This is the reply from the engineer concerning the standing water, dated 1-19-21.

Good morning Dianne;

Pursuant to our conversation earlier this morning about the standing water in the retention ponds, I'd like to offer this explanation.

In Pond 2, the northern pond, there are 3 contributing factors for the standing water. 1) During the grading operations by Nichols, elevations were shot on the 2 mitered end sections at the west end of the pond as well as the notch in the control structure. It was found that the invert elevations of the mitered end sections were within 1-1/2" of that of the notch. There isn't adequate longitudinal slope across the pond to provide adequate of the drainage thru the pond. 2) The soils in this area of the County are very silty and mucky. Water is not able to percolate into and thru the soil; however, 3) even if percolation could be improved, the water table is right at the surface and could be tidally influenced, as the pond is so close to the creek. Considering these 3 factors, actual elimination of the water in the pond bottom doesn't appear feasible without installing a new underdrain system.

The pond was originally designed to have an underdrain in the side bank. Instead, it was installed directly under the bottom of the pond without any filter medium (it was never installed in conformance with the approved plans). The wrong type of pipe (pipe used for septic drainfields) was used and a "sock" was installed around the pipe rather than an encased filter system. Apparently, when the original excavation was done, they had an issue with groundwater and installed the underdrain to lower the water table so they could shape the pond. However, to reinstall the underdrain, even directly under the pond bottom, would be very costly and, considering the existing soils, lowering of the groundwater would be very slow.

With fluctuations of rainfall throughout the year, standing water can be expected during the rainy season and dry-up conditions during dry times. It may be best to see what type of plants populate the pond bottom. After adequate plant population, the hay bale can be removed to allow water to move more quickly, as it is there just to keep the "mud" from entering the master collection system and washing into the creek. Pond 3 has a similar situation although not as severe as Pond 2.

I hope this serves to address your concerns and those of residents adjacent to the ponds. Let me know if you need further explanation of this issue.

Bob

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CURLEW LANDINGS
POND 2 BOTTOM OPTIONS

February 22, 2021

In June of 1988, the site plan for Curlew Landings was designed by DFR Engineering and processed thru the City of Dunedin for issuance of their permit. That site plan reflected 3 stormwater retention ponds. Although the plan identifies them as "retention areas (ponds)", they are not "retention ponds" but rather "detention ponds". To clarify the terminology, a "retention pond" is one which holds water with no release other than through percolation into the ground. A "detention pond" is one which holds water and, through a control structure with either a notch or an orifice, releases it slowly to a pipe system. All 3 ponds in the drainage system are detention ponds.

