for a full width channel deepened from -40.0 to -45.0 feet MLW from the Delaware Bay to the Philadelphia/Camden waterfront, a distance of about 102.5 miles. Approximately 33 million cubic yards of dredged material would be removed for initial construction over a four-year period. Over the 50-year project life, approximately 300 million cubic yards of maintenance dredging will occur. Dredged material from the river would be placed in confined upland disposal areas. Material excavated from the Delaware Bay would be primarily sand and would be used for beneficial purposes including wetland environmental restoration and underwater sand stockpiling. In order to provide capacity for the dredged material from the Delaware River, four new upland disposal areas ranging in size from 275-350 acres will be constructed. Each area will be divided into two cells, which will enable the District to manage the areas to provide wetland and wildlife habitat. By rotating the disposal of dredged material between the cells, in addition to rotation of the new areas with existing sites, individual cells will be maintained as undisturbed wetland habitat for four to five years. After the initial construction of dikes and installation of drainage structures both cells will initially receive approximately 3-6 feet of predominantly fine grained, nutrient rich dredged material. One cell will continue to receive dredged material over a 7-8 year period; the other cell will be managed for wetland/wildlife values over a 3-4 year period. Desirable wetland vegetation will not become established unless the water in the wetland cell is drawn down to bare substrate. After the initial filling the active cell would be dewatered and managed in a conventional manner. The water in the wetland cell would be drawn down afler dredging is completed, and the area would be seeded from a helicopter with a combination of desirable wetland species. After the plants have become established (i.e., after one growing season), water would be diverted from the active dredged material disposal cell into the wetland cell, to levels of 1-2 feet deep . These species should become established during the first growing season and remain during the 3-4 year period until more dredged material is placed on the cell, when this procedure would be repeated to establish wetland vegetation on the other cell. An important aspect of this wetland creation is phragmites control. There is a risk that phragmites would become established during the drawdown of the cells for planting by invading rhizomes from adjacent plants. To minimize this risk, impoundment berms would be sprayed with herbicide in the late summer, prior to the drawdown. After the area is reflooded, an appropriate fish species would be introduced to the flooded cell to control mosquitos. If due to climatic reasons additional water is needed in the wetland cell, it will be diverted from the active dredged material disposal cell during fbture dredging activities. By utilizing a combination of conventional management measures combined with careful environmental control it is envisioned that these new upland areas can serve the Corps dredging needs and provide beneficial wetland habitat for the life of the project [ABSTRACT].

URL: http://www.wes.army.mil/el/dots/budm/pdf/techsess15-21.pdf

154: Demonstration Manufactured Soil from Toledo Harbor Dredged Material

Authors: U.S. Army Corps of Engineers: Buffalo District, U.S. Army Corps of Engineers: Waterways Experiment Station, City of Toledo, N-Viro International and Terraforms

Application to Upland Testing: The U.S. ACE, Buffalo District has identified manufactured soil as one of its long-term management alternatives for dredged material removed from the Toledo Harbor. Preliminary screening tests at the U.S. ACE Waterways Experiment Station and at Scott's Co., Marysville Ohio research facility have shown that dredged material can produce a high quality soil material for landscaping. The WES tests indicated a mixture of 69 percent dredged material, 30 percent sawdust or yardwaste and 10 percent NVS produced a fertile material. This document describes a demonstration project of manufactured soil in September 1996 in Toledo, Ohio. Two high-profile landscaping projects (The University of Toledo and The Toledo Botanical Gardens) successfully utilized the manufactured soil.

URL: (Fact Sheet) http://www.wes.army.mil/el/factsheets/recsoil.pdf

155: Demonstration Manufactured Soil from Toledo Harbor Dredged Material, Part 2

Authors: U.S. Army Corps of Engineers: Buffalo District, U.S. Army Corps of Engineers: Waterways Experiment Station, City of Toledo, N-Viro International and Terraforms

Secondary Title: Field Demonstration

Application to Upland Testing: Detailed demonstration project

156: Environmental Assessment of Poplar Island Dredged Material Placement Site, Talbot County, Maryland

Authors: V. P. Dalal, J. E. Baker and R. P. Mason

Year: 1999

Journal: Estuaries

Volume: 22

Number: 3B

Pages: 770-784

Application to Upland Testing: The Poplar Island Dredged Material Placement Site in Talbot County, Md. is proposed to be used for the restoration of Poplar Island and for the creation of desirable habitats lost through erosion of Poplar Island by the beneficial use of clean and uncontaminated dredged material from the Chesapeake Bay approach channels to the Port of Baltimore. The Poplar Island baseline environmental assessment studies included among others, seasonal water quality, benthic community, and benthic tissue contaminants, that were carried out by the Maryland Department of the Environment, in cooperation with the University of Maryland, from September 1995 to July 1996. The purpose of the study was to document the present-day levels of nutrients, trace metals, and organic contaminants in the area to establish a baseline against which subsequent levels and biological responses may be compared. The overall results of the study indicate that Poplar Island and vicinity areas are non-impacted in terms of water quality and benthic tissue contamination. The nutrient levels in the water column were below average for this region of Chesapeake Bay, while the trace metals and organic contamination in the benthic tissues were comparable to other sites within Chesapeake Bay that are not impacted by direct inputs. Concentrations were equivalent or lower than those found at Hart-Miller Island, a disposal facility outside Baltimore Harbor, Md. containing dredged material [ABSTRACT].

157: Evaluation of Polychlorinated Biphenyl and Polycyclic Aromatic Hydrocarbon Concentration in Two Great Lakes Dredged Material Disposal Facilities

Authors: D. W. Bowman, J. M. Brannon and S. A. Batterman

Year: 1996

Secondary Title: Water Quality 96, 11th Seminar

158: Evaluation of Toledo Harbor Dredged Material for Manufactured Soil

Author: U.S. Army Corps of Engineers: Waterways Experiment Station

Year: 2001

Secondary Title: Part 1: Greenhouse Bench-scale Test

Application to Upland Testing: To address both the excess of dredged material and sewage sludge, the U.S. Army Engineer Research and Development Center (ERDC) Environmental Laboratory, Vicksburg, Miss., began to evaluate the potential for manufacturing artificial soil from dredged material and organic wastes. Cooperative Research and Development Agreements (CRDAs) were established with commercial companies to develop the technology for manufacturing soil from dredged material. The recycled soil manufacturing technology offers a quick, simple, low- technology, effective, and affordable means of allowing the reuse of

dredged material, provides additional placement capacity for future dredged material by emptying many existing full CPFs, and recycles waste materials to the benefit of the American people.

Screening tests (seed germination and plant growth) were used in Phase 1 of the recycled soil manufacturing technology to evaluate the feasibility of manufacturing soil using dredged material from Toledo Harbor Cell 1 placement facility. Screening tests included proprietary blends with a range of dredged material content, a range of cellulose content, and N-Viro biosolids.

URL: http://www.wes.army.mil/el/elpubs/pdf/trel01-25.pdf

159: Great Lakes Confined Disposal Facilities

Authors: U.S. Environmental Protection Agency and U.S. Army Corps of Engineers

Year: 2003

Secondary Title: Draft Report to Congress

Application to Upland Testing: This report covers the status of all 45 existing Great Lakes confined disposal facilities (CDFs), background on their history, planning, design, construction, and use. The report also includes an evaluation of the cumulative effect of these facilities on the Great Lakes.

160: Harbour Sludge as Barrier Material in Landfill Cover Systems

Authors: K. Tresselt, G. Miehlich, A. Groengroeft, S. Melchior, K. Berger and C. Harms

Year: 1998

Journal: Water Science and Technology

Volume: 37

Number: 6-7

Pages: 307-313

Application to Upland Testing: Sediment dredged from the port of Hamburg, Germany is treated and stored upland in a storage facility. The site is covered by a system of topsoil above a sand drainage layer and a barrier layer made of processed harbour sludge in order to minimize the input of water after completion of the site. In 1995 in-situ investigations have started to study the hydraulic properties, the water balance and the water quality of the cover system of the storage site Hamburg. Two lysimeters (500 m2 each) were constructed. During the first dry year after the construction of the lysimeters discharge rates < 0.05 mm/d were measured below the sludge barrier. The hydraulic gradients indicate downward water movement in the sludge barrier during the summer and the winter of 1996. The chemical composition of the discharge below the barrier is typical for sludge pore water. An increase of the discharge above the sludge barrier neither led to an increase of discharges nor to changes in the concentration of the water compounds below the barrier. We assume that up to now there is no preferential flow through the sludge barrier. The cover system including the sludge barrier performs very well. The monitoring of the lysimeters is continued [ABSTRACT].

161: Houston-Galveston Navigation Channel: Blueprint for the Beneficial Uses of Dredge Material

Author: R. J. Wagner

Year: 2000

Journal: Coastal Management

Volume: 28

Number: 4

Pages: 337-352

Application to Upland Testing: The beneficial uses of dredge material from the Houston- Galveston Navigation Channel (HGNC) to create large-scale wetlands represents a blueprint for other large U.S. ports. The port authority's interagency coordination team, the Beneficial Uses Group (BUG), successfully developed

an innovative 50-year plan to deal with dredge material disposal from the channel widening and maintenance project. The creation of intertidal wetlands will initiate the restoration of the United States' second most productive estuary, in concert with the Galveston Bay National Estuary Plan, while capturing increasingly scarce government financing for port maintenance and improvement operations. An overview of the various beneficial uses of dredge material in the HGNC enlarging project is presented with a detailed investigation of the Bayport Demonstration Marsh. The HGNC project is analyzed as a prototype for successful extensive wetland creation ventures, and several key design criteria for similar large-scale marsh creation projects are given [ABSTRACT].

