# MWMC Eugene-Springfield WPCF Facility Plan—Pretreatment Expansion Alternatives

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## Executive Summary

Projected 2025 wet weather peak hour flow at the Eugene-Springfield Water Pollution Control Facility (E-S WPCF) being used for facility planning alternatives analysis is 300 mgd. The existing pretreatment facility has a peak wet weather capacity of 175 mgd. To accommodate the additional 125 mgd of future peak flow, two alternatives have been evaluated. The first alternative is to expand the existing pretreatment facility. The second alternative is to construct a new pretreatment facility east of the existing influent screw pumps. The capital cost comparison and non-monetary comparison are summarized in Table 1.

TABLE 1
Summary of Pretreatment Expansion Alternatives Comparison
*MWMC Facility Plan, Eugene-Springfield*

| Alternative | Capital Cost (millions of dollars) | Non-Monetary Rating[a] |
|---|---|---|
| 1 – Expand Existing Pretreatment Facility | $12.8 million | 21 |
| 2 – Construct New Pretreatment Facility | $17 million | 19 |

Notes:
[a] Non-monetary score is out of a possible maximum score of 30 points.

Capital costs associated with expansion of the existing facility are approximately $12,800,000. Capital costs associated with construction of a new pretreatment facility are approximately 30 percent higher than the expansion of the existing facility. A non-monetary evaluation of the two alternatives indicates that expansion of the existing pretreatment facility is slightly more favorable than constructing a new facility. Therefore, it is recommended that expansion of the existing pretreatment facility be carried forward in the predesign effort.

For the purpose of comparing alternatives it was assumed that an additional 160 mgd of capacity would be constructed so that the frequency with which the existing pretreatment facility would have to be brought online could be minimized. Also, it was assumed that the new pretreatment facility would have full grit removal capacity. As more detailed planning and design efforts proceed for the expansion of the existing pretreatment facility, both of these assumptions should be evaluated more closely. It may be more cost-effective to provide only the required 125 mgd of additional capacity and provide flexibility to bring the existing pretreatment facility online and offline on a more frequent basis. Regarding grit removal, as part of the approach to expand primary clarifier capacity the ability to pump thin sludge out of the clarifiers and thicken it in gravity thickeners will be provided (see Technical Memorandum No. 6, Primary Clarifier Capacity Analysis and Enhancements). One option would be to degrit the thin primary sludge and avoid construction of grit removal in the pretreatment expansion. Grit accumulation in the primary clarifier centerwells is an issue of concern that would have to be addressed if the degritting primary sludge approach is pursued.

# Introduction

This technical memorandum has been prepared as part of the Metropolitan Wastewater Management Commission (MWMC) E-S WPCF Facility Plan Update and Pre-Design (Project No. 80010) and consists of an evaluation of alternatives for providing additional pretreatment capacity at the E-S WPCF. Projected 2025 wet weather peak hour flow at the E-S WPCF being used for facility planning alternatives analysis is 300 mgd (see Technical Memorandum No. 3, Flow and Load Projections). The existing pretreatment facility has a peak capacity of 175 mgd based on the criteria of one screen offline at peak conditions. Consequently, the existing pretreatment facility must be expanded or a new pretreatment facility constructed to accommodate the additional 125 mgd of flow.

# Existing Facilities

The pretreatment facility at the E-S WPCF is comprised of influent screw pumps, coarse bar screens, aerated grit removal, and preaeration. Screenings and grit are processed in a separate building through screenings washer/compactors and grit separation. Table 2 summarizes the pretreatment facility processes and equipment.

TABLE 2
E-S WPCF Pretreatment Facility Unit Processes and Equipment
*MWMC Facility Plan, Eugene-Springfield*

| Equipment | Type | Quantity | Capacity (each/total firm[a]/total[b]) |
|---|---|---|---|
| Raw Sewage Pumps | Helical Screw (capacity at peak flow) | 4 | 21/63/84 mgd |
| Bar Screens | Mechanically raked, 1/2-inch opening | 6 | 35 /175/210 mgd |

