Music in Site: Integrating elements of site-specificity into composition

Mace Francis
Edith Cowan University

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Music in Site

Integrating Elements of Site-Specificity into Composition

Mace Francis

BMus Hons (First Class)

This thesis is presented in fulfilment of the requirements for the degree of

Doctor of Philosophy

West Australian Academy of Performing Arts

Faculty of Education and the Arts

Edith Cowan University

November 2014
Abstract

Architectural spaces and their acoustic characteristics offer unique musical material for the compositional process. Acoustic and physical design features of unorthodox performance spaces can become part of works and their performances. This thesis examines ways to integrate acoustic characteristics of an architectural space into the compositional process, and discusses how different levels of site-specificity may be engaged in this process.

This research grew from an interest in composing music for the acoustic problems of performance spaces rather than trying to resist them, after a jazz ensemble performance in a large reverberant space. This led to exploring built environments that offered an acoustic characteristic which could be used to initiate musical material which is directly linked to the site.

Three sites were chosen as starting points for composition according to their varying acoustic characteristics; a stairwell, a tunnel and a bridge. Each site presented unique acoustic and physical characteristics as well as challenges which required creating a pre-compositional testing and work-shopping methodology. The processes and experiments engaged led to three varying compositions which are discussed in part two of this exegesis.

The research also draws inspiration from secondary literature in theatre, dance and choreography that interrogates the way works can be linked to their particular site. British academic Fiona Wilkie developed a scale of site-specificity for theatre that provides a useful tool to gauge the level and type of site interaction each composition maintains and forms a frame for the different approaches used. In addition, dance choreographer and theorist, Fiona Hunter’s methodology for testing the possibilities of a site for an artwork has been employed. The three creative works at the centre of this project, Stairwell to Fifteen (four brass musicians, cimbalom and found percussive sounds in a stairwell), From Traffic Rises (eight acoustic musicians, electronics and four speakers) and Tunnel Listen (two clarinets, soprano sax, alto sax, tenor sax, two trumpets, two trombones and tuba) explore a range of approaches to site-specificity and embodiment as compositional devices.

The outcome of this research has not only been the creation of these three new works, but also the exploration of an alternative compositional process which begins and is informed by a physical space as a musical starting point.
The declaration page
is not included in this version of the thesis
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PART ONE: BACKGROUND

Chapter 1: Overview and Background to the Research

1.1 Rationale for the Project
When composing music which will ultimately be presented in traditional performance venues, composers rarely consider the performance space itself as a source of inspiration. Purpose built performance spaces such as concert halls, jazz clubs and auditoriums are usually designed to present music in such a way “as to reduce the amount of destructive interference” (Henderson, 2014). Exploring unorthodox performance spaces and their acoustic and sonic possibilities during the composition permits a fresh perspective on the compositional process. It is this potential in the space itself that has prompted me to reconsider the role of performance spaces and what creative possibilities they may have to offer my music, starting from the composition stage.

The germ of the idea for this research project came about while my ensemble, the Mace Francis Orchestra (MFO) was performing at The Perth Convention Centre in 2007. The performance site is a large indoor space with a high ceiling and hard reflective walls. This highly reverberant site proved less than ideal for live music performance as the sound bounced repeatedly off the walls, creating a chaotic echo for the majority of the performance. One of the pieces, Ice Breaker (2007) composed by MFO ensemble member Andrew Murray, featured a straight semi-quaver rhythmic groove. I noted that the bounce back from the room was in exact triplets to the crotchet tempo we were playing. While this was very confusing and frustrating at the time, it did instigate interest in the possibilities of working with these acoustic ‘problems’ rather than trying to work against them. I began to wonder how music could be composed to integrate these acoustic qualities of the performance site.

1.2 An Introduction to Process
This research project started as a personal creative journey to explore compositional techniques and music outside of my current experience as a composer. The result has
been the development of three new works that explore different relationships between a site and my compositional process. This includes the consideration of: acoustic and sound characteristics of the sites, compositional methodologies, and ways the site can be part of the live performance of a work. The works are entitled *Stairwell to Fifteen* (Francis, 2013a), *From Traffic Rises* (Francis, 2012c) and *Tunnel Listen* (Francis, 2013b).

After some initial exploration, three urban sites in the Perth metropolitan area were chosen as a basis for the works- a stairwell, a pedestrian bridge and a tunnel. To find these three appropriate sites I spent a period of time seeking out various spaces in the state of Western Australia which I thought would be successful. These included sites like ‘The Wall’ at Churchmans Brook which features a sheer flat granite face 30 metres high (Tourist website, 2006), the ‘Whispering Wall’ in Kings Park, the largest park in Perth City, as well as the underpass joining Trinity College and the University of Western Australia (UWA) in Nedlands. I also investigated undercover/multi level car parks, and the Swan View Tunnel in John Forrest National Park.