162: Innovative Erosion Control Involving the Beneficial Use of Dredge Material, Indigenous Vegetation and Landscaping Along the Lake Erie Shoreline

Authors: E. J. Comoss, D. A. Kelly and H. Z. Leslie

Year: 2002

Journal: Ecological Engineering

Volume: 19

Number: 3

Pages: 203-210

Application to Upland Testing: Current conventional erosion protection techniques are both costly and can detract from the natural environment. The purpose of this paper is to describe how Presque Isle State Park, located along the shoreline of Lake Erie in Pennsylvania, implemented a low-cost and innovative erosion protection project. Erosion within the back bay area of the park threatened the park's heavily used multi-purpose trail. With a matching grant from the Great Lakes Commission, the park developed a plan that placed riprap off the shoreline of the trail, anchored downed trees from the park in the riprap to function as timber groins, and then filled in the area between the trail and the riprap with sand dredged from a local sandbar. Geotextile and wattles were then positioned in the fill to aid in vegetative rooting. After placement of the geotextile and the wattles, indigenous vegetation was transplanted in the newly created area. Completion of the project resulted in several additional hectares of stabilized vegetation while providing an economical, natural, and aesthetic alternative to conventional shoreline erosion protection. The project affords a valuable example to other parks and recreational facilities along the Great Lakes faced with the challenge of minimizing erosion and maintaining a natural appearance [ABSTRACT].

163: In-Situ Processing of Dredge Sediments from the Port of New York and New Jersey: Case Studies of Large Volume Upland Placement for Use as Structural Fill and Brownfield Remediation

Authors: J. Ward, T. L. Dunlap and D. A. Ardito

Year: 1997

Secondary Title: International Workshop on Dredged Material Beneficial Uses

Application to Upland Testing: A joint project of ECDC Environmental and ITEX has established a fully operational dredge sediments recovery and recycling facility at Port Newark, N.J. The facility treats dredged sediments at dockside before removing them from the barge. Proprietary mixing equipment mixes specially prepared cement-based additives to improve the material's compressive and supportive strengths. The process also reduces leachability of any contaminants that may be present in the dredged material. The facility is currently processing 4,000 cubic yards per day of material from dredging projects in the New York Harbor area and has capacity to expand to 12,000 cubic yards per day production. Processed material is being used for structural fill at a local shopping mall development site and a second beneficial use location will open in August or September 1997.

URL: http://www.wes.army.mil/el/dots/budm/pdf/techsess15-21.pdf

164: Interim Report: Collation and Interpretation of Data for Times Beach Confined Disposal Facility, Buffalo, New York

Authors: E. A. Stafford, J. W. Simmers, R. G. Rhett and C. P. Brown

Year: 1991

Number: LEDO Miscellaneous Paper D 91 17 ; NTIS No. AD A239 637

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

165: Manufactured Soil from Toledo Harbor Dredged Material and Organic Waste Materials

Authors: W. Cadet, C. R. Lee and T. C. Sturgis

Year: 1997

Secondary Title: International Workshop on Beneficial Use of Dredged Material

Application to Upland Testing: Manufactured soil was evaluated in greenhouse screening tests and demonstrated at Toledo, Ohio using dredged material, organic waste material and biosolids. greenhouse screening tests evaluated germination and growth of four plant species: ryegrass, tomato, marigold, and vinca. Various blends of dredged material ranging from 40 to 80 percent, and organic waste materials (sawdust, yard waste)ranging from 10 to 50 percent, and biosolids at 10 percent. Based on results of the screening tests, a demonstration was conducted to produce 660 cubic yards of manufactured soil. The manufactured soil was used to landscape the front entrance to the University of Toledo and the Toledo Botanical Garden. The demonstration was a cooperative effort among the City of Toledo, Toledo Port Authority, CRDA partners (Terraforms and N- Viro), the Corps Buffalo District and WES, and was an overwhelming success. The Buffalo District supplied the dredged material and funded the demonstration. The Port Authority located potential demonstration sites to receive the manufactured soil. Terraforms supplied the patented formula, and manpower to locate blending equipment for the demonstration and onsite technical support. N-Viro International supplied the biosolids for the manufactured soil. WES coordinated all activities for the demonstration. The City of Toledo supplied dump trucks to haul manufactured soil from the processing site at the Corps' Cell 1 confined disposal facility (CDF) to the University of Toledo and to Toledo Botanical Garden. Commercialization of the manufacture of soil products with up to 800,000 cubic yards of dredged material per year has been proposed by Terraforms and interested local entities. At that rate, the existing CDF will be available for accepting dredged material from the Toledo Harbor just about the time the newly constructed CDF will be filled to capacity [ABSTRACT].

URL: http://www.wes.army.mil/el/dots/budm/pdf/techsess1-7.pdf

166: Port Redesign and Planned Beach Renourishment in a High Wave Energy Sandy-Muddy Coastal Environment, Port Gisborne, New Zealand

Authors: T. Healy, S. Stephens, K. Black, R. Gorman, R. Cole and B. Beamsley

Year: 2002

Journal: Geomorphology

Volume: 48

Number: 1-3

Pages: 163-177

Application to Upland Testing: Redesign of Port Gisborne for the 21st century has encompassed a broad interdisciplinary approach. This procedure has taken into account the operational requirements of the port, effects of dredging and construction upon the benthic fauna, and wave activity within the port confines after the proposed development. Added amenity value of the development to the local community is an important ancillary redesign consideration. Initially, a major research project into the environmental impacts of the developments has been undertaken.

The project, which commenced in 1996 and is still continuing, involves an iterative approach integrating the initial design and development options with the operational feasibility, construction constraints, environmental constraints, social acceptability, and economic practicality of the port; all of these require in-depth assessment to obtain the necessary planning and development approvals. This requires close liaison between the professional environmental research scientists, port management, port operation staff (pilots), construction engineers, planners, and the community interest groups.

Numerical modelling of the hydrodynamics of Poverty Bay, simulating waves and current effects on the various initial designs options, and calibrated against data from a substantial field program, has been a fundamental tool. It was applied experimentally to determine the best option for the port layout, as well as to assess sedimentation impacts. Modelling results indicated a significant increase in maintenance dredging expected as a result of deepening the navigation approach channel. Because this may have an impact on the nearby sandy beach by inducing erosion, the best option for disposal of the sandy dredged material was determined to be disposal in the surf zone for subtidal beach profile renourishment. Textural analysis of the sediments trapped in the navigation channel demonstrated that they were suitable for this purpose [ABSTRACT].

167: Prediction of Surface Runoff Water Quality from an Upland Dredged Material Disposal Site

Authors: C. R. Lee and J. G. Skogerboe

Year: 1983

Secondary Title: International Conference on Heavy Metals in the Environment

168: Proceedings of the International Workshop on Dredged Material Beneficial Uses

Author: M. Landin (Ed.)

Year: 1997

Publisher: Sponsored by U.S. Army Corps of Engineers and U.S. Environmental Protection Agency

Application to Upland Testing: The proceedings from this workshop contain numerous abstracts with relevant information and insights for beneficial reuse of dredged material. Some of these are cited separately in this bibliography

URL: http://www.wes.army.mil/el/dots/budm/pdf/97workshop.pdf

http://www.wes.army.mil/el/dots/budm/pdf/contents.pdf

http://www.wes.army.mil/el/dots/budm/pdf/intro.pdf

http://www.wes.army.mil/el/dots/budm/pdf/agenda.pdf

http://www.wes.army.mil/el/dots/budm/pdf/techsess1-7.pdf

http://www.wes.army.mil/el/dots/budm/pdf/techsess8-14.pdf

http://www.wes.army.mil/el/dots/budm/pdf/techsess15-21.pdf

http://www.wes.army.mil/el/dots/budm/pdf/techsess22-28.pdf

http://www.wes.army.mil/el/dots/budm/pdf/authors.pdf

http://www.wes.army.mil/el/dots/budm/pdf/appA.pdf

169: The Production of Synthetic Aggregate from a Quarry Waste Using an Innovative Style Rotary Kiln

Authors: P. J. Wainwright, D. J. F. Cresswell and H. A. v. d. Sloot

Year: 2002

Journal: Waste Management and Research

Volume: 20

Number: 3

Pages: 279-289

Application to Upland Testing: The large volumes of wastes generated by industrialised society has led to efforts to find practical uses for these wastes, while offsetting the consumption of natural resources. This paper describes the use of an innovative rotary kiln to produce synthetic aggregates from a variety of waste streams. The main waste used was a quarry fines which was blended with either paper sludge, clay, or a dredged harbour sediment. The different combinations were extruded and fired in the kiln to produce a material suitable for natural aggregate replacement. Two of the synthetic aggregates produced were tested by incorporation in to concrete as coarse aggregate replacement. The concrete 28-day compressive strengths achieved were above 40 N mm-2 and compared favourably with control concretes made with natural aggregates and a commercially available lightweight aggregate (Lytag). Leaching tests have also been carried out to assess the potential environmental impact of utilisation. Although not finalised, these tests have also given favourable results [ABSTRACT].

170: Promoting Dredged Material as a Resource - Dredged Material Is a Valuable Resource That Can Be Used in Environmentally Beneficial Ways

Authors: L. J. Sabat, C. Vogt and B. Holliday

Year: 2002

Journal: Sea Technology

Volume: 43

Number: 8

Pages: 47-52

171: Reclamation of Solid Waste Landfills by Capping with Dredged Material

Authors: R. K. Mohan, J. B. Herbich, L. R. Hossner and F. S. Williams

Year: 1997

Journal: Journal of Hazardous Materials

Volume: 53

Number: 1-3

Pages: 141-164

Application to Upland Testing: A cost-effective method for reclaiming solid waste landfills by capping with clayey dredged material is illustrated in this paper using a closure design developed for bauxite residue landfills in Texas. The design consisted of capping the landfills with dredged material obtained from maintenance dredging at a nearby bay and establishing a vegetative layer on the cap using salt-tolerant plant species. A research methodology comprised of laboratory cylinder tests, field revegetation tests and computer-based transport modeling was used to evaluate the effectiveness of the various capping alternatives and to select the final design parameters for the landfill. Results from this study indicated that a cap consisting of a 0.31 m (1.0 ft) sandy dredged material layer (topsoil layer for establishing vegetation) underlain by a 0.61 m (2.0 ft) clayey dredged material layer (low permeability layer) can be used as an effective barrier for closure of solid waste landfills yielding effective isolation of the waste from the environment. The design developed in this study can be applied to other similar solid waste sites with minor modifications depending upon the waste properties, site characteristics, and closure requirements of the facility [ABSTRACT].

