BOARDMAN RIVER FEASIBILITY STUDY
Detailed Analysis of the Effect on Wetlands

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Submitted by:

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EXECUTIVE SUMMARY

This executive summary should not be used as an isolated document. It must be understood in the context of the entire report and serves only as a summary of the findings.

Environmental Consulting & Technology, Inc. (ECT) has completed a detailed analysis of the effects of six alternatives regarding the fates of the Boardman Dams on wetlands in the four impoundments along the Boardman River, namely Boardman Lake, Sabin Pond, Boardman Pond, and Brown Bridge Pond in Grand Traverse County, Michigan. The six alternative scenarios were developed after screening 81 possible combinations of alternatives for the four dams. The purpose of this report is to 1) summarize the existing conditions of wetlands within the four impoundments and 2) describe likely effects of the six alternatives on those wetlands and associated rare wetland species.

Data provided in ECT’s October 2007 Wetland Determination Report were utilized in the summary of existing wetland conditions within and near the four impoundments. Hydrology, bathymetry, soils, existing vegetation, and presettlement vegetation information were used to predict changes in wetland habitat extent and type subsequent to implementation of the six alternative scenarios. New wetland acreages were estimated with the use of scaled drawings.

Existing wetland conditions within the impoundments are characterized by submerged aquatic and floating wetland types with relatively low floral and faunal species and structural diversity. Existing wetland conditions adjacent to or near the impoundments are characterized by emergent, scrub-shrub, and forested wetland types. No changes in wetland type and extent and rare species habitat are predicted for alternatives that had no effect on the water elevation within an impoundment.

Adequate information is available to allow for ECT’s best judgment regarding determination of the effects on wetlands resulting from the various alternatives. Available data are sufficient to determine the approximate amount of wetland acreage and relative proportion of wetland ecological types anticipated to form. However, the information necessary to accurately depict the exact location and extent of new wetland development on a map is lacking, except in the broadest sense. Therefore, wetland development predicted for the various alternatives has not been depicted graphically.

In general, wetland loss adjacent to or near the impoundments as a result of alternatives proposing the lowering of water elevations is anticipated to be minimal, due to the majority of existing wetlands being sustained by groundwater inputs within the Boardman River Valley. The only scenarios involving significant loss of wetlands are those calling for the modification of Boardman Dam. Under these scenarios, it is anticipated that newly developed emergent wetlands formed within Boardman Pond in 2007 and 2008 following the 2007 emergency draw-down would be lost.

Rather than a loss of wetland habitat, alternatives proposing the reduction of water elevation within an impoundment are predicted to result in 1) a gain in wetland acreage with the conversion of open water areas to wetlands and 2) an increase in species and structural diversity with the conversion of deep aquatic habitats to emergent and ultimately forested/scrub-shrub systems. Such a shift in wetland type and extent is anticipated to improve the quality of and increase the quantity of rare species and overall wildlife habitat available along Boardman River.
The effects on wetlands associated with the four impoundments are summarized for each of the six alternative scenarios in the table below.

## SUMMARY OF EFFECTS ON WETLANDS

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>ALTERNATIVE 1</th>
<th>ALTERNATIVE 25</th>
<th>ALTERNATIVE 41</th>
<th>ALTERNATIVE 43</th>
<th>ALTERNATIVE 79</th>
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1.0 INTRODUCTION

Environmental Consulting & Technology, Inc. (ECT) was contracted by the Grand Traverse Band of Ottawa and Chippewa Indians to conduct a detailed analysis of the effects of six alternative fates for the Boardman Dams on wetlands within and adjacent to Boardman Lake, Sabin Pond, Boardman Pond, and Brown Bridge Pond in Grand Traverse County, Michigan (Figure 1.1). The six alternative scenarios were developed after screening 81 possible combinations of alternatives for the four dams. The purpose of this report is to 1) summarize the existing conditions of wetlands within the four impoundments and 2) describe likely effects of the six alternatives on those wetlands and associated rare wetland species.

Since the majority of rare species reported in the Michigan Natural Features Inventory (MNFI) database for the Boardman River Watershed utilize wetland habitats, the anticipated effects on these species are considered in relation to predicted changes to wetland habitat in and/or adjacent to the four impoundments. This report does not explore the effects of the various alternatives on all wildlife species but is limited to those wetland species listed by the state and reported to occur in the Boardman River Watershed. Two rare species reported to occur within the watershed, Kirtland’s warbler (Dendroica kirtlandii; state endangered bird) and Hill’s thistle (Cirsium hillii; special concern plant), are not addressed in this report because they occur in dry ecosystems, such as jack pine barrens and oak savannas, and are not associated with wetlands.

