STAFF REPORT

To: **Coastside County Water District Board of Directors**
Via David Dickson, General Manager

From: **Joe Guistino**

Agenda: **February 9, 2010**

Report Date: February 3, 2010

Subject: **Approval of Denniston Filter Repair Change Order**

Recommendation: Authorize staff to proceed with Change Order #1 to the contract with ERS Industrial Services to repair Denniston filter underdrain piping at a cost of $35,754.99.

Background: The Denniston WTP was shut down on 9 December to determine the cause of poor backwash and insufficient cleaning of the filters. Upon opening the plumbing to the underdrain system, we discovered an accumulation of an inordinate amount of media, indicating a possible failure of the underdrain system. The media in the underdrain is the most likely cause for the restricted backwash rates and subsequent ineffective cleaning of the filters. With Board approval we hired ERS Industrial Services to do the inspection.

Once the filter media was removed, ERS discovered a hole caused by corrosion in the original header in filter #3. This hole allowed fine media particles to enter the filtered water manifold and eventually plug the underdrains of all three filters.

The best solution to this problem, according ERS and the third-party filter expert we hired to assist in the evaluation (see Attachment A), is to replace the original (1972) carbon steel underdrain headers with stainless steel. ERS's proposed price to perform this work is $35,754.99 (see proposal in Attachment B).

Fiscal Impact:
Additional cost of $35,755, bringing the total cost of Denniston filter evaluation and repair to approximately $90,000. This amount was not budgeted and will come from reserves.

February 5, 2010

Mr. Joe Guistino
Superintendent of Operations
Coastside County Water District
766 Main St.
Half Moon Bay, CA 94019

Subject: Denniston Water Treatment Plant Filter Inspection

Dear Joe:

This letter summarizes the work I've done for the Denniston WTP to assess the cause(s) of loss of media in the plant's three pressure filters. The scope of work to be accomplished is as follows:

1. Visit the site to become familiar with the plant's operation. CCWD will provide a summary of the operating records for the filters, and MWH will inspect the underdrain plumbing and the condition of the filters before the media is removed.
2. Review abridged versions of the plant's operating records for last several years.
3. Revisit site once the media has been removed from one or two filters to help make a determination as to the cause and remedy of the filter underdrain or media failure.
4. Provide a letter report on the findings.

As you explained, the Denniston WTP was originally constructed in 1971. The original filter underdrain configuration included a single 8" steel manifold extending the length of each filter with perforated 1½" PVC laterals extending to the edge of the pressure vessels. In 2005, the filters were rebuilt by ERS. The purpose of rebuilding the filters was because they were losing filter media. The laterals were replaced with 1½" stainless steel wedgewire screens, but the manifolds were not replaced in Filters 1 and 2. The manifold in Filter 3 was replaced but the material remained steel. The filter media remained the same: 12" of anthracite over 18" of greensand. A 5" layer of gravel below the greensand was installed to support the media and cover the laterals (to help distribute backwash flow).

Approximately 18 months ago, the operators indicated that the backwash flow began to decrease in Filter 1. This condition subsequently spread to the other filters (Filter 3 followed by Filter 2). Prior to taking the plant offline for the current inspection, the backwash flow had decreased by about half of the original 1800-1900 gpm flow rate. The suspicion was that the plant had begun losing media again, which would clog the underdrains and inhibit the flow.

In this assessment, I visited the plant twice. My first visit to the plant was on January 21, 2010. At that time, ERS was finished removing media from Filter 2 and in the process of

removing media from Filter 1 (See Photo 1). Media removal from Filter 3 had not been started, yet. We also met with Steve Twitchell to gain a more complete understanding of the history of problems and discuss possible causes and solutions. My second visit to the plant was on January 26, 2010, after all the media had been removed from all three filters. During that visit, I was able to go inside Filter 3 to inspect the underdrains.

Photo 1. Denniston WTP Filter Media Removal

Photo 2 shows the inside of Filter 2 with the laterals still in place. It is apparent that corrosion has been occurring at the connection between the stainless steel wedgewire laterals and the manifold.

This corrosion was cause for concern, but the laterals were still intact, and at that point there were no obvious reasons for loss of media. Inside the building, blind flanges had been removed from the ends of the pipes extending from the underdrain manifolds. As seen in Photo 3, media was found in the manifolds of all three filters.