172: Recovery of Dredged Material for Beneficial Use: The Future Role of Physical Separation Processes

Authors: T. J. Olin-Estes and M. R. Palermo

Year: 2001

Journal: Journal of Hazardous Materials

Volume: 85

Number: 1-2

Pages: 39-51

Application to Upland Testing: Sediments dredged from navigational waterways have historically been disposed in confined disposal facilities (CDFs) or in open water. When sediments are contaminated, open water disposal is typically not an alternative, and sediments are placed in CDFs. Many CDFs are nearing capacity, and siting and constructing new facilities is both difficult and expensive. In many cases, CDFs contain both clean and contaminated dredged material. Removal of materials suitable for beneficial use (BU) is one alternative under consideration to extend the life of existing CDFs, as is separation of recoverable materials at the time of disposal. Several technologies for recovery of clean materials or treatment of contaminated materials for beneficial use are presently under evaluation. Physical separation technologies have been demonstrated to have potential in reducing the volume of sediment that must be managed with confined disposal, but there are several technical issues that remain to be addressed. Determination of beneficial use specifications, physical and chemical characterization of dredged material, overall site characterization, selection of suitable unit operations, management of liquid and solid residuals, and cost/benefit analysis, are all important aspects to successful implementation of separation processes. Several of these elements are presently being evaluated in research conducted by the U.S. Army Corps of Engineers, at the ERDC Waterways Experiment Station (WES) [ABSTRACT].

173: Restoring Marsh Elevation in a Rapidly Subsiding Salt Marsh by Thin-Layer Deposition of Dredged Material

Authors: M. A. Ford, D. R. Cahoon and J. C. Lynch

Year: 1999

Journal: Ecological Engineering

Volume: 12

Number: 3-4

Pages: 189-205

Application to Upland Testing: Thin-layer deposition of dredged material on coastal marsh by means of high-pressure spray dredging (Jet-Spray®2) technology has been proposed as a mechanism to minimize wetland impacts associated with traditional bucket dredging technologies and to restore soil elevations in deteriorated marshes of the Mississippi River delta. The impact of spray dredging on vegetated marsh and adjacent shallow-water habitat (formerly vegetated marsh that deteriorated to open water) was evaluated in a 0.5-ha Spartina alterniflora-dominated salt marsh in coastal Louisiana. The thickness of dredged sediment deposits was determined from artificial soil marker horizons and soil elevation change was determined from sedimentation–erosion tables (SET) established prior to spraying in both sprayed and reference marshes. The vertical accretion and elevation change measurements were made simultaneously to allow for calculation of shallow (~5 m depth) subsidence (accretion minus elevation change). Measurements made immediately following spraying in July 1996 revealed that stems of S. alterniflora were knocked down by the force of the spray and covered with 23 mm of dredged material. Stems of S. alterniflora soon recovered, and by July 1997 the percent cover of S. alterniflora had increased threefold over pre-project conditions. Thus, the layer of dredged material was thin enough to allow for survival of the S. alterniflora plants, with no subsequent colonization by plant species typical of higher marsh zones. By February 1998, 62 mm of vertical accretion accumulated at this site, and little indication of disturbance was noted. Although not statistically significant, soil elevation change was greater than accretion on average at both the spray and reference marshes, suggesting that subsurface expansion caused by increased root biomass production and/or pore water storage influence elevation in this marsh region. In the adjacent shallow water pond, 129 mm of sediment was deposited in July 1996 as a result of spraying, and despite initial shallow subsidence and continual erosion through February 1998, water bottom elevation was raised sufficiently to allow S. alterniflora to invade via rhizome growth from the adjacent marsh. Hence, thin-layer deposition of dredged material at this site was effective at restoring and maintaining marsh elevation after 1.5 years. However, if the open water sediment deposits are not soon completely stabilized via further vegetative colonization, erosion may eventually lower elevations to the level where emergent vegetation cannot persist [ABSTRACT].

174: Sediments and Sediment-Derived Soils in Illinois: Pedological and Agronomic Assessment

Authors: R. G. Darmody and J. C. Marlin

Year: 2002

Journal: Environmental Monitoring and Assessment

Volume: 77

Number: 2

Pages: 209-227

Application to Upland Testing: Dredging sediments from water bodies in Illinois is done to preserve reservoir capacity, maintain navigation and recreation channels, and restore habitats, but the fate of the sediments is an issue. In anticipation of a major sediment dredging operation in Lake Peoria in the Illinois River, a retrospective study of sediment placement operations was performed. Sediments previously dredged from reservoirs and placed in retaining ponds were sampled along with adjacent upland soils which served as references. Sediments from the Illinois River above Peoria were sampled from islands, river bottom, and adjacent floodplain. Dredged sediment retention ponds initially support wetland vegetation. After dewatering, the physical properties of sediments tend to become similar to upland soils and the retention basins are then able to support conventional agriculture. Sediment organic matter content was similar to local reference surface soils, and soil pH of the sediments was neutral or above. Sediment textures are dominated by silts and clays, with the Lake Peoria samples being most clayey. Calcium was the dominant cation in all the samples, and micronutrients measured were in adequate supply for plant growth. However, because the Illinois River watershed includes industrial inputs, river sediments contained elevated levels of some metals, but they were generally below levels of regulatory concern. Results indicated that properly handled dredge sediments could make high quality agricultural soils. In addition, sediment placement on poor soils could improve their productivity [ABSTRACT].

175: Use of Dredge Materials for Costal Restoration

Authors: B. Costa-Pierce, D. Kelly, D. Miller, C. Simenstad, B. Streever, M. P. Weinstein, P. Williams and R. Zimmerman

Year: 2002

Journal: Ecological Engineering

Volume: 19

Number: 3

Pages: 181-186

Application to Upland Testing: This editorial contains a summary of USACE and USEPA projects involving beneficial use of dredged material. There is also a synopsis of the Sea Grant Ecosystem and Habitats Symposium on the Beneficial Use of Dredged Materials for Wetland Restoration.

176: Use of Dredged Material for Capping Solid Waste Landfills

Authors: R. Mohan and J. Herbich

Year: 1997

Secondary Title: International Workshop on Dredged Material Beneficial Uses

Application to Upland Testing: Increased environmental awareness of the public, coupled with the enactment of stricter state and federal regulations, has resulted in the requirement that solid waste disposal facilities be capped with clean uncontaminated material upon closure. The capping of landfill disposal areas restricts potential upward contaminant migration from within the site and provides for a zone of clean material at the surface. Typically, compacted clays have been used for such applications due to their inherent low permeability, thus reducing surface water infiltration and contaminant transport, while maximizing the surface run-off. In many cases, clean maintenance-dredged sediments from rivers and harbors can usually meet the physical requirements of such caps and offer several advantages: (1) economic: this provides a placement site

for maintenance dredged material, (2) environmental: the low permeability of the silty and clayey dredged material minimizes surface infiltration and potential upward transport of contaminants, and (3) beneficial: this provides a beneficial use of clean dredged material from maintenance dredging. Effective capping of solid waste landfills requires careful and well-planned geo-environmental design and subsequent monitoring to evaluate performance. In general, solid waste landfills can be classified as follows, based on the nature of the waste product: (1) hazardous and toxic waste Landfills: are those that contain wastes defined by the Code of Federal Regulations, paragraph 40, (2) Class 1 Waste Landfills: are landfills which accommodate solid wastes, which after defined testing, contain specific constituents which equal or exceed listed levels or are ignitable or corrosive, (3) Class 2 Waste Landfills: are those that contain nonhazardous solid wastes which cannot be classified as Class 1 or 3, and (4) Class 3 Waste Landfills: are landfills that contain inert and essentially insoluble wastes that are not readily decomposable. Depending on the classification of landfills and applicable environmental regulations, they may require closure by specific capping layers and thicknesses. However, such caps typically consist of one or more layers of the following: barrier soil liner (low permeability layer, clay or equivalent), geomembrane liner, lateral drainage layer (sand), and vertical percolation barrier (topsoil for vegetation). Design requirements of various caps and potential use of various fractions of dredged material as part of such capping layers will be described in the presentation. Desired dredged material for such use (including water content, consistency, permeability, texture, pH, organic content, and soluble salt content) and potential techniques that will aid in such use (including direct placement and dewatering, dredged material rehandling/reuse facilities, particle separation techniques, and treatment chains for contaminated sediments), will be identified. In addition, experimental, analytical, and field simulation techniques for evaluating the effectiveness of maintenance dredged material for use in such caps will also be discussed. Finally, case studies of pilot-scale and full-scale projects where dredged material has been used for capping solid waste landfills (or is being planned for such use) will be presented [ABSTRACT].

URL: http://www.wes.army.mil/el/dots/budm/pdf/techsess15-21.pdf

177: Using Biosolids to Recliam Dredged Material: Recycled Soil Manufacturing Technology

Author: C. Lee

Year: 2001

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This is a brief summary of the applications to date by the Army Corps of Engineers of Recycled Soil Manufacturing Technology (RSMT). Included is a description of the use of material from the Toledo Harbor CDF to manufacture topsoil used at the University of Toledo botanical gardens. Several other projects around the nation are discussed, as is the potential application to mineland restoration.

URL: http://www.rmwea.org/tech_papers/mine_forest_land_2000/Lee.pdf

178: The WRDA of 1986 - Background and Beneficial Use of Dredged Material with Particular Reference to the Great-Lakes

Author: R. Ramraj

Year: 1994

Journal: Journal of Coastal Research

Volume: 10

Number: 1

Pages: 30-38

Application to Upland Testing: In 1986, the United States Congress passed the Water Resources Development Act (WRDA, 1986) with the objective of better managing some of this country's most valuable marine and terrestrial resources. Among the act's provisions was the authorization to initiate several new dredging projects, and to deepen and widen existing ones across the United States and the Great Lakes region. Hundreds of millions of dollars have been allocated for Great Lakes dredging projects. The execution of these schemes means that tens of millions of tons of dredged material, both clean and polluted, will have to be disposed of annually in an environmentally safe and economically sound manner. Much of the clean and lightly

contaminated portion of this material may be beneficially used. A large portion of the polluted part may be disposed of cheaply and safely by employing innovative disposal techniques which have been successfully utilized in some parts of the United States, but have yet to be employed in the Great Lakes. The purpose of this paper is to review some of the ways in which dredged materials have been utilized, and to suggest some innovative disposal methods which can be successfully practiced in the Great Lakes. These methods hare implications for possible future research on dredging and disposal, particularly in the Great Lakes region [ABSTRACT].