Data provided in ECT’s October 2007 Wetland Determination Report were utilized in the summary of existing wetland conditions within and near the four impoundments. Hydrology, bathymetry, soils, existing vegetation, and pre-settlement vegetation information were used to predict changes in wetland habitat extent and type subsequent to implementation of the six alternative scenarios. New wetland acreages were estimated with the use of scaled drawings. The effects of the six alternatives are summarized by impoundment and action to be applied to the dam, e.g. “retain and repair,” “modify,” and “remove,” in Sections 2.0 through 5.0.
2.0 BOARDMAN LAKE

2.1 BOARDMAN LAKE: EXISTING CONDITIONS

Existing Conditions of Wetlands:
The Boardman Lake impoundment behind the Union Street Dam is currently 339 acres. Approximately 140 acres of aquatic wetland occur within the impoundment, dominated by submerged and floating vegetation (Figure 2.1.1). The plant community within this type of wetland is characterized by relatively low species diversity and is dominated by floating and sago pondweeds (*Potamogeton natans* and *P. pectinatus*) and stonewart (*Chara* spp.). Approximately 5 acres of wetland occur near or adjacent to the Boardman Lake impoundment, consisting of 2.42 acres of palustrine scrub-shrub and 2.82 acres of palustrine emergent/palustrine scrub-shrub wetlands. These wetlands occur on very poorly drained sapric muck. Dominant shrub and emergent vegetation species include ninebark (*Physocarpus opulifolius*), black willow (*Salix nigra*), silky dogwood (*Cornus amomum*), common cattail (*Typha latifolia*), and purple loosestrife (*Lythrum salicaria*).

The only element occurrence of a threatened or endangered species recorded within the Michigan Natural Features Inventory (MNFI) database for the Boardman Lake area is that of the king rail (*Rallus elegans*), an endangered shorebird of permanent marsh habitats last sighted in the area in 1970. The threatened common loon (*Gavia immer*) has also been observed on Boardman Lake, but no nesting sites have been recorded.

2.2 BOARDMAN LAKE: RETAIN & REPAIR/MODIFY UNION STREET DAM (ALL ALTERNATIVES)

Effects on Wetlands:
Alternatives 1, 25, 41, 43, 79, and 81 proposing to retain and repair or modify the Union Street Dam will not change the water level in the impoundment. Therefore, no change in the acreage of wetland habitat is anticipated. No new wetlands are likely to form as a result of these alternatives. Wetlands within the impoundment will remain dominated by submerged and floating aquatic vegetation. Wetlands near or adjacent to the impoundment will remain dominated by scrub-shrub and emergent vegetation. By keeping the Union Street Dam in place, Alternatives 1, 25, 41, 43, 79, and 81 are likely to protect the upstream reaches of the Boardman River and its associated habitats by inhibiting the upstream migration of sea lamprey and other Great Lakes invasive species.

No changes to the quantity or quality of potential king rail or common loon habitat are anticipated.
3.0 SABIN POND

3.1 SABIN POND: EXISTING CONDITIONS

Existing Conditions of Wetlands:
The Sabin Pond impoundment behind the Sabin Dam is currently 40 acres. Approximately 15 acres of aquatic wetland occur within the impoundment, dominated by submerged, floating, and emergent vegetation (Figure 3.1.1). The plant community within this type of wetland is characterized by relatively low species diversity and is dominated by floating and sago pondweeds (*Potamogeton natans* and *P. pectinatus*), stonewart (*Chara* spp.), yellow pond-lily (*Nuphar advena*), and hardstem bulrush (*Schoenoplectus acutus*). Approximately 17 acres of diverse wetland habitat occur near or adjacent to the Sabin Pond impoundment, consisting of 0.57 acres of palustrine emergent, 0.14 acres of palustrine emergent/palustrine scrub-shrub, 9.40 acres of palustrine forested, 0.30 acres of palustrine forested/palustrine scrub-shrub, and 6.89 acres of palustrine forested/palustrine scrub-shrub/palustrine emergent/open water wetlands. Although some of these wetlands are influenced by inundation from the impoundment, most of these wetlands are primarily fed by groundwater seepage. They occur on very poorly drained sapric muck. Dominant forest, shrub, and emergent wetland vegetation species include northern white-cedar (*Thuja occidentalis*), red maple (*Acer rubrum*), common elder (*Sambucus canadensis*), common and narrow-leaved cattail (*Typha latifolia* and *T. angustifolia*), spotted joe pye weed (*Eupatorium maculatum*), hardstem bulrush, marsh shield fern (*Thelypteris palustris*), and jewelweed (*Impatiens capensis*).

