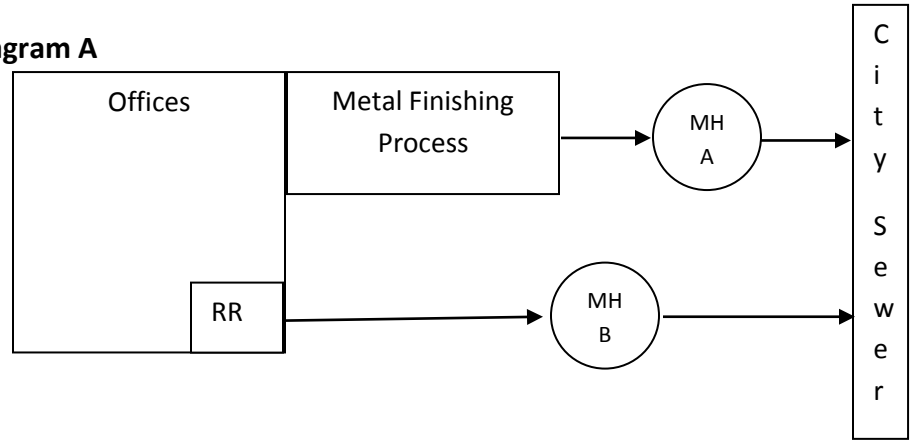
ACWA Local Limit Workshop – June 22, 2016
Practice Problems

1. The Diagram A depicts a metal finisher with categorical copper limit of 3.38 mg/L. Your municipality's local limit for copper is 2.20 mg/L.

a. What limit would you apply at the manhole A?

b. What limit would you apply at the manhole B?

Diagram A

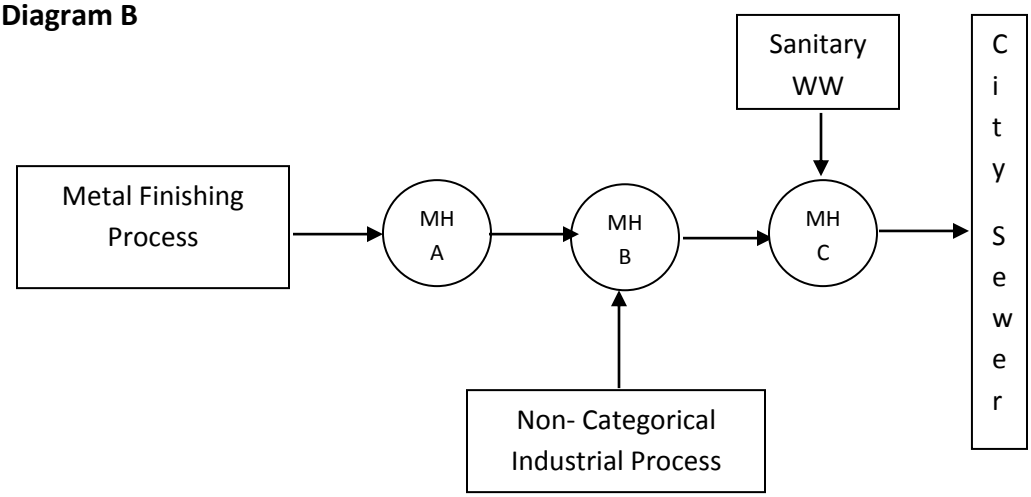


For Diagram B:

c. Discuss the point(s) at which you would apply the local and categorical limits.

d. If the local limit for copper was 4.55 mg/L, where would you apply the local limit?

