5-2023

Enhancing Security at Baxter Arena

Jennifer Davis

UNIVERSITY OF NEBRASKA AT OMAHA
UNIVERSITY HONORS PROGRAM

Baxter Arena Soft Target Hardening

Student: Jennifer Davis

Date: 5/15/2023

Table of Contents

Table of Figures

Table of Tables

Abstract

The purpose of this report is to detail two options proposed for enhancing security at Baxter Arena. Both options are focused on metal detection. In this report we will look at the benefits and negatives of metal detection, both handheld and stationery, and how it can be used in enhancing the security of Baxter Arena.

Introduction

Since the attacks on September 11th, 2001, building security has become more prioritized. The number of attacks against schools, stadiums, and areas of mass gatherings has also increased. A study from USA Today reports that there have been 541 mass killings since 2006 resulting in the loss of 2,819 individuals (USA Today, 2022). Most weapons used in these killings are guns, while deaths caused by other weapons are under 20% of the killings (USA Today). The location with the highest number of attacks is residences. Commercial, retail, and entertainment locations have the second highest number of attacks (USA Today).

In this report we will look at how to harden Baxter Arena to mitigate and deter any future attacks against the building and its patrons. There are various factors that can be implemented or changed to increase the security of sites and buildings. These factors can be broken down into layers of defense as explained in the next section.

Three Layers of Defense:

When looking at the security of a site, FEMA states in the Site and Urban Design for Security Document (FEMA, 2007) that a site should be broken into three layers of defense. The different layers of defense are expanded upon below.

1st Layer of Defense

The 1st Layer of Defense is the area outside of the site boundary. For Baxter Arena, this would be the roads and parking lots near the arena. In **Error! Reference source not found.** the area hatched in pink represents this first layer of defense.

2nd Layer of Defense

The 2nd Layer of Defense is the site property surrounding the building. In the case of Baxter Arena, this would include all the street furniture and sidewalks within its property lines. In **Error! Reference source not found.**, the green hatched area shows the 2nd layer of defense.

3rd Layer of Defense

The 3rd Layer of Defense is the building itself. This includes the exterior and interior aspects of the building. **Error! Reference source not found.** shows in the blue hatch area, the arena itself, as the 3rd layer of defense.