TABLE 2
E-S WPCF Pretreatment Facility Unit Processes and Equipment
*MWMC Facility Plan, Eugene-Springfield*

| Equipment | Type | Quantity | Capacity (each/total firm[a]/total[b]) |
|---|---|---|---|
| Screenings Grinder | Inline (rated at 150 cubic feet of screenings per hour) | 2 | 1,000/1,000/2,000 gpm |
| Grit Removal | Aerated Grit Chambers (101,000 gallons each; design criteria of 2.5 minutes detention time peak flow) | 4 | 58.3/175/233 mgd |
| Grit Slurry Pumps | Recessed Impeller | 4 | 300/900/1,200 gpm |
| Preaeration | Chambers (152,000 gallons each; design criteria of 15 minutes detention time at average flow) | 4 | 14.6/43.8/58.4 mgd |
| Screenings Conveyor | Sluice Water Pumps | 3 | 300/600/900 gpm |
| Screenings Washer/Compactor | Impeller Washer<br>Shafted Screw Conveyor and Compactor | 2 | 2,000/2,000/4,000 gpm |
| Compacted Screenings/Grit Conveyor | Shaftless, Dual-Drive, Reversing | 2 | 900/900/1,800 lb/hr (grit)<br>1,400/1,400/2,800 lb/hr (screenings) |
| Solids Loadout Conveyor | Shaftless Screw | 2 | 900/900/1,800 lb/hr (grit)<br>1,400/1,400/2,800 lb/hr (screenings) |
| Grit Separation | Cyclones | 4 | 300/900/1,200 gpm (cyclones) |
| | Classifiers | 2 | 600/600/1,200 gpm (classifiers) |

Notes:
[A] Total firm capacity is with largest unit out-of-service.
[B] Total capacity is with all units in service.

The existing pretreatment facility at the E-S WPCF has a peak capacity of 175 mgd. This is based on having one of the six screening channels and one of the four aerated grit chambers out –of service during peak flow events. However, even with all units online, the existing facility would not be able to accommodate peak flows in excess of approximately 200 mgd because of hydraulic restrictions associated with the pretreatment facility.

Although the influent screen pumps are physically part of the pretreatment facility, the capacity and future improvements to these units are addressed in Technical Memorandum No. 1, Wet Weather Peak Flow Analysis, which includes an assessment of collection system pump stations and force mains.

# Preliminary Screening of Alternatives

A preliminary screening of pretreatment processes produced the following ideas:

### Screening

- Expand existing screening facility
- Add fine vertical screens (for example, finer screen with smaller openings)
- Add rotary drum screens

### Grit Removal

- Modify/expand existing aerated system
- Add cyclonic (vortex) system
- Add primary sludge degritting

The candidate processes were given scores of 1 to 5 based on various performance, operations and maintenance (O&M), and implementation criteria. The ideas receiving the highest combined scores were given more consideration for inclusion in alternatives to be evaluated for expansion of pretreatment capacity. Fine vertical screening and primary sludge degritting received the highest scores—total scores of 49 and 53, respectively—for the screening and grit removal categories (see Technical Memorandum No. 2, Preliminary Screening of Alternatives, for the complete assessment). Fine vertical screening is incorporated in the evaluated pretreatment expansion alternatives. Even though adding cyclonic grit removal ranked lower than adding primary sludge degritting, cyclonic grit removal was selected for the purpose of comparing overall pretreatment expansion alternatives. The reason for selecting cyclonic or vortex grit removal for the evaluation was because a decision with regard to pumping thin primary sludge (which would be required to implement primary sludge degritting) had not been made (see Technical Memorandum No. 6, Primary Clarifier Capacity Analysis and Enhancements) at the time that this pretreatment expansion evaluation was conducted.

For the purpose of comparing alternatives it was assumed that an additional 160 mgd of capacity would be constructed so that the frequency with which the existing pretreatment facility would have to be brought online could be minimized.

Also, it was assumed that additional preaeration would not be provided in the expanded pretreatment facilities. Preaeration is currently used to alleviate odors from the primary clarifiers. This facility plan is recommending that the primary clarifier centerwells and launders be covered and the air collected and treated in odorous air treatment units (see technical memorandums No. 6, Primary Clarifier Capacity Analysis and Enhancements, and No. 11, Odor Control Enhancements). Therefore, the preaeration of the raw sewage in the expanded headworks would not be required.

