


Grand Traverse Town Center
Development
Constructed Wetland
Inspection Report



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1 Introduction

Cardno Inc. and Barr Engineering were contracted by Acme Township and the Village at Grand Traverse, LLC (VGT), respectively to assess the conditions of the wetland plantings within the site storm water management system at the Grand Traverse Town Center (Site) located in Acme Township, Grand Traverse County Michigan. The Site consists primarily of newly constructed and proposed commercial and retail buildings. Storm water detention and treatment at the Site relies on two detention basins, the east basin and the west basin, draining 47 acres and 40 acres respectively.

This document summarizes the progress of the storm water detention basins and associated plantings two years after implementation. Cardno and Barr will provide recommendations to Acme Township for further action and monitoring at the site.

2 Site Layout

The storm water system for the Site is comprised of two basins, the east basin (Basin #1) and the west basin (Basin #2). Basin #1 empties into three marsh pools separated by low berms and then empties into a grassed swale before exiting through natural wetlands adjacent to Acme Creek. Basin 2 empties into a grassed swale which flows into two marsh pools separated by a low berm and then flows into the natural wetland adjacent to Acme Creek.

3 Methodology

3.1 Biological Monitoring of Storm Water Basins and Treatment Train

Monitoring of the vegetation within the storm water basins, marsh pools, and grassed swales was accomplished by senior biologist, Joe von Wahlede of Cardno. Each area was walked in a meander style survey method and plant species were identified within each habitat. Unknown species at the time of the investigation were collected and brought back for keying out to species. General observations of wildlife presence and use were noted. Additionally, observations were recorded on sediment deposition within the planted zones, turbidity in the water, water depth within the basins, pools, and swales, and general plant health. Representative photographs were taken in each area.

Cardno can provide a detailed list of plant species recorded in each area upon request.

4 Site Observations

4.1 East Side

4.1.1 Basin

The vegetation in the main storm water basin (Basin #1) has increased in density along the north and east edges compared to the lack of vegetation in these areas last year. The water in the basin appears to be approximately two feet or deeper and there is vegetation growing below the surface of the water. The south end of the basin, near the outlet, has the greatest density of vegetation within the whole basin. The banks

are well vegetated. The east bank still contains some bare ground areas, but they appear to be filling in with vegetation. There does not appear to be any erosion concerns.

Of the species planted for the Basin Shelf plant list, approximately 50% of the species were present in Basin #1 which is an eight percent increase from last year. Of the species planted for the herbaceous plant list, approximately 60% were present in Basin #1. Comparing the number of plants identified and species present in Basin #1 in 2017 with 2016, there is marked improvement. Reed canary grass (*Phalaris arundinacea*) is still present, but it does not appear to have spread through the basin because it is still concentrated in small clumps at the south end of the basin.

Wildlife observations include northern leopard frog (*Lithobates pipiens*), green frog (*Lithobates clamitans*), killdeer (*Charadrius vociferus*), red-winged blackbirds (*Agelaius phoeniceus*), green heron (*Butorides virescens*), mallards (*Anas platyrhynchos*), damselfly (*Ondonata*) species. Canada goose (*Branta canadensis*) droppings and white-tailed deer (*Odocoileus virginianus*) tracks were also observed at the water's edge.

Water flowing out of the basin into the first marsh pool is clear which indicates the basin is effective in minimizing sedimentation.

4.1.2 Marsh Pool #1

The water flowing into Marsh Pool #1 (formerly labeled Basin 1A in 2015) is clear and snails were observed in the sediment at the outflow. This marsh pool is very dense with vegetation throughout the entire pool.

Of the species planted from the Basin Shelf seed mix, approximately 63% of the total species were observed in this pool. From the herbaceous plant list, approximately 55% of the total species were observed in this pool. Hard-stemmed bulrush (*Scirpus acutus*) was observed this year and was not present last year. There were additional plant species present this year which were not planted. Reed canary grass was observed in small quantities intermixed with the native vegetation.

Wildlife observed included snails, northern leopard frogs and green frogs (*Rana clamitans*), and tadpoles. The vegetation was fairly dense prohibiting observations of other wildlife species.

Water depths ranged from six inches at the outlet to a foot at the berm separating the first and second pool. These water depths have increased since the 2016 visit when water depths ranged from four to six inches. Water was flowing well between the two marsh pools and the water was not turbid.

4.1.3 Marsh Pool #2

Vegetation in Marsh Pool #2 was also fairly dense and has increased in density since 2016. Of the total species planted from the Basin Shelf seed mix, approximately 83% were observed in Marsh Pool #2. Of the total species planted from the herbaceous plant list, the total plant species has not changed from the previous year and remains at 56% of the total planted. Reed canary grass was observed in small quantities intermixed with the native vegetation.

Water depths ranged from 24 inches at the berm separating Pool 1 from Pool 2 to 12 inches at the berm separating Pool 2 from Pool 3. There is not much change from the previous year.

Wildlife observed in Pool 2 included northern leopard frogs, damselflies, dragonflies, mallard, green heron, and red-wing blackbird (*Agelaius phoeniceus*). As was observed last year, there was a mallard hen that was flushed along the bank of Pool #2 and her observed behavior indicated that she had a nest or ducklings nearby. This appears to be suitable nesting habitat for mallards.