Diagram B



2. You are determining the pollutants of concern for a local limit study. The jurisdiction for which you are responsible has 25 significant industrial users (SIU).

a. Several months ago, an O & M crew had to evacuate a pump station in a heavily industrialized area because an explosive atmosphere was detected. Analysis of the pump station wet well indicated the presence of hexane. POTW influent analysis has not detected hexane. Should hexane be a pollutant of concern? Explain.

b. Scenario 1: An investigation into the incident described above found that one industry was responsible for the discharge of hexane to the pump station and no other industries utilize hexane. Should a local limit for hexane be developed? Explain.

c. Scenario 2: An investigation into the incident described above found that three industries discharge hexane to the pump station, while four other industries located at different areas of the City discharge hexane. Should a local limit for hexane be developed? If so which industries should receive the local limit?

3. During a local limit study, the following inf/eff results are obtained for lead (in mg/L) without accounting for hydraulic detention times through the POTW:

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Influent	21.57	17.04	25.89	30.11	19.76	17.39	21.09
Effluent	1.55	2.36	0.98	1.95	0.72	0.54	1.22

a. Which removal rate methodology would be the most appropriate to use?

b. Calculate the removal rate.

c. Inf/eff results at another treatment facility are presented below. Calculate the removal rate using these data. How do the removal rates calculated in (b) and (c) compare?

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Influent	0.10	0.02	0.15	0.11	0.02	0.09	0.01
Effluent	0.05	ND	0.05	0.04	ND	0.02	ND

(Pb method detection limit = 0.01 mg/L)

d. If the average daily influent concentration was 0.05 mg/L and the average daily effluent concentration was 0.07 mg/L, how could you calculate the removal rate given:

- Average flow for the POTW = 32.6 MGD
- Average Pb sludge loadings = 10.5 lbs/day

e. Instead of calculating a site specific removal rate for Pb, you decide to use a literature value. Discuss how this might impact the safety factor you would utilize in the calculating the maximum allowable industrial loading (MAIL).

4. A POTW has five SIUs with the following reported average daily flows:

- **Industry A – 0.20 MGD**
- **Industry B – 0.050 MGD**
- **Industry C – 0.10 MGD**
- **Industry D – 0.25 MGD**
- **Industry E – 0.15 MGD**

The maximum allowable headworks loading (MAHL) for zinc is calculated at 35.55 lbs/d.

a. Calculate the MAIL if the uncontrolled zinc loading is 10.08 lb/d, a safety factor of 20%, and a growth allowance of 20%.

b. Using the uniform concentration method calculate the zinc local limit for the 5 SIUs.

c. Scenario 1: A review of SIU historical effluent data finds the following average daily discharge concentrations for zinc:

- Industry A – 2.14 mg/L
- Industry B – 1.53 mg/L
- Industry C – ND
- Industry D – 3.50 mg/L
- Industry E – 1.95 mg/L

If you were to implement the uniform concentration based LL calculated in (b), for these industries what issues might arise? Discuss ways you could mitigate those issues.

d. Scenario 2: A review of SIU historical effluent data finds the following average daily discharge concentrations for zinc:

- Industry A – ND
- Industry B – ND
- Industry C – ND
- Industry D – 3.50 mg/L
- Industry E – ND

Describe the Local Limit allocation method you would use in this scenario. Calculate the limit using that methodology.

e. A year after establishing the uniform concentration limit from (b), a new industry moves into town that will discharge 0.075 MGD with an average Zn concentration of 1.1 mg/L. Do you need to re-calculate the Zn limit?

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Practice Problems - Answers

1. The Diagram A depicts a metal finisher with categorical copper limit of 3.38 mg/L. Your municipality's local limit for copper is 2.20 mg/L.

a. What limit would you apply at the manhole A?