While all the sites I visited with high expectations were not as successful as I had hoped, the visits did develop an awareness of how spaces sounded and reacted to the sounds created within them. The three sites that were eventually chosen for this project were all discovered by accident. That is, I came into contact with these spaces while using them for their intended utilitarian urban purpose. I used the stairwell to get to an office at ECU, the tunnel while riding my bike and the pedestrian bridge while out walking. It wasn’t until I had developed an awareness from the previous site explorations that I realised their potential.

Each of the three chosen sites offered varying acoustic properties and new ways to initiate my compositional process. Each are man-made sites with a connection to travel or transport from one place to another, so have a purpose and meaning unrelated to their acoustic properties. This travel and transport element was also explored in my compositions.

I formed an ensemble of musicians made up of artists who I have collaborated with over my years in the jazz field. A different sized ensemble was created for each work, a
Music in Site

choice often dictated by the physical size of the performance space as well as the acoustic properties of the space. The ensembles varied throughout the design of each work as tests and experiments revealed the possibilities of each site.

Each composition was scored in a way that communicated my musical ideas to the musicians most efficiently. Both Stairwell to Fifteen and Tunnel Listen were scored using conventional notation without a key signature. This is a convention I was educated with through the study of contemporary jazz orchestral scores by composers such as Bob Brookmeyer (USA, 1929-2011) and Ed Partyka (USA, 1967-). In the workshop period for each piece, I conducted the ensemble and worked from the score while the musicians worked from separate instrumental parts that are produced and edited through the Sibelius notation software I use. These pieces were developed through a process of workshops, drafts, edits and rehearsals that resulted in a final performance as well as the scores contained in appendix two.

From Traffic Rises used a graphic notation system which allowed each member of the ensemble to read from a single score through a series of networked iPads using the Decibel ScorePlayer (Wyatt, 2013) software. The ensemble set up did not allow for the use of a conductor to coordinate the musicians due to the way they were configured in the space, and the music required a freer expression of rhythm and pitch enabled by the graphic notation.

In addition to performances of the works throughout my candidature, a final recital and recording of the three compositions took place on December 17th 2013 at two venues on the Edith Cowan University Mt Lawley campus. The performance was a key creative outcome of the research project, and it should be noted that the recorded evidence and corresponding scores of the compositions found in the appendices are merely representations of the pieces. Each piece is intended to be experienced in its performance setting to fully engage with the music’s relationship to site and the listener’s positioning is crucial for these compositions.

1.3 Researcher Background

Historians have emphasized innovation as a primary force driving jazz forward, identifying new techniques, concepts and structures that
presumably helped push the music to ever higher stages of development.
(Tucker & Jackson, 2013)

My background as a musician and composer has been in jazz, studying guitar performance and later graduating from jazz composition at the West Australian Academy of Performing Arts (WAAPA) in 2004. In 2005 I formed the thirteen-piece large jazz ensemble called the Mace Francis Orchestra (MFO) which I continue to direct and compose for. This ensemble’s instrumentation is based on the line-up of a traditional big band but with only thirteen musicians: four saxophones, three trumpets, three trombones, electric guitar, electric bass and drum kit. This smaller line-up and exclusion of a piano was a deliberate attempt to try to create a lighter, more open-sounding ensemble, allowing a focus on melodic lines rather than dense conventional harmony, while still having instrument numbers to create a large sound.

From the beginning of the ensemble’s formation, the focus has been on performing original music composed for the ensemble. There was a conscious choice in using the word ‘orchestra’ in the name of the ensemble, rather than ‘big band’. The latter term tends to conjure up preconceived ideas of music from the 1930/40’s, dance bands and composers such as Duke Ellington (USA, 1899-1974), Glenn Miller (USA, 1928, 1944) or Benny Goodman (USA, 1909-1986). As a jazz composer in the jazz genre, ‘orchestra’ implies a more creative freedom to explore a greater range of compositional concepts. Over the past nine years I have developed a musical style for MFO which has moved away from what could be considered a traditional big band jazz sound. Although there are definite elements in the compositions that could be considered belonging to the jazz idiom, such as a constant rhythm section pulse to drive the momentum of the music, improvisation over harmonic structures and the use of functional harmony, my handling of these are moving further away from jazz paradigms. Such techniques are exemplified in my composition Pandora’s Mood (Francis, 2011) which is composed with a textural focus using ambiguous, non-functional harmony for the accompaniment of a trumpet solo, and is characterised by less drum and bass repetition than usually featured in big band compositions. Works such as Pandora’s Mood mark the beginning of my interest in experimenting with jazz musicians outside jazz compositional formats.
The notion of external influences on musical content is by no means new and is something that I have always strived for in my own practice. In my compositional project *Chinese Whispers* (Francis, 2005, 2006, 2008, 2010) I invited composers to create a collaborative new work using the last composer’s work as a starting point. This research has provided a bridge from my usual creative practice to this proposed research project by way of setting external compositional parameters to influence my own process. In *Chinese Whispers* these compositional parameters are set before the project begins in the way of rules (ie. set pitches, tempo and instrumentation) and are combined with the situation of being presented with another composer’s work acting as a creative foundation. This proposed research project takes on this interest in external influences and develops it further.