Prior to my second visit to the plant, ERS had found one of the laterals in Filter 1 had come loose. Subsequently, after removing the media and laterals, all the laterals were replaced by plugs, and the filters were pressure tested. A crack in the Filter 1 manifold was found at the location where the new pipe installed in 2005 was welded to the old pipe. See Photo 4.

Photo 2. Corrosion of Steel Manifold at Connection Points of Wedgewire Laterals

Photo 3. Filter Media Inside Filter Underdrain Manifold Pipe

Photo 4. Location of Crack in Filter 1 Manifold Pipe

During the second visit, I was also able to view the condition of the manifolds at the connections to the laterals and found that they were all severely corroded. See Photo 5. This confirmed my concern from the initial visit.

Based on my review of the filters and the information provided, my conclusion is that the media found in the underdrains most likely came from the loose lateral in Filter 1. This explains the reason that Filter 1 had its backwash rate reduction prior to the other filters. Over time, media made its way into the filtered water pipe and then was forced back to the other filters while backwashing. See Photo 6 for the pipe configuration of the filter effluent and backwash supply. This would also explaing why Filter 3, the closest to the backwash supply pipe, was the second filter to experience reduced backwash flow.

Reinstallation of the laterals and repair of the manifold should eliminate the loss of media. However, in doing so, I recommend replacing the manifolds piping with stainless steel. The corrosion of the existing steel piping is almost certainly caused by dissimilar metals in contact which creates a galvanic corrosion cell. In this case, the steel will corrode to protect the stainless steel. When the rebuilding was doing in 2005, the stainless steel laterals should have been insulated from the steel using plastic bushings or other similar measures. Replacing the steel manifolds with stainless steel and insulating them at the point of connection to the existing piping should prevent such corrosion from happening in the future. This is common practice by other filter manufacturers and other engineers within MWH.

Photo 5. Rusted Lateral Connections in Filter 3

Photo 6. Filter Effluent and Backwash Supply Piping

I understand that you are currently proceeding with the modifications outlined above. Upon completion, you can expect many years of trouble-free operation.

It has been a pleasure to work with you again. If you have any questions or need additional information, please do not hesitate to call me.

Sincerely,

Michael L. Price, P.E.
Vice President and Northern California Water Practice Leader

Attachment B

INDUSTRIAL SERVICES, INC.

February 5, 2010

Mr. Steve Twitchell

Coastside Water District
766 Main Street
Half Moon Bay, CA. 94019

QUOTE #012910-1Q
Fax: 650-726-5245
Email: stwitchell@coastsidewater.org

Dear: Steve

ERS is pleased to submit its proposal for our TurnKey Service on your 3 each 8' x 22' single cell Pressure Vessels.

Our service includes removal, packaging and disposal of existing Underdrain Headers supply and installation of new Underdrain Headers, per design.

ERS to provide:

1) Qualified Manpower
2) Forklift
3) Disposal and disposal transport
4) High power industrial vacuum system
5) Confined space equipment as follows:
   a) Supervisor/Environmental Technician/Hole watch
   b) Ventilation fan for air circulation
   c) Tripod/winch for emergency evacuation
   d) Four gas monitor for pre-entry testing, as well as for continuous testing
   e) 2-way Radios for communication with in-tank personnel
   f) Cellular phone as an emergency response tool
   g) Half-face cartridge type respirators (Supplied air respirators available if required)
   h) Harnesses with safety ropes for all men
   i) Daily monitoring log
   j) Complete and post-confined space entry permit (if required)

Attachment B
Quote # 012910-1Q
February 5, 2010

6) New Headers as follows:
   a) All new 8" Headers

PRICING: Carbon Steel with Endura Flex Coatings **$44,731.42**

PRICING: Stainless Steel **$35,754.99**

Quote Valid for 45 days

Our time and materials work is billed at $89.00 per man-hour, straight time, plus materials with a 20% margin. Price includes all applicable sales tax.

Please feel free to call me should you need further information or any clarification. My car phone is 510-552-5301; office is 510-770-0202.

Sincerely,

Rick D. Langlois
Vice President Sales