179: Bark Camp Home Page

Author: Pennsylvania Department of Environmental Protection

Year: 2002

Application to Upland Testing: These webpages describe the Bark Camp Mine Reclamation Project that the Commonwealth of Pennsylvania has been conducting for the past several years. The project utilizes 500,000 cubic yards of dredge material from New Jersey and Pennsylvania.

URL: http://www.dep.state.pa.us/dep/deputate/minres/bamr/bark_camp/barkhomepage.htm

180: Residual Waste Management Regulations

Secondary Title: 25 PA Code Chapters 287 to 299

Application to Upland Testing: These regulations contain definitions, scope, permit requirements including design and operation standards for waste processing and disposal facilities, financial assurance requirements and storage and transportation requirements for residual (nonhazardous industrial) waste.

181: An Overview of Toxicant Identification in Sediments and Dredged Materials

Authors: K. T. Ho, R. M. Burgess, M. C. Pelletier, J. R. Serbst, S. A. Ryba, M. G. Cantwell, A. Kuhn and P. Raczelowski

Year: 2002

Journal: Marine Pollution Bulletin

Volume: 44

Number: 4

Pages: 286-293

Application to Upland Testing: The identification of toxicants affecting aquatic benthic systems is critical to sound assessment and management of our nation's waterways. Identification of toxicants can be useful in designing effective sediment remediation plans and reasonable options for sediment disposal. Knowledge of which contaminants affect benthic systems allows managers to link pollution to specific dischargers and prevent further release of toxicant(s). In addition, identification of major causes of toxicity in sediments may guide programs such as those developing environmental sediment guidelines and registering pesticides, while knowledge of the causes of toxicity which drive ecological changes such as shifts in benthic community structure would be useful in performing ecological risk assessments. To this end, the U.S. Environmental Protection Agency has developed tools (toxicity identification and evaluation (TIE) methods) that allow investigators to characterize and identify chemicals causing acute toxicity in sediments and dredged materials. To date, most sediment TIEs have been performed on interstitial waters. Preliminary evidence from the use of interstitial water TIEs reveals certain patterns in causes of sediment toxicity. First, among all sediments tested, there is no one predominant cause of toxicity; metals, organics, and ammonia play approximately equal roles in causing toxicity. Second, within a single sediment there are multiple causes of toxicity detected; not just one chemical class is active. Third, the role of ammonia is very prominent in these interstitial waters. Finally, if sediments are divided into marine or freshwater, TIEs performed on interstitial waters from freshwater sediments indicate a variety of toxicants in fairly equal proportions, while TIEs performed on interstitial waters from marine sediments have identified only ammonia and organics as toxicants, with metals playing a minor role. Preliminary evidence from whole sediment TIEs indicates that organic compounds play a major role in the toxicity of marine sediments, with almost no evidence for either metal or ammonia toxicity. However,

interpretation of these results may be skewed because only a small number of interstitial water (n=13) and whole sediment (n=5) TIEs have been completed. These trends may change as more data are collected [ABSTRACT].

182: Act 307 Type B Cleanup Criteria for Groundwater and Soil

Author: Michigan Department of Environmental Quality

Year: 1994

Secondary Title: Revision 3

Application to Upland Testing: Type B criteria were calculated using currently available toxicological data and the algorithms set forth in the Act 307 Rules. These criteria may change as new toxicity data become available. They are not necessarily final cleanup standards. These criteria might be used by the department to evaluate certain used of dredged material, such as an unrestricted fill.

URL: http://www.deq.state.mi.us/documents/deq-wmd-swp-AppendixC.pdf

183: Draft Compost Rules

Author: Michigan Department of Environmental Quality

Year: 2002

Application to Upland Testing: The composting of organic wastes is regulated pursuant to Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). Persuantly, these draft standards were issued. They could be applied by the MDEQ in decisions regarding compost or topsoil production from dredged materials.

URL: http://www.michigan.gov/deq/0,1607,7-135-3312_4123-56887–,00.html

184: Operational Memo 115-10

Author: J. Sygo

Year: 1999

Secondary Title: Sanitary Landfill Alternate Daily Cover Approval, Requirements and Procedures

Application to Upland Testing: This memorandum was issued persuant to NREPA part 115 to clarify protocols for daily cover at MSW landfills. Dredged material is considered a class C cover material and is therefore subject to testing for contamination. Sample criteria are given based on a number of site-dependant characteristics.

URL: http://www.deq.state.mi.us/documents/deq-wmd-opmemo-115-10.pdf

185: Case Studies: Characterization Tests to Determine Dredged Material Suitability for Beneficial Uses

Author: Dredging Operations and Environmental Research Program (DOER)

Year: 1999

Number: Technical Note DOER-C7

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Application to Upland Testing: This document contains a series of brief case studies showing how the numerous characterization tests contained in Technical Note DOER-C2 were applied under a tiered framework to evaluate the suitability of a dredged material for a specific beneficial use. The case studies include: Final landfill cover in Mobile, Ala.; Topsoil manufacture in Toledo, Ohio; and Soil manufacture and construction block manufacture in N.Y. / N.J. Harbor.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc7.pdf

186: Case Study Series

Author: Great Lakes Dredging Team

Publisher: Great Lakes Commission

Application to Upland Testing: This series of case studies presents examples of beneficial uses of dredged material that have occurred around the Great Lakes basin. The case studies include: Pennsylvania Uses Interstate Consistency Provisions of the Coastal Management Act to Achieve Beneficial Use of Dredged Material; Beneficial Use of Dredged Material in Brown County, Wis.; Duluth-Superior Harbor Dredged Material Management Plan; The Port of Toledo and the Maumee River Basin; and Waukegan Harbor

URL: http://www.glc.org/dredging/case/

187: Manufactured Soil Prom Contaminated New York/New Jersey Harbor Dredged Material

Authors: C. R. Lee, T. C. Sturgis, K. Donato and E. Stern

Year: 1997

Secondary Title: International Workshop on Beneficial Use of Dredged Material

Application to Upland Testing: Manufactured soil was produced from New York/New Jersey Harbor fresh anaerobic dredged material and organic waste materials. Greenhouse screening tests were conducted with various blends ranging from 30-80 percent dredged material, 10-60 percent organic waste (sawdust, yard waste), and 10 percent biosolids (Bionsoil). Greenhouse screening tests results indicated that a manufactured soil blend could grow grass. The other plant species could not tolerate the salt content of the blend. A demonstration was conducted at the Port of Newark in which manufactured soil was blended and three different phytoremediation approaches were tested. Phytoremediation I consisted of plant species to contain contaminants within the dredged material. Phytoremediation II consisted of a plant species to remove metals from the dredged material. Phytoremediation III consisted of plant species to biodegrade organic contaminants. All grasses grew and performed well [ABSTRACT].

URL: http://www.wes.army.mil/el/dots/budm/pdf/techsess1-7.pdf

188: Evaluation of Manufactured Soil Using Dredged Material from New York/New Jersey Harbor Newton Creek Site.

Authors: T. C. Sturgis, C. R. Lee, H. C. Banks, Jr, M. R. Burchell, I and K. Johnson

Year: 2001

Secondary Title: Phase 1: Greenhouse Bench-Scale Test

Publisher: U.S. Army Corps of Engineers, Research and Development Center Environmental Lab

Application to Upland Testing: Manufactured soil/beneficial reuse of dredged material is a potential strategy/alternative for long-term confined disposal. The development of a manufactured topsoil product will allow the U.S. Army Corps of Engineers to remove dredged material from confined disposal facilities (CDFs). This will increase the capacity of the CDFs and eliminate the shortage of CDFs for dredged material storage. In addition, manufactured topsoil from dredged material will potentially result in a product that can be reused in ways that are beneficial to the environment. Manufactured soil can be used for topsoil, bagged soil, landscaping, superfluid site cover, mining site cover, and landfill cover. The U.S. Army Engineer Research and Development Center, Vicksburg, Miss., has established cooperative research and development agreements to develop technology for the manufacture of topsoil using sediment/dredged material (decontaminated and contaminated), cellulose waste materials, and nutrient-rich organic waste materials. The recycled soil manufacturing technology (RSMT) allowed the development of fertile topsoil that could be used in a beneficial, productive, and environmentally sound manner. In addition, the RSMT will provide an alternative to conventional disposal of the nation's waste/resource material from the Metcalf and Eddy Process (decontaminated New York/New Jersey Harbor dredged material via solvent extraction) and untreated dredged material collected directly from the New York/New Jersey Harbor Newton Creek Site. Screening tests included proprietary blends with a range of dredged material content, a range of cellulose, and animal derived biosolids [ABSTRACT].

URL: http://www.wes.army.mil/el/elpubs/pdf/trel01-35.pdf

189: Evaluation of Manufactured Soil Using Dredged Material from Confined Placement Facilities in Mobile, Alabama

Authors: T. C. Sturgis, C. R. Lee, H. C. Banks, Jr., K. Johnson and J. P. Langan

Year: 2002

Secondary Title: Phase 1: Greenhouse Bench-Scale Test

Publisher: U.S. Army Corps of Engineers: Waterways Experiment Station,

Application to Upland Testing: Recycling of waste materials within the environment must be a serious national goal in order for the United States to manage its resources wisely. The U.S. Army Engineer Research and Development Center, Vicksburg, Miss., has established cooperative research and development agreements to develop technology for the manufacture of topsoil using contaminated and uncontaminated sediment/dredged material, cellulose waste materials, and biosolids. The recycled soil manufacturing technology (RSMT) allowed the development of fertile topsoil that could be used in a beneficial, productive, and environmentally sound manner. In addition, the RSMT will provide an alternative to conventional disposal of the nation's waste/resource materials (e.g., in landfills or confined disposal facilities). Bench-scale screening tests (seed germination and plant growth) were used to evaluated the feasibility of using dredged material from Mobile, Ala., confined disposal facilities (CDFs) to develop a fertile manufactured topsoil. Bench-scale screening tests included proprietary blends with a range of dredged material content from three CDFs (North Blakeley, South Blakeley, and North into), a range of cellulose content, and animal derived biosolids [ABSTRACT].

