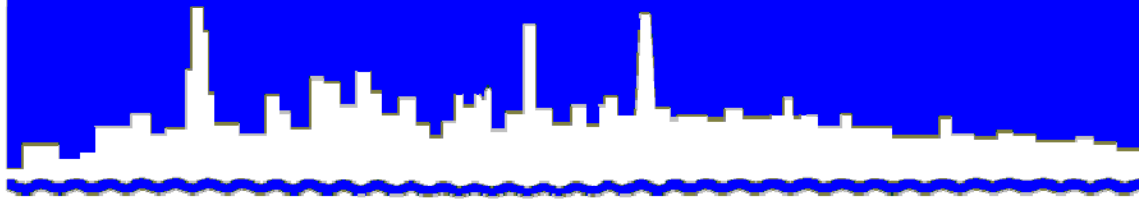


*Protecting Our Water Environment*



***Metropolitan Water Reclamation District of Greater Chicago***

*MONITORING AND RESEARCH  
DEPARTMENT*

***REPORT NO. 15-12***

***POTENTIAL IMPACTS ON TREATMENT PROCESSES AND  
BIOSOLIDS QUALITY THAT MAY RESULT FROM USE OF A  
COPPER BASED PRODUCT FOR CONTROLLING ODORS  
AT THE CALUMET WATER RECLAMATION PLANT***

***June 2015***

**Metropolitan Water Reclamation District of Greater Chicago**  
**100 East Erie Street Chicago, Illinois 60611-2803 312-751-5600**

***Potential Impacts on Treatment Processes and  
Biosolids Quality That May Result From Use of a  
Copper Based Product for Controlling Odors  
at the Calumet Water Reclamation Plant***

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We would also like to thank Ms. Coleen Maurovich, Administrative Specialist, for proofreading, formatting, and organizing this report.

## **DISCLAIMER**

Mention of any product, chemical, and equipment in this report does not constitute an endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

# **POTENTIAL IMPACTS ON TREATMENT PROCESSES AND BIOSOLIDS QUALITY THAT MAY RESULT FROM USE OF A COPPER BASED PRODUCT FOR CONTROLLING ODORS AT THE CALUMET WATER RECLAMATION PLANT**

## **Background**

Odor is becoming a major issue for the Metropolitan Water Reclamation District of Greater Chicago's (District) Calumet Water Reclamation Plant (WRP), as it is located in close proximity to an urban populated area. In general, wastewater treatment facilities generate strong odors emanating from certain compounds, mainly organic sulfur compounds, volatile organic compounds, and nitrogenous compounds commonly generated during the microbial degradation of bioavailable proteins present in the municipal wastewater. The specific odorants include methyl mercaptan, dimethyl sulfide, dimethyl disulfide, p-cresol, indole, skatole, and trimethylamine. Strong odors can result in complaints from the community and create unpleasant working conditions for the employees. The number of citizens voicing their concerns about odors and their potential health impacts has recently increased in the Calumet area.

Just as beauty is said to be in the eye of the beholder, objectionable odors can often be in the nose of the complainant, and people show a different level of sensitivity to odors. For example, a person raised on a family-owned cattle ranch or hog farm may not be offended by malodors wafting from a nearby wastewater treatment plant, but a person raised in a sanitized suburb may react strongly to even mild odors. Current trends show a move from sampling-based regulations to community involvement in determining acceptable standards for controlling offensive odors in populated areas.

The District has realized this problem and is evaluating both short-term and long-term solutions to resolve this issue. The Water Environment Research Foundation has conducted many research studies where different metal salts (like alum, ferric chloride, magnesium chloride, etc.) were tested to control odors. The results showed variable effectiveness of these products.

Planet Breeze was brought to the District's attention by a plant manager from the Detroit Water and Sewage Department (DWSD) who had first-hand experience with the use of Planet Breeze in response to odor complaints from the community. Planet Breeze is manufactured and distributed by D3W Industries ([www.D3Windustries.com](http://www.D3Windustries.com)). This report presents an evaluation of Planet Breeze for its potential use in reducing odors in the solids processing operations at the Calumet WRP. The evaluation was conducted based on the experience of other WRPs in the United States and an evaluation of the potential impact of Planet Breeze on Calumet WRP operations.

## **Planet Breeze Characteristics and Mode of Odor Control**

Planet Breeze is distributed in the form of a liquid. The main active ingredient in Planet Breeze is copper (Cu) sulfate (Cu sulfate penta-hydrate,  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ; 18.5 – 20 percent by

weight) (Table 1). Planet Breeze works by controlling microbial odors such as mercaptans and other decomposition by-products. The manufacturer claims that the product is effective in a range of environments such as cold or hot weather and in low oxygen environments. The product is water-soluble. The product acts by creating oxidative stress, which kills the microbes that generate odorous compounds.

Copper is a national pollutant of concern (POC), according to the United States Environmental Protection Agency (USEPA), because it can adversely impact the water quality of receiving streams, as well as water treatment plant processes, such as the activated sludge process, by either inhibiting carbonaceous or nitrogenous microorganisms. Copper is also one of the nine trace metals regulated for biosolids quality, according to the 40 CFR Part 503 Rule (Part 503). The recommended dosage for using Planet Breeze for odor control in sludge processing is shown in Table 1.

### **Experience of Other Planet Breeze Users**

Monitoring and Research (M&R) Department staff contacted plant managers at the DWSD and the Solon, Ohio WRP to get more information on their experience with Planet Breeze. The Solon, Ohio WRP adds Planet Breeze to sludge before dewatering and has observed a significant reduction in odor. Similarly, the DWSD has been adding Planet Breeze to its sludge storage tanks for the past few years and has observed a significant odor reduction, from a score of 5 (before) to a score of 2 or less (zero being odor free). The DWSD conducted several studies and, based on the results, is using a Planet Breeze to sludge ratio of 1:40,000 in storage tanks and a spray application of diluted Planet Breeze to water (1:30, v/v) for sludge drying (Appendix B). From these discussions, it is clear that Planet Breeze is an effective product for odor control using the approach of these WRPs. Therefore, the Planet Breeze dosages employed at these WRPs were used in our evaluation of the potential impact of Planet Breeze on Calumet WRP operations.

### **Evaluation of Planet Breeze**

Since Cu is a POC with potential impacts on water quality, activated sludge, and other biological processes, we evaluated various scenarios in which Planet Breeze could be used at the Calumet WRP to mitigate odor and the potential impact on operations. The evaluation included the impact of Planet Breeze use on (1) biosolids quality (40 CFR 503 Limits), (2) effluent water quality, (3) activated sludge process, and (4) anaerobic digestion.

The characteristics and recommended dosage of Planet Breeze are presented in Table 1, and data for the Calumet WRP, which was used for this evaluation, are presented in Table 2. All evaluations are based on 1 gallon (G) Planet Breeze for 30,000 G digester draw/sewage sludge. Since this is the maximum concentration recommended by the USEPA (Appendix A), impacts will be even lower if diluted concentrations are used.



TABLE 1: COMPOSITIONAL CHARACTERISTICS OF PLANET BREEZE AND SUGGESTED DOSAGE

Parameter	Composition/Suggested Rate of Use
Formula and concentration	CuSO <sub>4</sub> .5H <sub>2</sub> O; 18.5% - 20.0%
Concentration of Cu	~ 5% or 50,000 mg/L
USEPA suggested rate for sludge <sup>1</sup>	1 G <sup>3</sup> Planet Breeze for 30,000 G - organic sludge 1 G Planet Breeze for 60,000 G - sewage sludge
Suggested rate for drying sludge <sup>2</sup>	0.026 inch layer of 1:50 diluted Planet Breeze or 1,200 G/Acre diluted (1:50) or 24 G/Acre concentrated

<sup>1</sup>See Appendix A for USEPA registration.

<sup>2</sup>See Appendix B for calculations from laboratory experiment.

<sup>3</sup>Gallon.

TABLE 2: CALUMET WATER RECLAMATION PLANT SOLIDS  
MANAGEMENT DATA

Parameter	Flow/Quantity
Digester draw (2010 and 2011 average)	0.61 MGD
Solids content of digester draw	2.23%
Annual biosolids production (2010 and 2011 average)	24,290 DT
Number of lagoons	8
Total volume of filled-up lagoons (May 31, 2014) <sup>1</sup>	157 MG
Total area of drying pads used	122 acres
Average amount of biosolids dried/acre/yr	199 DT
Average lagoon decant (50% of digester draw)	0.30 MGD

<sup>1</sup>Volume of biosolids estimated from all filled up lagoons at CALSMA as of May 3, 2014 (Appendix C).

**Impact on Biosolids Quality.** The impact of Planet Breeze use on biosolids quality was evaluated with respect to Cu-loading in the District's biosolids and the Part 503 limit for Exceptional Quality (EQ) biosolids. Three scenarios were evaluated: (1) Planet Breeze added to digester draw, (2) Planet Breeze added on biosolids drying beds, and (3) Planet Breeze added both to digester draw and on drying beds. The dosage used in this evaluation is 1:30,000 for the addition to digester draw (the USEPA recommendation suggests a 1:30,000 rate for organic sludges, Appendix A. This is the highest concentration suggested; thus this presents the worst-case scenario, and all evaluations are based on this rate) and a spray of diluted Planet Breeze (1:50 on the drying beds @1,200 G/Acre as used by DWSD, Appendix B). The average and maximum Cu concentrations in Calumet WRP biosolids for the years 2010 and 2011 were used as the reference concentrations. The results of this evaluation are presented in Table 3 and show that use of Planet Breeze has a minimal impact on biosolids quality. Scenario 3, which represents the highest Cu loading, will increase biosolids Cu by approximately 25 percent (from 372 to 463 mg/kg).