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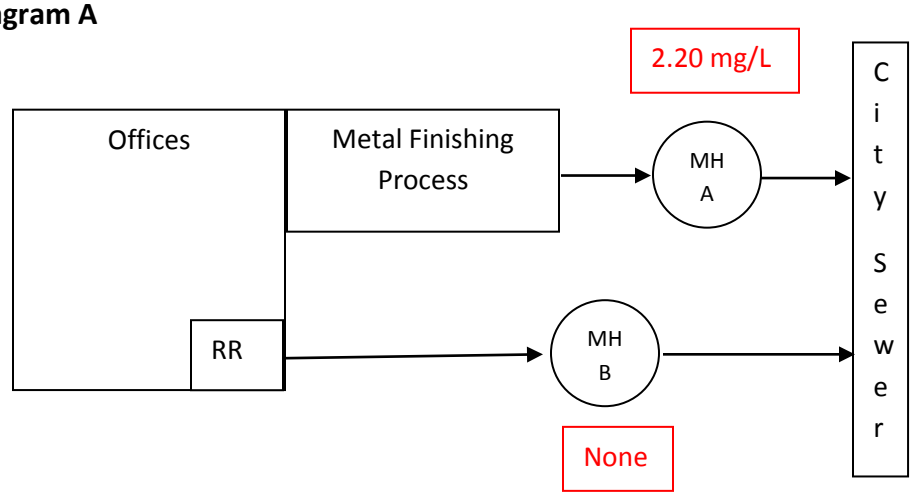
Diagram A

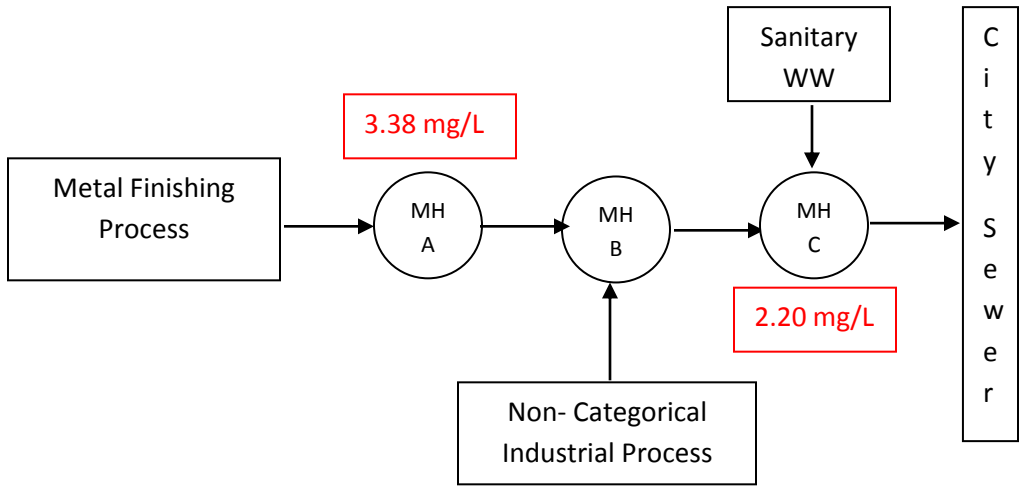


For Diagram B:

c. Discuss the point(s) at which you would apply the local and categorical limits.

d. If the local limit for copper was 4.55 mg/L, where would you apply the local limit?

Diagram B



2. You are determining the pollutants of concern for a local limit study. The jurisdiction for which you are responsible has 25 significant industrial users (SIU).

a. Several months ago, an O & M crew had to evacuate a pump station in a heavily industrialized area because an explosive atmosphere was detected. Analysis of the pump station wet well indicated the presence of hexane. POTW influent analysis has not detected hexane. Should hexane be a pollutant of concern? Explain.

b. Scenario 1: An investigation into the incident described above found that one industry was responsible for the discharge of hexane to the pump station and no other industries utilize hexane. Should a local limit for hexane be developed? Explain.

c. Scenario 2: An investigation into the incident described above found that three industries discharge hexane to the pump station, while four other industries located at different areas of the City discharge hexane. Should a local limit for hexane be developed? If so which industries should receive the local limit?

3. During a local limit study, the following inf/eff results are obtained for lead (in lbs) without accounting for hydraulic detention times through the POTW:

a. Which removal rate methodology would be the most appropriate to use?