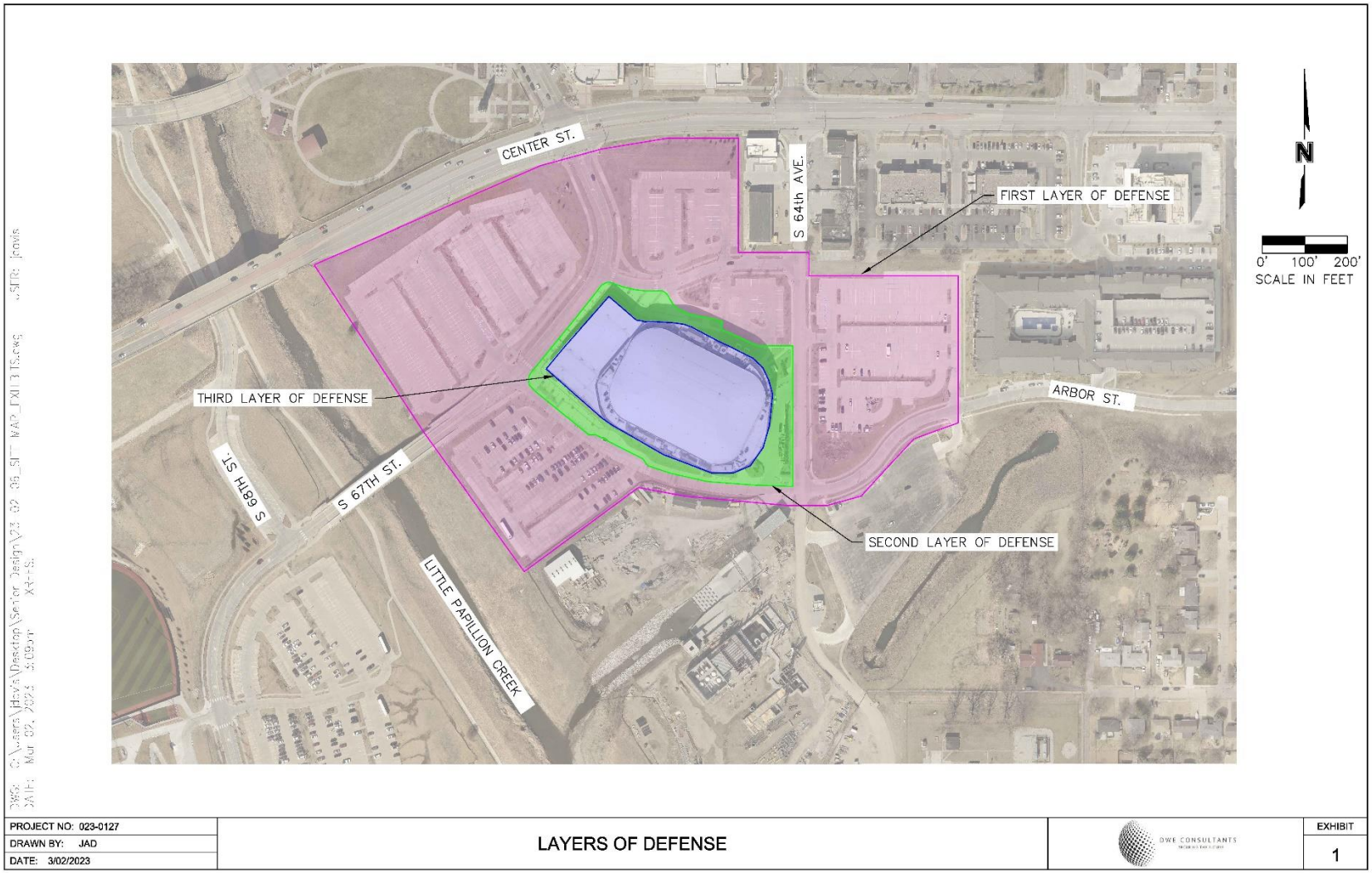


Figure 1. Layer of Defense Exhibit

A site can be enhanced in many ways, such as increasing barriers, or changing the layout of roads leading towards the building. This report will be focusing on the 3rd Layer of defense, mainly a security measure that can be implemented inside Baxter Arena.

The security measure that will be discussed is metal detection. Metal Detectors have been increasingly used across the world to increase safety by preventing and deterring attacks. The global metal detector market is expected to have a compound annual growth rate of 3.9% from 2021 to 2027 (Businesswire, 2022).

This report will discuss the two different options for metal detectors, handheld or walk-through metal detectors. It will also give a rough cost estimate for both options as well as the benefits and negatives of both. The implementation of metal detectors will also be assessed for the impacts it will have on public health, safety, and welfare as well as any cultural, societal, environmental, and economic impacts.

Walk-through Metal Detectors

This section will discuss the aspects of installing walk-through metal detectors at the entrances of Baxter Arena. The key areas it will look at include the different metal detectors that could be installed, and a rough cost estimate for the chosen metal detector. The layout of the metal detectors will also be discussed along with any electrical requirements. Benefits and downsides will be addressed, and pedestrian traffic flow through the metal detectors will be analyzed to see if time is increased or decreased from their use.

Options

Two options will be discussed in this section. These options are the Garrett PD 6500*i* walkthrough metal detector manufactured by Garrett Metal Detectors. The second option is the Evolv Express Touchless Security Screening manufactured by Evolv Technologies.