**Impact on Effluent Water Quality.** Copper is a national POC, as designated by the USEPA, and is also regulated by the state of Illinois water quality standards for receiving waters. The use of Planet Breeze may affect the effluent water quality in relation to Cu. This is important for the Calumet WRP, where not only lagoon decant but also storm runoff from drying beds are returned to the headworks and ultimately may impact effluent water quality. Assuming a worst-case scenario, volumes of lagoon decant and runoff from drying beds, varying from 0.3, 1.5 MGD, and 9.0 MGD, and Cu concentrations, ranging from the recommended rate of Planet Breeze (1G Planet Breeze for 30,000 G digester draw, see Table 1) application (1X) to three times (3X) the recommended rate, were evaluated to determine the impact of cumulative Cu loading.

The rationale for choosing flow volumes varying from 0.3 to 9.0 MGD was that 0.3 MGD is the lagoon decant based on normal operations (50 percent of average daily digester draw decanted from lagoons), which was close to the ~ 0.3 MGD measured by a United States Geological Survey (USGS) study conducted by the District to estimate lagoon decant (Appendix C) at the Calumet WRP. A two-month study (November/December 2013) conducted by the USGS showed that the average and maximum flow of lagoon decant were 0.15 and 0.32 MGD, respectively. During the same time, the average digester draw-off going to lagoons ranged from 0.37 to 1.04 MGD. Flow of 1.5 MGD was evaluated based on operations data that showed during an average year, between three to five lagoons are filling, so it was assumed all five lagoons may decant 0.3 MGD on the same day; and 9.0 MGD was the estimated maximum from the tentative schedule provided by the Maintenance and Operations (M&O) Department for the next two years (Appendix D). Maximum possible flow based on engineering design for different lagoons is presented in Appendix E. The maximum flow of 9 MGD is estimated from Appendices D and E for the years 2015 and 2016. According to the CALSMA lagoon schedule plan (Appendix D), five lagoons (3, 4, 8, 14, and 15) will be filled up in 2015, and four lagoons (1, 6, 7, and 18) will be filled up in 2016. The maximum possible flows based on design capacity of pipes to carry decant from these lagoons (Appendix E-2) is used to arrive at the 9.0 MGD maximum flow estimation (9.4 and 8.4 to be exact for 2015 and 2016, respectively).

TABLE 3: IMPACT OF COPPER LOADING FROM PLANET BREEZE USE ON BIOSOLIDS QUALITY

Scenario/Parameter	Cu Concentration in Biosolids, mg/kg
40 CFR 503 EQ Limit	1,500
Biosolids Cu (2010 and 2011 average)	372
Biosolids Cu (2010 and 2011 maximum)	480
<b>Scenario 1 (Planet Breeze added to digester draw at ratio 1:30,000)<sup>1</sup></b>	
Estimated average biosolids Cu concentration	439
Possible maximum Cu concentration	546
<b>Scenario 2 (Planet Breeze applied to drying beds as 1:50 dilution spray (1,200 G/Acre)<sup>2</sup></b>	
Estimated average biosolids Cu concentration	397
Maximum possible Cu concentration	505
<b>Scenario 3 (Planet Breeze applied to digester draw + drying beds)<sup>3</sup></b>	
Estimated average biosolids Cu concentration	463
Estimated maximum Cu concentration	571

<sup>1</sup>Cu concentration may increase by 66 mg/kg due to Planet Breeze addition in digester draw.

<sup>2</sup>Cu concentration may increase by 25 mg/kg due to Planet Breeze use on drying pads.

<sup>3</sup>Cu concentration may increase by 91 mg/kg due to Planet Breeze addition in digester draw and use on drying pads.

The rationale for choosing concentrations of Cu varying from 1X to 3X was based on annual precipitation (P) and annual potential evaporation (PE) in the Chicago area. Evaporation from the surface of lagoons may cause higher concentrations of Cu in the surface layer, depending on the weather conditions and time of the year, and this accumulation of Cu in the surface layer of lagoons, which may be decanted, is accounted for based on PE and P values. On an annual basis PE/P ~ 1, during summer months PE/P > 1.5, and during drought years PE/P > 2.2; thus 1X, 2X, and 3X concentrations were used to reflect a normal year, summer months, and drought years, respectively.

The results in Table 4 indicate that, based on the recommended rate of Planet Breeze application and average volumes of lagoon decant and runoff from drying pads (0.3 MGD), the estimated Cu loadings in influent will increase by 4 lbs/day to 46 lbs/day, which is only 10 percent and 20 percent of the allowable headworks loadings of 442 lbs/day at the WRP's average daily flow and dry weather flow allowable headworks loading of 232 lbs/day, respectively. However, for the rare event when all five lagoons may decant on the same day and at three times the concentration of Cu in Planet Breeze, the estimated average Cu loading in influent will increase to approximately 24 percent and 45 percent of the allowable headworks loadings at the daily average and dry weather flows, respectively. Thus, the chances of impacting effluent water quality are none to very low. Even under a worst-case scenario, when the estimated maximum flow of 9.0 MGD may occur at 1X concentration, the estimated Cu loading may still be only 38 percent and 72 percent, respectively, of allowable average influent loading and allowable dry weather influent loading. Estimated Cu concentrations in WRP influent may only exceed allowable headworks loading under a very rare event when the lagoon decant flow is at the estimated maximum (9 MGD) and the concentration is twice that of the application concentration (2X); and also, under the dry weather conditions, the risk of such a scenario actually happening is minimal. Nonetheless, there will be increased Cu loading in the influent that should be monitored closely in the future if Planet Breeze is used at the Calumet WRP. There are occasional spikes in Cu loading; for example, maximum daily loadings of influent Cu at the Calumet WRP were 408 lbs/day, 449 lbs/day, and 413 lbs/day on February 23, 2010, August 2, 2011, and May 15, 2012, respectively. Thus, on occasion, the Cu loading may increase above the allowable headworks loading (Table 4) and may need to be monitored closely after the Calumet WRP begins using Planet Breeze. Based on this analysis, use of Planet Breeze seems to be reasonably safe; however, caution is warranted if prolonged use should be considered and if the average daily load of Cu in the influent increases unexpectedly.

**Impact on Activated Sludge and the Anaerobic Digestion Process.** As described in previous sections, Cu is a national POC, as designated by the USEPA, and also may inhibit carbonaceous and nitrogenous microorganisms and thus may disrupt the activated sludge process at the Calumet WRP. Copper may be toxic to the anaerobic digestion process at the Calumet digesters, with a threshold inhibitory concentration of 40.0 mg/L. This is important for the Calumet WRP, where not only lagoon decants but also storm runoff from drying beds is returned to the plant headworks. The threshold limit for inhibiting nitrogenous microorganisms is more stringent as compared to carbonaceous microorganisms. Based on the most conservative nitrogenous microorganisms inhibition threshold of 0.05 mg/L, the allowable headworks loading

TABLE 4: IMPACT OF COPPER LOADING FROM PLANET BREEZE USE ON WATER QUALITY STANDARDS ASSUMING ALL COPPER IS IN SOLUBLE FORM

Lagoon Decant, MGD	Copper Loading in Lagoon Decant and Drying Pad Runoff (lbs/day)			Estimated Copper Loading in WRP Influent (lbs/day)		
	1X <sup>1</sup> Conc.	2X Conc.	3X Conc.	1X Conc.	2X Conc.	3X Conc.
0.3	4	8	13	46	50	55
1.5	21	42	63	63	84	105
9.0	126	255	381	168	297	423

AHL<sup>2</sup> Based on State Water Quality Standards at WRP Average Flow = 442 lbs/day

AHL<sup>3</sup> Based on State Water Quality Standards at WRP Dry Weather Flow = 232 lbs/day

Actual Average Influent Loading of Soluble Copper (2010 and 2011 Average)<sup>2</sup> = 42 lbs/day

<sup>1</sup>1X Concentration based on 1 G Planet Breeze per 30,000 G sludge.

<sup>2</sup>Allowable headworks loading (AHL) from M&R Report No. 14-58 (Re-Evaluation of Local Pretreatment Limits – 2014).

<sup>3</sup>Allowable headworks loading (AHL) based on Calumet WRP dry weather flow of 128 MGD.

for the Calumet WRP is 298 lbs/day and 153 lbs/day based on average and dry weather flows, respectively (Table 5). The actual loading and estimated loading of Cu due to Planet Breeze use should not exceed the allowable headworks loading of 153 lbs/day to avoid any potential of activated sludge toxicity (Table 5) during dry weather flow conditions, even under the condition when all five lagoons are decanted on the same day and at the highest concentrations (1.5 MGD flow and 3X concentration). The estimated Cu in WRP influent may exceed the allowable headworks loading only under very rare conditions when lagoons may decant at estimated design maximum. The risk of that scenario actually happening is very low. Based on data presented in Table 5, it is highly unlikely that the Cu concentration will increase to a level where it may cause any toxicity to either the activated sludge or the anaerobic digestion process.