### 1.4 Influences on the Project

This moving away from the ‘big band’ sound has been an international trend for many contemporary large jazz ensembles over the last three decades. Composers such Maria Schneider (USA, 1960-) and Bob Brookmeyer create orchestral textures with their saxophone section musicians doubling on flutes, clarinets and double reed instruments. Brookmeyer’s composition *Elegy* (2002) was composed for his friend and composition teacher Earle Brown (USA, 1926-2002) (Brookmeyer, 2003) from whom he studied with between 1982 and 1985. Brown was a renowned experimental avant-garde composer who was associated with the New York School of composers which also included John Cage (USA, 1912-1992), Morton Feldman (USA, 1926-1987) and Christian Wolff (France, 1934-) (The Earle Brown Music Foundation, 2013).

Brookmeyer said of that period, “He [Brown] asked me to ‘through-compose’ more, less ‘free stuff’” (Francis, 2004b). The composition features the melody played by cor anglais in the saxophone section which is a very unusual instrument for a jazz orchestra. During this period Brookmeyer also “began listening and studying music by western classical composers, Lutoslawski, Berioz and Ligeti... and studied composition and conducting with Joel Thome [USA, 1939-] who introduced Brookmeyer to the use of numbers in composition” (Francis, 2004a, p. 8).

Many of my own influences and inspirations are jazz composers who do not fit into a classical definition. Brookmeyer’s searching for compositional influences outside of
jazz is evident in his teaching where the only texts that he gets his students to read are *The Shaping Forces in Music* (Toch, 1977) and *Serial Composition* (Brindle, 1966), neither of which are ‘jazz’ texts (Francis, 2004a, p. 12).

Schneider comments about her conscious conceptual changes from big band tradition to her new sound in an interview for the online jazz journal *All About Jazz*;

> I had to stretch out further and further and make the music more orchestral. As my music goes further away from typical big band idiom, the musicians have to stretch their conceptions of what it means to sit in a big band setting. (Williamson, 1999)

One of Schneider’s most recent compositions, *Winter Morning Walks* (2012) was not written for her usual creative vehicle, her jazz orchestra, rather the Australian Chamber Orchestra featuring classical soprano singer Dawn Upshaw (Schneider, 2014). Schneider speaks of her influences which are outside the usual jazz idiom of creating melodies over chord progressions. She talks of being inspired by nature;

> When I delve into the world and look at trees, and you look at the magnificence of birds, their path to migration, it’s really inspiring. My reason for making music is the joy of expressing the beautiful things in life. (Cole, 2012)

While innovators such as Schneider and Brookmeyer look outside of the jazz tradition to classical and experimental music influences, as well as to the natural world for their large jazz ensemble compositions, I decided to look even further afield, to outside of traditional ideas of ‘music’ altogether. Much like experimental composers such as Alvin Lucier (USA, 1931-), Meredith Monk (USA, 1942-) and Iannis Xenakis (Greece, 1922-2001), I decided to draw compositional inspiration not from any musical style, but from the physical acoustic and sound properties of sites.

**1.5 Research Questions**

The aim of this research is rooted in my desire to expand my compositional practice by using the acoustic characteristics of a physical site as material for new compositions. I wondered if a new compositional process that integrates and interacts with the acoustic
and sound characteristics of a specific site could be developed. I chose three sites that possessed unique acoustic qualities and possibilities and undertook pre-compositional tests to discover how they could be used in compositions.

This compositional methodology is very different to what I would usually employ in the creation of a new musical work. Throughout this research project I have discovered how much of my usual compositional process does not ever consider the final performance site until the actual performance or sound check. Whilst composing music to be performed, I did not consider the effect of the final performance site and it was only considered if there was a challenge, such as interference or annoyance.

1.5.1 General Research Questions
Throughout the work-shopping and composition of the three pieces, the following broad research questions have been addressed:

- What elements of a site can be successfully integrated into the compositional process?
- What ways a physical site can be made an integral part of a music performance?
- What degrees of site-specificity can be realised in music compositions?

As each project developed, they revealed their own research questions which were specific to each site.

These questions are addressed in each composition, and are discussed in the subsequent chapters.