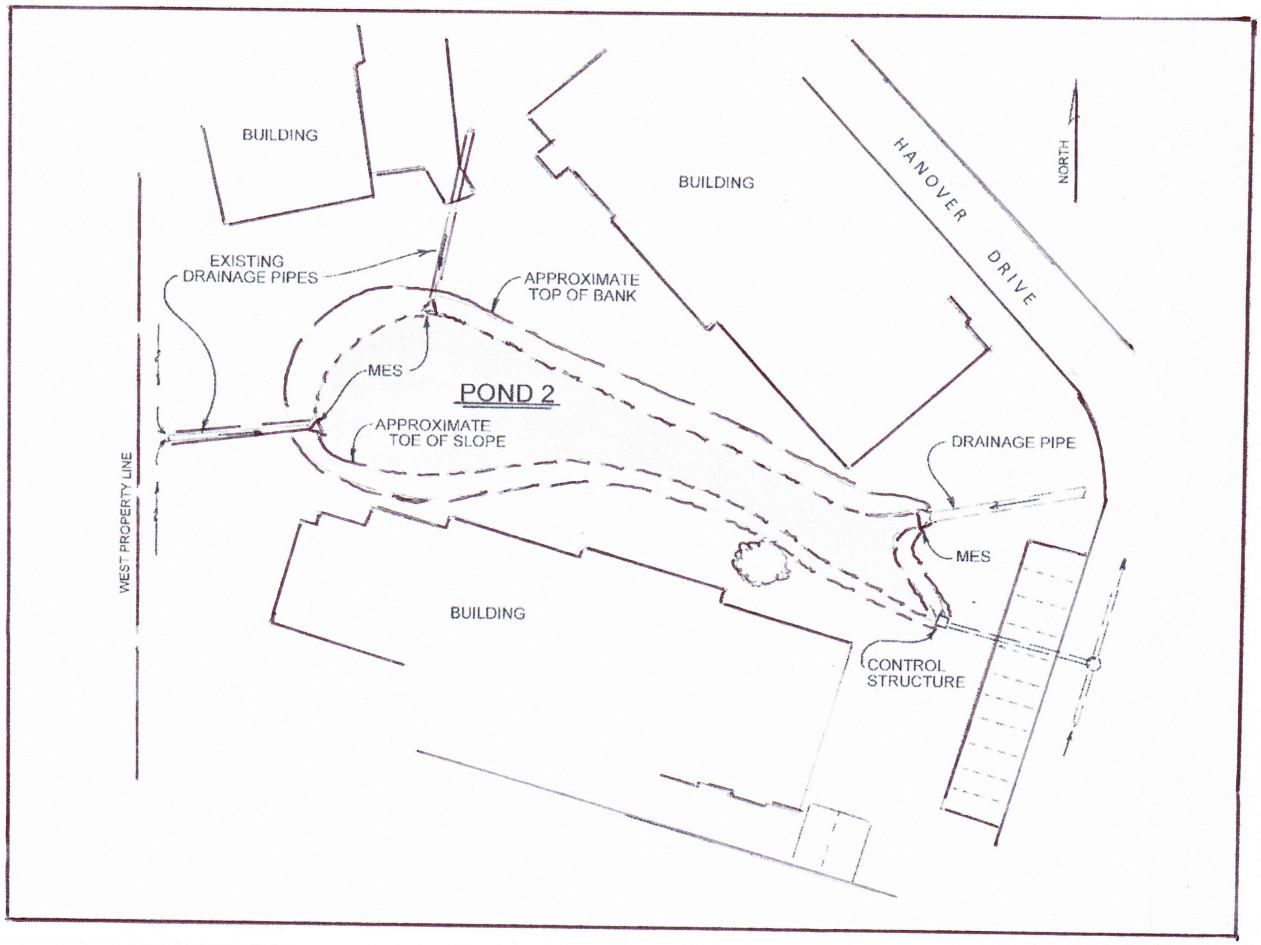

Figure 1: Sketch showing the location and configuration of Pond 2.

Pond #1 is shown as an existing pond located on the north side of Duchess Boulevard. Pond #2 is a proposed pond to be located between the buildings on the west side of Hanover Drive and Pond #3 is also proposed and shown to be located behind the building on the south side of Duchess Boulevard.

The configuration of Pond 2 is basically as shown in Figure 1 with only a few modifications to alignment of the pipe systems. Pond 3, however, apparently being originally constructed in substantial conformance with the approved plans, has been totally reconfigured pre-2002, apparently to conform to a shift in building placement. Although this report addresses options for modifying Pond 2 only, history is being provided as to how the regrading of Pond 2 became required.

In July, 2020, the City of Dunedin notified Curlew Landings of a flooding issue of a single family residence on the south side of Pond 3. I was called to the site by Ameri-Tech Community Management to develop a site plan for alleviating the flooding being experienced by the homeowner(s). A site contractor was retained to deepen and reshape the swale running along the south property line so that discharge to the drainage system in Alt U.S Hwy 19 would be improved. After that work was completed, the City engineer came back to verify the work was complete.

During his visit, he noticed that the mitered end section (MES) at the west end of Pond 3 was buried, causing a backup in the drainage system upstream of the MES and resulting in overflow into the swale along the south property line. That additional flow was being diverted into the swale and was accentuating the flooding of the single family home. He ordered the soil from in front of the MES to be removed along with any soil within the upstream pipe system. When the swale regrading was complete, he revisited the site, this time also taking time to review Pond 2. He noticed that the pipe draining into the east end of the pond had a substantial amount of soil in front of it, thereby blocking flow from the inlet in Hanover Drive from effectively reaching the pond. He stated that Pond 2 must also be brought back into compliance with the approved plans.

Plans for the retrofitting of Pond 2 were developed and put out for bids. Being the lowest bidder, the G.A. Nichols Company was awarded the work. Regrading work of Pond 2 began in October, 2020 and was substantially complete near the end of January, 2021. However, after regrading of Pond 2 was substantially completed, some of the residents had issues with the final appearance of, and standing water in, that pond.