For the evaluation of the impact on the anaerobic digestion process, it is assumed that the removal efficiency of Cu is 100 percent; that is, all Cu in influent ends up in sludge and goes to the digesters. The results in Table 5 indicate that the chances of activated sludge toxicity and toxicity to the anaerobic digestion process at the Calumet WRP due to the use of Planet Breeze for odor control are low.

**Effect on Composting.** Composting is a biological process, and Cu sulfate is a biocide that may inhibit the composting process at very high rates of application. The estimated increase of Cu concentrations in biosolids by approximately 25 percent will not have any impact on the composting process because the initial biosolids Cu concentration is reduced by 50 percent when biosolids are mixed with woodchips or other feed stocks during composting. The estimated Cu concentration in the compost is generally three to four times lower than the Part 503 EQ biosolids limit. Research shows that composting of manures and sludges is not impacted by higher Cu concentrations (Harada et al., 1993; Lau and Wong, 2001). A brief literature review of compost characteristics from various wastewater treatment plants across the United States, Canada, and around the world shows Cu concentrations in composted Class A biosolids and animal manure to be ranging from 100 mg/kg to as high as 1,200 mg/kg (Zheljazkov and Warman, 2003). Furthermore, research shows that metals are complexed with organic acids produced during the composting process, which renders them less bioavailable (Barker and Bryson, 2002), and composting is often used for the bioremediation of heavy metals.

TABLE 5: IMPACT OF COPPER LOADING FROM PLANET BREEZE USE ON ACTIVATED SLUDGE AND ANAEROBIC DIGESTION PROCESSES

Lagoon Decant, MGD	Copper Loading in Lagoon Decant and Drying Pad Runoff (lbs/day)			Estimated Copper Loading in WRP Influent (lbs/day)		
	1X <sup>1</sup> Conc.	2X Conc.	3X Conc.	1X Conc.	2X Conc.	3X Conc.
0.3	4	8	13	89	93	97
1.5	21	42	63	106	127	148
9.0	126	255	381	211	340	466

AHL<sup>2</sup> Based on Nitrogenous Microorganisms Inhib. at WRP Average Flow = 298 lbs/day

AHL<sup>3</sup> Based on Nitrogenous Microorganisms Inhib. at WRP Dry Weather Flow = 153 lbs/day

AHL<sup>2</sup> Based on Toxicity to Anaerobic Digestion = 226 lbs/day

Actual Average Influent Loading of Total Copper (2010 and 2011 Average)<sup>2</sup> = 85 lbs/day

<sup>1</sup>1X Concentration based on 1 G Planet Breeze per 30,000 G sludge.

<sup>2</sup>Allowable headworks loading (AHL) from M&R Report No. 14-58 (Re-Evaluation of Local Pretreatment Limits – 2014).

<sup>3</sup>Allowable headworks loading (AHL) based on Calumet WRP dry weather flow of 128 MGD.



## CONCLUSION

Based on this evaluation, the use of Planet Breeze seems to be a safe, short-term measure to control odors at the Calumet WRP. The use of Planet Breeze at the recommended rates has little or no effect on biosolids quality, the activated sludge process, the anaerobic digestion process, and effluent water quality. However, the operations should be routinely monitored, and data should be collected for evaluating the long-term impact of Cu, if any, on plant operations and biosolids quality. The WRPs that are known to be using Planet Breeze are listed in Appendix E.

## RECOMMENDATIONS FOR FURTHER TESTING

Based on this evaluation, the following recommendations are made for pilot- or full-scale testing.

### **Biosolids Drying Operations**

Dilute Planet Breeze with water (1:50, v/v), and spray this solution at the rate of 1,200 G per acre on the drying pad with a pressure hose either the same day or the next day after loading sludge onto the drying beds. If needed, a second dose at the same rate could also be applied. No more than three doses should be applied to any batch of sludge during a drying cycle.

### **Lagoons Storage and Aging**

As a first step, only a topical application of Planet Breeze may be done when any lagoon is filled up to total capacity. Data on the different capacities of lagoons and average storage per foot of each lagoon at the Calumet WRP (Table 6) is used to estimate topical applications of Planet Breeze. It is assumed that only the top 1-ft. layer of biosolids in the lagoon will be active and responsible for odor generation; thus estimations of Planet Breeze (1:45,000 Planet Breeze:Liquid Biosolids) are provided for each lagoon-based surface of 1-ft. lagoon capacity. Suggested and maximum rates per application for filled-up lagoons based on lagoon capacity are presented in Table 6. Application would be repeated every two to three months in case the odor reoccurs.

If the odor is not significantly reduced to an acceptable level, then apply Planet Breeze directly to the digester draw before pumping to lagoons at the rate of one G Planet Breeze per 45,000 G digester draw (1:45,000). Decrease the ratio to 1:30,000 if odors are still an issue. The ratio should not be reduced further in any case.

TABLE 6: CAPACITY OF LAGOONS AT THE CALUMET WATER RECLAMATION PLANT AND SUGGESTED APPLICATION RATE OF PLANET BREEZE TO CONTROL ODOR

Lagoon	Total Capacity (MG)	Average Storage Per Foot (MG)	Plant Breeze Application <sup>1</sup>	
			Suggested ----- gallons -----	Maximum -----
1	21.3	1.275	113	170
2	22.3	1.312	117	175
3	20.3	1.109	99	148
4	20.5	1.108	98	148
5	24.2	1.582	141	211
6	27.8	1.655	147	221
7	37.0	2.139	190	285
8	50.4	3.150	280	420
14	26.8	1.411	125	188
15	24.5	1.237	110	165
17	41.3	2.140	190	285
18	42.4	2.131	189	284
19	40.2	2.020	180	269

<sup>1</sup>Based on one 1 G Planet Breeze per 45,000 G of liquid biosolids in surface 1 ft. of filled-up lagoon, and maximum allowed is based on 1:30,000 (Planet Breeze to liquid biosolids ratio).

## **Composting Operations**

Planet Breeze may be diluted to 1:50 with water and applied at a rate of 170 G per 100 ft. length of a windrow by spraying with a pressure hose on the same day a windrow is constructed. The application can be repeated after each turning of the compost pile. The total number of applications for a windrow should not exceed five.

## **Operational Control**

The M&R Department should evaluate the concentration of Cu in the WRP influent and effluent and in biosolids (the District's monthly Part 503 biosolids monitoring) for two to three years or until a steady state is achieved. The M&R Department will advise M&O Department staff to modify or stop application of Planet Breeze if Cu concentrations approach the pre-set threshold. The M&O Department should make sure that all filled-up lagoons are not decanted on the same day.

## **Material Safety Data Sheets**

All operations' staff should be provided with material safety data sheets for Planet Breeze and be trained by the Safety Section or the supplier for the safe use and adoption of best management practices (Appendix G).

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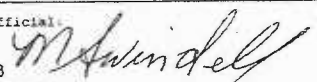
APPENDIX A

PLANET BREEZE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
APPROVED FORMULATION FOR ODOR CONTROL

# Planet Breeze - US EPA



US EPA approved formulation

 <p><b>U.S. ENVIRONMENTAL PROTECTION AGENCY</b> Office of Pesticide Programs Antimicrobials Division (7510C) 1200 Pennsylvania Avenue NW Washington, D.C. 20460</p> <p><b>NOTICE OF PESTICIDE:</b> <u>  x  </u> Registration <u>      </u> Reregistration  (under FIFRA, as amended)</p>	<p>EPA Reg. Number: 86282-4</p>	<p>Date of <b>MAY 25 2011</b></p>
	<p>Term of Issuance: <b>Conditional</b></p> <p>Name of Pesticide Product: <b>Planet Breeze P</b></p>	
<p>Name and Address of Registrant (include ZIP Code): D3W Industries 777 Doheny Drive Northville, MI 48167</p>		
<p>Note: Changes in labeling differing in substance from that accepted in connection with this registration must be submitted to and accepted by the Registration Division prior to use of the label in commerce. In any correspondence on this product always refer to the above EPA registration number.</p>		
<p>On the basis of information furnished by the registrant, the above named pesticide is hereby registered/re-registered under the Federal Insecticide, Fungicide and Rodenticide Act.</p> <p>Registration is in no way to be construed as an endorsement or recommendation of this product by the Agency. In order to protect health and the environment, the Administrator, on his motion, may at any time suspend or cancel the registration of a pesticide in accordance with the Act. The acceptance of any name in connection with the registration of a product under this Act is not to be construed as giving the registrant a right to exclusive use of the name or to its use if it has been covered by others.</p> <p>This product is conditionally registered in accordance with FIFRA sec 3(c)(7)(A) provided that you:</p> <ol style="list-style-type: none"> <li>1. Submit and/or cite all data required for registration of your product under FIFRA sec. 3(c)(5) when the Agency requires all registrants of similar products to submit such data; and submit acceptable responses required for re-registration of your product under FIFRA section 4.</li> <li>2. Make the labeling changes listed below before you release the product for shipment:             <ol style="list-style-type: none"> <li>a. Revise the "EPA Registration Number to read, "EPA Reg. No.86282-4".</li> </ol> </li> </ol>		
<p>Signature of Approving Official: Marshall Swindell Product Manager Team-33 Regulatory Management Branch I Antimicrobials Division (7510P)</p> 		<p>Date: <b>MAR 25 2011</b></p>

Page 2  
EPA Registration No. 86282-4

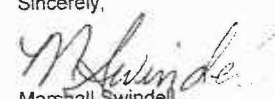
b. Submit the Storage Stability and Corrosion Characteristics studies within one (1) year from the date of this Notice of Registration.