Garrett PD 6500*i*

The Garrett PD 6500*i* *(*https://garrett.com/security/walk-through/pd-6500i-walk-through-metal-detector) metal detector meets the security standards of most international airports including U.S., European, French, Spanish, and Japanese airports. The metal detector is split up into 33 zones to ensure all weapons will be detected. The dimensions of the metal detector are a height of 80 inches and a width of 35 inches. The detector has an overall depth of 23 inches. Because the width of the passageway is 25 inches, it exceeds the minimum ADA compliance width of 32 inches. Specifications can be found in Appendix A.

Evolv Express

A recent technology that promises to provide higher security with less wait time is the Evolv Express (https://www.evolvtechnology.com/products/evolv-express) Touchless Security Screening by Evolv technologies. The technology can be programmed to ignore objects like cellphones and keys while still detecting guns, knives, and sharp objects. This metal detector would be important for areas where traditional metal detectors may cause long queue lines. More information on this product can be found in Appendix A.

Layout

This section discusses the layout of the metal detectors. The figure shown below gives a proposed layout for the Garrett metal detectors. This includes five metal detectors at the main entrance and four metal detectors at the North Entrance. The layout of the Evolv Express units was not proposed because Evolv Express proposes and installs the layout after a site visit of the venue. The metal detectors are spaced 36 inches apart to ensure ADA standards are met.