1.6 Chapter Overview
This exegesis is divided into two parts. Part one is made of three chapters that provide the background to the research and the research questions. Chapter One introduces the project, my background as a composer and the research rationale. Chapter Two discusses the positioning of my project in the current field of research discussing key works and theoretical concepts that have influenced my research. Definitions of site-specificity, sound art, soundscape, spatialisation, composition and improvisation will all be discussed in relation to my work. Chapter Two then introduces the methodologies
employed to create the works from the initial surveying of potential sites through to the performance of these new works.

Part Two consists of three chapters that explore each composition in detail. The structure of each of these chapters is chronological in nature, discussing the events leading up to choosing the particular site, through the experimentation and work shopping of the site, composing the various drafts and finally the performance and recording of each piece.

A fourth chapter in Part Two concludes the exegesis with a summary of the findings related to the initial research questions and the potential for further research.

1.7 Documentation
Scores and recordings of the works are included with this document in the appendices. As discussed earlier, this research is grounded in the relationship of composition and the performance space, and it is important to experience the works in a live performance setting. The experience for the listener is very specific in each piece and relates to the position of the listener in the space during the performance. These aspects are difficult to render on a stereo audio recording, and a spatialised recording was beyond the scope of this project. While whole recordings of the performances are included in Appendix Two, it must be noted that these are only a guide for the reader. Scores are included in Appendix One and video footage of the final live performance of the works in Appendix Three. Photographs have been included throughout the exegesis to add context to the music and how they relate to the performance site.

1.8 Research Limitations
This research project was limited by logistical and financial factors. Due to financial means, I limited the number of musicians involved in workshops, testing, rehearsals and performances to a few colleagues. I decided that ten musicians kept the project realisable whilst providing enough instruments and timbral variation to explore ideas. I was also limited by the time that these musicians were able to contribute to this research project as they all work other jobs and perform with other musical ensembles.
I also limited myself to sites within a thirty minute drive from the Perth CBD. While it restricted the range of possible sites, it was much more manageable when asking participants to contribute their time.

It should be noted that this research deliberately avoids a thorough engagement with the science of acoustics. My research and response to the musical tests and experiments are intuitive, in keeping with my compositional practice and the practice-led methodologies employed. As composer Alvin Lucier notes;

*I am not as interested in the resonant characteristics of spaces in a scientific way as much as I am in opening that secret door to the sound situation that you experience in a room.* (Simon & Lucier, 2013, p. 195)

**1.9 Chapter Summary**

Chapter One has provided an introduction to the research that has included discussions of the background and influences to the project and my own work. The format of the exegesis and its relationship to the practical part of the project has been described and the research questions and limitations outlined. The next chapter will discuss the positioning of my project in the current field of research discussing key works and theoretical concepts that underpin my research. Definitions of site-specificity, sound art, soundscape, spatialisation, composition and improvisation will all be discussed and the methodologies employed to create the works from the initial surveying of potential sites through to the performance of these new works are discussed.
Chapter 2: Positioning the Research

2.1 Introduction

Three sites have been chosen as the central research focus for this project: a stairwell, a pedestrian bridge and a tunnel. Each of these architectural and man-made spaces has been designed to control and manoeuvre humans through space and time, creating patterns of behaviour which may or may not be obvious to the users of these everyday mundane spaces.

My research has focused on what each of these sites can offer me by way of compositional inspiration and material. In the early stages of this research I discovered that the built environment provided consistency in construction, approachability and their acoustic characteristics. In comparison, outdoor natural sites risk being “an almost hopeless task, since the probable variability in each situation is so great” (Brant, 1967, p. 237). The three chosen sites were easy to access and without interference, even though they were still being used by the public. Additionally, their acoustic characteristics remained stable every visit. The traffic soundscape on the pedestrian bridge, whilst outdoors, remained consistent at every visit so long as I returned at approximately the same time and day of the week.

My intention with each of these sites was to find compositional techniques and musical material within them. This ‘inspiration’ came to me through attentive listening on site, testing the site with a ‘tool kit’ I developed for that specific purpose and experimenting through guided improvisation with other musicians. This ‘tool kit’ (see Figure 1) was a small bag of items that allowed me to test and record the site in more detail and was easy and convenient to travel with. The kit grew over the period of the research project, and ended up including the following items:

My journal and pencil, digital audio recorder, tape measure, melodica, cow bell, drum stick and mobile phone. My mobile phone contains tools which I used in this research including the built-in camera, the Mobile Metronome application built by Gabriel Simões and a decibel reader application called Sound Meter developed by Smart Tools Co. My phone is not in the photo as it is being used to take the photo. This core tool kit developed depending on what project I was working on at the time.
From these early tests and compositional investigations, a range of compositional material revealed itself to me which I decided to treat, using a variety of compositional techniques. Many of these were new to my jazz composition training and more closely related to contemporary western art music techniques such as spatialisation, soundscape, sound art, graphic notation and electronic manipulation of sound.