URL: http://www.wes.army.mil/el/elpubs/pdf/trel02-12.pdf

190: Concepts and Technologies for Bioremediation in Confined Disposal Facilities

Authors: T. E. Myers and C. W. Williford

Year: 2000

Number: ERDC TN-DOER-C11

Publisher: U.S. Army Corps of Engineers, Research and Development Center

Application to Upland Testing: The research described in this technical note is aimed at transforming CDFs, diked structures designed to retain dredged material solids from disposal to treatment facilities. Benefits will include operation of CDFs as reclamation facilities, conversion of contaminated dredged material to a soil-like material for beneficial use, and recovery of CDF storage capacity, thereby avoiding the costs of new CDFs. This technical note has two purposes: to assist U.S. ACE district staff in their application of bioremediation techniques to organic contaminants in CDFs, and to identify research needed to better understand and optimize contaminant biodegradation in CDFs. Design concepts and bioremediation technologies that show promise for practical application to recalcitrant organic contaminants in dredged material are described. The technologies reviewed include composting, landfarming, and land treatment. Information provided includes description of technologies, applicability, limitations, costs, and the science on which bioremediation technologies are based.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc11.pdf

191: Beneficial Use of Contaminated Dredged Material as a Source of Aluminum and Iron for Cement Production

Author: K. Gardner

Publisher: University of New Hampshire: Environmental Research Group

Application to Upland Testing: The Center for Contaminated Sediments Research (CCSR) has initiated a project to use dredged material as an alternative feedstock: eliminating the need for cement plants to purchase bauxite and iron on the commodities market. Cost savings for cement plant - cost savings for dredging

operation. For a plant with overall capacity of 3.2 million tons per year, 650,000 tons of sediment can be used. Cost savings: $1.6 million for the cement plant, and $26 million for dredging (with no charge for taking cement). CCSR has begun collaborating with Lafarge Cement, U.S. EPA, U.S. Army Corps of Engineers, and New York State Department of Environmental Conservation to conduct a full-scale demonstration of this technology. Issues to resolve include public acceptance, worker health and safety, materials handling, and verification of organic contaminant destruction.

This application is still in the research stage, as a full-scale production of Portland cement has not yet been achieved. The prospect is attractive for sediments with organic contaminants, as the very high temperatures of cement kilns would remove them. Metal contaminants, especially mercury, would not be destroyed and could be emitted at high levels in flue gas.

URL: http://www.unh.edu/civil-engineering/research/erg/ccsr/cement_project.html

192: Comparative Life Cycle Assessment of Portland Cement Manufacture from Contaminated Sediments Vs. Conventional Materials

Authors: T. Seager, K. Gardner, J. Dalton and M. Weimer

Year: 2003

Secondary Title: Industrial Ecology for a Sustainable Future: Abstracts from the Second ISIE Conference

Application to Upland Testing: This research quantifies the life-cycle ramifications of using contaminated sediments as an alternative mineral feedstock in manufacture of Portland cement. The chemical compositions typical of sediments and conventional raw materials are similar, allowing partial substitution of dredged material. Laboratory results suggest that cement can be manufactured from contaminated sediment samples without jeopardizing structural characteristics. Consequently, this application may have several environmental and economic advantages over current permissible disposal practices such as landfilling. The high temperatures attained in cement kilns effectively destroy organic contaminants (e.g., PCBs). Metals, with the notable exception of mercury, are retained in the cement product and become largely immobilized in the concrete products. Therefore, pollutants of concern may be destroyed or effectively sequestered from the environment. However, the process is expected to work best in wet-process plants, which are less energy efficient than dry-process, and chloride fouling of the kiln is expected to require more frequent maintenance. Nevertheless, increased energy requirements in processing may be partially offset by transportation savings, while increased maintenance costs are offset by savings in landfill tipping fees and reduced raw material costs. This research is expected to inform sediment management decisions. It has the potential to foster less expensive remediation of contaminated sites and more sustainable production of Portland cement and concrete products [ABSTRACT].

193: Risk-Based Site Evaluation Process Guidance Documents

Author: Minnesota Pollution Control Agency

Year: 1998

Application to Upland Testing: The Minnesota Pollution Control Agency (MPCA) has developed guidance outlining a risk-based approach to decision making during site investigation and remedy selection under the state's Voluntary Investigation and Cleanup (VIC) and Superfund Programs. The *Risk-Based Site Evaluation* (RBSE) *Manua*l provides a tiered process for making decisions based on an evaluation of risks to human health and the environment. MPCA staff members with expertise in risk assessment, soil physics, hydrogeology, and remediation technologies have developed this guidance and accompanying risk evaluation spreadsheets that comprise the *RBSE Manual.*

The *Risk-Based Site Evaluation Manual* is composed of individual documents describing the process of site characterization, community involvement, evaluating the risk to human health and the environment posed at a site, and how to address that risk. Working drafts of the documents are now available. Additional documents will be made available as they are completed.

This risk-based process would likely be applied to many upland beneficial uses of dredged material. Contaminant criteria to evaluate sediments would in many cases be taken from these guidance documents, in particular, the Soil Reference Value (SRVs) and Soil Leaching Values (SLVs)

URL: http://www.pca.state.mn.us/cleanup/riskbasedoc.html

194: Risk-Based Guidance for Evaluating the Soil Leaching Pathway

Author: Minnesota Pollution Control Agency: Site Remediation Section

Year: 1998

Secondary Title: Draft Guidelines

Application to Upland Testing: This set of documents, as part of the Risk-Based Site Evaluation Process, provides guidance on use and development of contaminant specific soil leaching values (SLVs) for evaluating the risk to ground water at sites from the soil-to-ground water leaching pathway. The basis for and application of Tier 1 SLVs are presented and a step-wise procedure is presented for using site specific information for developing Tier 2 SLVs for making site corrective action decisions based on this pathway. These SLVs would be applicable in upland beneficial use scenarios where leaching of contaminants from the sediment to groundwater is a potential concern. The document consists of a short overview, a user's guide, and an Excel spreadsheet for use in calculating values. Tier 1 SLVs are included in the User's Guide.

URL: http://www.pca.state.mn.us/cleanup/riskbasedoc.html#slp

195: Decision Making Process for Dredged Material Management

Author: Great Lakes Dredging Team

Year: 1998

Publisher: Great Lakes Commission

Application to Upland Testing: This document has been developed by the Great Lakes Dredging Team in order to describe the decision making process used by the U.S. Army Corps of Engineers to determine the appropriate method(s) for management of dredged material from federal navigation projects, to describe the key environmental laws and regulations involved in this process, and to describe the responsibilities of other federal and state resource agencies and local proponents in this decision making process. A flow chart provides a visual overview of the decision making process for dredged material management, including the agencies and legislative authorities involved. Although not specifically targeted at upland beneficial uses, much of the discussion, particularly concerning applicable regulations will be of interest to upland projects.

URL: http://www.glc.org/dredging/dmm/decision.pdf

196: The Beneficial Reuse of Dredged Material for Upland Disposal

Authors: P. R. Krause and K. A. McDonnell

Year: 2000

Publisher: Harding Lawson Associates

Application to Upland Testing: This document presents a comprehensive overview of considerations facing upland beneficial use operations in the California area. Much of this information is pertinent to such uses in the Great Lakes basin as well. In particular, the paper contains a thorough review of treatment technologies and containment and rehandling technologies

URL: http://www.glc.org/dredging/benuse/Reusepaper_1.PDF

197: Poscrete Demonstration Project: NYSDEC Testing Matrix and Summary Report

Author: Blue Water Environmental Inc.

Year: 2003

Application to Upland Testing: Blue Water Environmental, Inc., (BWE) in 1999 successfully demonstrated production of a granular fill material, termed "Poscrete", from sandy petroleum-contaminated soil thermally treated at BWE's facility, high-early-strength portland cement, and dredge material. Use of the freshly treated soil, still at high temperature, and the Type III cement in the blend causes the product to harden within five hours and be usable almost immediately. Under a NYSDEC demonstration permit, BWE blended various formulations of these ingredients to produce batches of Poscrete that were tested for physical strength and chemical leachability. Incoming dredge material came from both freshwater and marine sources, and from one source contained elevated cadmium from a Superfund cleanup. BWE reports that Poscrete manufactured from all types of dredge material successfully met strength criteria for structual fill established by the NYS Department of Transportation. Leach testing did not show contravention of water quality standards for cadmium. Saline and mucky dredge materials did not appear to hamper curing when anticipated and compensated for in the blend. Poscrete manufactured during the demonstration was approved for use as structural fill in landfill construction on Long lsland. A NYSDEC beneficial use determination (BUD) is pending; NYSDEC may impose restrictions on use of Poscrete, for example, in residential settings [ABSTRACT].

This report illustrates a process to transform types of dredge material that may be difficult work with in raw form, into usable, potentially marketable materials. It includes quality control tests of general relevance to dredge material processing and treatment.

198: Municipal Waste Management Regulations

Secondary Title: 25 Pa. Code Chapters 271 to 285

Application to Upland Testing: These regulations contain definitions, scope, waste planning, recycling and waste reduction requirements, permit requirements including design and operating standards for processing and disposal facilities, financial assurance requirements and storage and transportation requirements for municipal waste.

200: 25 PA Code Chapter 287, Subchapter H

Application to Upland Testing: This subchapter outlines general permits for processing, beneficial use, or both, of residual waste other than certain uses of coal ash authorization and limitations. Dredged material is considered residual waste so for its beneficial use, we can issue a general permit can be issued (see Scenario 8) as has been done with the use of dredged material as road base material in road construction.