The only element occurrence of a threatened or endangered species recorded within the Michigan Natural Features Inventory (MNFI) database for the Sabin Pond area is that of the wood turtle (*Glyptemys insculpta*), a reptile of special concern known to inhabit various wetland types, especially forested river floodplain wetlands adjacent to upland habitats with sandy soils. This species is not legally protected by state law but may become listed in the future with continued population decline. It was very recently recorded near Sabin Pond in 2005 and in two other sections further east along the Boardman River. Blanding’s turtle (*Emys blandingii*) is another special concern species believed to be present near the impoundments along the Boardman River. It’s presence at Sabin Pond has not been confirmed.

3.2 SABIN POND: RETAIN & REPAIR/MODIFY SABIN DAM (ALTERNATIVES 1 & 41)

Effects on Wetlands:
Alternatives 1 and 41 proposing to retain and repair or modify the Sabin Dam will not change the water level in the impoundment. Therefore, no change in the acreage of wetland habitat is anticipated. No new wetlands are likely to form as a result of these alternatives. Wetlands within the impoundment will remain dominated by submerged and floating aquatic and emergent vegetation. Wetlands near or adjacent to the impoundment will remain dominated by forested, scrub-shrub, and emergent vegetation.

No changes to the quantity or quality of potential wood turtle or Blanding’s turtle habitat are anticipated.
3.3 SABIN POND: REMOVE SABIN DAM (ALTERNATIVES 25, 43, 79, & 81)

Effects on Wetlands:
Alternatives 25, 43, 79, & 81 proposing to remove the Sabin Dam will lower the impoundment’s water level. As a result of this decrease in water elevation, it is anticipated that both wetland acreage and type will change within the Sabin Pond impoundment. Overall, approximately 28 acres of wetland are anticipated to form following drawdown of the impoundment. Less than half of the submerged/float/emergent wetlands located within the impoundment over the toe of slope are likely to form uplands. However, over half of these low diversity submerged/float/emergent wetlands are anticipated to succeed to emergent wetlands initially. New emergent wetlands will likely be dominated by a more diverse set of wetland species, including blue vervain (*Verbena hastata*), swamp milkweed (*Asclepias incarnata*), common cattail, black bulrush (*Scirpus atrovirens*), hardstem bulrush, spotted joe pye weed, jewelweed, common boneset (*Eupatorium perfoliatum*), sensitive fern (*Onoclea sensibilis*), and beggar-ticks (*Bidens* spp.). Over time, it is anticipated that these new emergent wetlands will succeed to approximately 5 acres of forested/scrib-shrub wetlands with dominants such as northern white-cedar, red maple, common elder, and marsh shield fern. Several small forested/scrib-shrub/emergent wetlands directly adjacent to the west side of the impoundment may also be impacted by the drawdown. Due to the presence of groundwater seepage as a source of hydrology, it is unlikely that these small wetlands will convert to uplands following drawdown. When surface water influences are removed as the water elevation is lowered, it is more likely that these wetlands will shift from emergent/scrib-shrub to a slightly drier species composition with dominance by wetland trees and shrubs.

Throughout the central portion of the impoundment directly adjacent to the newly formed river channel, it is anticipated that approximately 23 acres of open water will be converted to and remain emergent/scrib-shrub wetland. These permanently emergent/scrib-shrub portions will be similar in structure and composition to areas found elsewhere along the Boardman River and likely be dominated by common elder, silky dogwood (*Cornus amomum*), red-osier dogwood (*Cornus sericea*), sandbar willow (*Salix exigua*), tag alder (*Alnus rugosa*), blue vervain, swamp milkweed, spotted joe pye weed, common boneset, common cattail, black bulrush, sedges (*Carex* spp.), hardstem bulrush, and burreed (*Sparganium* spp.).

Considering 1) the gain in wetland acreage with the conversion of open water areas and 2) the increase in species and structural diversity with the conversion of deep aquatic habitats to emergent and ultimately forested/scrib-shrub systems, Alternatives 25, 43, 79, and 81 will improve the quality of and increase the quantity of wildlife habitat available along this stretch of the Boardman River. Stagnant, low-oxygen, deep-water habitats will be replaced by flowing, oxygenated riparian habitats with varying water depth and higher structural and floral and faunal species diversity.