3. Submit two (2) copies of your final printed labeling before distributing or selling the product bearing the revised labeling.

If these conditions are not complied with, the registration will be subject to cancellation in accordance with FIFRA sec. 6(e). Your release for shipment of the product constitutes acceptance of these conditions.

A stamped copy of the "accepted" label is enclosed for your records.

If you have any questions concerning this letter, please contact Martha Terry at (703) 308-6217.

Sincerely,  
  
Marshall Swindell  
Product Manager 33  
Regulatory Management Branch I  
Antimicrobials Division (7510P)

Enclosure

A-1

# Planet Breeze - US EPA



## PRECAUTIONARY STATEMENTS Hazards to Humans and Domestic Animals

### DANGER

Corrosive. Causes irreversible eye damage. Do not get in eyes or on clothing. Prolonged or frequently repeated skin response may cause allergic reactions in some individuals. Avoid contact with skin. Wear protective eyewear (goggles, mask, face shield, and safety glasses), chemically resistant shoes and latex or nitrile gloves. Harmful if swallowed, inhaled, or absorbed through the skin. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse. Remove contaminated clothing and wash clothing before reuse.

### ENVIRONMENTAL HAZARDS

Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA. Treatment of algae can result in oxygen loss from decomposition of dead algae. This loss can be threatening to other aquatic organisms. To minimize this risk, only treat one-third to one-half of the total treatment area and wait 10 to 14 days between treatments. If treated water is to be used as a source of potable water, the metallic copper must not exceed 1 ppm. Consult your local State Fish and Game Agency or proper state authorities before product application, as permits may be required before use.

### GENERAL INFORMATION

Planet Breeze P is for use on landfills, sewage, and to help control bacterial odors. It can also be used to control algae/bacterial growth in ponds, lakes, irrigation reservoirs and potable water supplies.

### DIRECTIONS FOR USE

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

Use only in well ventilated areas. If using in an enclosed space, be sure to use mechanical ventilation. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Application rates may vary depending on the amount of organic matter in the material to be treated. Planet Breeze P should be mixed with water at a range of rates from 1:50 to 1:500 (mixing ratio to be determined by a qualified Planet Breeze P specialist) and sprayed or misted over the odoriferous material. Excluding Organic Sludge, see specific mixing directions below. The reduction of odors should be immediately apparent. This application method can be used for landfills, lagoons, waste water treatment plants, or any other solid or liquid waste with bacterial odors. Planet Breeze P may also be injected directly into flowing waste streams to control bacterial odors. bacteria (injection rates to be determined by a qualified Planet Breeze P specialist).

Under the Federal Insecticide, Fungicide, and Rodenticide Act as amended, for the pesticide, registered under EPA Reg. No. 86282-4

**Waste treatment in lagoons, flow through ponds, digesters, and wastewater treatment systems:** Application rates may vary depending on amounts of organic matter (sewage) in water system. Application must be done by applying Planet Breeze P directly from the container into the water. Several application points speed up dispersal. Use one gallon of full strength Planet Breeze P in 60,000 gallons (8,000 cubic feet) of sewage. For easiest results disperse Planet Breeze P evenly throughout the waste. Bacterial odors should be noticeably reduced in 1-2 weeks. Repeat application when odor reoccurs.

**Organic Sludge:** Planet Breeze P must be thoroughly mixed with sludge. Apply at the rate of one gallon Planet Breeze P in 30,000 gallons of sludge.

**Landfills:** Planet Breeze P should be mixed with water at a range of rates from 1:50 to 1:500 (mixing ratio to be determined by a qualified Planet Breeze P specialist) and sprayed or misted over the offensive material.

**General Algae/Bacteria Control:** Apply Planet Breeze P in late spring or early summer when algae first appear. Dosage rates depend on the species, amount of algae/bacteria present, water hardness/temperature/clarity, and whether the water is turbid, static or flowing. Higher dosages are required for water below 60°F, higher algal/bacterial concentrations, and for hard or cloudy water. Applications should be made by pouring Planet Breeze P directly from the container into lakes, ponds, reservoirs and irrigation canals. For ponds and lakes, begin treatments along the shore and proceed outward in bands to allow fish to move into water that hasn't been treated. Applying Planet Breeze P evenly at multiple points will ensure proper product dispersal and is recommended for all applications, especially those involving flowing water. For higher algae concentrations, spraying or misting the affected surface area in addition to applying product at multiple points will help break up large blooms. Use higher dosages for nitella, chara and filamentous algae (pond scum) and lower dosages for planktonic algae. If unsure of proper dose, start with a smaller dose and gradually increase until growth control has been achieved or until maximum product dosage has been reached (see below for dosage rates).

**To Control Algae/Bacteria in Lakes, Ponds and Reservoirs:** Apply Planet Breeze P evenly throughout the water supply. Apply at a rate of one pint (16oz) Planet Breeze P per 7,500 gallons (maximum) to 300,000 gallons of water. For best results, apply to warm stagnant water (above 60°F) on a sunny day when algae are on or near the surface. For potable water supplies never exceed one gallon of Planet Breeze P per 60,000 gallons (1ppm metallic copper or 16mg/L per the ANSI/NSF Standard 60 for safe drinking water).

**To Control Algae/Bacteria in Irrigation Conveyance Systems:** For continuous application, add one pint of Planet Breeze P for each 7,500 gallons (maximum) to 300,000 gallons of water. For conveyance systems over 30 miles, it is recommended to apply at points every 30 miles. However, do not exceed total dosage of 1 gallon Planet Breeze P per 60,000 gallons of water.

### APPLICATION AND HANDLING EQUIPMENT

Application, handling, or storage equipment MUST consist of either fiberglass, polypropylenes, viton, most plastics, or stainless steel. Never use mild steel, nylon, or brass. Clean equipment around full strength Planet Breeze P. Always rinse equipment such as sprayers or misters free and clean of Planet Breeze P each night with plenty of fresh, clean water.

Under the Federal Insecticide, Fungicide and Rodenticide Act as amended, for the pesticide, registered under EPA Reg. No. 86282-4

APPENDIX B

EXAMPLE CALCULATIONS USED TO ESTIMATE PLANET BREEZE RATE OF  
APPLICATION FOR BIOSOLIDS ODOR CONTROL



## Kumar, Kuldip

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**From:** Kress, Ron [RonKress@dohenycompanies.com]  
**Sent:** Wednesday, September 17, 2014 11:08 AM  
**To:** Kumar, Kuldip  
**Cc:** Lionas, Nick; Hammond, Jessica; Kress, Ron  
**Subject:** Planet Breeze Application Calculation

Good Morning Dr. Kumar,

Per our conversation yesterday afternoon, here are the calculations we used for the lab study in Detroit to determine an effective treatment layer thickness for Planet Breeze odor control.

In the Detroit Water and Sewer Department (DWSD) WWTP lab, we determined that 18.5mL of 1:30 diluted Planet Breeze solution was the total volume necessary to neutralize the offensive odors of untreated sludge in a round petri dish (3.75" = r). We used a Windex-like spray bottle of solution and measured the total volume after ten pumps (18.5mL). This study gave us the application volume needed to effectively neutralize the offensive odor.

We then calculated the area of the petri dish. Using  $\pi r^2$ , we determine 44.178 square inches is the area. We convert our 18.5mL to gallons (18.5/3785mL/Gal) and multiply that by 231 cubic inches per gallon to get application volume in cubic inches.

Using  $V/A = L$ , we divide volume (V) = 1.1291 cubic inches by area (A) = 44.178 to get application thickness, or length (L) = .025558 in. This number is very small - convert to microns. Multiply L by 25.4mm/inch and multiply that by 1000microns per mm to get our answer of 649.17 microns. This is an effective Planet Breeze application layer thickness to neutralize topical sludge odors onsite at the DWSD WWTP.

By way of these calculations, we can estimate volume of Planet Breeze necessary to treat much larger areas such as a sludge lagoon by plugging in the known values of A and L.

If you have any questions regarding the above, please feel free to contact me directly.