4.1.4 Marsh Pool #3

Pool 3 was dense with vegetation and remained similar to that observed in 2016.. In 2015, it was observed that 50% of the area planted for cattails had dead vegetation and 90% of the area planted to

bur reed (*Sparganium eurycarpum*) were dead. Observations in 2016 indicated that these two species bounced back and did not show any signs of mortality and in 2017, there was no signs of mortality. Of the species planted for the Basin Shelf mix, approximately 83% were observed. Of the species planted from the herbaceous plants, approximately 55% were observed. There was a marked improvement from 2016 where the planted species observed was 33% of the total plants for both the Basin Shelf mix and the herbaceous mix. Reed canary grass was present in small quantities intermixed with the native vegetation.

Water depths ranged from six inches at the berm separating Pool 2 from Pool 3 to nine inches at the berm exiting to the grassed swale. These water depths were a bit deeper than those observed in 2016.

Wildlife observed included northern leopard frogs.

4.1.5 Grassed Swale

Water leaving Pool #3 into the grassed swale was flowing well and was clear of turbidity. Water depths ranged from four to six inches. Of the total species in the Grassed Swale seed mix, 36% were observed in the swale which is a slight increase from last year. Reed canary grass was present within this habitat, though not in great abundance. There were several clumps of reed canary grass observed towards the west end of the swale. Wildlife observations included deer tracks. No erosion within the wetland was observed at the grass swale outlet location and water was clear.

4.2 West Side

4.2.1 Basin

This basin (Basin #2) has improved since the site visit in 2016. In 2016, the primary issue was the presence of algal mats. The water levels appeared to be higher this year than in 2017 and it also appeared there was more flow out of the basin. The shore areas had filled in well with vegetation and saturation occurred to the toe of slope. There appeared to be more wetland vegetation in the saturated zones. There was also an increase of the invasive reed canary grass along the north and west sides of the basin.

Of the species planted for the Basin Shelf plant list, approximately 50% of the species were present in Basin #2 which is a 46% increase from last year. Of the species planted for the herbaceous plant list, approximately 88% were present in Basin #2. Dead river bulrush stalks were observed in 2015 and no river bulrush was observed in 2016 or 2017. River bulrush is the only species in the herbaceous plant list that is not present in the basin. There are additional wetland species that were not planted occurring in the basin this year which supplements the absent planted vegetation.

Wildlife observations include green frogs, leopard frogs, green heron, killdeer, Belted Kingfisher (*Megaceryle alcyon*) and damselflies. There were two families of mallards in the basin. No plant herbivory was observed near the basin's edge.

There were no green algal mats.

Water flowing out of the basin into the grassed swale is clear which indicates the basin is effective in minimizing sedimentation.

4.2.2 Grassed Swale

The grassed swale was more vegetated and had more hydrology in it compared with observations recorded in 2016. This year, of the total species in the Grassed Swale seed mix, 56% were observed in the swale which is a 75% increase from last year. There were no invasive species observed within the swale. Wildlife observations included leopard frogs and deer tracks.

4.2.3 Marsh Pool #1

The appearance of this Marsh Pool has changed slightly from observations in 2016. There does not appear to be much herbivory in the pool and the vegetation is dense.

Of the species planted from the Basin Shelf seed mix, approximately 55% of the total species were observed in this pool which is a 60% increase from last year. From the herbaceous plant list, approximately 67% of the total species were observed in this pool which is a 50% increase from last year. Reed canary grass was observed in this pool this year.

Wildlife observed included northern leopard frogs and green frogs. The average pool depth is approximately 6 inches.

4.2.4 Marsh Pool #2

In 2017, the average water depth was approximately six inches (at pool center). Of the species planted from the Basin Shelf seed mix, approximately 55% of the total species were observed in this pool which is a 60% increase from last year. From the herbaceous plant list, approximately 67% of the total species were observed in this pool which is a 50% increase from last year. In 2017, there are other supplemental wetland species that have been colonized into this habitat. Reed canary grass is present in this pool. Water flowing out of this pool, through the swale, and into the natural wetland adjacent to Acme Creek was not turbid. No erosion within the wetland was observed at the grass swale outlet location.

5 Summary and Conclusions

The diversity of plant life in both basins and associated pools and swales have increased from 2016. The East Basin has a higher density of vegetation and more diversity. The West basin has a higher diversity of vegetation than last year and no presence of algal mats. The average percentage of species observed that were planted in the East Basin is 63% which is an increase from 30% last year. In the West basin, the average percentage of species observed that were planted is 54% compared with 37% last year. The number of plant species observed that were planted in each of the habitats ranges from seven to 15 with an average of 11 species. Last year, it was observed that 18 wetland species were inhabiting these areas. In 2017, both basins have over 20 wetland species.

The only issue that has not been resolved in the basin systems is the presence of the invasive species Reed Canary grass. However, in observations collected this year, it does not appear to be dominating the systems or increasing in density where it was discovered in 2016. It has colonized in the West basin and the pools of the West Basin where it had not been previously observed in 2016. It will be present in all of the basins and pools because it grows in the landscape surrounding the systems. There is a natural wetland between the East and the West basin where it dominates the wetland. Any attempts to treat the Basins to eradicate this plant species will be a losing battle because the other reed canary grass populations in the landscape will continue to provide a seed source.

Although this is an engineered storm water management system and not a wetland mitigation project, performance standards used to judge wetland mitigation projects suggest that 20 species by the end of a five year monitoring period is a successful outcome. It is our opinion, that wetland portion of the storm water basins has met the goals of creating diversity and the designed habitats to facilitate improvement of the water quality prior to it entering the watershed. It is Cardno's professional opinion that the wetland plant community has become established and further monitoring is no longer required.