This chapter begins with a discussion around the differences between the meanings of site and space. It then goes on to discuss the various ways sound reacts in built structures in relation to the sound phenomenon that I use in my research. This then leads to a discussion that examines both the theoretical underpinnings and methodology employed to deduce and engage the potential of the sites. The conceptual frame work of Fiona Wilkie’s scale of ‘site-specificity’ in the theatre is discussed and adapted, as is a methodology from Victoria Hunter’s concept of ‘embodying the site’ in her dance work Beneath (2004). An examination of range of contextual references for the work follows and a discussion of my practice-led methodology will round out the end of this chapter.

**2.2 Engaging with Site and Space**

Throughout the exegesis I refer to the location where these musical events develop from or occur as either ‘site’ or ‘space’. The term ‘site’ is defined in the Oxford Dictionary as “a place where a particular event or activity is occurring or has occurred” (Unknown, 2014). I prefer to use this term to describe the physical location of the places I have explored for their musical potential as it links to the concepts of site-specificity, which I will explore in more detail later in this chapter.
Music in Site

The term ‘space’ is also used to describe the physical location of the musical events, however it has a much broader use than the term ‘site’. Contemporary Brazilian performance artist Lílian Campesato provides definitions in relationship to her artworks:

*Many of the references attached to a site can be triggered by sounds and become part of the work. The idea of space is translated into the idea of site, incorporating social, psychological, perceptive, acoustic and visual characteristics of a place; space becomes a representational element in the artwork. (2009, p. 28)*

I engage Campesato’s important difference between site and space throughout the exegesis. ‘Site’ is used to describe the physical structure which I have explored for compositional and musical material. ‘Space’ is used in a more abstract way to describe both the physical location and specific aural environments created by compositions.

Each of the three works play with these ideas of site and space. *Stairwell to Fifteen* uses the stairwell site as the performance place and source of compositional material. It is also a built structure within which a reverberant musical sound space is created within the built structure by contributing sounds into to the specific site. *From Traffic Rises* takes the soundscape of an immersive sound space on the pedestrian bridge and translates it and its related spatial qualities into a specific ‘designed’ listening space: a concert hall. The tunnel site used in the creation of *Tunnel Listen* engaged a different approach again. By studying, recreating and exaggerating the acoustic characteristics of the tunnel, a new acoustic space is created in the concert hall performance site.

A thematic focus of the project has been the way sound interacts with, and exists in, the built environment. From this interaction I have drawn sounds, acoustic effects and spatial models which have led me to create three new works.

2.3 Sound and Architecture

*Can architecture be heard? Most people would probably say that as architecture does not produce a sound it cannot be heard. But neither does it radiate light, yet it can be seen [Steen Rasmussen]. (P. Doyle, 2005, p. 38)*
There has been a long association of music and the architecture that has either inspired it or housed it. Johann Wolfgang von Goethe famously said “I call architecture frozen music... the influence that flows upon us from architecture is like that of music” (Eckermann, 1839, p. 282). This association between the built environment and the sounds they effect, control or house is the focus of this research and the source material for my three compositions.

Architecture is defined by Barry Blesser and Linda-Ruth Salter as “the design, arrangement, and manipulation of the physical properties of a space” (2007, p. 1). They go on to explain that every space, both built and natural, because of its “numerous surfaces, objects, and geometries in a complicated environment creates an aural architecture” (2007, p. 2). This aural architecture is what I played with and tested to develop compositional material for each piece. Every space has unique aural architecture, therefore every space has its own acoustic characteristics to inspire new musical works.

2.4 Sounds Behaviour in Space

“Sound is a mechanical wave that results from the back and forth vibration of the particles of the medium through which the sound wave is moving” (Henderson, 2013). Architecture and the sounds that are produced in it share a close symbiotic relationship. “Sound is propagation and is therefore directly connected to circumstances” (Augoyard & Torgue, 2011, p. 9), such as the internal dimensions, size, shape and internal and external building materials of the space. In addition, the volume, timbre and density of a sound will affect its behaviour in a space. Below is a list of five sound behaviours in architecture, outlined by video and sound artist Bill Viola (USA, 1951-) in his paper titled The Sound of One Line Scanning (2013). Each of these sound phenomena were sought in the chosen sites and utilised in the composition process.