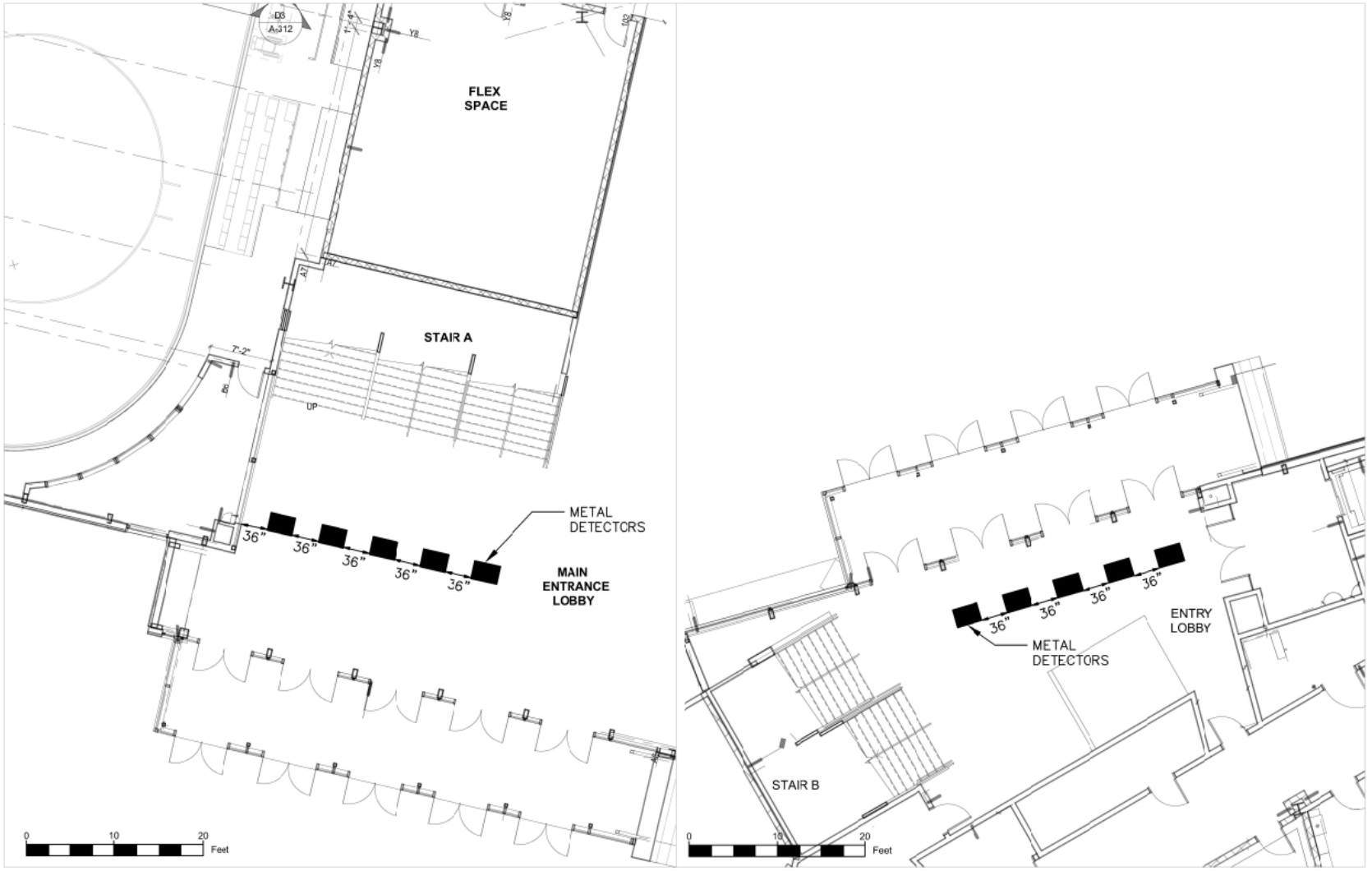


Figure 2. Metal Detectors Layout

Cost Estimate

In this section the cost of both options will be compared. **Error! Reference source not found.** shows the cost of both options.

Table 1. Walk-through Metal Detector Cost Estimate

Walk-through Metal Detector Cost Estimate			
Type	**Price**	**Quantity**	**Total**
Garrett PD6500*i*	$ 5,500.0	10	$55,000.0
Evolv Express (single lane)	$ 35,000.0	2	$70,000.0
Evolv Express (dual lane)	$ 42,500.0	2	$85,000.0

The cost of the Garrett PD6500*i* is approximately $5,500 for a single metal detector. The quantity was obtained from the proposed layout in the previous section. The Evolv Express has two different prices that depend on whether the metal detector is a single or dual lane. The price of the Evolv Express units is also based on a 4-year subscription. The Manufacturer Suggested Price (MSRP) for a single lane is $140,000 and for a dual lane is $170,000. Because this price is for a total of four years, the cost estimate was broken down into the cost for a single year. For the single lane, the yearly cost would be $35,000, and for the dual lane the cost would be $42,500. One thing to note for the Evolv Express is that the MSRP is a suggested price. The price may decrease depending on negotiation and the number of units being used.

Electrical

The Garett PD 6500*i* operates with fully automatic 100 to 240VAC, 50 to 60 Hertz, or 45 watts (Garrett PD 6500*i* Specification Sheet, 2020). These electrical requirements follow the common electrical requirements of most outlets in the United States and would likely not require any

electrical changes for the entrances of Baxter Arena. Evolv Express has similar power requirements of 100-240 VAC and 50 to 60 Hertz (Evolv Express Operator Manual, n.d.). This system will also not require major electrical changes.

Benefits

There are numerous benefits to using walk-through metal detectors. One benefit is its time-efficiency. Most stadiums and arenas employ some form of searching patrons before giving them access to a building. This includes pat downs, bag checks, or hand-held metal detection. Using a walk-through metal detector decreases the amount of time needed to search an individual person, allowing for shorter lines and faster security checks. Another benefit is increased detection, as metal detectors have a greater detection than pat-downs, or non-metal detector security checks.

Downsides

A common downside listed for metal detectors is their invasion of individual privacy. While individual privacy is important and should be respected, the privacy of an individual is outweighed by the safety of others. Another downside is the potential for health complications. This is especially true for individuals who have pacemakers, infusion pumps, spinal cord stimulators, and ventilators (National Institute of Justice, 2001). Precautions should be taken for these individuals, but metal detectors do not cause significant symptoms in most individuals (American Heart Association, 2022).

Pedestrian Traffic Statistics

The pedestrian traffic statistics will vary based on the metal detection unit used. Because of this both systems listed above will be discussed separately.