Taking a minute to describe the intended design of Pond 2, there is a control structure located at the east end of the pond. A 6" wide notch was designed to detain stormwater runoff and regulate the discharge rate from the pond to that of the existing discharge before development of the complex. The elevation of the invert (bottom) of the notch was established at elevation 3.00 (3 feet above high tide in Curlew Creek). Additionally, a 6" underdrain was designed to collect and treat the first inch of runoff from the drainage area tributary to this pond. The invert (bottom) of that pipe was established at elevation 2.50. Therefore, the top of the underdrain pipe was designed to be at the control (notch) elevation of the structure, 3.0, which was the same elevation as that of the pond bottom.

The site contractor who originally graded the pond and installed the underdrain most probably encountered issues with groundwater during the construction. Thus, when the pond was regraded to the limits and elevations shown in the approved plans, water presently stands in the pond, which can be seen as the normal groundwater. Because some residents have concerns about the standing water in the pond, this report will identify options for retrofitting the pond bottom to make it more aesthetically pleasing. There are a few things that can be done to satisfy the concerns of the residents, none of which will satisfy all those who are unhappy with the present conditions.

There are 2 MES located at the west end of this pond. The MES on the southwest side of the pond drains the swale area along the west side of the complex and prevents overflow of runoff generated by Curlew Landings into the adjacent subdivision. The MES on the northwest side of the pond drains runoff from the parking lot into the pond. It was determined that the MES on the northwest side of the pond was the same elevation as that of the notch in the control structure and that of the MES on the southwest side was only about 2" above its counterpart. With this information being verified during numerous site visits, it was determined that there is no longitudinal slope in the pond to evacuate the water in a timely manner.

As the pond exists to date, the bottom elevation of the pond varies about 4" – 6" below the notch in the control structure, resulting in about that depth of standing water. The pond was designed to be a "pond", not a dry swale. However, there are options available to make the pond more attractive without eliminating its storage capacity or function. Each of the ideas are presented below with the cost of each being presented at the end of this report.

<u>OPTION 1 - DIG THE POND DEEPER</u>: If consideration is to be given to excavating the pond deeper, it should be remembered that, due to the silty soils, the side slopes would have to be 4:1 (4 feet horizontal to 1 foot vertical) to maintain stability of the slopes. With the present width of the water surface varying between 8 feet and 30 feet, the maximum depth expected to be realized in the pond can be expected to be about 30" with the shallowest point being about 12". .