Best Regards,

Ron Kress



"We Service What We Sell"

Ron Kress | Product Manager  
777 Doheny Court  
Northville, MI 48167  
Office 248-349-0904  
Fax 248-349-2774 Cell 248-535-5134  
[RonKress@dohenycompanies.com](mailto:RonKress@dohenycompanies.com)

[www.dohenycompanies.com](http://www.dohenycompanies.com) - [www.vacuumtruckscanada.ca](http://www.vacuumtruckscanada.ca)

APPENDIX C

UNITED STATES GEOLOGICAL SURVEY CALUMET LAGOON FLOW STUDY

USGS Calumet Lagoon Flow Study

Date	Avg Flow GPM	Total Flow gal/day	Tot-P mg/L	P Load lbs/day	Prec. in.	Dig Draw flow in 1000 gal
10/29/2013	103.26	148,694	122.60	152.04	0	589
10/30/2013	155.48	223,891	115.91	216.43	1.18	734
10/31/2013	226.51	326,174	71.17	193.60	0.85	686
11/1/2013	159.14	229,162	62.07	118.63	0.05	780
11/2/2013	92.91	133,790			0.01	783
11/3/2013	73.96	106,502			0.00	779
11/4/2013	92.4	133,056	2215.80	2458.84	0.00	769
11/5/2013	132.5	190,800	80.40	127.94	0.00	721
11/6/2013	120.91	174,110	67.07	97.39	1.11	795
11/7/2013	122.08	175,795	60.83	89.18	0.00	776
11/8/2013	102.34	147,370	42.30	51.99	0.00	679
11/9/2013	102.24	147,226			0.00	614
11/10/2013	96.35	138,744			0.00	374
11/11/2013	90.79	130,738			0.17	648
11/12/2013	97.21	139,982	91.40	106.71	0.00	779
11/13/2013	102.56	147,686	41.63	51.28	0.00	781
11/14/2013	98.18	141,379	55.51	65.45	0.00	578
11/15/2013	108.84	156,730	29.15	38.10	0.00	867
11/16/2013	94.91	136,670			0.33	760
11/17/2013	107.27	154,469			0.46	751
11/18/2013	121.84	175,450	61.64	90.19	0.00	608
11/19/2013	122.71	176,702	55.34	81.55	0.00	425
11/20/2013	103.13	148,507	48.29	59.81	0.21	826
11/21/2013	102.3	147,312	153.15	188.16	0.12	778
11/22/2013	96.34	138,730	3.17	3.67	0.05	778
11/23/2013	89.29	128,578			0.00	864
11/24/2013	87.67	126,245			0.00	1037
11/25/2013	87.67	126,245	15.64	16.47	0.00	950
11/26/2013	87.69	126,274	19.52	20.56	0.00	949
11/27/2013	87.22	125,597	11.16	11.69	0.00	836
11/28/2013	135.63	195,307			0.00	946
11/29/2013	110.81	159,566	12.91	17.18	0.00	983
11/30/2013	136.38	196,387			0.00	961
12/1/2013	95.52	137,549			0.00	1043
12/2/2013	91.13	131,227	26.99	29.54	0.12	890
12/3/2013	100.44	144,634	31.47	37.96	0.06	954
12/4/2013	101.15	145,656	0.20	0.24	0.05	864
12/5/2013	114.41	164,750	13.75	18.89	0.00	648
12/6/2013	124.22	178,877	10.62	15.84	0.00	779
12/7/2013					0.00	778
12/8/2013					0.13	605
12/9/2013		150,000	10.69	13.37	0.01	518
12/10/2013					0.00	721
12/11/2013		152,883	11.74	14.97	0.05	1009

USGS Calumet Lagoon Flow Study

Date	Avg Flow GPM	Total Flow gal/day	Tot-P mg/L	P Load lbs/day	Prec. in.	Dig Draw flow in 1000 gal
12/12/2013					0.00	1036
12/13/2013					0.05	1009
12/14/2013					0.27	1038
12/15/2013					0.00	893
12/16/2013					0.02	984
12/17/2013					0.00	1037
12/18/2013					0.00	1037
12/19/2013	81.68	117,619			0.09	1038
12/20/2013	96.02	138,269	32.67	37.67	0.20	807
12/21/2013	112.71	162,302			0.42	981
12/22/2013	124.52	179,309			0.11	981
12/23/2013	103.69	149,314	36.49	45.44	0.00	1038
12/24/2013	92.23	132,811			0.00	1037
12/25/2013	87.75	126,360			0.02	1037
12/26/2013	90.26	129,974			0.00	1037
12/27/2013	90.40	130,176			0.00	1038
12/28/2013	99.23	142,891			0.00	1039
12/29/2013	91.56	131,846			0.00	1037
12/30/2013	87.84	126,490			0.05	1037
12/31/2013	89.49	128,866			0.09	1033
<b>Average</b>		<b>152,883</b>		<b>139.81</b>	<b>172.98</b>	<b>782,027</b>
<b>Minimum</b>		<b>106,502</b>		<b>0.20</b>	<b>0.24</b>	<b>374,000</b>
<b>Maximum</b>		<b>326,174</b>		<b>2215.80</b>	<b>2458.84</b>	<b>1,043,000</b>
<b>Total</b>					<b>6.28</b>	

Avg P load lag. superN lbs/day	Avg P conc lag. superN mg/L	Avg Dig Draw to lagoons gal/day
144.22	116.49	782,027
0.24	0.20	374
2458.84	2215.80	1043

APPENDIX D

CALUMET WATER RECLAMATION PLANT PLAN FOR SOLIDS MANAGEMENT,  
SCHEDULE FOR FILLING AND EMPTYING OF VARIOUS LAGOONS

## CALSMA Lagoon Schedule Plan

	2012	2013	2014	2015	2016	2017	2018	2019
<b>Filling</b>	1	1	2	3	1	2	3	1
	6	6	17	4	6	17	4	6
	14	7	19	8	7	19	8	7
	18	17		14	18		14	18
	19	18		15			15	
<b>Emptying</b>	7	17	1 remaining	7	17	14	7	2
	18	19	6	18	19	15	18	17
	1	2	2			8	1	19
	6	14	17 partially			3	6	
		1 partially				4		

## Dry Ton Amounts

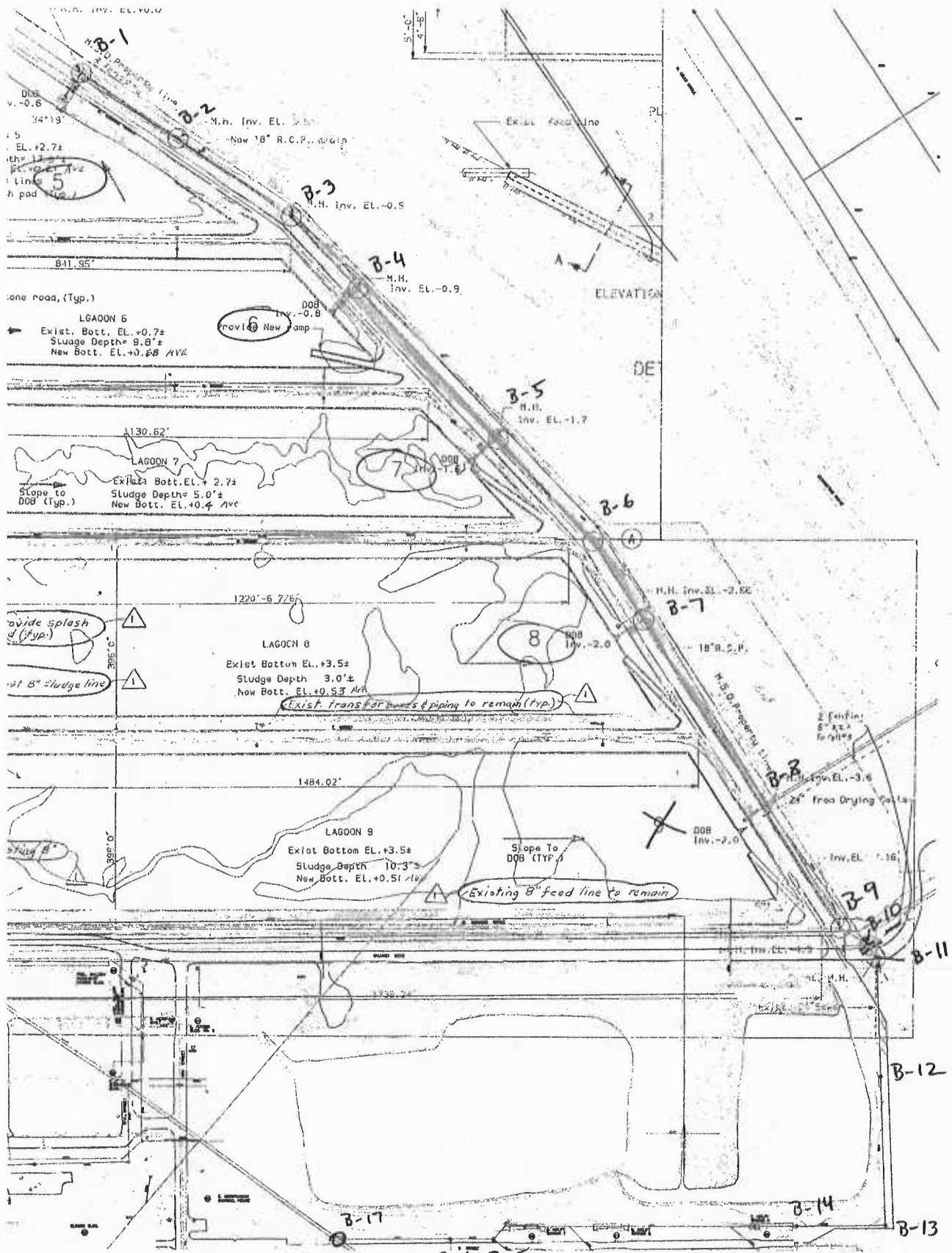
	2012	2013	2014	2015	2016	2017	2018	2019
<b>Filling</b>	2,200	1,881	5,500	3,000	5,000	5,500	3,000	5,000
	4,365	3,654	10,000	3,000	4,000	10,000	3,000	4,000
	5,167	6,114	10,000	12,000	6,000	10,000	8,000	6,000
	2,164	4,002		4,000	10,000		4,000	10,000
	5,556	5,768		4,000			4,000	
	19,452	21,419	25,500	26,000	25,000	25,500	22,000	25,000
<b>Emptying</b>	5,028	4,222	2,000	6,000	10,000	4,000	6,000	5,500
	8,134	8,627	4,000	10,000	10,000	4,000	10,000	10,000
	4,190	4,189	5,500			8,000	5,000	10,000
	4,690	2,795				3,000	4,000	
		2,079				3,000		
	22,042	21,912	11,500	16,000	20,000	22,000	25,000	25,500