For the Garrett metal detectors, it is estimated that it takes around 9 seconds to walk through a metal detector. This equals 6.67 individuals a minute, or 400 an hour (Patron Screening Best Practices Guide, 2016).

During an interview with an Evolv Express Representative, the pedestrian statistics of 3,500-3,800 were given for the dual indoor units, and 2,000 was given for the single lane indoor units per hour. The Evolv Express System screens a higher number of patrons because individuals are being screened as they flow through the system, instead of having to walk through individually.

Using the amount of Garrett metal detectors from the layout, around 3,600 patrons would be screened an hour. Using two dual lane Evolv Express units, 7,600 patrons would be screened an hour. Two single lane Evolve Express units would screen 4,000 patrons an hour.

Handheld Metal Detectors

Handheld Metal Detectors are another form of metal detection that can be used to increase security. They are also cheaper compared to Walk-through Metal Detectors, making them a great option when security needs to be increased but budgetary factors preclude walk-through metal detectors.

Options

Two options are considered in this report. The first option is from Garrett, the same manufacturer as one of the walk-through metal detectors. The specific product is called the Garrett Super Wand (https://garrett.com/security/hand-held/superwand-hand-held-metal-detector). The other option is manufactured by CEIA USA, and the product is called the PD140E compact handheld metal detector (https://www.ceia.net/security/product.aspx?a=PD140E).

Garrett Super Wand

The Garrett Super Wand measurements are a width of 3.25 inches with a thickness of 1.25 inches and a length of 19 inches. More information is included in Appendix A.

PD140E

The PD140E is manufactured by CEIA USA and is compliant with the National Institute of Justice Standard. The dimensions of the metal detector are 14.2 inches long, with a width of 3.2 inches and a thickness of 1.6 inches. The battery life for this product is around 100 plus hours of continuous service. More information on the specifications can be found in Appendix A.

Cost Estimate

The cost of the Garrett Superwand and the PD140E are very similar. An exact price could not be determined for the PD140E, so an estimated price based on similar detection wands was used. It is estimated that around 9 handheld metal detectors would be needed for Baxter Arena, this number is based on the earlier layout of the walk-through metal detectors. The cost estimate of these wands is significantly cheaper than the cost estimate for the walk-through metal detectors. This is due to the size and detection method of the handheld metal detectors.

Table 2. Hand-held Metal Detector Cost Estimate

Hand-Held Metal Detectors			
Type	**Price**	**Quantity**	**Total**
Garrett Superwand	$ 179.0	9	$1,611.0
PD140E	$ 170.0	9	$1,530.0

Benefits

Benefits of a hand-held metal detector are like those of a walkthrough metal detector in that they provide increased security. Hand-held detectors are a more portable option compared to walk-through metal detectors, making them a better option when space is limited or when outside or

multiple location uses is needed. Hand-held metal detectors are also more cost-effective with an estimated 2009 price of $100-$400 compared to $2,000 -$10,000 for walk-through metal detectors (Homeland Security, 2009).

Downsides

A downside to hand-held metal detectors is that it can take more time than a walk-through metal detector. Even so, because most venues have some form of security check in place already, the time to check with a hand-held metal detector would not be much longer than a pat-down. Hand-held metal detectors can have the same effect on pacemakers and other medical implants that walk-through metal detectors cause.

Pedestrian Traffic Statistics

Because both handheld metal detectors use the same screening methods, the timing for both will be the same. It takes approximately 16 seconds to screen a patron. This equals 3.75 patrons a minute, or 225 patrons an hour (Patron Screening Best Practices Guide, 2016). Using nine handheld metal detectors would screen around 2,025 patrons an hour. This number is significantly lower than walk-through metal detectors mainly because it takes longer to screen using a handheld metal detector compared to a walk-through metal detector.

Impacts

In this section the impact of implementing metal detectors at Baxter Arena will be assessed by seven different factors. These factors are listed in the following sections.