201: Interim Guidance on Assessing the Risk Posed by Pathogens Associated with Dredged Material

Author: K. J. Indest

Year: 2003

Number: ERDC/TN EEDP-01-49

Publisher: U.S. Army Corps of Engineers: Long-Terms Effects of Dredging Operations (LEDO) Program

Application to Upland Testing: This technical note provides guidance in assessing presence of pathogens in dredged material and the associated risks with use of that material. The document includes a discussion of types of pathogenic contamination, sources, and testing methods.

URL: www.wes.army.mil/el/dots/pdfs/eedp01-49.pdf

202: Federal Consistency Determination under the Federal Coastal Zone Management Act of 1972

Secondary Title: as amended and issued by the Pennsylvania Coastal Zone Management Program for commercial dredging

Application to Upland Testing: This may apply to other dredging operations along Lake Erie coastal areas and along some tidal portions of Delaware river.

203: 25 Pennsylvania Code Chapter 77

Application to Upland Testing: If dredged materials are mined from a dredged disposal site for future use such as, landfill cover, a mining permit is required under 25 Pa. Code Chapter 77. (e.g., Biles Island).

204: The Air Pollution Control Act

Secondary Title: Pennsylvania State Code §4001 - 4015, Article III (relating to air resources)

205: The Administrative Code of 1929

Secondary Title: 71 Pennsylvania State Code § 51 - 720.13

206: The Noncoal Surface Mining Conservation and Reclamation Act

Secondary Title: 32 Pennsylvania State Reclamation Act §§ 3301 -3326

207: The Surface Mining Conservation and Reclamation Act

Secondary Title: 52 Pennsylvania State Code § 1396.1 - 1396.31

208: The Dam Safety and Encroachments Act

Secondary Title: 32 Pennsylvania State Code § 693.1 - 693.27

209: General Permitting Procedure

Author: Bureau of Land Recycling and Waste Management

Year: 1993

Secondary Title: Technical Guidance

Number: 258-2000-765

Publisher: Pennsylvania Department of Environmental Protection

Application to Upland Testing: This policy is developed to establish a consistent and uniform general permitting process for the processing or beneficial use, or both, of residual waste.

URL: http://www.dep.state.pa.us/eps/docs/cab200149b1126000/fldr200149e0051190/fldr200149e05141a5/doc20026l85837076/258-2000-765.pdf.

210: Policy and Procedure Establishing Criteria for Use of Uncontaminated Soils, Rock, Stone, Unused Brick and Block, Concrete and Used Asphalt as Clean Fill

Author: Bureau of Land Recycling and Waste Management

Year: 1996

Secondary Title: Technical Guidance

Number: 258-2182-773

Publisher: Pennsylvania Department of Environmental Protection

Application to Upland Testing: The final safe fill regulations will replace clean fill guidance.

URL: http://www.dep.state.pa.us/eps/docs/cab200149b1126000/fldr200149e0051190/

fldr200149e05141a5/fldr2002b2h4223001/doc2002b2h4337002/258-2182-773.pdf

http://www.dep.state.pa.us/eps/docs/cab200149b1126000/fldr200149e0051190/fldr200149e05141a5/fldr2002b2h4223001/doc2002b2h5128004/258-2182-773%20Listing.pdf

211: General Permit for Dredged Material in Road Applications

Author: Bureau of Land Recycling and Waste Management

Number: WMGR072

Publisher: Pennsylvania Department of Environmental Protection

Application to Upland Testing: The approval in this permit is for the beneficial use of dewatered dredged material for use as a road bed material in roadway construction provided the dredged material complies with the chemical quality standards of Condition 2 and the applicable Pennsylvania Department of Transportation (PaDOT) specifications covering its proposed use. The permit contains five tables of contaminant criteria the dredged material must meet to qualify for use under the permit

212: Biodredge Project - Indian Lake Watershed

Author: T. Dobbels

Year: 2002

Publisher: Ohio State University, Logan County Extension Agent: Agriculture and Natural Resources

Application to Upland Testing: This paper presents a summary of a soil production project involving dredged material from Indian Lake, OH. The dredged material was mixed with swine manure solids. Tests for nutrients and plant growth suggested that the ideal mixture was about 30 percent manure solids and 70 percent dredged material. The product was used in some local park applications and was also marketed for other uses in the area. An economic analysis suggested that it would not be cost effective for large-scale agricultural application, but that it would be cost-effective for small scale uses. The analysis revealed that the costs were particularly favorable if the material could be mixed and used within 10 miles of the source of dredged material.

213: Great Lakes Dredged Material Upland Beneficial Use Scenarios

Author: Great Lakes Commission

Year: 2004

Application to Upland Testing: Published as a companion to this annotated bibliography, this document reviews the regulatory framework used in the various Great Lakes states to address a number of upland beneficial uses. In many cases, obvious regulations or precedent is lacking and potentially applicable regulations and criteria are explored.

214: A Regional Framework for Testing and Evaluating Dredged Material for Upland Beneficial Uses

Author: Great Lakes Commission

Year: 2004

Application to Upland Testing: Published as a companion to this annotated bibliography, this briefing paper presents a framework that can be used to evaluate the appropriateness of a dredged material for a given beneficial use. The paper guides the reader from the process of identifying potential use opportunities to implementing and maintaining the selected use.

215: Guide for Industrial Waste Management

Author: U.S. Environmental Protection Agency

Year: 2003

Number: EPA530-C-03-002

Application to Upland Testing: This guide contains information for both project managers and community members on the following topics

- Considerations for siting industrial waste management units
- Methods for characterizing waste constituents
- Fact sheets and Web sites with information about individual waste constituents
- Tools to assess risks that might be posed by the wastes
- Principles for building stakeholder partnerships
- Opportunities for waste minimization
- Guidelines for safe unit design
- Procedures for monitoring surface water, air, and ground water
- Recommendations for closure and post-closure care

Of particular interest to many beneficial use projects is the information, mostly in chapter one, on building community partnerships. Numerous strategies are described for fostering relationships and support among community members.

URL: http://www.epa.gov/epaoswer/non-hw/industd/guide.htm

216: Act 2 - Land Recycling and Environmental Remediation Standards Act

Year: 1995

Application to Upland Testing: This act provides for an industrial and commercial sites recycling program, a framework for setting environmental remediation standards, established the Voluntary Cleanup Loan Fund, the Industrial Land Recycling Fund and the Industrial Sites Cleanup Fund. The standards contained for site remediation are potentially applicable to some upland uses of dredged material in Pennsylvania, particularly under the state's "safe fill" regulations.

URL: http://www.dep.state.pa.us/eps/docs/cab200149b1126000/fldr2002aea3947001/doc2002aeb4835007/Act2of1995.pdf

217: RCRA Public Participation Manual

Author: U.S. Environmental Protection Agency

Year: 1996

Application to Upland Testing: The manual provides detailed descriptions for dozens of public participation techniques – required and optional, formal and informal. It also contains a wide variety of resources such as EPA policy memoranda, lists of contacts, fact sheets, and examples of public notices and press releases.

The manual describes when and how to conduct public participation events required by RCRA. In addition, it describes opportunities companies can provide that go beyond the requirements, and provides insights into how to cooperate and communicate with other stakeholders. The manual will be helpful to beneficial use projects that are setting up public participation programs, even in cases that do not fall under RCRA regulation.

URL: http://www.epa.gov/epaoswer/hazwaste/permit/pubpart/manual.htm

218: Proposed General Permit Wmgr096 to Beneficially Use Residual Waste

Author: Pennsylvania Department of Environmental Protection

Year: 2003

Number: 33 Pa.B. 5573

Application to Upland Testing: This proposed rule would permit the beneficial use of regulated fill as construction material for the following activities: to bring an area to grade; to control runoff; and to limit infiltration. "Regulated fill" is contaminated soil, contaminated dredged material, contaminated used asphalt,

historic fill and contaminated brick, block or concrete from construction and demolition activities that is separate from other waste and recognizable as such. The proposed general permit includes maximum concentration limits, sampling and analysis requirements, siting limitations, deed notice requirements, recordkeeping requirements and provisions for ecological protection. The proposed rule was issued in November 2003 and is subject to public comment prior to issuance of a final rule.

URL: http://www.pabulletin.com/secure/data/vol33/33-45/2154.html

http://www.dep.state.pa.us/dep/subject/advcoun/solidwst/2003/gp2soil.pdf

219: Use of Risk Assessment in Dredging and Dredged Material Management

Author: U.S. Army Corps of Engineers Waterways Experiment Station (WES)

Year: 1998

Number: Technical Note DOER-R1

Application to Upland Testing: This technical note explains the use of risk assessment to facilitate dredged material management decision-making in navigable waterways by U.S. Army Corps of Engineers project managers and field operations personnel. The document does not promote risk assessment as a tool for use in every dredged material management decision. It is likely to be most useful, and most used, in those cases that constitute the exception rather than the rule. The use of risk assessment is intended to supplement the analytical options currently available to dredged material managers by building on the existing technical framework and the existing tiered approaches.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerr1.pdf

220: Simplified Laboratory Runoff Procedure (SLRP): Procedure and Application

Authors: R. A. Price and J. G. Skogerboe

Year: 2000

Number: ERDC/TN EEDP-02-29

Application to Upland Testing: The Simplified Laboratory Runoff Procedure (SLRP) was developed to provide a faster, less expensive approach to evaluate surface runoff water quality from dredged material placed in an upland environment. SLRP is available as a tool for screening dredged material to estimate potential water quality problems and the need for more quantitative testing using the Rainfall Simulator/Lysimeter System (RSLS) and/or management activities. Previous Environmental Effects of Dredging Programs (EEDP) technical notes describe the development and an example application of SLRP. The purpose of this technical note is to describe the SLRP chemical extraction procedures and application of results.