Aged
Unaged

APPENDIX E

ESTIMATIONS OF MAXIMUM DESIGN FLOWS FROM VARIOUS LAGOONS AT THE  
CALUMET WATER RECLAMATION PLANT

# East Lagoons Drain Layout (#5, 6, 7, 8)



Calumet Intersecting Sewer  
E-1



Lagoon #	Max Flow (cfs)	Max Flow (MGD)
1	3.00	1.94
2	3.00	1.94
3	2.12	1.37
4	2.88	1.86
17	3.32	2.15
<b>West Drain</b>	<b>3.32</b>	<b>2.15</b>
5	1.52	0.98
6	1.44	0.93
7	1.43	0.92
8	3.77	2.44
<b>East Drain</b>	<b>4.72</b>	<b>3.05</b>
14	2.89	1.87
15	2.86	1.85
18	7.09	4.58
19	15.53	10.04
<b>South Drain</b>	<b>15.53</b>	<b>10.04</b>
<b>NOT USED CURRENTLY//INACTIVE</b>		

NOTE: Maximum West/East/South Drain Flow is based on assumption that more than one (1) lagoon is being drained simultaneously

Assumptions: n= 0.013 Clay and old (20-yr) ductile iron  
0.013 average value for concrete pipe (RCP)

MH/CB No.	Material	Diam. (in)	Slope (%)	L (ft)	Invert in	Invert out	Pipe full Q (cfs)	Pipe full Q (gpd)	Pipe full V (fps)	
1-1						0.00				
1-1 to A-1	Ductile Iron	12	0.71	56			3.00	1,950,000	3.82	99-269-2P
A-1					-0.40	-0.40				
A-1 to A-2 from 2-1	Ductile Iron	18	0.20	300			4.70	3,040,000	2.66	
A-2					-1.00					
A-2 to A-3 from 3-1	Ductile Iron	18	0.20	299			4.71	3,050,000	2.66	
A-3					-1.70					
A-3 to A-4 from 4-1	Ductile Iron	18	0.23	301			5.07	3,280,000	2.87	
A-4					-2.50					
A-4 to A-5**					-2.50	-2.50				
A-4 to A-5*	Ductile Iron	18	0.24	205			5.19	3,360,000	2.94	
A-5*					-3.00	-3.00				
A-5* to A-6*	Ductile Iron	18	0.25	150			5.22	3,380,000	2.95	
A-6*					-3.27					
A-6* to A-7*	Ductile Iron	18	0.80	55			9.40	6,080,000	5.32	
A-7*					-3.81	-3.86				
A-7* to A-8	RCP	18	0.10	340			3.32	2,150,000	1.88	
A-8					-4.20	-4.20				
A-8 to A-9	RCP	18	0.36	111			6.31	4,080,000	3.57	
A-9					-4.60	-4.60				
A-9 to A-10	RCP	18	0.20	220			4.64	3,010,000	2.63	
A-10					-5.03	-5.03				
A-10 to A-11	RCP	18	1.22	11			11.60	7,500,000	6.56	
A-11					-5.16	-19.15				
A-11 to SP Interceptor	RCP	24	15.00	5			87.62	56,630,000	27.89	
SP Interceptor						-19.90				
2-1						-0.60				
2-1 to A-2	Ductile Iron	12	0.71	56			3.00	1,950,000	3.82	99-269-2P
A-2					-1.00					
3-1						-1.50				
3-1 to A-3	Clay or Ductile Iron	12	0.36	56			2.12	1,380,000	2.70	
A-3					-1.70					
4-1						-2.10				
4-1 to A-4	Clay or Ductile Iron	12	0.65	61			2.88	1,860,000	3.66	
A-4					-2.50					
17-1						-2.25				
17-1 to A-6	Ductile Iron	12	1.46	70			4.30	2,790,000	5.48	94-236-2P
A-6					-3.27					
A-4						-2.60				
A-4 to A-4s**	Clay	15	0.25	40			3.24		2.64	MUPPS
A-4s**					-2.60					

E-3

\*Note 1: The lengths of pipe between MHs A-4 & A-7 was estimated based on scaled drawings due to lack of physical dimensions on As-built and/or Design Drawings

\*\*Note 2: This portion of the supernatant was probably abandoned. It is the original 47-26 contract. TARP Pumping Station was constructed at a later time that would interfere with that original piping layout

Assumptions: n= 0.013 Clay and old (20-yr) ductile iron  
0.013 average value for concrete pipe (RCP)

MH/CB No.	Material	Diam. (in)	Slope (%)	L (ft)	Invert in	out	Pipe full Q (cfs)	Pipe full Q (gpd)	Pipe full V (fps)
18-1						-5.09			
18-1 to D-1	RCP	21	0.20	113			7.09	4,580,000	2.95
D-1					-5.32	-5.42			
D-1 to D-2	RCP	24	0.18	163			9.71	6,280,000	3.09
D-2					-5.72	-5.72			
D-2 to D-3	RCP	24	0.47	143			15.49	10,010,000	4.93
from 19-1					-5.12				
D-3					-6.39	-6.39			
D-3 to D-4	RCP	24	0.47	70			15.53	10,040,000	4.94
D-4					-6.72				
D-4 to Calumet Intercept	RCP								
Calumet Intercepting Sewer									

96-249-2P

19-1						-4.15			
19-1 to D-3	RCP	21	1.64	59			20.29	13,120,000	8.44
D-3						-5.12			

E-4

15-1						-2.50			
15-1 to C-1	RCP ???	15	0.20	51			2.86	1,850,000	2.33
C-1					-2.60	-2.60			
C-1 to C-2	RCP	15	0.20	322			2.90	1,880,000	2.37
from 14-1					-1.72				
C-2					-3.25	-3.25			
C-2 to C-3	RCP	15	0.20	105			2.89	1,870,000	2.35
C-3					-3.46	-3.46			
C-3 to C-4	RCP	15	0.20	104			2.90	1,880,000	2.37
C-4					-3.67	-3.67			
C-4 to C-5	RCP	15	0.21	472			2.94	1,910,000	2.40
C-5					-4.65				
C-5 to Calumet Intercept	RCP								
Calumet Intercepting Sewer									

MUPPS & 96-249-2P

14-1						-1.63			
14-1 to C-2	RCP ???	15	0.20	45			2.89	1,870,000	2.35
C-2						-1.72			

96-249-2P & MUPPS

ALL INVERTS FOR LAGOONS #14 & 15 ARE ONLY HYPOTHETICAL DUE TO LACK OF AS-BUILT OR DESIGN CONTRACT INFO; ACTUAL INVERTS/SLOPES MUST BE FIELD VERIFIED FOR ACCURATE FLOW ESTIMATE

Assumptions: n = 0.013 Clay and old (20-yr) ductile iron  
0.013 average value for concrete pipe (RCP)