Public Heath

Public health will be impacted positively from the implementation of metal detectors. Public health is endangered when people become injured either physically or emotionally. Metal Detectors will detect potential weapons, decreasing the likelihood of an attack happening. This will decrease physical and mental injuries.

Safety

Safety will also be increased with the implementation of metal detectors. Metal Detectors screen against weapons such as knives and guns that can cause harm to patrons at an event. The ability to detect and confiscate these weapons increases the security of an event.

Welfare

Welfare encompasses public health and safety. Because both public health and safety are positively impacted, welfare will also be positively impacted. Metal detectors also avoid pat-downs which can invade individual privacy and lead to a negative impact on welfare.

Cultural

Culturally, the United States has seen an increase in the use of metal detectors in airports, schools, museums, and venues. Implementing metal detectors will positively affect the culture by assuring patrons that security measures are being taken to assure safety. It will also show that the venue cares for the safety of its patrons.

Societal

A study from the National Academy of Sciences found that PTSD was present in a third of the population that was affected by the Oklahoma City Bombing (S. Butler, et.al., 2003). Mass shootings and terrorist attacks will affect individuals for the rest of their lives. Using metal detectors to prevent these attacks from happening decreases the likelihood of an attack and its detrimental effects. This produces a positive societal impact.

Environmental

The components in metal detectors may pose an environmental risk to the environment if disposed of improperly. Because metal detectors will be used on the inside of the building, the environment will not be greatly impacted.

Economic

A major argument against increased security is the misconception that there will be a loss of patrons. A study conducted by the USC Center for Risk and Economic Analysis of Terrorism Events (CREATE) showed that patrons are more likely to attend events that have increased security. An increase in attendance leads to an increase in tickets, travel, and overall revenue for a community (Security Magazine, 2020). Enhancing Baxter's safety through providing metal detection will create a positive economic impact for UNO and the City of Omaha.

Sustainable Development Goals (SDGs)

The Sustainable Development Goal that this project will be fulfilling is SDG 16. The SDG 16 goal states that it will "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels." (United Nations, 2022). To measure how this project will fulfill this goal, it will be viewed through the following target and indicator.

Target: Significantly reduce all forms of violence and related death rates everywhere.

Indicator: 16.1.2 conflict related deaths per 100,000 population, by sex, age, and cause.

The main hazards that metal detection would decrease are shootings, bombings, and stabbings depending on the system used. The detection rates will also vary based on the effectiveness and sensitivity of the metal detection system. For the purposes of this study, it was assumed that the implementation of metal detectors would prevent the loss of 8 lives. This was used to calculate the decrease this would cause to the national and global death toll from the combination of mass shootings, terrorist attacks and stabbings.

The information used to determine the impact of this analysis was information on the loss of lives both nationally and globally due to shootings, bombings, and stabbings. Nationally, the average number of deaths per year due to terrorism is 50 deaths (Ritchie, H. et. al., 2013). The average amount of people killed from mass shootings is around 51 people (Lynch, S., 2022). Around 1,035 people are killed in the USA from knives or instruments each year (Statista Research Department, 2022). The total population of the USA is around 333,287,557 (census.gov, 2022). The amount of deaths per 100,000 of the US population is 0.3409 deaths per every 100,000 people. If eight individuals were saved from Baxter installing metal detectors the deaths per 100,000 people would decrease to 0.3384 deaths per 100,000 people. This is not a drastic decrease, but any decrease in deaths is better than none.

Looking at the global death rates, around 26,000 people are killed by terrorist attacks each year (Ritchie, H. et al., 2013). The deaths due to mass shootings are around 62.76 deaths (TRT World, 2022). The number of stabbings is around 97,183 globally in 2019 (United Nations, 2019). The total population of the world is 8 billion people (United Nations, n.d.). This equates to around 1.54 deaths per every 100,000 people in the world population. This could decrease by 0.0001 per 100,000 people if the improvements at Baxter Arena prevented an attack. This decrease is very small, but it is an improvement.