2.4.1 Reflection

When a soundwave is interrupted by other materials and surfaces, the wave is either reflected or absorbed or a combination of both. In the case of a solid surface most of the soundwave is reflected (Kurtus, 2005). Reverberation and echo are the reflections upon multiple surfaces within a space and are the two acoustic phenomena that I used a great deal of in Stairwell to Fifteen and Tunnel Listen.
2.4.2 Echo
I used echo in *Tunnel Listen* because of its rhythmic potential created by “the distinctly perceived repetition of a sound due to reflection” (Hutchison, 1972, p. 65). This repetition can be “single or multiple, depending on how many times the sound bounces” (P. Doyle, 2005, p. 38). In the case of the tunnel site, only a single repetition of the echo was created which is also known as ‘slap back’. This type of echo is much better suited for musical interaction because the repetition is “spaced with sufficient delay time to make the repeat clearly audible, but near enough in time to the source to provide a rhythmic effect” (P. Doyle, 2005, p. 235).

2.4.3 Reverberation
When multiple reflections in the space produce a condition where “a sound can be repeated over and over on top of itself, the past becoming indistinguishable from the present” (Viola, 2013, p. 42) - this is called reverberation, also known as ‘reverb’. This differs from echo as it depends greatly on the size of the site and the distance of the surfaces from the sound production. Echo needs a definite distance to hear the repetition of sound, whereas reverberation could also be described as the build up and then decay of a number of small echoes.

This difference can be observed in the stairwell and tunnel sites that I investigated. The stairwell is a contained small space with many hard surfaces reflecting the sound waves repeated all over the space, creating reverberation. This is in contrast to the tunnel which had hard surfaces and uninterrupted distance for the sound waves to travel, reflect and return in the form of an echo.

Reverb is an effect that can be applied to a sound signal during digital sound processing to make it ‘sound’ like it’s in a specific kind of space. This space could be anything from a recording studio or a jazz club stage to a concert hall or cathedral. Two common uses are to make instruments sound like they are being played in a specific space by post production recording techniques or to apply a thickness effect or an exaggeration of the “distance” effect (B. Doyle, 2011), which can be created by post production techniques usually with a range of reverb environments.
2.4.4 Resonance
Resonance occurs when soundwaves reinforce themselves. This can happen “either by the addition of an identical sound or when the material properties or spatial dimensions match the physical shape of the soundwaves themselves” (Viola, 2013, p. 42). Lucier describes this sound characteristic when talking about his seminal resonance work, *I Am Sitting in A Room* (1970). “The space acts as a filter; it filters out all of the frequencies except the resonant ones. It has to do with the architecture, the physical dimensions and acoustic characteristics of the space” (Simon & Lucier, 2013, p. 194).

I discovered some resonant tones in the tunnel site when I was testing the space with trumpet player Callum G’Froerer. Some of the pitches played on the trumpet, in the site, caused the space to create and sound out these resonant tones. I used this idea in *Tunnel Listen* as a compositional technique, which is similar to French composer Olivier Messiaen’s (1908-1992) technique ‘added resonance’. This is an orchestration effect that consisted “of a note or chord played quietly in the bass or upper register over louder principle material” (Van Der Walt, 2007, p. 17). The effect of this technique gives the feeling of the space just in control of its acoustics and reminds me of that moment just before the public amplification system (PA) starts to feedback in a sound check.

2.4.5 Sympathetic Vibration
This sound phenomenon occurs when a sound evokes the vibration or resonance of an identical sound source. Viola clearly explains with the example of when “a bell is struck, another identical one across the room begins vibrating, giving off the same sound” (2013, p. 42). During my tests in the stairwell site, sympathetic vibrations from the found percussion could be heard in the strings and resonator of the cimbalom. The hand-railings in the stairwell also vibrated sympathetically from the brass and cimbalom sounds throughout the performance of *Stairwell to Fifteen*. This supported the sensation of creating an acoustic space within the stairwell site.

All these sound characteristics affect our relationship with the built architectural space. Viola best describes this relationship between the architectural space and sound:

*The science of acoustics is the study of sound in space. It assumes strong architectural association because, although it can be described as simply*
the study of the behaviour of sound waves, sound manifests itself at its most complex and interesting when bouncing off solid forms, most noticeably those of man-made interior spaces. (Viola, 2013, p. 41)

2.5 Space and Musical Experience

Acoustics are used to influence our perception of the architectural space. An example of this could best be found in large cathedrals where “it is immediately noticeable that sound commands the space” (Viola, 2013, p. 41). On the other side of the scale, recording studios with acoustic treatment to ‘deaden’ the sound can feel stifling when you spend too much time in one.

Both the cathedral and recording studio examples are spaces that have been designed and built to fulfil a function of which the acoustic characteristic is of upmost importance. The modern recording studio is treated to become a neutral space, “with no ambience, no sound of its own” (Parkes, 2012) and lacking in any acoustic character so the sounds created inside of it can be controlled and enhanced in post production. This was different when studios were created for music that only used acoustic instruments with no amplification, as was Abbey Road Studios in London. These studios “were designed purely for their acoustics, for the sound you could achieve in the space” (Parkes, 2012).