URL: http://www.wes.army.mil/el/dots/pdfs/eedp02-29.pdf

221: Planning Level Cost-Benefit Analysis for Physical Separation at Confined Disposal Facilities

Authors: T. J. Olin-Estes, S. E. Bailey, S. A. Heisey and K. D. Hofseth

Year: 2002

Number: ERDC TN-DOER-C27

Publisher: U.S. Army Corps of Engineers

Application to Upland Testing: This technical note is the fourth in a series providing guidance on evaluating the potential for recovery of dredged material from confined disposal facilities (CDFs) for beneficial use (BU). Olin-Estes and Palermo (2000a, 2000b) and Olin-Estes (2000) discuss physical separation concepts as they apply to dredged material recovery, mathematical relationships for estimating recoverable material, and methods for developing sampling plans for CDFs to support these evaluations. This technical note describes a conceptual approach to estimating the comparative cost benefit for separation as a volume reduction method, based on recoverable volume, processing cost, and disposal facility life and replacement cost. Although intended for CDF applications, the concepts are applicable to non-CDF beneficial uses.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc27.pdf

222: Determining Recovery Potential of Dredged Material for Beneficial Use - Debris and Trash Removal

Authors: P. A. Spaine, D. W. Thompson, L. W. Jones and T. E. Myers

Year: 2001

Number: ERDC TN-DOER-C24

Publisher: U.S. Army Corps of Engineers: Engineer Research and Development Center

Application to Upland Testing: Dredged material stored in confined disposal facilities (CDFs) often contains significant amounts of trash and debris. Removal of this trash and debris is usually necessary to upgrade the material before it can be put to alternate beneficial uses and free up disposal facility capacity. This technical note describes equipment and techniques that may be used for the removal of these materials. It is one of a series of DOER technical notes on Determining Recovery Potential of Dredged Material for Beneficial Use, about methods of extending the life of CDFs by removal of the dredged material for beneficial use. Much of the content applies directly to removal of debris from non-CDF dredged material intended for beneficial uses.

URL: http://www.wes.army.mil/el/dots/doer/pdf/doerc24.pdf

223: Confined Disposal Facilities on the Great Lakes

Author: J. A. Miller

Year: 1998

Publisher: U.S. Army Corps Of Engineers: Great Lakes & Ohio River Division

Application to Upland Testing: This report provides an overview of the confined disposal facilities for dredged materials on the Great Lakes. The report discusses the purpose and authority for these facilities, the regulation of dredge and fill activities, the process by which these facilities are planned and constructed, and summarize the design, operation and monitoring of confined disposal facilities. This report is a compilation of existing information on confined disposal facilities and is intended to be used for information and reference by federal, state, and local agencies and concerned citizens.

URL: http://www.lrd.usace.army.mil/gl/cdf98.pdf

224: Safe Drinking Water Act (SDWA)

Year: 1974

Application to Upland Testing: This act initiated the promulgation of primary and secondary drinking water standards which may, directly or indirectly, be the source for some dredged material contamination criteria.

URL: http://www.epa.gov/safewater/sdwa/sdwa.html

225: Los Angeles Region Dredged Material Management Plan Cement-Based Stabilization Pilot Study

Authors: C. Chian, Y. Poon, J. Fields, W. Halczak and K. Loest

Year: 2002

Secondary Title: Proceedings "Dredging '02 Key Technologies for Global Prosperity"

Publisher: American Society of Civil Engineers

226: Proposed Guidelines for Ecological Risk Assessment

Author: U.S. Environmental Protection Agency

Year: 1996

Application to Upland Testing: These proposed guidelines offer methodology for conducting a thorough ecological risk assessment. Although the guidelines are not specific to uses of dredged material, they are

generic and can therefore easily be adapted to such cases. Ecological risk assessment, as described here, involves three phases: problem formulation, analysis, and risk characterization. A major theme emphasized in these guidelines is the interaction between risk assessors and risk managers at the beginning and end of the risk assessment process. In problem formulation, the proposed guidelines emphasize the complementary roles of assessors and managers in determining the scope and boundaries of the assessment and selecting endpoints. The risk characterization section discusses estimating, interpreting and reporting risks and encourages clear, transparent, reasonable and consistent risk characterizations.

URL: www.epa.gov/ORD/Webpubs/ecorisk/

227: Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment

Author: U.S. Environmental Protection Agency

Year: 1997

Number: EPA/540/R-97/006

Application to Upland Testing: This document provides a framework for conducting an ecological risk assessment at a Superfund site. It is intended for site managers and others having legal responsibility for the management of a site, but is applicable to a wider audience. It does not specifically address use of dredged material, but contains many concepts that can be applied to upland beneficial uses of dredged material that resemble any aspect of a superfund site, including use as a fill or cover material.

URL: www.epa.gov/oerrpage/superfund/programs/risk/ecorisk/

228: Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems

Authors: D. MacDonald, C. Ingersoll and T. Berger

Year: 2000

Journal: Archives of Environmental Contamination and Toxicology

Volume: 39

Number: 1

Pages: 20-31

Application to Upland Testing: This article presents and describes the preparation of a set of contamination guidelines that can be used to assess the toxicity of freshwater sediments. Although the guidelines are not expressly intended for evaluation of upland placement of the dredged sediment, application of these criteria may be appropriate for addressing ecological concerns for some upland beneficial uses.

229: ARCS Biological and Chemical Assessment of Contaminated Great Lakes Sediment

Author: U.S. Environmental Protection Agency

Year: 1993

Number: EPA/905/R-93/006

Application to Upland Testing: This document presents a quality assurance and quality control plan that specifies the policies, organization, objectives and the QA/QC activities needed to achieve the data quality control requirements of the Assessment and Remediation of Contaminated Sediments (ARCS) program. Specific tests discussed include the microtox, daphnia magnia and selenastrum capricornutum elutriate toxicity tests, whole sediment toxicity tests, benthic community structure evaluations, mutagenicity and genotoxicity assays. In some cases, these or similar tests may be appropriate in the evaluation of upland beneficial uses of dredged material.

URL: www.epa.gov/glnpo/arcs/EPA-905-r93-006/EPA-905-r93-006.html

230: Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas

Author: U.S. Army Corps of Engineers: Waterways Experiment Station (WES)

Year: 1985

Secondary Title: Environmental Effects of Dredging Technical Notes

Number: EEDP-04-01 through EEDP-04-04

Application to Upland Testing: This series of technical notes provides information for predicting the effluent quality for dredged material, including the modified elutriate test.

URL: www.wes.army.mil/el/dots/pdfs/eedp04-1.pdf

www.wes.army.mil/el/dots/pdfs/eedp04-2.pdf

www.wes.army.mil/el/dots/pdfs/eedp04-3.pdf

www.wes.army.mil/el/dots/pdfs/eedp04-4.pdf

231: The Use of Dredged Materials in Abandoned Mine Reclamation

Authors: New York / New Jersey Clean Ocean and Shore Trust and Pennsylvania Department of Environmental Protection: Bureau of Abandoned Mine Reclamation and Bureau of Land Recycling and Waste Management

Year: 2003

Secondary Title: Final Report of the Bark Camp Demonstration Project

Application to Upland Testing: This report summarized the Bark Camp mine reclamation project in Pennsylvania. Numerous aspects of the project can be applied to other beneficial use projects. The report covers the entire project, from construction to monitoring to public involvement.

URL: www.nynjcoast.org/AMR/barkcampreport.html

232: Geotechnical Properties of Cement Treated Dredged Sediment to Be Used as Transportation Fill

Authors: D. Dermatas, P. Dutko, J. Balorda-Barone and D.-H. Moon

Year: 2002

Secondary Title: Proceedings "Dredging '02 Key Technologies for Global Prosperity"

Publisher: American Society of Civil Engineers

233: Prioritizing Abandoned Coal Mine Reclamation Projects within the Contiguous United States Using Geographic Information System Extrapolation

Authors: Y. Gorokhovich, M. Reid, E. Mignone and A. Voros

Year: 2003

Journal: Environmental Management

Volume: 32

Number: 4

Pages: 527-534

Application to Upland Testing: Coal mine reclamation projects are very expensive and require coordination of local and federal agencies to identify resources for the most economic way of reclaiming mined land. Location of resources for mine reclamation is a spatial problem. This article presents a methodology that allows the combination of spatial data on resources for the coal mine reclamation and uses GIS analysis to develop a priority list of potential mine reclamation sites within contiguous United States using the method of extrapolation. The extrapolation method in this study was based on the Bark Camp reclamation project. The mine reclamation project at Bark Camp, Pennsylvania, USA, provided an example of the beneficial use of fly

ash and dredged material to reclaim 402,600 sq mi of a mine abandoned in the 1980s. Railroads provided transportation of dredged material and fly ash to the site. Therefore, four spatial elements contributed to the reclamation project at Bark Camp: dredged material, abandoned mines, fly ash sources, and railroads. Using spatial distribution of these data in the contiguous United States, it was possible to utilize GIS analysis to prioritize areas where reclamation projects similar to Bark Camp are feasible. GIS analysis identified unique occurrences of all four spatial elements used in the Bark Camp case for each 1 km of the United States territory within 20, 40, 60, 80, and 100 km radii from abandoned mines. The results showed the number of abandoned mines for each state and identified their locations. The federal or state governments can use these results in mine reclamation planning [ABSTRACT].

This study illustrates the potential for systematic, region-wide assessment methods to identify suitable locations for proposed beneficial uses.

234: Development of a Modified Elutriate Test for Estimating the Quality of Effluent from Confined Dredged Material Disposal Areas

Author: M. R. Palermo

Year: 1986

Number: Technical Report D-86-4

Publisher: U.S. Army Corps of Engineers Waterways Experiment Station

235: Priorities for Ecological Protection: An Initial List and Discussion Document for EPA

Author: U.S. Environmental Protection Agency

Year: 1997

Number: EPA/600/S-97/002

Application to Upland Testing: A good discussion of ecological risk assessment principles

236: Wildlife Exposure Factors Handbook, Volume I of II

Author: U.S. Environmental Protection Agency Office of Research and Development

Year: 1993

Number: EPA/600/R-93/187

237: Wildlife Exposure Factors Handbook, Volume II of II

Author: U.S. Environmental Protection Agency Office of Research and Development

Year: 1993

Secondary Title: Appendix: Literature Review Database

Number: EPA/600/R-93/187

238: Test Methods for Evaluating Solid Waste

Author: U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response

Year: 1980

Secondary Title: TCLP Method SW-846 1311 Toxicity Characteristic Leaching Procedure

Number: SW-846

Application to Upland Testing: Contains the U.S. EPA's official protocol for conducting the Toxicity Characteristic Leaching Procedure (TCLP). Originally published in 1980, this protocol has been updated several times.