Recommendations

Four metal detection options have been discussed in this report. While all four would aid in increasing security at Baxter Arena, the walk-through metal detectors would provide greater security without increasing patron entry time. Of these two options, Evolv Express is recommended because it has the least impact on the entry and exit of patrons from an event.

References

USAToday. (August 18, 2022). Mass killing database: Revealing trends, details and anguish of every US event since 2006. (Accessed March 17th, 2023).

FEMA. (2007). FEMA 430: Site and Urban Design for Security. U.S. Department of Homeland Security, Washington D.C.

Businesswire. (August 15, 2022). Global Metal Detector Market Analysis Report 2022 A $2 Billion Market to 2027 – Trends, Opportunities and Competive Landscape – ResearchandMarkets.com. (Accessed March 17th, 2023).

Garrett PD 6500*i* Specifications Sheet. (January 2020). Garrett Technologies. https://garrett.sharefile.com/share/view/s97c204d226f5401ca36023b1127236a3/fo77ec24-2299-44e7-a989-253f5aeac7ee

Evolv Express Operator Manual. (n.d.) Software Version 4.0. Evolv Technologies. https://s.ipvm.com/uploads/embedded_file/829f9cb7b9cc39eea48787d487ad4f04f0a247e906bc1ee2a738b0c27ecc2a35/fc9c4a02-bbe8-4975-bb59-dcd51f633030.pdf

National Institute of Justice. (January 2001). Users' Guide for Hand-Held and Walk-Through Metal Detectors, NIJ Guide 600-00. National Law Enforcement and Corrections Technology Center, Rockville, MD.

American Heart Association (Nov. 28, 2022). Devices that May Interfere with ICDs and Pacemakers. https://www.heart.org/en/health-topics/arrhythmia/prevention--treatment-of-arrhythmia/devices-that-may-interfere-with-icds-and-pacemakers#:~:text=Don't%20stand%20near%20the,such%20as%20a%20pat%20down. (Accessed March 17th 2023).

Patron Screening Best Practices Guide. (March 2016). Department of Homeland Security. https://www.cisa.gov/sites/default/files/publications/patron-screening-guide-03-16-508.pdf

Homeland Security (July 2009). Metal Detectors for Personnel Screening.

S. Butler, A. Panzer, L. Goldfrank. (2003). "Preparing for the Psychological Consequences of Terrorism: A Public Health Strategy." National Library of Medicine. https://www.ncbi.nlm.nih.gov/books/NBK221638/

Security Magazine (September 11, 2020). Americans willing to pay more for increased security at public venues. https://www.securitymagazine.com/articles/93330-americans-willing-to-pay-more-for-increased-security-at-public-venues

United Nations (2022). The Sustainable Development Goals Report 2022. https://sdgs.un.org/goals/goal16 (Accessed 3/8/2023).

Ritchie, H., Hasell, J., Mathieu, E., Appel, C. and Roser, M. (2013). Terrorism. Our World in Data. Revised October 2023.

https://ourworldindata.org/terrorism#:~:text=In%20most%20years%20terror%20attacks,the%20United%20States%20every%20day. (Accessed 3/24/2023)

Lynch, S. (February 2022). Death toll from mass shootings in the United States is rising, study finds. Reuters.com. https://www.reuters.com/world/us/death-toll-mass-shootings-united-states-is-rising-study-finds-2022-02-04/

Statista Research Department. (October 2022). "Number of murder victims in the United States in 2021, by weapons used". https://www.statista.com/statistics/195325/murder-victims-in-the-us-by-weapon-used/

Census.gov. (December 2022). Growth in U.S. Population shows Early Indication of Recovery Amid Covid-19 Pandemic. https://www.census.gov/newsroom/press-releases/2022/2022-population-estimates.html#:~:text=DEC.

components%20of%20change%20released%20today.