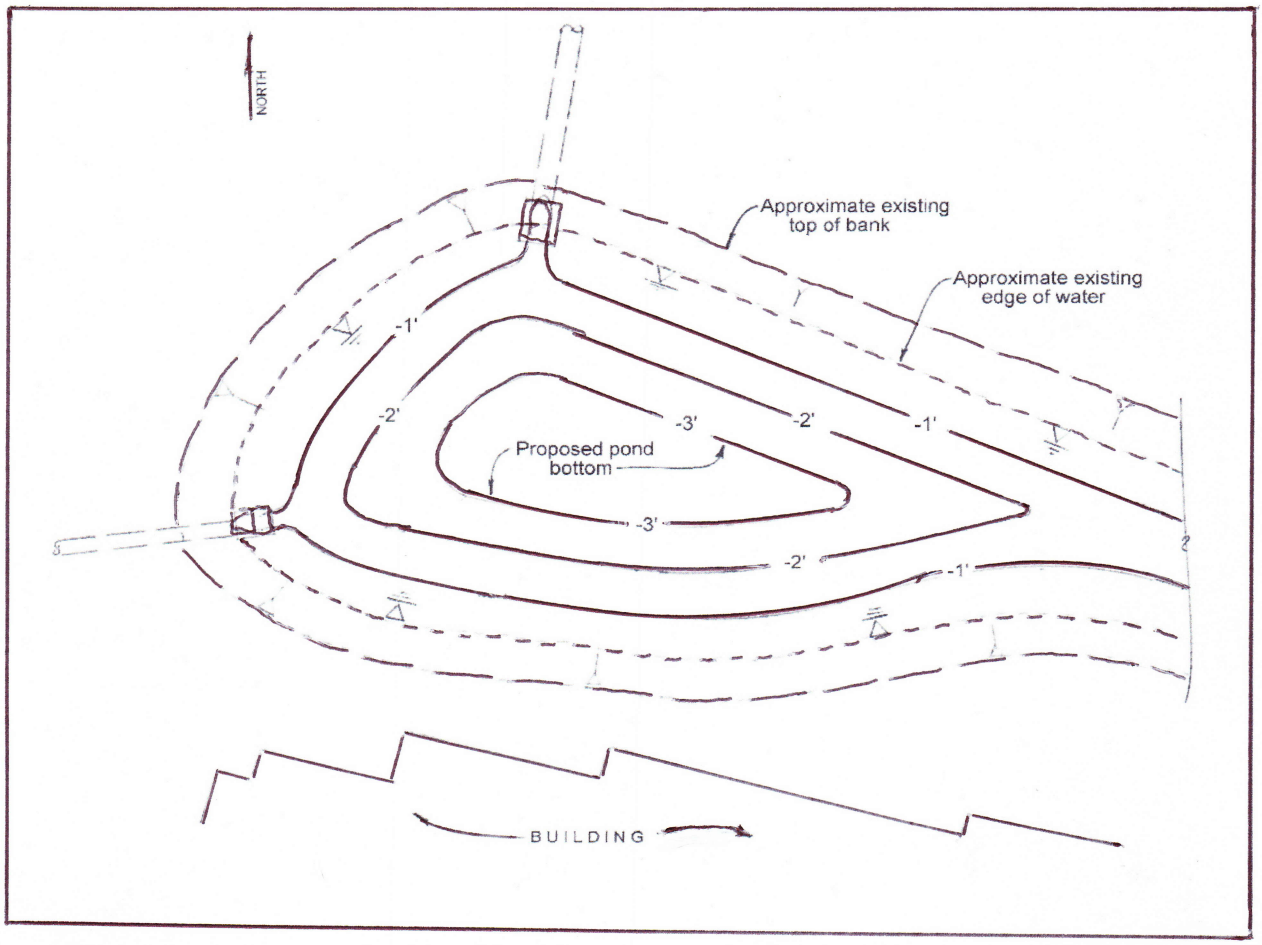

Figure 2: Western end of Pond 2 with proposed depths shown as negative numbers.

The actual width and depth of the water would vary according to rainfall amounts. During the rainy season, water should be expected to be deeper; during the dry season, the narrower portion of the pond could be expected to be dry. Consideration should be given to widening and deepening only the western end of the pond, leaving the narrower portion of the pond to resemble a creek.

PROS: This option can be aesthetically beneficial to the adjacent residents if the area is planted with flowering wetland plants. The plants would provide habitat for birds and additionally serve as a filtering medium to clean the water before it's discharged to Curlew Creek. Wetland species such as pickerel weed, blue flag and arrowhead makes a nice combination.

CONS: In order to excavate the pond deeper, it will be necessary to use a backhoe, loader and trucks to remove and shape the soil. Additionally, to reshape the area properly, it will be essential to properly dewater the area before the work begins, thereby requiring a pump to be running continuously during grading activities. Excavated soil would be removed from the concrete parking lot at the west end of the pond, requiring restoration of the disturbed area.

Mosquitos will always be an issue when standing water is present. As long as there is some form of plant growth in the pond, mosquito fish, Gambusia affinis, can be stocked in the pond to control mosquitos. One has to weigh the benefit of an attractive water course against mosquitos. Even if there is no standing water in Curlew Landings, the mosquitos will find another close by water source in which to breed; the mosquitos won't go away.

<u>OPTION 2 - ONLY INSTALL WETLAND PLANTS</u>: Wetland (transitional) plants can be installed without digging the pond deeper. Species of plants would have to be selected that can withstand dry conditions and yet tolerate wet conditions. However, it should be remembered that if the pond is not dug deeper, during the dry season there may not be water in the pond. Plants can be installed continuously along the pond/swale perimeter or installed in groups in certain areas of the pond.