Given increases in emergent, scrib-shrub, and forested wetlands adjacent to sandy upland habitat, it is likely that Alternatives 25, 43, 79, and 81 will increase the quantity and quality of wood turtle habitat available. Although submerged and floating aquatic vegetation habitat of the Blanding’s turtle will transition to emergent, scrib-shrub, and forested wetlands, the turtle is known to utilize a variety of wetland habitats including swamp, emergent marsh, fen, wet meadow, inundated shrub swamp, and floodplain forest. Other rare species known to occur within the watershed that may benefit from this improved habitat diversity include the red-shouldered hawk (*Buteo lineatus*), bald eagle (*Haliaeetus leucocephalus*), and ebony boghaunter (*Williamsonia fletcheri*). With the lowering of the impoundment, the potential also exists for rare natural communities like northern fen and rich conifer swamp to develop along the numerous groundwater seeps occurring at the southern end of Sabin Pond.
4.0 BOARDMAN POND

4.1 BOARDMAN POND: EXISTING CONDITIONS

Existing Conditions of Wetlands:
The Boardman Pond impoundment behind the Boardman Dam was originally 103 acres. Following an emergency drawdown in 2007 during which the water level in the impoundment was dropped approximately 16 feet, approximately 25 acres of newly formed emergent wetland have replaced open water and submerged and floating wetland vegetation within the impoundment. The previous aquatic plant community was characterized by relatively low species diversity and was dominated by floating and sago pondweeds (*Potamogeton natans* and *P. pectinatus*) and stonewart (*Chara* spp.). The new emergent plant community developing within the impoundment is characterized by higher species diversity and is dominated by blue vervain (*Verbena hastata*), nodding bur-marigold (*Bidens cernnuus*), nodding smartweed (*Polygonum lapathifolium*), rice-cut grass (*Leersia oryzoides*), hardstem bulrush (*Schoenoplectus acutus*), three-square (*Schoenoplectus pungens*), and sedges (*Carex* spp.). Approximately 15 acres of diverse wetland habitat occur near or adjacent to the Boardman Pond impoundment, consisting of 1.20 acres of palustrine emergent, 11.32 acres of palustrine emergent/palustrine scrub-shrub, 0.60 acres of palustrine scrub-shrub, and 1.58 acres of palustrine forested/palustrine scrub-shrub (Figure 4.1.1). Although some of these wetlands are influenced by inundation from the impoundment, most of these wetlands occur upstream of the wide upstream end of the impoundment and are primarily fed by groundwater seepage. They occur on poorly and very poorly drained mucky sand. Dominant forest, shrub, and emergent wetland vegetation species include northern white-cedar (*Thuja occidentalis*), black ash (*Fraxinus nigra*), tag alder (*Alnus rugosa*), ninebark (*Physocarpus opulifolius*), common cattail (*Typha latifolia*), rice-cut grass, nodding bur-marigold, blue vervain, spotted Joe pye weed (*Eupatorium maculatum*), common boneset (*Eupatorium perfoliatum*), hardstem bulrush, and sensitive fern (*Onoclea sensibilis*).

While no threatened and endangered element occurrences are recorded for the Boardman Pond area within the Michigan Natural Features Inventory (MNFI) database, the U.S. Army Corps of Engineers reported the occurrence of the common loon (*Gavia immer*) in the pond. This threatened species prefers to nest in lakes, rivers, and ponds isolated from extensive human disturbance. It has been recorded by MNFI in seven additional sections within the watershed as recently as 2003, especially in the Forest Lakes area north of the Boardman River. Although not known to nest near any of the four impoundments, the threatened red-shouldered hawk (*Buteo lineatus*) is known to occur in the forested region between Boardman and Brown Bridge Ponds. The wood turtle (*Glyptemys insculpta*), a reptile of special concern that inhabits various wetland types including forested river floodplain wetlands adjacent to upland habitats with sandy soils, is known to occur in the free-flowing sections of the Boardman River between Boardman and Brown Bridge Ponds. Blanding’s turtle (*Emys blandingii*) is another special concern species believed to be present near the impoundments along the Boardman River. It’s presence at Boardman Pond has not been confirmed.
4.2 BOARDMAN POND: RETAIN & REPAIR BOARDMAN DAM (ALTERNATIVE 1*)

**Effects on Wetlands:**

Alternative 1 proposing to retain and repair the Boardman Dam will not change the water level in the impoundment from its current elevation, 16 feet below the original impoundment level. As a result of the 16-foot decrease in water elevation becoming permanent, it is anticipated that both wetland acreage and type will change within the Boardman Pond impoundment. Overall, approximately 31 acres of wetland are anticipated to form in the long term. As described above, approximately 25 of these 31 acres are new emergent wetlands forming in the northeast corner, east central side, and southern end of the original impoundment. The new emergent wetlands are dominated by blue vervain, nodding bur-marigold, nodding smartweed, rice-cut grass, hardstem bulrush, three-square, and sedges. Over time, it is anticipated that these new emergent wetlands will succeed to forested/scrub-shrub wetlands with dominants such as northern white-cedar, black ash, red maple, tag alder, ninebark, sensitive fern, and marsh shield fern (*Thelypteris palustris*). An additional 6 acres of submerged and floating aquatic wetland are anticipated to form along the west central side of the impoundment, currently occupied by shallow open water. Approximately 11 acres of small forested/scrub-shrub/emergent wetlands directly adjacent to the upstream end of the impoundment may also be impacted by the drawdown. Due to the presence of groundwater seepage as a source of hydrology, it is unlikely that these small wetlands will convert to uplands following drawdown. Although surface water influences have been reduced as the water elevation was lowered, these wetlands remain connected to the floodplain of the Boardman River and will likely continue to receive surface water inputs from spring flooding. It is likely that these wetlands will shift from emergent/scrub-shrub to a slightly drier species composition with dominance by wetland trees and shrubs.