MH/CB No.	Material	Diam. (in)	Slope (%)	L (ft)	Invert in	out	Pipe full Q (cfs)	Pipe full Q (gpd)	Pipe full V (fps)
5-1						0.00			
5-1 to B-1	RCP	12	0.18	55			1.52	990,000	1.93
B-1					0.50	0.50			
B-1 to B-2	RCP	18	0.22	230			4.90	3,170,000	2.77
B-2					0.00	0.00			
B-2 to B-3	RCP	18	0.18	276			4.47	2,890,000	2.53
B-3					-0.50	-0.50			
B-3 to B-4	RCP	18	0.20	196			4.75	3,070,000	2.69
from B-1					-0.90				
B-4					-0.90	-0.90			
B-4 to B-5	RCP	18	0.19	414			4.62	2,990,000	2.61
from 7-1					-1.70				
B-5					-1.70	-1.70			
B-5 to B-6	RCP	18	0.21	281			4.85	3,140,000	2.75
B-6					-2.30	-2.30			
B-6 to B-7	RCP	18	0.19	188			4.60	2,980,000	2.60
from B-1					-2.66				
B-7					-2.66	-2.66			
B-7 to B-8	RCP	18	0.20	465			4.72	3,060,000	2.67
B-8					-3.60	-3.60			
B-8 to B-9	RCP	18	0.21	272			4.77	3,090,000	2.70
B-9					-4.16	-4.16			
B-9 to B-10	RCP	18	0.21	65			4.86	3,150,000	2.75
B-10					-4.30	-4.30			
B-10 to B-11	RCP	18	0.24	25			5.10	3,300,000	2.89
B-11					-4.36	-7.63			
B-11 to B-12	RCP	24	0.32	300			12.86	8,320,000	4.09
B-12					-8.60	-8.60			
B-12 to B-13	RCP	24	0.49	303			15.82	10,230,000	5.04
B-13					-10.08	-10.08			
B-13 to B-14	RCP	24	1.75	166			29.90	19,330,000	9.52
B-14					-12.96	-24.48			
B-14 to B-15	RCP	24	0.21	627			10.26	6,640,000	3.27
B-15					-25.77	-26.27			
B-15 to B-16	Ductile Iron	36	0.21	76			30.60	19,780,000	4.33
B-16					-26.43	-26.43			
B-16 to B-17	Ductile Iron	36	0.20	206			30.12	19,470,000	4.26
B-17					-26.85	-28.75			
B-17 to Calumet Interceptor	Ductile Iron w/ Concrete	36	0.22	9			31.44	20,330,000	4.45
Calumet Intercepting Sewer					-28.77	-36.20			
6-1						-0.80			
6-1 to B-3	RCP	12	0.16	62			1.44	930,000	1.83
B-3					-0.90				
7-1						-1.60			
7-1 to B-4	RCP	12	0.16	62			1.43	930,000	1.82
B-4					-1.70				
8-1						-2.00			
8-1 to B-6	RCP	12	1.12	59			3.77	2,440,000	4.80
B-6					-2.66				

82-244-2P

89-201-2P

77-284-2P

82-244-2P

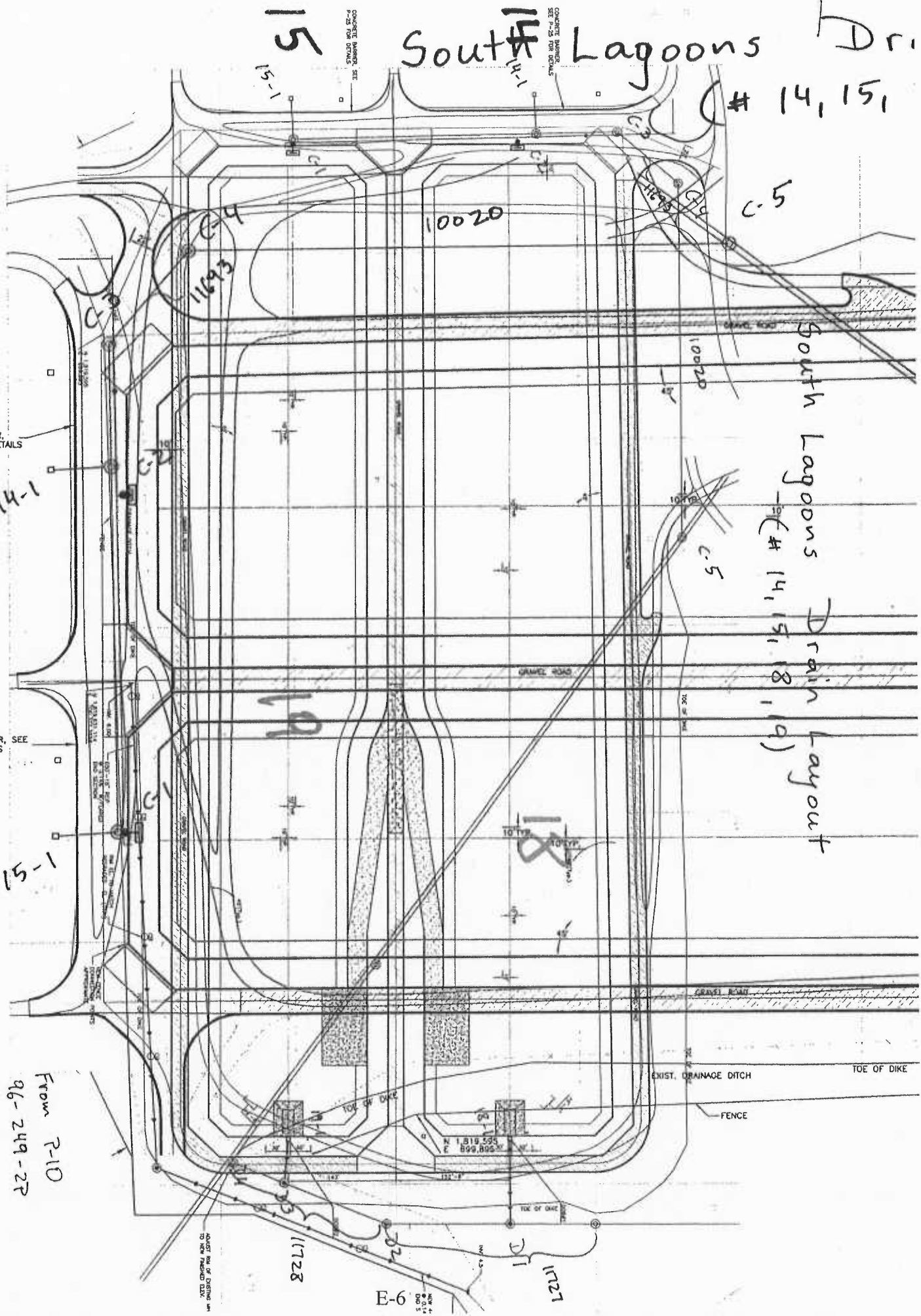
I-5

# South Lagoons Dr.

# 14, 15,

South Lagoons Drain Layout

(# 14, 15, 18, 19)



CONCRETE BARRIER, SEE P-25 FOR DETAILS

CONCRETE BARRIER, SEE P-25 FOR DETAILS

From R-10  
96-249-2P

ADJUST R/O OF DRIVE LN  
TO NEW PAVED TALK.

E-6  
894  
805  
5

APPENDIX F

LIST OF CURRENT KNOWN PLANET BREEZE USERS

TABLE F-1: LIST OF CURRENT KNOWN PLANET BREEZE USERS

WRP	Plant Breeze Use	Contact
Solon, Ohio (5.4 MGD)	Belt press for odor	Paul Solanics (440.248.4895)
Detroit, Michigan (600 MGD)	Sludge topical application	Jon Packman (313.297.9827)
Archbold, Ohio	Wet wells odor	Mike Short (419.572.1117)
Lucas County, Ohio	H <sub>2</sub> S and odor control for Lift Station	
Farmington Hills, Michigan	Odor control	

APPENDIX G

MATERIAL SAFETY DATA SHEETS FOR COPPER SULFATE SOLUTION





## MATERIAL SAFETY DATA SHEET

### COPPER SULPHATE SOLUTION – MINING GRADE

#### SECTION 01 – PRODUCT AND COMPANY INFORMATION

**Product Name** .....Copper Sulphate Solution  
**Synonyms** .....Cupric Sulphate Solution, Aqueous Copper Sulphate, Liquid Blue Vitriol  
**Appearance** .....Blue Liquid  
**Product Use** .....Used in the flotation of mineral products  
**Supplier Name** .....LogiChem Pty Ltd incorporating Jostek Chemicals  
**Address** .....Bulong Road, PARKESTON, Kalgoorlie, Australia  
PO Box 878 Kalgoorlie WA 6433 Australia  
**Phone** .....(08) 9091-7708  
**Fax** .....(08) 9091-7709  
**24 Hour Emergency Phone** .....(08) 9091-7708

#### SECTION 02 – COMPOSITION

Chemical Components	Cas No.	Proportion by weight
Copper Sulphate Pentahydrate	7758-99-8	20-30%
Water	7732-18-5	70-80%

#### SECTION 03 – HEALTH HAZARDS IDENTIFICATION

##### Hazardous According to Criteria of ASCC (NOHSC)

**Harmful (Xn)**  
**Irritant (Xi)**  
**Dangerous to the environment (N)**

##### Risk Phrases:

R22 ..... Harmful if swallowed  
R36/38 ..... Irritating to eyes and skin  
R50 ..... Very toxic to aquatic organisms  
R53 ..... May cause long-term adverse effects in the aquatic environment.

##### Summary

Moderate toxicity - irritant. Use safe work practices to avoid skin or eye contact and vapour inhalation. Chronic over exposure may cause kidney/ liver and blood damage. Potential skin sensitising agent.

**Eye** ..... Irritant. Contact may result in lacrimation, irritation, pain, redness and conjunctivitis. Prolonged contact – corneal burns and possible permanent damage.

**Inhalation** ..... Irritant. Over exposure to vapours or mists may result in upper respiratory tract irritation, nausea and headache. Due to the low vapour pressure of this product an inhalation hazard is not anticipated unless sprayed.

**Skin** ..... Irritant. Contact may result in itching, pain, redness, rash and dermatitis. Prolonged contact may result in sensitisation and burns.

**Ingestion** ..... Moderately toxic. Ingestion may result in nausea, vomiting, abdominal pain and diarrhoea. Large doses may result in kidney/liver and blood damage.