Mean Removal Efficiency = $\frac{\text{Inf - Eff}}{\text{Inf}}$

b. Calculate the removal rate.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
Influent	21.57	17.04	25.89	30.11	19.76	17.39	21.09	152.85
Effluent	1.55	2.36	0.98	1.95	0.72	0.54	1.22	9.32

$= \frac{152.85 - 9.32}{152.85} = 0.939 =$ **94%**

c. Inf/eff results at another treatment facility are presented below. Calculate the removal rate using these data. How do the removal rates calculated in (b) and (c) compare?

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	
Influent	0.10	0.02	0.15	0.11	0.02	0.09	0.01	0.50
Effluent	0.05	0.005	0.05	0.04	0.005	0.02	0.005	0.18

= 0.50 -0.18 = 0.64 = **64%**
0.50

EPA's 2004 Local Limit Guidance, appendix R:

Pb published removal rates

Median = 61%

Range = 1 -92%

d. If the average daily influent concentration was 0.05 mg/L and the average daily effluent concentration was 0.07 mg/L, how could you calculate the removal rate given:

- Average flow for the POTW = 32.6 MGD
- Average Pb sludge loadings = 10.50 lbs/day
- Daily Pb Loadings = 32.6 MGD * 0.05 mg/L * 8.34 = 13.59 lb.
- Removal rate = Pb sludge/ Pb inf = 10.50/13.59 * 100% = **77.26%**

e. Instead of calculating a site specific removal rate for Pb, you decide to use a literature value. Discuss how this might impact the safety factor you would utilize in the calculating the maximum allowable industrial loading (MAIL).

4. A POTW has five SIUs with the following reported average daily flows:

- **Industry A – 0.20 MGD**
- **Industry B – 0.050 MGD**
- **Industry C – 0.10 MGD**
- **Industry D – 0.25 MGD**
- **Industry E – 0.15 MGD**

The maximum allowable headworks loading (MAHL) for zinc is calculated at 35.55 lbs.

a. Calculate the MAIL if the uncontrolled zinc loading is 10.08 lb, a safety factor of 20%, and a growth allowance of 20%.

MAIL = MAHL – Unc – SF – GA

MAIL = 35.55 lb – 10.08 – 7.11 – 7.11 = **11.25 lb**

b. Using the uniform concentration method calculate the zinc local limit for the 5 SIUs.

Lbs = conc. * Total IU MGD * 8.34

11.25 lb = conc. * 0.75 MGD *8.34 = **1.80 mg/L**

c. Scenario 1: A review of SIU historical effluent data finds the following average daily discharge concentrations for zinc:

- Industry A – 2.14 mg/L
- Industry B – 0.75 mg/L
- Industry C – ND
- Industry D – 3.50 mg/L
- Industry E – 1.95 mg/L

If you were to implement the uniform concentration based LL you calculated in (b), for these industries what issues might arise? Discuss ways you could mitigate those issues.

d. Scenario 2: A review of SIU historical effluent data finds the following average daily discharge concentrations for zinc:

- Industry A – ND
- Industry B – ND
- Industry C – ND
- Industry D – 3.50 mg/L
- Industry E – ND

Describe the Local Limit allocation method you would use in this scenario. Calculate the limit using that methodology.

Contributory flow method

Lbs = conc. * Contributing IU MGD * 8.34

11.25 lb = conc. * 0.25 MGD *8.34 = **5.40 mg/L**

e. A year after establishing the uniform concentration limit from (b), a new industry moves into town that discharges 0.075 MGD with an average Zn concentration of 1.1 mg/L. Do you need to re-calculate the Zn limit?

Calculate the mass of Zn the new SIU will contribute: 1.1 mg/L*0.075 MGD*8.34 = 0.69 lbs/d

What was the growth allowance calculated in (b)? 7.11 lbs/d

New IU mass < GA mass, so no need to re-calculate Zn limit