URL: www.epa.gov/epaoswer/hazwaste/test/main.htm

239: Construction Cost Data Books

Author: R.S. Means

Publisher: Reed Construction Data

Application to Upland Testing: This series of books contains a large amount of information for estimating costs of construction projects. Much of this information may be useful in upland beneficial use projects.

URL: www.rsmeans.com/bookstore

240: Managing Lakes and Reservoirs

Author: NALMS

Year: 2001

Publisher: North American Lake Management Society

Application to Upland Testing: This books presents a framework for managing community water resources. Many parts, especially the discussion of community involvement may be useful to managers of dredged materials.

URL: www.nalms.org/bkstore/p2-01.htm

241: Making Bricks from Contaminated Sediments

Author: J. Ulbricht

Year: 2002

Secondary Title: European Conference on Dredged Sludge Remediation

Application to Upland Testing: This paper presents the results of studies to determine the feasibility of using dredged material to produce bricks. One advantage of this process is the destruction of organic contaminants by the high kiln temperatures. Inorganics are partially lost to the stack gas, where they can be captured and partially retained in the bricks, where leaching results presented here show that they are immobile.

242: Formulation of Environmentally Sound Waste Mixtures for Land Application

Authors: A. W. Schumann and M. E. Sumner

Year: 2004

Journal: Water, Air and Soil Pollution

Volume: 152

Number: 1-4

Pages: 195-217

243: National Coastal Program Dredging Policies

Author: J. L. Lukens

Year: 2000

Secondary Title: An analysis of State, Territory, and Commonwealth policies related to Dredging and Dredged Material Management

Number: NOS/OCRM/CPD 00-02

Publisher: National Oceanic and Atmospheric Administration - National Ocean Service

Office of Ocean and Coastal Resource Management - Coastal Programs Division

Application to Upland Testing: This two-volume series provides a detailed overview of state-level dredging and dredged material management policies across the U.S. Specifically, it covers dredging policies in the following six categories:

- state coordination mechanisms & permit processing
- economic concerns
- habitat, sediment, and water quality
- dredging techniques and best management practices
- dredged material disposal
- beneficial uses of dredged material

Each coastal program's policies are summarized individually and then are compiled together for a national perspective. This national summary and analysis evaluates the extent and specificity of each policy category. It also recognizes individual programs that are particularly comprehensive in these policy areas and delineates where programs may need to improve their policy base. Appendix A of this document is a reference digest of all of the 34 coastal programs:

- enforceable dredging polices and their supporting legal authorities
- encouragement and non-enforceable policies
- specific state-programs or actions that implement these dredging policies

While this appendix is not to be used as a legal citation, it can be used as a research tool for understanding the legal underpinnings of a coastal program's permitting, review, and management of dredging activities. These documents may be very helpful in understanding state level regulation pertaining to dredging and subsequent beneficial use, particularly in comparing approaches across states.

URL: http://www.ocrm.nos.noaa.gov/pdf/finaldredge.pdf

244: State, Territory, and Commonwealth Beach Nourishment Programs

Author: C. Hedrick

Year: 2000

Secondary Title: A National Overview

Number: NOS/OCRM/CPD 00-02

Publisher: National Oceanic and Atmospheric Administration: National Ocean Service

Office of Ocean and Coastal Resource Management - Coastal Programs Division

URL: http://www.ocrm.nos.noaa.gov/pdf/finalbeach.pdf

245: Implementation Guidance for the Control of Undesirable Vegetation on Dredged Material

Author: C. R. Lee

Year: 2001

Number: ERDC TN-DOER-C20

Publisher: U.S. Army Engineer Research and Development Center

Application to Upland Testing: The purpose of this technical note is to provide guidance for implementing selected management practices to control undesirable vegetation on dredged material. Under the Dredging Operations and Environmental Research program, demonstration projects were conducted to develop management strategies to control undesirable weedy vegetation on dredged material. A recommended management strategy is recommended for controlling undesirable vegetation.

URL: www.wes.army.mil/el/dots/doer/pdf/doerc20.pdf

246: Canadian Environmental Quality Guidelines

Author: Environment Canada

Year: 2002

Application to Upland Testing: These guidelines offer a system of risk-based contaminant criteria for numerous environmental media, including air, water, sediments and soil. For evaluating upland placements of dredged material, the soil environmental quality guidelines are most likely to apply. These are divided into four categories, agricultural, residential and parklands, commercial, and industrial, based on property uses. The agricultural category includes exposure through consumption of produce in addition to inhalation and dermal contact and is the most stringent for most contaminants. Although they do not necessarily carry any regulatory weight in any U.S. states, the criteria can offer general guidance concerning potential threshold limits for certain applications. The documentation may also provide useful guidance concerning risk-based evaluation of beneficial uses.

URL: http://www.ec.gc.ca/CEQG-RCQE/English/default.cfm

247: Comparative Risk Assessment Methods and Their Applicability to Dredged Material Management Decision-Making

Authors: J. Cura, T. Bridges and M. McArdle

Year: 2004

Journal: Human and Ecological Risk Assessment

Volume: 10

Number: 3

Pages: 485-503

Application to Upland Testing: This article reviews the status of comparative risk assessment within the context of environmental decision-making; evaluates its potential application as a decision-making framework for selecting alternative technologies for dredged material management; and makes recommendations for implementing such a framework. One of the most important points from this review for decision-making is that comparative risk assessment, however conducted, is an inherently subjective, value-laden process. There is some objection to this lack of total scientific objectivity ("hard version" of comparative risk assessment). However, the "hard versions" provide little help in suggesting a method that surmounts the psychology of choice in decision-making schemes. The application of comparative risk assessment in the decision-making process at dredged material management facilities will have an element of value and professional judgment in the process. The literature suggests that the best way to incorporate this subjectivity and still maintain a defensible comparative framework is to develop a method that is logically consistent and allows for uncertainty by comparing risks on the basis of more than one set of criteria, more than one set of categories, and more than one set of experts. It should incorporate a probabilistic approach where necessary and possible, based on management goals [ABSTRACT].

248: Properties of Portland Cement Made from Contaminated Sediments

Authors: J. Dalton, K. Gardner, T. Seager, M. Weimer, J. Spear and B. Magee

Year: 2004

Journal: Resources Conservation and Recycling

Volume: 41

Number: 3

Pages: 227-241

Application to Upland Testing: Hundreds of millions of cubic meters of contaminated sediments are dredged from US harbors and waterways annually for maintenance of navigation, environmental remediation, or both. In recent years, inexpensive ocean dumping has been largely eliminated as a disposal alternative causing a crisis in the management of sediment. This paper presents a new beneficial use alternative for contaminated dredged material, which is to use dredged material as a feedstock in the conventional manufacture of Portland cement. The paper demonstrates the efficacy of the process at the bench and pilot scales, and presents a summary of practical and economic considerations. A bench scale manufacture was carried out with feedstock mixtures containing 1-12 percent dredged material from the New York/New Jersey (NY/NJ) harbor. The clinkers were quantitatively analyzed with X-ray powder diffraction and differences in phase concentrations were observed in the clinker samples manufactured with dredged material (decreased alite and increased belite) suggesting that additional burn time was needed to account for the quartz present in the sediments. The free chloride concentrations in the clinker samples were below ACI limits for cement used with reinforcing steel; however, the chloride in the dredged material remains a manufacturing concern and is expected to increase annual maintenance costs. A pilot scale manufacture was carried out in a batch rotary kiln; X-ray diffraction analysis and ASTM tests for strength, soundness, and setting time suggested that with better optimized burning conditions, dredged material can be successfully incorporated into full scale manufacture [ABSTRACT].

249: Preparation of Briquettes from the Golden Horn Bottom Sediments by Hydro-Thermal Agglomeration Process

Authors: O. Celik and I. Elbeyli

Year: 2004

Journal: Waste Management and Research

Volume: 22

Number: 2

Pages: 100-107

Application to Upland Testing: The Golden Horn (GH) sediments, which consist mainly of clay, organic substances and heavy metals, are formed with the contribution of industrial and domestic wastes released in the Golden Horn Estuary. On account of their mineralogical and chemical composition, these sediments may be regarded as a suitable raw material for briquette production. In this study, the utilization of GH dredged bottom sediments was investigated for preparation of briquettes. Dried GH sediments were mixed with time and sand in different percentages, moulded at various squeezing pressures and hardened under several steam pressure values by autoclaving. The briquettes produced through these different process conditions were tested for compressive strength according to the Turkish standards (TS705). It was found that variations in compressive strength were dependent on the amount of lime (Ca(OH)(2)) and sand (SiO2) added. Results show that the compressive strength increased with increasing lime and decreasing sand in the mixtures prepared for briquettes. It is concluded that briquettes with a compressive strength value of 294 kgf cm(-2) can be produced. This allows the GH sediments to be taken into account as a raw material in brick production, as far as compressive strength requirements are concerned. This possibility may represent an important way either for reducing environmental pollution or for recycling waste materials in industrial applications.

250: Upland Dredged Material Environmental Effects Database

Author: U.S. ACE Waterways Experiment Station

Year: 2004

Application to Upland Testing: UDMEED contains ecotoxicological and background data relevant for disposal of contaminated sediment in upland areas, including both terrestrial and wetland and including exposure via consumption of food organisms. An extensive literature search of articles published over the period 1985-2000 was performed. As a result of the search, the database currently contains exposure-residue-

effects data deemed relevant from articles covering the period 1986-2001. The site allows searching of references by species, chemical or chemical class, and type of effect.

URL: http://www.wes.army.mil/el/udmeed/

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