Considering 1) the gain in wetland acreage with the conversion of open water areas and 2) the increase in species and structural diversity with the conversion of deep aquatic habitats to emergent and ultimately forested/scrub-shrub systems, Alternative 1 will improve the quality of and increase the quantity of wildlife habitat available along this stretch of the Boardman River. A portion of the stagnant, low-oxygen, deep-water habitats will be replaced by submerged aquatic, emergent, and forested/scrub-shrub wetland habitats with varying water depth and higher structural and floral and faunal species diversity.

Given increases in aquatic, emergent, scrub-shrub, and forested wetlands adjacent to sandy upland habitat, it is likely that Alternative 1 will increase the quantity and quality of habitat available for rare species known to occur within the watershed, such as wood turtle, Blanding’s turtle, bald eagle (*Haliaeetus leucocephalus*), red-shouldered hawk, and ebony boghaunter (*Williamsonia fletcheri*). Although a portion of the open water habitat for the common loon has been lost by the 16-foot drawdown, this species was observed within the impoundment following drawdown in 2007 and will likely benefit from the diversified wetland vegetation forming along the margins of its habitat in Boardman Pond.

* Alternative 1 is intended to represent a “no action” option, freezing conditions in time, so the impoundments remain at their current water elevations. Therefore, “retain and repair” for Boardman Dam means that the water level in the impoundment will not change from its current elevation, 16 feet below the original impoundment level.
4.3 BOARDMAN POND: MODIFY BOARDMAN DAM (ALTERNATIVES 41 & 43)

Effects on Wetlands:
Alternatives 41 and 43 proposing to modify the Boardman Dam will return the water level in the impoundment to its original design elevation prior to the 2007 emergency drawdown. As a result of the water level in the impoundment returning to its original design elevation prior to the 16-foot emergency drawdown, it is anticipated that approximately 25 acres of newly formed emergent wetland will be converted back to open water habitat along the northeast corner, east central side, and southern end of the original impoundment. Approximately 11 acres of small forested/scrub-shrub/emergent wetlands directly adjacent to the upstream end of the impoundment are likely not to be impacted by the raising of the impoundment’s water level.

Considering 1) the loss in wetland acreage with the conversion of newly formed emergent wetland to open water areas and 2) the resulting decrease in species and structural diversity with the conversion of emergent habitats to stagnant, low-oxygen, deep-water habitats, Alternatives 41 and 43 will likely decrease the quality and the quantity of wildlife habitat available along this stretch of the Boardman River. Given decreases in aquatic and emergent wetlands adjacent to sandy upland habitat, it is likely that Alternatives 41 and 43 will either 1) not change or 2) decrease the quantity and quality of habitat available for rare species known to occur within the watershed, such as common loon, wood turtle, Blanding’s turtle, bald eagle (*Haliaeetus leucocephalus*), red-shouldered hawk, and ebony boghaunter (*Williamsonia fletcheri*).