The classic cathedral, built from the Middle Ages until the twentieth century, before the PA system was in common use, was created with large amounts of reverberation so the sound of the religious speaker and choir would travel and amplify in the space, enhancing the spiritual message. Sound & Space in Renaissance Venice (2009) by Deborah Howard and Laura Moretti is a book which scientifically studies the relationship between the architect, the composer and religious architectural spaces of Venice. Their research is based on experiencing the re-creation of religious choral works by the composers who created these works specifically for those churches in Venice during the sixteenth century. They open their book with a series of research questions;

To what extent did these architects themselves deliberately seek particular acoustic effects in the churches they designed? Did they discuss musical
It is interesting to note that in the sixteenth century they had a different theory of sound propagation to what we rely on now. They used an early Greek definition of sound, adopted by Roman architect Marcus Vitruvius Pollio (c. 80-70 BC-c. 15 BC), which was described to be “emitted in concentric waves like ripples on a pond” (Howard & Moretti, 2009, p. 6).

In contrast to light, which casts clear shadows, sound can be heard from behind an obstruction, and because of this characteristic, it proved difficult to identify the physical process correctly. (Howard & Moretti, 2009, p. 6)

It wasn’t until the seventeenth century that Isaac Newton revealed the theory of sound waves we rely on today, in his *Principia* (1687). Even so, the architects of the time had an understanding that the shape of the room, the building materials and the type of ceiling (dome or beamed flat) all influenced the acoustic characteristics of the space.

Howard and Moretti used a balance between scientific measurement and audience perception surveys as a basis for their research. They measured the early decay time (the time it takes the sound to die away), standard reverberation time (the time for the overall sound to die away to inaudible), clarity index (the measurement of the energy in the sound signal in the first eighty milliseconds) and lateral energy fraction (the measure of the amount of energy received from the side when the listener is facing the sound source) (Howard & Moretti, 2009, p. 16). These scientific findings were compared to the results compiled by the audience surveys which asked the listeners to rate their perception of the space by rating the loudness, clarity, reverberance, envelopment, intimacy, warmth, brilliance, echo, timbre, background noise, choir and organ balance and their overall impression of the acoustics (Howard & Moretti, 2009, p. 206). What they found was that the scientific acoustic quantitative data measured in the acoustic spaces was supported by the qualitative data collected from the non-expert audience participants. They conclude their book by stating while it is difficult to prove that the architects and composers worked together to create these ideal performance spaces,
there is evidence that during the sixteenth century “it must have become apparent through experience that the new complex polyphony needed a very fine balance between resonance and clarity, in order for the intricacies of the compositional innovations to be appreciated to the full” (Howard & Moretti, 2009, p. 200).

I was interested in testing what the spaces could offer the listener using a similar intuitive and perceptive list of criteria. I tested the stairwell by creating a range of sounds in the space and documenting the results. I let my ear guide me in trying to get the most out of the loudness, reverberation, envelopment and intimacy of the space. Instrumental balance, timbre and warmth were also experimented with to make sure the composition represented the space in a true way.

I refer back to the Lucier quote on page eight which comments on the difference between a scientific approach to the creation of a new work or the intuitive research of an artist; “I am not as interested in the resonant characteristics of spaces in a scientific way as much as I am in opening that secret door to the sound situation that you experience in a room” (Simon & Lucier, 2013, p. 195). It is that ‘secret door’ which I have tried to open in each of the three sites I have chosen for this research. I discovered different sound situations in each of the sites, not through scientific testing but through intuitive creative testing. I used improvising musicians in the stairwell and tunnel sites and for analysing the soundscape of the pedestrian bridge I utilised active listening. Through these intuitive methods I was able to unlock the compositional potential in each site.

The site itself defines and guides the musical material in each of my three compositions. Howard and Moretti propose that the performance space itself has guided the history of western music development to some extent, as discussed below.

2.6 The Influence of Space on Musical Development

David Byrne (UK, 1952-) argues in his book *How Music Works* (2012) that many music’s throughout history had been influenced, and their innovations driven by, the physical spaces that were available for them to perform. His theory supports my idea for a reversed composition process where the physical site is considered and can also offer musical information at the beginning of the compositional process. Byrne says this of
his creative practice stating that “in a sense, we worked backwards, either consciously or unconsciously, creating work that fit the venue available to us” (2012, p. 14).

Byrne supports his argument by tracing historical moments in mostly Western music. The highly reverberant space of a cathedral dictated to the composers what was possible harmonically, only to allow more consonant compositions all within the same key or mode to avoid unwanted dissonance.

*The reverberation time in those spaces is very long – more than four seconds in most cases – so a note sung a few seconds ago hangs in the air and becomes part of the present sonic landscape. A composition with shifting musical keys would inevitably invite dissonance as notes overlapped and clashed – a real sonic pileup. (Byrne, 2012, pp. 16-17)*

As performance spaces got smaller and less reverberant, more complicated music could be experimented with, without the worry of notes overlapping and causing dissonance. In Mozart’s time, the 1700’s, the small, more intimate spaces where he would perform were “filled with people whose bodies and elaborate dress would deaden the sound, and that, combined with the frilly decor... meant that his similarly frilly music could be heard in all its intricate detail” (Byrne, 2012, p. 18).

Byrne’s argument aligns with my research because it views the creation of music from the perspective of the space it will be presented in. Each of my three compositions have exploited musical material in different ways. *Stairwell to Fifteen* combines the reverberant physical space and melodic possibilities of found sounds as the source material and the performance space. Rather than subscribing to Byrne’s ideal that only consonant sounds can be produced in reverberant spaces, I often chose to embrace the cacophony created by the dissonance in a reverberant space.

*From Traffic Rises* and *Tunnel Listen* were not composed to be performed in the original sites where the material was derived, but were performed in a traditional concert performance setting, building upon Byrne’s arguments for the importance of site. However, the performance of *From Traffic Rises* was composed for a specific performance space which needed dry acoustics and a physical layout which allowed the ensemble and speaker set up to surround the audience. Each of these compositions
display the importance of the performance space and its direct contribution to the compositional process. This close relationship is also described as ‘site-specific’, but within this general term are layers of specificity which will be used to define my compositional work.

2.7 Site and Site-Specificity

Alvin Lucier’s words - “Every room has its own melody, hiding there until it is made audible” (1995, p. 92) – articulate the way I have thought about the chosen sites and how they have informed my compositional process. My process of approaching these sites has been to engage with them in such a way that they reveal their ‘melody’ or other musical elements to me, which I then incorporate into my compositional process to make them ‘audible’. This relationship, which articulates “exchanges between the work and the place in which its meanings are defined” (Kaye, 2000, p. 1), is termed ‘site-specific’.

The term ‘site-specific’ started being used in the 1970’s to describe sculptural artworks and theatre, which were not being performed in traditional theatres or exhibited in traditional galleries. These included “acts of theatre and performative events at landscape locations, in village streets, in urban situations. In houses, chapels, barns, disused factories, railway stations; on hillsides, in forest clearings, under water” (Pearson, 2010, p. i).

The site became part of the artwork and in some cases the most important part of the work, as Simon Pershigetti (UK, 1954-), core member of the UK based performance research group Wrights & Sites (Hodge, 2013), explains;

If site-specific work makes any departure from the usual premise of theatre it is made out of a desire to let PLACE speak louder than the human mediator or actor who enters the place. (2000, p. 9)

I make use of this idea that the site is an integral part of the creation of my music and in the case of Stairwell to Fifteen, an important member of the ensemble. In this case the site contributes found percussive sounds and the reverberant acoustic treatment of the sounds created in the space by the musicians.
2.7.1 Site-Based

The term ‘site-specific’, as defined above, is problematic as it is often applied to any art that is presented in an unorthodox performance setting. While this is sometimes the case, some suggest that the term ‘site-specific’ should be only used for artworks or performances that are truly specific to a chosen site. This term has been challenged by Australian editor of the About Performance journal, Gay McAuley, who acknowledges that there are varying degrees of site-specificity and so prefers to use the broader term “site-based” (2005, p. 8) to refer to creative works that have a relationship between place and performance. McAuley recognises a site-based performance when “the site becomes the dominant signifier rather than simply being that which contains the performance, as the theatre building does in traditional theatre practice” (2005, p. 7).

In my own research, the term ‘site-based’ can be applied to all three works as they have all been developed from a particular site with the musical material being the dominant signifier of the site rather than the site itself. This term was especially useful when describing my composition Tunnel Listen as the musical material was developed and exaggerated from musical events which occurred in the tunnel site. ‘Site-based’ is a much more suitable term to define Tunnel Listen because the final piece is performed away from the site, in a traditional performance venue and there are not recordings of the site to directly represent it in the piece. The musical material is based on an event which occurred in a particular site.

While the other two compositions in this research project, Stairwell to Fifteen and From Traffic Rises, could be defined as site-based, a more specific term could be used in relationship to site-specificity.

2.8 A Scale of Site-Specificity

British performance theorist Fiona Wilkie looks deeper into the degrees of site-specificity of site-based creative work. In her paper entitled “Mapping the Terrain: a Survey of Site-Specific Performance in Britain” (2003) she argues that there are varying degrees of site-specificity by asking the question “Does site-specific imply site-exclusive?” (p. 149). Just because you perform a piece of music in a park does not necessarily mean it is site-specific to that park. The same piece of music could quite easily be performed in a barn with equal success and similar effect. