April 29, 2024

Tim Navone, President
Marin Catholic High School
675 Sir Francis Drake Boulevard
Kentfield, CA 94904
tnavone@marincatholic.org

Re: Biological Site Assessment for the Marin Catholic High School Field Lighting Project, Kentfield, California

Mr. Navone:

This letter provides a biological assessment related to the proposed installation and use of artificial evening lighting (Project) at Marin Catholic High School's (MCHS) Dino Ghilotti Motta Stadium (athletic stadium) in Kentfield, unincorporated Marin County, California. The lighting array would replace a temporary lighting system currently in use. Another Project element considered herein is shifting some existing utilization of the stadium (games and practices) to evening hours. The focal assessment area includes land covers with sensitive species that are proximate to MCHS, namely Creekside Marsh. The assessment evaluates potential impacts to sensitive biological resources resulting from Project implementation in the context of the California Environmental Quality Act (CEQA).

Summary of Findings

The Project involves use of permanent field lighting system for the athletic stadium, to replace a temporary system (in use for decades). The new lighting system would be accompanied by a schedule shift for athletic games and practices from afternoon to early evening hours, with use of the lights ending no later than 10:00 PM and usually earlier. The lighting array would be DarkSky compliant and designed specifically to minimize light trespass. No illumination of nearby Creekside Marsh (where sensitive wildlife species are present, e.g. the listed CRR) is anticipated to occur due to use of the lighting system, and light visibility (glare) is expected to moderately increase in only a very small portion of the marsh closest to the stadium (approximately 0.5 percent of the total marsh). It is anticipated that any potential impacts to sensitive species due to Project implementation will be minor, and that wildlife will habituate to the altered conditions. As such, the Project is not anticipated to result in any potentially significant impacts under CEQA.

Author Qualifications

I (Jason Yakich) have over 17 years of experience as a wildlife biologist and biological consultant with a particular focus on avian biology. My experience includes direct field experience with most special-status birds in northern California, and a working knowledge of the regulatory framework relevant to these species. I hold a federal 10(a)1(A) permit to conduct active surveys

for the listed California Ridgway's rail (CRR; *Rallus obsoletus obsoletus*), a focal species in this assessment. I have 14 years of experience conducting surveys for CRR throughout its current range, have identified this species numerous times during both formal surveys and informal observations at Creekside Marsh. I have also managed and participated in biological compliance efforts for several projects in and adjacent to tidal/brackish marsh habitats around the San Francisco Bay estuary generally and the Corte Madera Creek watershed specifically.

Methods

Background Literature and Sources

A variety of available background literature concerning artificial night lighting and bird strikes was reviewed in preparation of this letter. The primary source of information used here is *Ecological Consequences of Artificial Night Lighting* (book) by Rich and Longcore (2006). Various journal articles in the primary scientific literature were also reviewed and referenced herein. For birds, the following additional literature was reviewed:

- "Evaluation of New Obstruction Lighting Techniques to Reduce Avian Fatalities" (Patterson 2012)

For Project specifications, the following sources were used:

- "MUSCO Football Lighting – Marin Catholic HS Football Field Illumination Report" by Pearce Renewables (January 2024), which presents modeled lighting impacts due to the Project
- Personal communications with Matilda Pulaha of Pearce Renewables regarding modeled lighting impacts specific to Creekside Marsh (March 2024)
- "Environmental Noise Impact Report" for the Project by Coffman Engineers, Inc. (April 2024)
- Personal communications with Alan Rosen and Harold Goldberg of RGD Acoustics regarding modeled acoustic impacts from the Project (July 2016)[1]

Field Visits

I have familiarity with the vicinity of MCHS due to numerous field visits that occurred over the course of four years (2018 to 2022) in support of the nearby Bon Air Bridge Replacement Project. These visits included (on-site) participation in six years of protocol-level surveys for CRR (in the southern portion of Creekside Marsh; see below) and various other activities including intermittent biological monitoring during specific bridge demolition/construction activities, and performance of nesting bird surveys (covering the bridge itself and adjacent areas) in May to July of 2018.

Field visits specific to the MCHS lighting project are as follows:

- February 23, 2021 – Review of MCHS athletic stadium and adjacent campus, including demonstration of temporary lighting system (dusk period); review of adjacent Creekside Marsh
- January 30, 2024 – CRR survey and habitat review in northern Creekside Marsh
- February 15, 2024 - CRR survey and habitat review in northern Creekside Marsh
- March 5, 2024 – CRR survey and habitat review in northern Creekside Marsh, assessment of trees adjacent to the athletic stadium

[1] *Alan Rosen co-authored both the original 2016 environmental noise report (by RGD Acoustics) and the 2024 updated report (by Coffman Engineers).*

- March 28, 2024 – CRR survey in northern Creekside Marsh

Project Site Description
The project site consists of the MCHS athletic stadium and immediately surrounding vicinity (Figure A-1, Attachment A). The high school property is situated within a greater area of primarily urban/suburban development which includes residential neighborhoods in Kentfield and unincorporated Greenbrae to the west, north and east, Marin General Hospital and associated developments to the south, and the Bay Club Ross Valley and Hal Brown Park to the south and southwest.

Hal Brown Park contains two adjacent areas: Creekside Park is a developed community park featuring a playground, picnic area, and associated pathways and landscaping; Creekside Marsh is a preserved area of tidal marsh and intermixed uplands that is approximately 20 acres in size. The marsh receives and releases tidal waters directly from/to Corte Madera Creek via culverts. Tidal marsh within Creekside Marsh is dominated by pickleweed (*Salicornia virginica*) and features various other halophytic plant species typical of such marshes within the San Francisco Bay estuary. Although there are areas of well-developed marsh (exhibiting a range of elevational zones) within Creekside Marsh, there are also interspersed smaller upland elevations where marsh extent is limited to absent. Development, roads and/or pedestrian trails are present along all of Creekside Marsh's periphery and host habitual anthropogenic disturbances and influences. These include automobile traffic (along the heavily used commute artery of Bon Air Road, which also hosts Marin General Hospital), tennis and pickleball at the Bay Club, pedestrians (dog walkers and joggers), cyclists, and public use of Hal Brown Park. Other nearby sources of routine disturbance include MCHS and the College of Marin's athletic facilities and associated practices and games (baseline condition); the latter is located approximately 1,200 feet to the west of the marsh.

Project Description
The proposed Project consists of several elements related to use of the MCHS athletic stadium, which are as follows:

- Installation of four 80-foot-tall lighting fixtures by MUSCO Sports Lighting, Inc. on the periphery of the field and surrounding track. The lighting array would illuminate the field to the extent necessary to conduct athletic games and practices during early evening hours. Two fixtures would be respectively located on both sides of each of the 10-yard line markers. The lighting array would include both 228 LED lights for field illumination, and 96 LED (weaker) upward lighting that is necessary for ball visibility during gameplay.
- While maintaining current evening practices, games and additional practices that currently occur during the day would shift to early evening hours as outlined below. The lighting array would not be used outside of these periods.
    - Practices would occur Monday to Friday during most weeks from late August through March, each practice occurring in the period from sunset to 9:15 PM. (See below regarding current [baseline] evening use.)
    - Up to 11 football games from August through early December would shift to evening hours, with the total number of games each year determined by the team's advancement in the playoffs; a minimum of five such games would occur from August to October. Football games would each be completed by 10:00 PM.
    - Five to nine men's and women's soccer games per month would shift to evening hours from December through mid-February; these would each be completed by

7:00 PM. Two additional soccer games would occur in early March, completed by 9:00 PM.
    - Approximately two men's and women's lacrosse games per week would shift to evening hours from mid-February through mid-May, completed by 9:00 PM.
- Installation of safety/egress LED lighting around portions of the athletic stadium, including a location near Creekside Marsh.

Since 1984, MCHS has used a temporary field lighting system on a more limited basis. The system involves use of four portable "flood"-style, traditional (non-LED) lighting fixtures that are employed annually for football practices (Monday to Friday) from early November to as late as mid-December; the total use period within a given year varies dependent on the team's advancement in the playoffs. While only rarely employed after December, authorization from the County for use of the temporary lights includes the full period of standard time (through early March).

Special-Status Wildlife Species

Special-status species are defined herein as those with heightened legal protections above baseline levels (if any such exist) and/or those typically subject to consideration under CEQA. They include species/taxa that have been formally listed under the federal and/or California Endangered Species Acts, CDFW Species of Special Concern, and state Fully Protected Species.

Several special-status wildlife species are either known or presumed to be present in Creekside Marsh and are addressed below.

California Ridgway's rail

CRR is the resident Ridgway's rail subspecies of northern and central California and occurs exclusively in tidal salt and brackish marshes; it is currently restricted to the San Francisco Bay estuary. This taxon is listed as endangered under both the federal and California Endangered Species Acts and is named a Fully Protected Species under the California Fish and Game Code. According to the California Department of Fish and Wildlife (CDFW) Natural Diversity Database (CNDDB), CRR is documented to occur in Creekside Marsh (CDFW 2024). More specifically, as per formal surveys conducted annually under the auspices of the Invasive Spartina Project (ISP), several CRR individuals were detected annually from 2009 to 2018 in Creekside Marsh; the maximum number of individual rails detected (during a given survey within each year) ranged from three (in 2013) to 12 (in 2012), and eight rails were noted during the apparent final year of monitoring in 2018 (e.g., Olofson Environmental 2018).[2] Additionally, WRA conducted annual protocol-level CRR surveys focused on the southern portion of the marsh from 2014 to 2020, apart from 2017.[3] The results obtained during WRA's surveys were similar to those of ISP, with multiple CRRs observed within the marsh annually, primarily its central and western portions. WRA also performed three CRR surveys in early 2024 which adhered to protocol and detected at least three rails in the northern portion of the marsh. Among WRA's various observations the nearest CRR to MCHS was located approximately 425 west of the periphery of the campus (approximately 540 feet away from the edge of spectator seating; March 6, 2024). Although the

[2] *ISP surveys used variations of the "Standardized North American Marsh Bird Monitoring Protocol."*

[3] *Surveys were in support of the Bon Air Bridge Replacement Project and thus focused on habitat areas within approximately 1,000 feet of the bridge. The protocol used was the standard presence/absence survey protocol by the USFWS (2015); in 2014 an earlier but similar USFWS protocol was employed. The USFWS reviewed and commented on the results in each respective year.*

locations of CRR nesting territories within the marsh should be expected to vary across years, and foraging may occur in all areas where tidal marsh is present, the portion of the marsh adjacent to the campus does not appear to be subject to regular use based on several recent years of survey data.

Other special-status species
The following species are also documented to occur at or in the vicinity of Creekside Park as per CDFW (2024) and other sources, including WRA's observations during various field activities at the site.

Table 1: Special-status Wildlife Species with Potential to Occur in Creekside Park and Vicinity

Common and Scientific Names	Status*	Occurrence Potential in the Project Area and Vicinity
salt-marsh harvest mouse *Reithrodontomys raviventris*	FE, SE, SFP	Previously documented in Creekside Marsh (in 1959) and at the mouth of Corte Madera Creek, most recently in 1980 (CFDW 2024, SFEI 2005). While often assumed extant at Creekside Marsh, this species is likely extirpated from the marsh and vicinity (Dr. Katie Smith personal communication, March 2024).
San Francisco (saltmarsh) common yellowthroat *Geothlypis trichas sinuosa*	SSC	Present year-round in Creekside Marsh (WRA observations). Presumably nests there in areas with taller/denser emergent and/or transitional vegetation.
Bryant's savannah sparrow *Passerculus sandwichensis alaudinus*	SSC	Present year-round in the San Francisco Bay area; may nest within tidal marsh and adjacent upland habitats at Creekside Marsh. Not observed by WRA during the breeding season.
San Pablo song sparrow *Melospiza melodia samuelis*	SSC	Present year-round throughout Creekside Marsh and adjacent vegetated areas (WRA observations, presumably of this subspecies), including nesting.
white-tailed kite *Elanus leucurus*	SFP	WRA has observed individuals foraging over and adjacent to the marsh on several occasions. No nest sites have been observed, but trees suitable for nesting are present around some of the park's perimeter as well as in adjacent areas.
California black rail *Laterallus jamaicensis coturniculus*	ST, SFP	Apparently present in Creekside Marsh only sporadically (CDFW 2024). Not observed to date by WRA, even though active (call-broadcasting) surveys were conducted in 2014, 2015, 2016 and 2019 in the southern portion of the marsh. Nesting may occur in some years.
steelhead (central California coast DPS) *Oncorhynchus mykiss*	FT	Occurs in Corte Madera Creek but only during in-/out-migration; will not be impacted by the Project.
longfin smelt *Spirinchus thaleichthys*	FC, ST, SSC	May occasionally occur in Corte Madera Creek, and rarely in Creekside Marsh during high tides; will not be impacted by the Project

Common and Scientific Names	Status*	Occurrence Potential in the Project Area and Vicinity
green sturgeon *Acipenser medirostris*	FT, SSC	May occasionally occur in Corte Madera Creek, although there is no spawning habitat upstream; will not be impacted by the Project.

*FE- Federal Endangered
FT- Federal Threatened
FC- Federal Candidate
SE- State Endangered
ST- State Threatened
SSC- CDFW California Species of Special Concern
SFP- State Fully Protected Species

General wildlife

General (non-status) wildlife in the vicinity Hal Brown Park are primarily common species with at least some adaptations to urban/suburban environments, as well as brackish-marsh species within Creekside Marsh and along Corte Madera Creek. The area provides foraging and nesting habitat for variety of locally common bird species including mallard (*Anas platyrhynchos*), red-tailed hawk (*Buteo jamaicensis*), killdeer (*Charadrius vociferous*), Anna's hummingbird (*Calypte anna*), northern mockingbird (*Mimus polyglottos*), American robin (*Turdus migratorius*), western scrub-jay (*Aphelocoma californica*), and bushtit (*Psaltriparus minimus*). Additionally, Corte Madera Creek and the tidal channels of Creekside Marsh support a variety of aquatic and wetland-oriented birds (waterfowl and shorebirds), most particularly during the winter (non-breeding period) when relatively large numbers of such species are present locally.

WRA has observed California voles (*Microtus californicus*) in and adjacent to the marsh; other common mammal species (rodents) such as California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*) and western harvest mouse (*Reithrodontomys megalotis*) may inhabit landscaped and ruderal portions of Hal Brown Park. Common and widespread, urban-adapted mammals such as raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*) are also presumably present. Bat species adapted to urban environments including California myotis (*Myotis californicus*) and big brown bat (*Eptesicus fucus*) may occur, although see additional comments regarding bats in the "Lighting Impacts" section below. Reptile species adapted to disturbed/urban environments, such as western fence lizard (*Sceloporus occidentalis*), southern alligator lizard (*Elgaria multicarnata*) and gopher snake (*Pituophis catenifer*) are common in much of Marin County and likely present in the vicinity of Hal Brown Park. Amphibians are less likely to inhabit the marsh due to the salinity of tidal waters.

Fish species adapted to saline and brackish water presumably enter Creekside Marsh's larger tidal channels from Corte Madera Creek (with the tide) and may include striped bass (*Morone saxatilis*; non-native), Pacific staghorn sculpin (*Leptocottus armatus*), threespine stickleback (*Gasterosteus aculeatus*), and others.

Artificial Lighting Background

Birds

The phenomenon of birds being attracted to and disoriented by artificial lighting, at times resulting in mortality, is well-documented, most particularly for powerful light sources such as lighthouses, lightships and floodlit buildings and structures. This phenomenon is especially pronounced for nocturnally migrating birds during foggy conditions and/or when the cloud ceiling

is low. Ogden (1996) suggested that structures located at critical points along migratory routes may present a greater hazard than those located elsewhere. Although elements of the literature conflict with each other regarding the susceptibility of birds to different types of lighting, Rich and Longcore (2006) suggest that wavelength and light intensity are the most important variables, and that shorter wavelength (ultra-violet) and less intense lights are far less likely to attract and/or disorient birds. Patterson (2012) states that LED light sources (the type that would be utilized for the Project) are generally regarded by wildlife biologists as less likely to attract birds than more traditional lighting mechanisms (e.g., incandescent lighting).

Lighting has been also shown to impact birds that are resident (whether permanently or seasonally) in habitats adjacent to lighting sources. These impacts are less direct than those of migrating birds, and both positive and negative impacts have been implicated. Rich and Longcore (2006) suggest that artificial alterations to the diurnal/nocturnal schedule can impact physiology and behavior, including singing, reproductive cycles, migration timing, and activity length. Most birds are diurnal, and increased night lighting can increase visibility for predators, increasing predation risk. Conversely, night lighting may increase available forage time, providing a benefit to these birds. A study by Dominoni et al. (2013a) found that songbirds began singing and foraging earlier in the day after being exposed to artificial lighting during a typical "night time." This change in habits may have broader implications on food-web dynamics as these birds may also be attracting urban predators that have acclimated to altered light regimes. A second study by Dominoni et al. (2013b) found that changes in lighting regimes also had a greater effect on the reproductive cycles of birds in rural environments than those in urban ones, indicating that birds not acclimated to night lights may experience greater impacts.

Bats

As summarized by Rich and Longcore (2006), because they tend to congregate insects in space and time, streetlights and similar sources of fixed, bright nocturnal lighting are attended by many species of foraging bats. This tendency is associated with foraging guild: fast-flying species that forage in open areas typically show the strongest predilection for foraging near lights. Such artificial light sources likely increase foraging efficiency for these species, at least in some contexts, and thus may have positive effects on the local populations of these bats. Other bat species appear to avoid foraging in the vicinity of artificial nocturnal light, and thus well-lit areas may have a deterrence effect on these bats, resulting in potential negative effects to local populations if lighting is widespread within otherwise suitable foraging areas. A study by Schoeman (2015) supported this theory, finding that bat communities near urban lighting sources are mostly comprised of "urban exploiter" bat species that take advantage of the night lighting to forage, while "urban avoider" species intolerant of urban areas and night lighting show much reduced abundance in these areas. Additionally, LED light sources are generally regarded as less attractive to insects than traditional lighting, though such attraction varies across different types of insects and the wavelength(s) of light used. The introduction of novel lighting arrays may also disturb occupied bat roosts, altering temporal patterns of use up to and including abandonment of a roost.

Other wildlife

A brief summary of information provided by Rich and Longcore (2006) for other groups of wildlife is provided below.

- Little is known about the effects of artificial lighting on mammals other than bats. However, given what is known about mammal biology and behavior (e.g., most species are nocturnal), artificial lighting should be presumed to have at least some negative

baseline effects, including increased predation risk and decreased foraging and movement activity.

- In general, there is a dearth of information on the effects of night-lighting on reptiles and amphibians. Some nocturnal predatory reptiles may benefit from increased visibility of prey species such as insects attracted to lighting. Conversely, nocturnal prey species may decrease their activity resulting from increased risk of predation or decreased foraging success. Night lighting has been shown to prolong periods of activity in diurnal reptiles.
- Fishes as well as their aquatic invertebrate prey have been documented to modify their behavior in response to artificial nocturnal lighting, including altering their activity patterns (both spatially and temporally) and avoiding lit areas. As might be expected, the effects tend to be strongest in aquatic features with shallow and/or clearer water, e.g. streams and creeks. Most examples provided involved strong light sources placed directly over or adjacent to the aquatic habitats in question, e.g., streetlamps illuminating a discrete area of a stream or pond.

Noise Background

Noise is known to have effects on wildlife. Many taxa, including birds, rely on acoustic signalling for predator avoidance, breeding, communication, etc., and may be especially susceptible to increased noise. However, much of the current literature focuses on the effects of discrete, high-volume events such as pile driving, construction or industrial noise, or air and watercraft noise. Other studies focus on mid-level volumes, and many of these examine the effects of highway noise on birds. Kaseloo (2005) summarizes over a dozen studies that report that road noise has a negative effect on birds, particularly during the breeding period. However, Kaseloo (2005) also reports that not all bird species in the reviewed studies responded negatively to the traffic noise, and some species in fact showed a positive response. These studies indicate that short-term loud noises may affect bird behavior through acute disturbances that are limited in spatial and temporal extent.

Other studies address issue of the effects of low-level and/or constant increases in noise over time. Reijnene and Foppen (1995) presented that male willow warblers (*Phylloscopus trochilus*) experience difficulties in mate attraction near highways due to noise pollution. Regarding effects of continuous noise on bird communities, Nicholoff (2003) suggested that increases of up to of 10 decibels (dBA) above background noise are unlikely to result in substantial adverse effects under most circumstances. However, wildlife perception of noise may be more sensitive than that of humans, at least for some species, and therefore a 10 dBA increase in noise (an effective doubling of loudness as perceived by the human ear) over the existing maximum levels may be considered significant. In these cases, wildlife may vacate the area, or adapt to the disturbance by changing their behavior. Wood and Yezerinac (2006) showed that song sparrows (*Melospiza melodia*) at noisier locations in urban environments exhibited measurably different sound characteristics to their songs than sparrows in rural areas. In *Responses of Wildlife to Noise* (1995), Bowles states that wildlife can be flexible in environments with increased noise and that "habituation is the crucial determinant of success in the presence of noisy disturbances." For example, birds familiar with aircraft can be nearly insensitive to the noise and habitat use by birds and mammals can resume to normal following habituation to the noise, or when the noise disturbance has stopped. Thus, while noise is known to affect wildlife, in many situations individuals may be able to adjust to it.

Potential Project Impacts

All potential impacts to biological resources resulting from both use of the permanent artificial night light array, and shifts in the schedule for games and practices, would be incidental. The Project is located entirely within the MCHS grounds, which are already developed or otherwise consist of disturbed/managed land covers. No impacts to jurisdictional wetlands and non-wetland waters, or sensitive vegetation communities known from the vicinity, will occur due to Project implementation. Potential impacts are thus limited to impacts from the increased evening lighting and noise to sensitive wildlife species within Creekside Marsh, and also to air space above and adjacent to the field.

Lighting Impacts

Creekside Marsh

Although available literature states there are likely effects from increased artificial night lighting on locally resident wildlife, few studies have quantified its effects. Thus, while there may be effects from the increase in evening lighting, it is extremely difficult if not practically infeasible to estimate how acute or widespread they will be. As such, the most useful information to consider is Project-specific lighting impacts as modelled *en situ* by Pearce Renewables (January 2024) and associated personal communications (March 2024). The following elements are important to note:

- The proposed array would consist entirely of LED lighting, i.e., the technology generally regarded as having reduced impacts to birds and other wildlife.
- The array would be activated only during discrete periods, i.e., during evening games and practices (to be completed no later than 10:00 PM in every instance, and usually earlier). Lighting conditions will otherwise be unaltered.
- The lighting array will be DarkSky approved.[4] A key element of this status (among other attributes) is full minimization, via technical means, of both horizontal and vertical light trespass.
- Modeled lighting impacts (illumination; measured in foot-candles) demonstrate that no light trespass of Creekside Marsh will occur when the athletic field lighting array is active. Anticipated maximum horizontal and vertical illumination levels (trespass) along the public trail adjacent to the marsh are respectively shown in Figures A-2 and A-3 (Attachment A). No light trespass would occur in the horizontal direction. The trespass in the vertical (downward) direction along the trail would be no more than 0.1 foot-candle, at one of the 13 modelling points; the remaining points feature 0.0 maximum illumination (Figure A-3). For context, 0.1 foot-candle is the difference between a full moon and deep twilight. This minor amount of illumination along the trail would likely fade quickly from the marsh edge heading into the marsh.
- Modeled lighting intensity (glare; measured in candelas) along the trail during use of the array is shown in Figure A-4 (Attachment A).[5] The Pearce Renewables report concludes that glare will be "zero to minor" (less than 500 candelas at maximum) along Bon Air Road, located within 175 feet of the athletic stadium's outer track edge (at its nearest point). Applying this same threshold to Creekside Marsh, approximately 0.1 acre of the

[4] *Information about DarkSky is available online at: https://darksky.org/what-we-do/darksky-approved/.*

[5] *Modeling does not factor in the trees situated between the athletic field and the trail; the trees would have at least some blocking effect on the lighting (dependent on specific location).*

marsh in its extreme northeast may be subject to glare greater than 500 candelas (roughly 0.5 percent of the total tidal marsh present). Given that the area potentially subject to moderate glare is small and consists partially of transitional (marsh to upland) vegetation, any effects of glare are anticipated to be minimal and inconsequential.

While some impacts (e.g., wildlife behavior modification) may occur for certain species in the immediate vicinity of the athletic stadium and greater campus, they are expected to be discountable in the context of Creekside Marsh and wildlife populations that are present there. Regarding CRR this species is already subject to a variety of urban impacts within Creekside Marsh (noise, various adjacent human activities). Any additional impacts due to the lighting component of the Project (with no light trespass into the marsh) would presumably be unmeasurable. In fact, in terms of illumination itself the proposed lighting system would if anything likely have fewer impacts than the temporary system given the LED source and technical components of the array engineered specifically to minimize light trespass.

A second Project lighting component with relevance to Creekside Marsh is the proposed installation of egress/safety lighting around the westernmost portion of the "greater" athletic stadium (area including access routes, parking zones, etc.), where light sources may be placed within approximately 100 feet of Creekside Marsh at the closet point. Although no specifications regarding this component were available for WRA's review at the time of this writing, it is my understanding that lighting fixtures in this area would use LED technology exclusively, be no higher than 12 feet from the ground, and oriented specifically to avoid or otherwise minimize lighting trespass into adjacent areas. Given these assumptions, it is anticipated that biological impacts due to use of the egress lighting will be very limited in spatial extent and magnitude, and thus discountable.

Other adjacent areas
While illumination of the air space directly over the athletic field when the lighting array is active is anticipated, the array would use highly directional light sources that are designed specifically to illuminate only the field and a discrete, necessary amount of air space (e.g., so balls are visible when in the air during gameplay). The upward lighting component would consist of 96 LED lighting, versus the brighter 228 LED lighting used specifically for the field. As per correspondence with Pearce Renewables (personal communication, March 2024) and the DarkSky approved status of the proposed array, no perceptible light is anticipated to be directed upward into the sky from the lighting fixtures.

When activated, any artificial light source has some potential to attract and/or disorient birds, particularly those that are transients in local air space (e.g., nocturnal migrant birds that lack familiarity with the local environment). If attraction/disorientation is particularly strong, there is some potential for birds to collide with manmade structures, which again is presumably more likely to occur for non-local birds. In the case of the Project, it is unlikely that LED-based and highly directed illumination of a single athletic field in suburban Marin County, during discrete evening periods over much of the year, will have any measurable adverse impacts on night-flying birds in airspace over the field compared to existing conditions in the vicinity, which are already illuminated at night.

The lighting array has some unknown potential to affect bat foraging, specifically attracting some species which adapt to night lighting and show increased foraging efficacy, and potentially dissuading non-light-adapted bats from foraging in the immediate area. Note however that LED

lighting is less attractive to insects than traditional lighting, so any such effects from the proposed array may be muted. Lighting (and noise) may also disturb occupied bat roosts if such are in proximity to the disturbance source; this would especially apply to maternity roosts (those occupied by females with dependent young) which in our region are generally active from March through August. There are CNDDB records of two special-status bat species within 5 miles of MCHS: Townsend's big-eared bat (*Corynorhinus townsendii*) and pallid bat (*Antrozous pallidus*), both of which are state Species of Special Concern (CDFW 2024). The former species roosts within caves, mines, and undisturbed buildings; the latter is more general with typical roost substrates including rocky crevices, large tree hollows, bridges, and secluded interior spaces of structures. The immediate vicinity of the MCHS athletic stadium does not provide suitable roosting habitat for either species, with buildings regularly occupied/used and maintained (lacking ingress/egress points to suitable interior spaces). Additionally, trees adjacent to the field lack typical roost characteristics, particularly for maternity roosts. Trees in this area are a mix of native and non-native species: coast redwoods (*Sequoia sempervirens*), an unidentified conifer (several individuals), coast live oaks (*Quercus agrifolia*), Monterey pines (*Pinus radiata*), and unidentified palms. All such trees are relatively small in size/stature, and no hollows/cavities with the potential to support bat maternity roosting (or roosting generally, including for non-status species) were observed in these trees.[6] As a landscaping element the subject trees are also maintained for aesthetic and safety purposes, with deceased/unhealthy limbs removed, precluding the formation of snags or hollows in limbs.

Bat use of the Hal Brown Park area appears to be relatively low based on previous WRA field work in the area. During a bat utilization assessment/survey of the pre-replacement Bon Air Bridge (over Corte Madera Creek) and directly adjacent areas in May 2015, WRA (unpublished data) found virtually no bat use of the area, with only three individual bat calls of one species (Mexican free-tailed bat [*Tadarida beasilliensis*]) observed via an ultrasonic detector that was deployed overnight near the bridge. WRA biologists observed one unidentified small bat (in the size range of most *Myotis* species) over the threshold of Creekside Marsh during a CRR survey on February 15, 2024; no bats have been observed in the course of WRA's many other field activities at and adjacent to Creekside Marsh, including during several years of CRR surveys which occur during dawn/dusk periods and thus are well-timed to observe flying bats.[7] These incidental results along with the general lack of accessible freshwater features (a critically important resource for bats) in the area suggest that only limited utilization by foraging bats typically occurs in the vicinity of Creekside Marsh and the adjacent high school. Thus, in the context of a DarkSky lighting array to be activated no later than 10:00 PM whenever employed, I anticipate that impacts to local bat populations due to the Project, if any such occur, would be minimal and discountable. It is also plausible that some locally common bat species may enjoy a small and localized benefit from the lighting (via more efficient foraging).

[6] *A few redwoods and pines are moderate in size, but still maintained as described and lacking in any apparent hollows that may support bats.*

[7] *Determining the presence/absence of (flying/foraging) bats is not the focus of these surveys. However, surveyors do note all wildlife species observed and spend each survey (one to typically two hours in duration) continuously observing the surrounding environment. Thus, the lack of bat observations during these surveys over several years is at least suggestive of relatively low bat abundance in the area.*

Noise impacts

Potential impacts to local wildlife due to Project-related noise will occur in two dimensions: 1) novel, increased noise following implementation (primarily due to greater attendance at games and resultant crowd noise), and 2) timing of such noise in the evening (nocturnal) hours, versus the baseline condition of similar noise currently occurring regularly but only during daylight hours. Such potential impacts could include behavior modification by wildlife, including: avoidance of the general vicinity of the athletic stadium, especially during games (or even the campus altogether if the disturbance level is sufficiently high); reduced foraging efficacy; and, reduced use of sheltering/roosting habitat that may be present in the vicinity. For birds (including listed CRR), excessive noise may disrupt reproductive activities, including potential mates locating each other, as well as nest attendance and the care of young.

As per the Project's "Environmental Noise Impact Report" and correspondence with RGD Acoustics, Inc. (July 2016), the calculated average noise levels as measured at eastern Creekside Marsh (near the MCHS campus) during a high-attendance, daytime football game is L_{eq} 58 dBA for spectator noise, and L_{eq} 59 dBA for use of the PA system. The specific location used for the calculation is approximately 180 feet west of the high school property and approximately 55 feet west of the marsh's edge. With implementation of the Project, while average attendance is projected to increase, any increase in spectator noise) is anticipated to be less than 1 dBA for the highest-attended games and typically zero otherwise. This increase is, in and of itself, far below the 10 dBA threshold outlined by Nicholoff (2003; referenced above) and otherwise so small as to be considered discountable in the present analysis. Additionally, this increase applies specifically to the portion of the marsh closest to the athletic stadium, and noise (decibel levels) will decrease at locations deeper into the main portion of the marsh, presumably to zero at sufficient distance even for the loudest games.

Other data provided by RGD Acoustics address the increase in noise levels during evening games versus the baseline condition of no evening games. Under baseline conditions L_{eq} dBA varies from approximately 43 to 46 dBA in Creekside Marsh (location specified above). Thus noise is estimated to increase by approximately 12 to 15 dBA when games are played in the evening, slightly greater but similar to the increase during daytime games.[8] Again, the estimated increase applies specifically to the marsh area adjacent to MCHS, and most of the marsh would receive reduced sound.

Wildlife inhabiting Creekside Park (including CRR) are presumably adapted to baseline urban disturbances that are present in the area. These include habitual traffic noise along Bon Air Road, public use of Hal Brown Park, baseline athletic activities at MCHS (games and practices, including evening practices for a portion of the year) and the Bay Club, and emergency vehicles utilizing Marin General Hospital. Given local conditions, local wildlife would presumably also adapt to noise generated by a shifted practice and game schedule. Thus, while increased noise from the project has some unknown potential to affect wildlife in Creekside Marsh (e.g., localized shifts in activity patterns), the level of effect would be less than significant under CEQA.

[8] *Ambient conditions are slightly quieter during evening hours due to reduced auto traffic on Bon Air Road.*

Cumulative Impacts

Cumulative impacts are defined herein as those that may occur incrementally over time due to the Project and/or other actions in the vicinity. As outlined above, the Project (use of the lighting array) will occur in effective perpetuity and on a fixed schedule. As such any associated (incidental) impacts to local wildlife will presumably be temporary in nature, with habituation to these disturbances occurring in the same manner as to the various other routine anthropogenic disturbances at and near Hal Brown Park (including baseline activities at MCHS). Regarding other actions in the vicinity, the MCHS campus is already thoroughly developed and subject to routine use, and other lands surrounding Hal Brown Park are also developed. Land uses and practices in these areas are unlikely to change in the foreseeable future; Marin General Hospital recently completed a large-scale redevelopment/renovation, the residential properties adjacent to Creekside Marsh are unlikely to be converted to another use, and utilization rates of public trails and similar features along the boundaries of the marsh will likely stay much the same. One alteration that is plausible is additional ecological restoration activities in Creekside Marsh, which would be a net benefit to local wildlife species dependent on the marsh.

Summary and Determination

The Project consists of installation and use of an artificial LED lighting array at the MCHS athletic stadium. Use would occur on a regular schedule from late August through mid-May annually, with the array de-activated no later than 10:00 PM, and often earlier depending on the sport in question and context. The Project would also result in shifting game and practices that currently occur during afternoon (daylight) hours to the evening. Baseline conditions also include use of a temporary (traditional) field lighting system regularly during a more limited period in November and December of each year.

The following attributes of the Project are key elements to this assessment:

- The Project would be implemented within a largely developed (suburban) environment with associated baseline disturbance occurring habitually year-round.
- The proposed lighting array would be DarkSky approved and engineered to fully minimize all horizontal and vertical light trespass outside of the field and immediate airspace over the field respectively.
- Modelling specific to the Project shows that no light trespass will occur in nearby Creekside Marsh which hosts sensitive wildlife species. Glare is expected to be negligible save for in a very small, marginal portion of the marsh near MCHS.
- A baseline condition of both field lighting and game/practices (noise) in the athletic stadium has existed for decades, the latter throughout the same annual period to be used by the Project. While the Project will increase the annual period of lighting use and shift games and practices to the evening, it is likely that any impacts from these shifts to local wildlife will be minimal and temporary in nature.
- Increases in noise due to increased spectator attendance (for evening games) are anticipated to be minimal and discountable compared to baseline conditions.

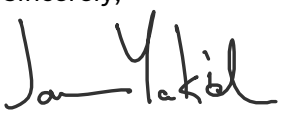
The Project categorically does not involve any land conversion or potential impacts to sensitive land covers, aquatic resources, or special-status plants. Based on the review of potential incidental impacts to wildlife included in this report, any such impacts would be ***less than significant***.

Recommended Best Management Practices
To further minimize any potential incidental impacts to sensitive biological resources in Creekside Marsh, it is recommended that the following measures be included in the final description and implementation of the Project:

- Safety/egress lighting in the western portion of the athletic stadium (near Creekside Marsh) should be designed so that no illumination of the marsh occurs when such lighting is used. This may be accomplished via directional lighting, shaders, light intensity, lower-height fixtures, and/or other means.
- Games and practices held during evening hours should occur only on the proposed fixed calendar schedule, and use of the lighting restricted to the proposed hours of sunset and 10:00 PM at the latest.
- Initial testing for the lighting array should occur from September 1 to January 31, outside of the CRR and general nesting bird season. This will avoid the potential for active nests and nesting activities to be impacted by the novel testing, and provide a period to adjust prior to the initiation of such activities.

Please contact me with any questions.

Sincerely,



Jason Yakich
Senior Biologist
yakich@wra-ca.com

Enclosures: Attachment A - Figures

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Figure A-1. Project Vicinity

Marin Catholic High School Lighting Project
Kentfield, Marin County, California

Equipment List For Areas Shown

Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	ABOVE GRADE LEVEL	LUMINAIRE TYPE	QTY/POLE	THIS GRID	OTHER GRIDS
2	F1-F2	80'	-	80.2'	TLC-LED-1500	7	7	0
				70'	TLC-RGBW	1	1	0
				15.5'	TLC-BT-575	2	2	0
2	F3-F4	80'	-	80.2'	TLC-LED-1500	7	7	0
				70'	TLC-RGBW	2	2	0
				15.5'	TLC-BT-575	2	2	0
4	Totals					42	42	0

*Above Grade level relative to the field

Attachment A
Tim Navone; April 2024

Figure A-2. Horizontal Illumination - Hal Brown Park Trail

Marin Catholic High School Football

Kentfield, CA

Grid Summary

Name	**Tital Marsh Spill**
Size	360' x 160'
Spacing	30.0' x 10.0'
Height	3.0' above grade

Illumination Summary

MAINTAINED HORIZONTAL FOOTCANDLES

	Entire Grid
Scan Average	**0.01**
Maximum	0
Minimum	0
Avg/Min	-
Max/Min	**-**
UG (adjacent pts)	0.00
CU	0.00
No. of Points	13
LUMINAIRE INFORMATION	
Applied Circuits	A,B
No. of Luminaires	**42**
Total Load	47.92 kW

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE IN FEET 1 : 30
0' 30' 60'

ENGINEERED DESIGN By: BeThomps • File #230653Ar1 • 21-Feb-24

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊠

We Make It Happen.

Equipment List For Areas Shown

Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	ABOVE GRADE LEVEL	LUMINAIRE TYPE	QTY/POLE	THIS GRID	OTHER GRIDS
2	F1-F2	80'	-	80.2'	TLC-LED-1500	7	7	0
				70'	TLC-RGBW	1	1	0
				15.5'	TLC-BT-575	2	2	0
2	F3-F4	80'	-	80.2'	TLC-LED-1500	7	7	0
				70'	TLC-RGBW	2	2	0
				15.5'	TLC-BT-575	2	2	0
4	Totals					42	42	0

*Above Grade level relative to the field

Attachment A
Tim Navone; April 2024

Figure A-3. Vertical Illumination - Hal Brown Park Trail

Marin Catholic High School Football

Kentfield, CA

Grid Summary

Name	**Tital Marsh Spill**
Size	360' x 160'
Spacing	30.0' x 10.0'
Height	3.0' above grade

Illumination Summary

MAINTAINED MAX VERTICAL FOOTCANDLES

	Entire Grid
Scan Average	**0.02**
Maximum	0
Minimum	0
Avg/Min	39.73
Max/Min	**176.40**
UG (adjacent pts)	0.00
CU	0.00
No. of Points	13
LUMINAIRE INFORMATION	
Applied Circuits	A,B
No. of Luminaires	**42**
Total Load	47.92 kW

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE IN FEET 1 : 30
0' 30' 60'

ENGINEERED DESIGN By: BeThomps • File #230653Ar1 • 21-Feb-24

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊠

We Make It Happen.

Attachment A
Tim Navone; April 2024

Marin Catholic High School Football

Kentfield, CA

Equipment List For Areas Shown

Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	ABOVE GRADE LEVEL	LUMINAIRE TYPE	QTY/POLE	THIS GRID	OTHER GRIDS
2	F1-F2	80'	-	80.2'	TLC-LED-1500	7	7	0
				70'	TLC-RGBW	1	1	0
				15.5'	TLC-BT-575	2	2	0
2	F3-F4	80'	-	80.2'	TLC-LED-1500	7	7	0
				70'	TLC-RGBW	2	2	0
				15.5'	TLC-BT-575	2	2	0
4	Totals					42	42	0

*Above Grade level relative to the field

Figure A-4. Lighting Intensity (Glare) - Hal Brown Park Trail

Grid Summary

Name	**Tital Marsh Spill**
Size	360' x 160'
Spacing	30.0' x 10.0'
Height	3.0' above grade

Illumination Summary

MAINTAINED VERTICAL FOOTCANDLES: 90° Tilt

	Entire Grid
Scan Average	**707.71**
Maximum	2009
Minimum	82
Avg/Min	8.61
Max/Min	**24.43**
UG (adjacent pts)	0.00
CU	0.00
No. of Points	13
LUMINAIRE INFORMATION	
Applied Circuits	A,B
No. of Luminaires	**42**
Total Load	47.92 kW

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE IN FEET 1 : 30
0' 30' 60'

ENGINEERED DESIGN By: BeThomps • File #230653Ar1 • 21-Feb-24

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊠

We Make It Happen.