4.4 BOARDMAN POND: REMOVE BOARDMAN DAM (ALTERNATIVES 25, 79, & 81)

Effects on Wetlands:
Alternatives 25, 79, and 81 proposing to remove the Boardman Dam will lower the impoundment’s water level approximately 43 feet from the original elevation and approximately 27 feet from its current elevation following the 2007 emergency drawdown. As a result of the 43-foot decrease in water elevation, it is anticipated that both wetland acreage and type will change within the Boardman Pond impoundment. Overall, approximately 69 acres of wetland are anticipated to form in the long term. As described above, approximately 25 of these 69 acres are new emergent wetlands forming in the northeast corner, east central side, and southern end of the original impoundment. Approximately 11 acres of additional emergent wetland is also expected to form along the west and east central sides of the impoundment currently covered in shallow open water. The new emergent wetlands are/will be dominated by blue vervain, nodding bur-marigold, nodding smartweed, rice-cut grass, hardstem bulrush, three-square, and sedges. Over time and as the water level in the impoundment is completely lowered, it is anticipated that these new emergent wetlands will succeed to forested/scrub-shrub wetlands with dominants such as northern white-cedar, black ash, red maple, tag alder, ninebark, sensitive fern, and marsh shield fern (*Thelypteris palustris*). Approximately 11 acres of small forested/scrub-shrub/emergent wetlands directly adjacent to the upstream end of the impoundment may also be impacted by the drawdown. Due to the presence of groundwater seepage as a source of hydrology, it is unlikely that these small wetlands will convert to uplands following drawdown. Although surface water influences will be reduced as the water elevation is lowered, these wetlands will likely remain connected to the floodplain of the Boardman River and will likely continue to receive surface water inputs from spring flooding. It is likely that these wetlands will shift from emergent/scrub-shrub to a slightly drier species composition with dominance by wetland trees and shrubs.
Throughout the central portion of the impoundment directly adjacent to the newly formed river channel, it is anticipated that approximately 33 acres of open water will be converted to and remain emergent/scrub-shrub wetland. These permanently emergent/scrub-shrub portions will be similar in structure and composition to areas found elsewhere along the Boardman River and likely be dominated by tag alder (*Alnus rugosa*), common elder (*Sambucus canadensis*), silky dogwood (*Cornus amomum*), red-osier dogwood (*Cornus sericea*), sandbar willow (*Salix exigua*), ninebark, blue vervain, nodding bur-marigold, rice-cut grass, swamp milkweed (*Asclepias incarnata*), spotted joe pye weed, common boneset, common cattail, black bulrush (*Scirpus atrovirens*), sedges (*Carex spp.*), hardstem bulrush, and burreed (*Sparganium spp.*).

Considering 1) the gain in wetland acreage with the conversion of open water areas and 2) the increase in species and structural diversity with the conversion of deep aquatic habitats to emergent and ultimately forested/scrub-shrub systems, Alternatives 25, 79, and 81 will improve the quality of and increase the quantity of wildlife habitat available along this stretch of the Boardman River. Stagnant, low-oxygen, deep-water habitats will be replaced by flowing, oxygenated riparian habitats with varying water depth and higher structural and floral and faunal species diversity.

Given increases in emergent, scrub-shrub, and forested wetlands adjacent to sandy upland habitat, it is likely that Alternatives 25, 79, and 81 will increase the quantity and quality of habitat available for rare species known to occur within the watershed, such as wood turtle, Blanding’s turtle, bald eagle (*Haliaeetus leucocephalus*), red-shouldered hawk, and ebony boghaunter (*Williamsonia fletcheri*). Although the open-water habitat of the common loon will be lost, nearby lakes to the east with relatively undeveloped shorelines will likely provide suitable alternative habitats for nesting.
5.0 BROWN BRIDGE POND

5.1 BROWN BRIDGE POND: EXISTING CONDITIONS

Existing Conditions of Wetlands:
The Brown Bridge Pond impoundment behind the Brown Bridge Dam is currently 192 acres. Approximately 77 acres of wetland occur within the impoundment, dominated by submerged, floating, emergent, and scrub-shrub vegetation (Figure 5.1.1). The plant communities within these lacustrine wetlands are characterized by moderately low species diversity and are dominated by floating and long-leaf pondweeds (*Potamogeton natans* and *P. nodosus*), stonewart (*Chara* spp.), rice cut grass (*Leersia oryzoides*), common beggar-ticks (*Bidens frondosus*), red-osier dogwood (*Cornus sericea*), hardstem bulrush (*Schoenoplectus acutus*), common cattail (*Typha latifolia*), and wild celery (*Vallisneria americana*). Approximately 144 acres of diverse wetland habitat occur near or adjacent to the Brown Bridge impoundment, consisting of 59.70 acres of palustrine forested and 84.34 acres of palustrine forested/lacustrine and palustrine emergent wetlands. Although some of these wetlands are influenced by inundation from the impoundment, most of these wetlands are primarily fed by groundwater seepage. They occur on very poorly drained sapric muck. Dominant forest, shrub, and emergent wetland vegetation species include northern white-cedar (*Thuja occidentalis*), red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), tag alder (*Alnus rugosa*), sedges (*Carex* spp.), common and narrow-leaved cattail (*Typha latifolia* and *T. angustifolia*), cinnamon fern (*Osmunda cinnamomea*), reedcanary grass (*Phalaris arundinacea*), and fowl manna grass (*Glyceria striata*).