# Pretreatment Expansion Alternatives

## Alternative 1—Expand Existing Pretreatment Facility

The concept of this alternative is to expand the existing pretreatment facility to a wet weather peak flow capacity of 300 mgd from the existing capacity of 175 mgd. The expansion to the existing pretreatment facility would actually be rated at 160 mgd so that the existing pretreatment facility would serve as a peak flow facility and the frequency with which the existing pretreatment facility would need to be brought online could be minimized. The expansion would occur to the south of the building as shown in Figure 1. The major new equipment and processes associated with this alternative include:

### Screenings:

- Four (4) new fine screens (1/4-inch opening), each with 40-mgd capacity. The screens would be installed south of the existing screenings channels.
- Two (2) new screenings washer/compactors

### Influent Flow Measurement:

- Four (4) Parshall flumes for flow measurement

### Aerated Grit:

- Four (4) new vortex grit separators
- Four (4) new grit pumps and cyclones
- Two (2) new grit classifiers
- Two (2) new screenings/grit hoppers

New grit and screenings handling equipment would be located in a new building south of the existing pretreatment area. The screenings channels and grit separators will be covered and the odorous air collected and treated in biotowers. The odorous air ducting and treatment are considered to be common between the two alternatives and therefore the associated costs are not included in the comparisons.

## Alternative 2—Construct New Dry Weather Pretreatment Facility

The concept of this alternative is to construct a new pretreatment facility to the east of the existing pretreatment facility as shown in Figure 1. This new facility would have a capacity of 160 mgd and would serve as the primary pretreatment facility during the dry season. During the wet season, or when influent flows exceeded 160 mgd, the existing pretreatment facility would be brought online. The major new processes and equipment associated with this alternative include:

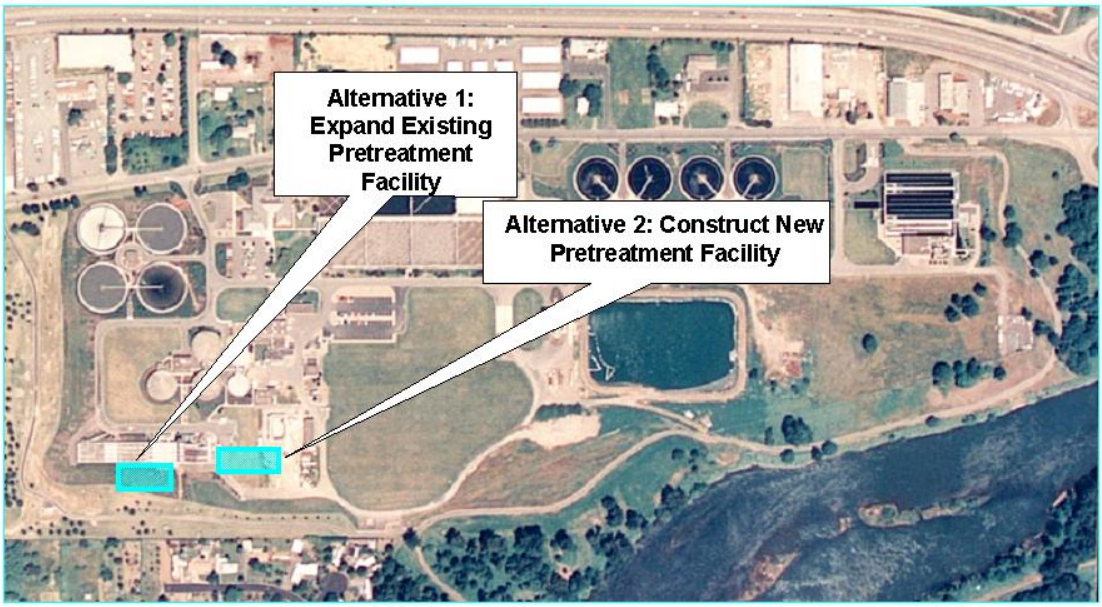


FIGURE 1
Site Locations for Pretreatment Facility Expansion Alternatives
*MWMC Facility Plan, Eugene-Springfield*

### Screenings:

- Four (4) new fine screens (1/4-inch opening), each with 40-mgd capacity
- Two (2) new screenings washer/compactors

### Influent Flow Measurement:

- Four (4) Parshall flumes for flow measurement

### Grit Removal:

- Four (4) new cyclonic grit separators, 20-foot-diameter each
- Four (4) new grit pumps, concentrators, and classifiers
- Two (2) new screenings/grit hoppers

The approach for odor control is similar to that of Alternative 1.