**Poison Schedule** ..... S6



MATERIAL SAFETY DATA SHEET

COPPER SULPHATE SOLUTION – MINING GRADE

SECTION 04 – FIRST AID MEASURES

- Ingestion** ..... If victim is conscious and can swallow, dilute stomach contents with 2 to 4 cupfuls of water or milk. Do not induce vomiting. Ingestion of cupric sulfate normally leads to spontaneous vomiting. When vomiting occurs naturally, rinse mouth and repeat administration of water. Seek medical attention immediately and bring a copy of this MSDS. Never give anything by mouth to an unconscious person.
- Eye** ..... Immediately flush with warm, running water, including under the eyelids, for at least 15 minutes. Seek medical attention immediately.
- Skin** ..... Remove contaminated clothing and wash affected area with soap and warm water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.
- Inhalation** ..... Remove victim from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Medical oxygen may be administered, if available, where breathing is difficult. Seek immediate medical attention.

SECTION 05 – FIRE FIGHTING MEASURES

- Flammability** ..... Copper sulphate solution is not flammable or combustible.
- Extinguishing Media** ..... Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam. Do not release runoff from fire control methods to sewers or waterways.
- Fire fighting procedures** ..... Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

SECTION 06 – ACCIDENTAL RELEASE MEASURES

- Leak / Spill** ..... Isolate hazard area and deny entry to unprotected personnel. Control source of spillage if possible to do so safely. If spill is small, mop up. For larger spill use absorbent (sand or other inert materials) to soak up spilled material. Place contaminated material and neutralization wastes in suitable containers for recovery or disposal. Treat or dispose of waste material in accordance with applicable regulations. Wash cleaned areas with an excess of water.
- Personal Precautions:** ..... Protective clothing, impervious gloves, and close-fitting safety goggles are recommended for persons responding to an accidental release (see also Section 8). Respiratory protection equipment should be worn where exposure to hazardous levels of mist is possible.
- Environmental Precautions:** ..... This product can pose a threat to the environment. Contamination of soil and water should be prevented. Keep spillage from entering ground, streams or sewers.

SECTION 07 – HANDLING & STORAGE

- Handling / Storage Procedures** ..... Store containers in a dry, cool, well-ventilated area away from incompatible materials. Keep container tightly closed. Protect from physical damage. Minimize generation of mist. Do not allow to freeze; if frozen thaw completely and mix prior to use. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas.

**MATERIAL SAFETY DATA SHEET**

**COPPER SULPHATE SOLUTION – MINING GRADE**

**SECTION 08 – PERSONAL PROTECTION AND EXPOSURE CONTROLS**

**Personal Protective Equipment**

**Protective Clothing** ..... Protective clothing, impervious gloves and rubber boots. Eye protection goggles should be worn where any possibility exists that eye contact with splash, spray or mist may occur. An eyewash and quick drench should be provided in work area. Workers should wash immediately when skin becomes contaminated and at the end of each work shift.

**Occupational Exposure Limits**

No value assigned for this specific material by the National Occupational Health and Safety Commission. However Exposure Standard(s) for constituent(s):

Copper dusts & mists (as Cu) ..... 8hr TWA = 1 mg/m<sup>3</sup>  
 Copper Fume ..... 8hr TWA = 0.2 mg/m<sup>3</sup>

As published by the National Occupational Health and Safety Commission.

TWA – the time-weighted average airborne concentration over an eight-hour working day, for five-day working week over an entire working life.

These Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentration of chemicals. They are not a measure of relative toxicity.

**Engineering Controls**

**Ventilation requirements** ..... Local or general ventilation should be used to maintain the working environment below recommended exposure limits

**Respiratory Protection** ..... Where copper sulphate mists are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (meeting the requirements of AS/NZS 1715 and AS/NZS 1716)

**SECTION 09 – PHYSICAL AND CHEMICAL PROPERTIES**

**Form / Colour / Odour** ..... Clear, deep-blue coloured solution with no odour

**pH** ..... Approximately 1

**Water Solubility** ..... 100% at 20°C

**Specific Gravity (Water =1)** ..... 1.145-1.22 (based on concentration)

**Vapour Pressure (hPa @ 20°C)** ..... Negligible at 20°C

**Boiling Point** ..... above 100°C

**Freezing Point** ..... below 0°C

**SECTION 10 – STABILITY AND REACTIVITY**

**Stability** ..... This material is stable and not considered reactive under normal temperatures and pressures.

**Incompatibility** ..... Avoid contact with alkalis, hydroxylamine, magnesium, ammonia, acetylene, sodium hypobromite, and nitromethane. Can be highly corrosive to most ferrous-based metals.

**Hazardous Decomposition Products:** ..... High temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging on dried residues of this material may generate toxic copper fumes and sulfur dioxide. The fumes will contain copper oxides, which, on inhalation in sufficient quantity, can produce metal fume fever.



MATERIAL SAFETY DATA SHEET

**COPPER SULPHATE SOLUTION – MINING GRADE**

**SECTION 11 – TOXICOLOGICAL INFORMATION**

The major routes of exposure in the industrial setting are skin, eyes, and inhalation of mist. Liquid and mist are strongly irritating to the eyes. Although copper is an essential element, mutagenicity and genotoxicity assays have produced equivocal positive results. When heated this product can release toxic sulfur dioxide gas. Individuals with "Wilson's Disease" are predisposed to accumulate copper and should not be occupationally exposed.

**Toxicity Data**

No LD50 data available for the product. However, for the constituent, COPPER SULPHATE PENTAHYDRATE: Oral Lowest Letha Dose (human) : 1088 mg/kg

**Acute Health Effects**

- Ingestion**..... Ingestion will cause nausea, vomiting, gastric pain, diarrhea and cramps. Large doses by ingestion may cause renal injury, coma and possibly death.
- Eye / Skin**..... Liquid and mist are likely to cause moderate to severe eye irritation. Skin contact is likely to cause irritation, with itching and redness of the skin.
- Inhalation**..... Inhalation of mist is irritating to the lungs and upper respiratory passages. Coughing and difficulty with breathing will occur with brief severe exposure. Mists may also be corrosive to the nose, throat and mucous membranes.

**Chronic Health Effects**

Repeated inhalation of a copper sulphate mist has resulted in a condition known as "vineyard sprayer's lung". The condition is asymptomatic until later stages, when symptoms include weakness, malaise, loss of appetite and weight, cough and greenish-brown sputum. Greenish tumours may occur in the liver and lungs of affected persons. Copper sulphate is not listed as a carcinogen by OSHA, National Toxicology Program (NTP), International Agency for Research on Cancer (IARC), ACGIH or the EU. Sulphuric acid is not listed as a carcinogen by OSHA, NTP, IARC, ACGIH or the EU. Both IARC and the NTP have concluded that there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic to humans, resulting in an increased incidence of primarily laryngeal cancers. The ACGIH also list strong inorganic acid mists containing sulfuric acid as a suspect human carcinogen (A2). OSHA and the EU do not list sulfuric acid mist as a carcinogen.

**SECTION 12 – ECOLOGICAL INFORMATION**

Copper is accumulated by plants and animals but biomagnification has not been shown to occur in either aquatic or terrestrial food chains. Dissolved copper can be highly toxic to aquatic life at relatively low concentrations with pH, hardness and dissolved organic compounds being factors that regulate the degree of toxicity. In soil, copper can be particularly toxic to invertebrates and phytotoxic to plants at elevated concentrations with soil properties being regulating factors.

**SECTION 13 – DISPOSAL CONSIDERATIONS**

Dispose of waste consistent with regulatory requirements. Do not wash down drain or allow to reach natural watercourses. Dispose of neutralized waste consistent with regulatory requirements. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas.

**SECTION 14 – TRANSPORTATION INFORMATION**

NOT classified as Dangerous Goods According to the Criteria of the Australian Dangerous Goods Code (ADG Code) for transport by Road or Rail. No special transport requirements are necessary.

**SECTION 15 – REGULATORY INFORMATION**

Classification..... This material is hazardous according to criteria of ASCC  
Xn: ..... Harmful  
Xi: ..... Irritant



**MATERIAL SAFETY DATA SHEET**

**COPPER SULPHATE SOLUTION – MINING GRADE**

**Risk Phrases**

R22 ..... Harmful if swallowed  
R36/38 ..... Irritating to eyes and skin  
R50 ..... Very toxic to aquatic organisms  
R53 ..... May cause long-term adverse effects in the aquatic environment.

**Safety Phrases**

S2 ..... Keep out of the reach of children  
S23 ..... Do not breathe vapour/mist/aerosol  
S24/25 ..... Avoid contact with skin and eyes  
S26 ..... In case of contact with eyes, rinse immediately with plenty of water and seek medical advice  
S35/37/39 ..... Wear suitable protective clothing, gloves and eye/face protection

Poisons Schedule ..... S6 Poison

This material is listed on the Australian Inventory of Chemical Substances (AICS)

**SECTION 16 – OTHER INFORMATION**

**MSDS Creations date** ..... 14 December 2006  
**Most recent revision date** ..... 29 April 2013  
**Revision Number** ..... 008  
**Reason for Revision** ..... Annual Update

THIS ISSUE NUMBER REPLACES ALL ISSUES

Contact Person ..... Jonty Eales – General Manager  
Telephone 08 9091-7708 (24 hours)

*Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.*

**END OF MSDS**