One of seven occurrences recorded in the Michigan Natural Features Inventory (MNFI) database for the Boardman River Watershed, the common loon (*Gavia immer*) has been reported for the western end of Brown Bridge Pond as recently as 1998. The U.S. Army Corps of Engineers also reported the occurrence of a Bald eagle (*Haliaeetus leucocephalus*) nest near Brown Bridge Pond. This state threatened raptor nests in large trees near open water areas such as ponds, rivers, streams, and lakes isolated from extensive human disturbance. MNFI reports its occurrence in two sections east of Brown Bridge Pond along the river and north of the river in the Forest Lakes area. Although not known to nest near any of the four impoundments, the threatened red-shouldered hawk (*Buteo lineatus*) is known to occur in the forested region between Boardman and Brown Bridge Ponds. A reintroduced pair of threatened trumpeter swans (*Cygnus buccinator*) has been observed within the Brown Bridge impoundment. The special concern wood turtle (*Glyptemys insculpta*), is known to occur in the free-flowing sections of the Boardman River between Boardman and Brown Bridge Ponds. Blanding’s turtle (*Emys blandingii*) is another special concern species believed to be present near the impoundments along the Boardman River. Its presence at Brown Bridge Pond has not been confirmed since the 1970’s.

5.2 BROWN BRIDGE POND: RETAIN & REPAIR/MODIFY BROWN BRIDGE DAM (ALTERNATIVES 1, 25, 41, & 43)

Effects on Wetlands:
Alternatives 1, 25, 41, and 43 proposing to retain and repair or modify the Brown Bridge Dam will not change the water level in the impoundment. Therefore, no change in the acreage of wetland habitat is anticipated. No new wetlands are likely to form as a result of this alternative. Wetlands within the impoundment will remain dominated by submerged and floating aquatic and emergent vegetation.
Wetlands near or adjacent to the impoundment will remain dominated by forested, scrub-shrub, and emergent vegetation.

No changes to the quantity or quality of potential common loon, bald eagle, red-shouldered hawk, trumpeter swan, wood turtle, or Blanding’s turtle habitat are anticipated.

5.3 BROWN BRIDGE POND: REMOVE BROWN BRIDGE DAM (ALTERNATIVES 79 & 81)

Effects on Wetlands:  
Alternatives 79 and 81 proposing to remove the Brown Bridge Dam will lower the impoundment’s water level approximately 30 feet. As a result of this decrease in water elevation, it is anticipated that both wetland acreage and type will change within the Brown Bridge impoundment. Overall, approximately 156 acres of wetland are anticipated to form following drawdown of the impoundment. As described above, the submerged and floating aquatic wetlands located within the northern border of impoundment over the toe of slope are likely to form uplands. However, these low diversity wetlands are anticipated to initially succeed to emergent wetlands along the southern border. New emergent wetlands will likely be dominated by a more diverse set of wetland species, including blue vervain (Verbena hastata), swamp milkweed (Asclepias incarnata), rice cut grass, common cattail, black bulrush (Scirpus atrovirens), hardstem bulrush, spotted joe pye weed (Eupatorium maculatum), jewelweed (Impatiens capensis), common boneset (Eupatorium perfoliatum), sensitive fern (Onoclea sensibilis), monkey flower (Mimulus ringens), and common beggar-ticks (Bidens frondosus). Over time, it is anticipated that these new emergent wetlands will succeed to approximately 156 acres of forested/scrub-shrub wetlands with dominants such as northern white-cedar, red maple, common elder, marsh shield fern (Thelypteris palustris), balsam fir, tag alder, sedges, common and narrow-leaved cattail, cinnamon fern, and fowl manna grass. The scrub-shrub/emergent portions of the forested wetlands directly adjacent to the east and south sides of the impoundment may also be impacted by the drawdown. Due to the presence of groundwater seepage as a source of hydrology and continuity with forested wetland systems, it is unlikely that these scrub-shrub/emergent systems will convert to uplands following drawdown. When surface water influences are removed as the water elevation is lowered, it is more likely that these wetlands will shift from emergent/scrub-shrub to a slightly drier species composition with dominance by wetland trees and shrubs. Small emergent/scrub-shrub zones may form directly adjacent to the newly formed river channel. However, it is anticipated that the majority of the Brown Bridge impoundment will eventually convert to forested/scrub-shrub wetland, especially considering that this area is shown as mixed deciduous and coniferous swamp in presettlement times circa 1800.

Considering 1) the gain in wetland acreage with the conversion of open water areas and 2) the increase in species and structural diversity with the conversion of deep aquatic habitats to emergent and ultimately forested/scrub-shrub systems, Alternatives 79 and 81 will improve the quality of and increase the quantity of wildlife habitat available along this stretch of the Boardman River. Stagnant, low-oxygen, deep-water habitats will be replaced by flowing, oxygenated riparian habitats with varying water depth and higher structural and floral and faunal species diversity. Although the open-water habitat of the common loon and trumpeter swan will be lost, nearby lakes to the north and east with relatively undeveloped shorelines will likely provide suitable habitats for nesting. Since their territory likely includes other nearby open-water habitats, loss of the Brown Bridge impoundment will not likely severely impact the bald eagle. Given increases in emergent, scrub-shrub, and especially forested wetlands adjacent to sandy upland habitat, it is likely that Alternatives 79 and 81 will increase the quantity and quality of habitat available for other rare species known to occur within the watershed, including wood turtle, Blanding’s turtle, red-shouldered hawk, and ebony boghaunter (Williamsonia fletcheri).
6.0 CONCLUSIONS

Existing wetland conditions within the impoundments are characterized by submerged aquatic and floating wetland types with relatively low floral and faunal species and structural diversity. Existing wetland conditions adjacent to or near the impoundments are characterized by emergent, scrub-shrub, and forested wetland types. No changes in wetland type and extent and rare species habitat are predicted for alternatives that had no effect on the water elevation within an impoundment.

Adequate information is available to allow for ECT’s best judgment regarding determination of the effects on wetlands resulting from the various alternatives. Available data are sufficient to determine the approximate amount of wetland acreage and relative proportion of wetland ecological types anticipated to form. However, the information necessary to accurately depict the exact location and extent of new wetland development on a map is lacking, except in the broadest sense. Therefore, wetland development predicted for the various alternatives has not been depicted graphically.

In general, wetland loss adjacent to or near the impoundments as a result of alternatives proposing the lowering of water elevations is anticipated to be minimal, due to the majority of existing wetlands being sustained by groundwater inputs within the Boardman River Valley. The only scenarios involving significant loss of wetlands are those calling for the modification of Boardman Dam. Under these scenarios, it is anticipated that newly developed emergent wetlands formed within Boardman Pond in 2007 and 2008 following the 2007 emergency draw-down would be lost.

Rather than a loss of wetland habitat, alternatives proposing the reduction of water elevation within an impoundment are predicted to result in 1) a gain in wetland acreage with the conversion of open water areas to wetlands and 2) an increase in species and structural diversity with the conversion of deep aquatic habitats to emergent and ultimately forested/scrub-shrub systems. Such a shift in wetland type and extent is anticipated to improve the quality of and increase the quantity of rare species and overall wildlife habitat available along Boardman River.

Specifically, Alternatives 1, 25, 41, 43, 79, and 81 proposing to retain and repair or modify the Union Street Dam will not change the water level in the Boardman Lake impoundment. Therefore, no change in the acreage of wetland habitat is anticipated for any of the alternatives for Boardman Lake. Similarly, Alternatives 1 and 41 proposing to retain and repair or modify the Sabin Dam will not change the water level in the impoundment. Therefore, no change in the acreage of wetland habitat is anticipated for these alternatives for Sabin Pond. Alternatives 1, 25, 41, and 43 proposing to retain and repair or modify the Brown Bridge Dam will not change the water level in the impoundment. Therefore, no change in the acreage of wetland habitat is anticipated for these alternatives for Brown Bridge Pond.

Alternatives 25, 43, 79, & 81 proposing to remove the Sabin Dam will lower the impoundment’s water level. Overall, approximately 28 acres of wetland are anticipated to form following drawdown of the Sabin Pond impoundment. Alternatives 79 and 81 proposing to remove the Brown Bridge Dam will lower the impoundment’s water level. Overall, approximately 156 acres of wetland are anticipated to form following drawdown of the Brown Bridge impoundment.

Alternative 1 proposing to retain and repair the Boardman Dam will not change the water level in the Boardman Pond impoundment from its current elevation, 16 feet below the original impoundment level. Overall, approximately 31 acres of wetland are anticipated to form in the long term for Boardman Pond.
Alternatives 41 and 43 proposing to modify the Boardman Dam will return the water level in the impoundment to its original design elevation prior to the 2007 emergency drawdown. As a result, it is anticipated that approximately 25 acres of newly formed emergent wetland will be lost via conversion back to open water habitat in Boardman Pond. Alternatives 25, 79, and 81 proposing to remove the Boardman Dam will lower the impoundment’s water level approximately 43 feet from the original elevation and approximately 27 feet from its current elevation following the 2007 emergency drawdown. Overall, approximately 69 acres of wetland are anticipated to form in the long term for Boardman Pond.

The effects on wetlands associated with the four impoundments are summarized for each of the six alternative scenarios in the table below.

<table>
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<th>CATEGORY</th>
<th>ALTERNATIVE 1</th>
<th>ALTERNATIVE 25</th>
<th>ALTERNATIVE 41</th>
<th>ALTERNATIVE 43</th>
<th>ALTERNATIVE 79</th>
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<td>Impoundment size (acres)</td>
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<td>674</td>
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