## Alternatives Analysis

Analysis of the alternatives is based on a non-monetary and monetary comparison.

## Non-Monetary Comparison

The purpose of a non-monetary comparison between the two alternatives is to evaluate issues other than cost that may influence the selection of one alternative over the other. Issues include constructibility, O&M, performance, siting, etc. Table 3 summarizes the preliminary results of the non-monetary comparison.

TABLE 3
E-S WPCF Pretreatment Expansion Alternatives Non-Monetary Comparison
*MWMC Facility Plan, Eugene-Springfield*

| Issue | Alternative 1 – Expand Existing Pretreatment Facility | Alternative 2 – Construct New Dry Weather Pretreatment Facility |
|---|---|---|
| Siting | 4 | 2 |
| Constructibility | 3 | 5 |
| Grit/Screening Removal Performance | 3 | 4 |
| Effect on Performance of Downstream Equipment | 3 | 4 |
| Operational Flexibility | 4 | 2 |
| Maintenance | 4 | 2 |
| Totals ( 30 points maximum) | 21 | 19 |

Scoring
1 = Negative/Difficult
5 = Beneficial

## Capital Cost Estimates

Capital cost estimates were developed for the two alternatives. Cost estimates were developed for the purpose of conducting relative comparisons between the alternatives and are based on very limited design information. The estimates are presented in 2004 dollars and include a 10 percent allowance for contractor markups (overhead, profit, mobilization/ demobilization, bonds, and insurance), a 25 percent construction contingency, and an additional 25 percent for engineering (design and construction management), legal, and administrative costs. Table 4 summarizes the cost estimates.

TABLE 4
E-S WPCF Pretreatment Expansion Alternatives Capital Cost Estimates
*MWMC Facility Plan, Eugene-Springfield*

| Alternative | Capital Cost |
|---|---|
| Alternative 1 – Expand Existing Pretreatment Facility | $12,800,000 |
| Alternative 2 – Construct New Dry Weather Pretreatment Facility | $17,000,000 |

# Conclusions and Recommendations

Based on the analysis presented above, the following conclusions and recommendations have been made.

- The non-monetary evaluation of the two alternatives indicates that expansion of the existing pretreatment facility is slightly more advantageous than constructing a new facility.
- Operational flexibility would be easier to attain with only one pretreatment facility.
- The new fine screens in the expanded pretreatment facility would operate under most conditions and would provide increased screenings performance over the existing screens.
- The cost of constructing a new pretreatment facility is approximately 30 percent greater than expanding the existing facility.
- Constructing a new pretreatment facility would be easier to construct because the existing facility could remain in operation during construction. However, this alternative will require future maintenance of two separate facilities. This additional, ongoing O&M effort may prove to be more of a burden to E-S WPCF than the constructibility benefit.
- Routing of new yard piping associated with a new pretreatment facility may prove difficult.

Based on these conclusions, it is recommended that the expansion of the existing pretreatment facility be carried forward for further predesign development. Selection and comparison of specific equipment associated with the selected alternative will be evaluated during predesign.

For the purpose of comparing alternatives, it was assumed that an additional 160 mgd of capacity (even though only 125 mgd is required) would be constructed so that the frequency with which the existing pretreatment facility would have to be brought online could be minimized. As more detailed planning and design efforts proceed for the expansion of the existing pretreatment facility, both of these assumptions should be evaluated more closely. It may be more cost-effective to provide only the required 125 mgd of additional capacity and provide flexibility to bring the existing pretreatment facility online and offline on a more frequent basis.

Also, with regard to grit removal, it was assumed that the new pretreatment facility would have full grit removal capacity. As part of the approach to expand primary clarifier capacity, the ability to pump thin sludge out of the clarifiers and thicken the sludge in gravity thickeners will be provided (see Technical Memorandum No. 6, Primary Clarifier Capacity Analysis and Enhancements). One option would be to degrit the thin primary sludge and avoid construction of grit removal in the pretreatment expansion. Grit accumulation in the primary clarifier centerwells is an issue of concern that would have to be addressed if the degritting primary sludge approach is pursued.