<u>OPTION 3 - INSTALL NEW UNDERDRAIN</u>: Underdrain can be installed to lower the normal groundwater; however, it should be understood that the soils in the pond are very silty and very, very slow to drain. As such, several underdrain lines (pipes) would have to be installed to lower the standing water. Because the top of the underdrain pipe presently in the control structure is at the same elevation as that of the pond bottom, the top of any pipe extension(s) would be fully exposed along its entire length. To remedy this, the bottom would have to be raised slightly to cover the pipes.

If the pond bottom is raised all the way to from the control structure to the MES at the west end of the pond to cover the underdrain, the new bottom elevation of the pond would be higher than the invert of the pipes at the MES. Therefore, there would be a very high potential for a delta (dirt mound) to form immediately out of both MES at the west end of the pond and the option of filling the pond bottom level with, or slightly above, the invert of the MES is not respected as being prudent. It is, therefore, recommended to only install underdrain through the narrowest portion of the pond or to a point about 130 feet or so west of the control structure.

Additionally, installation of the underdrain pipe would require it to be fully wrapped in filter fabric and bedded in stone. It would be impractical to install sod over the rock package, as there would be no soil in which the sod could take root. If this option is selected, it is recommended to install decorate stone on top of the rock package, giving it the appearance of a creek bed. See Figure 3.

Figure 3: An example of a stone swale for the eastern portion of Pond 2.

<u>OPTION 4 - COMBINATION OF OPTIONS</u>: What should be considered is a combination of several aforementioned options. The west end of the pond could be excavated a bit wider to the north and deeper to eliminate any delta formation and the area vegetated with wetland plants. A depth of 30" could be achieved and wetland plants installed. As the pond gets narrower moving east toward the control structure, it would become shallower. At that point, underdrain could be installed and the bottom covered with decorative stone. This combination would provide the aesthetic appeal as well as the pond's maximum filtering ability while providing low maintenance.

<u>COSTS</u>: Estimated costs for each of the 4 options are presented below. Please note that these costs are estimated only, as plans have not been developed for bidding. Additionally, due to the information needed to prepare plans for any of the wok noted herein, one should include an estimated cost of $1,500 for survey around the pond area as well as engineering cost estimated to be about $3,500.

<u>OPTION 1</u>: Excavation of only the western end of the pond.

Dewatering:	*$4,000*
Surveying & silt fencing:	*$800*
Excavation & dirt removal:	*$8,000*
Restoration:	*$2,000*
TOTAL ESTIMATED COST =	*$14,500*

OPTION 2: Plants should be installed at the rate of 1 bare root plant per 3 sq ft of pond area.
Estimated western pond area = 3,600 sq ft. Cost ~ $6,000.
Estimated swale (eastern) area = 1,800 sq ft. Cost ~ $3,000.
If plans are grouped (clustered), cost can be slightly reduced.

OPTION 3: Approximately 400 LF of 3" PVC underdrain would be needed to control the standing water in the pond. This required length of pipe is calculated to be installed only the swale portion of the pond; i.e., the narrow eastern portion.

Dewatering:	*$4,000*
Excavation & dirt removal:	*$4,500*
Filter fabric installed:	*$3,000*
Pipe & fittings:	*$3,500*
Gravel bedding installed:	*$3,500*
Decorative stone covering:	*$6,000*
TOTAL ESTIMATED COST =	*$24,500*

OPTION 4: If a combination of a planted pond on the western end and the eastern (swale) portion is selected, the cost can be expected to be as follows:

Dewatering entire pond area:	*$7,000*
Surveying & silt fencing:	*$1,000*
Excavation of western end of pond:	*$8,000*
Install wetland plants in western end:	*$6,000*
Filter fabric installed in eastern end:	*$3,000*
Pipe & fittings:	*$3,500*
Gravel bedding installed:	*$3,500*
Decorative stone covering:	*$6,000*
TOTAL ESTIMATED COST =	*$38,000*

SUMMARY: There are various options available to make Pond 2 more aesthetically pleasing. Of course, there is one other option that has not been discussed, that being to do nothing.

As stated earlier in this report, these options can also be implemented in Pond 3; however, due to the difference in the 2 ponds, the bottom of the swale thru Pond 3 can also be planted with a water tolerant species at an estimated cost of $1,000. If substantial improvements to Pond 2 are proposed, the City of Dunedin should be consulted to determine if the work qualifies for an exemption or if it will require a permit.