United Nations. (2019). Global Study on Homicide. Office on Drugs and Crime. https://www.unodc.org/unodc/en/data-and-analysis/global-study-on-homicide.html

United Nations. (n.d.) Population. https://www.un.org/en/global-issues/population#:~:text=The%20global%20human%20population%20reached,and%202%20billion%20since%201998. (Accessed 3/24/2023).

Appendix A

Figure 3. Garrett Walk-Through metal detector Fact Sheet

Touchless Security Screening

Evolv Express®

The days of invasive weapons screening are over.

Screening procedures that rely on metal detectors, hand wands, and invasive bag checks are slow and manual, resulting in uncomfortable, and unsafe, crowding.

Introducing the Evolv Express®

Evolv Express is the world's first and only touchless security screening solution that meets all of the post-pandemic security screening requirements. Express is proven to operate up to ten times faster than traditional metal detectors with its dual-lane, free-flow entrances and fusion of new sensor technology and artificial intelligence. The system is able to spot weapons while ignoring harmless personal items all while visitors simply walk through at a natural pace. Families and groups of people can now walk in together without long lines. It's a welcoming experience and allows them to make their way to the concessions or seats quicker.

AI differentiates personal items from threats.
Unlike traditional metal detectors, Evolv Express uses advanced sensor technology and artificial intelligence to screen guests while they walk through at a natural pace—without stopping and without handing over their belongings. Express offers a dual-lane, free-flow system proven to operate up to ten times faster than traditional metal detectors, alerting operators to the presence of weapons while ignoring harmless personal items like cell phones, keys, and coins.

See potential threats for faster issue resolution.
When a potential threat is detected by the system, real-time image aided alarms show guards where the potential threat is located on a person or in his or her bag. This greatly reduces the amount of physical contact required and allows guards to act quickly and efficiently.

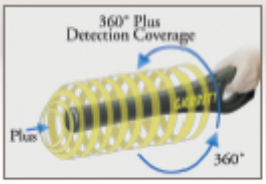
Prioritize the guest experience.
Families and groups can enter your venue together without long lines and without invasive checks. It's a welcoming experience that maintains dignity and accelerates entry for your guests and employees while keeping venues and facilities safe from threats.

Figure 4. Evolv Express Fact Sheet

Garrett *SuperWand*®

Hand-Held Metal Detector

Made in the USA



Made in USA — Look for the mark of Garrett quality

ISO 9001 CERTIFIED

No tools required to change standard 9V battery (included).

Three-color LED Indication	Green LED = ON Amber LED = LOW BATTERY Red LED = ALARM
Operating Temperatures	-35º F (-37º C) to 158º F (70º C)
Width	3.25" (8.3 cm)
Thickness	1.25" (3.2 cm)
Length	19" (48.3 cm)
Total Weight	18.6 oz (.53 kg)
U.S. Patent No.	D459,246 S
Battery Requirements	one 9V (included)
Warranty	2 Year, Limited Parts/Labor

Regulatory Information: The *SuperWand*® meets U.S. and international regulatory requirements for electromagnetic safety. Extensive research has found no information that would indicate Garrett products have adverse effects on pregnancy, medical devices (such as pacemakers) or magnetic recording media. However, directives by physicians and medical device manufacturers regarding metal detectors should be followed.

SUPERWAND Accessories (sold separately)

Rechargeable Battery Kit
110V Part No. 1612000
220V Part No. 1612100
Includes two (2) environmentally friendly Cadmium-free NI-MH batteries and charger.

Belt Holster
Part No. 1620300
Made with durable ballistic weave material and can be belt mounted.

GARRETT METAL DETECTORS
www.garrett.com

1.800.234.6151 (USA and Canada)
1.972.494.6151
1881 W. State Street
Garland, TX 75042
Email: security@garrett.com

Figure 5. Garrett SuperWand Fact Sheet

Figure 6. PD140E Fact Sheet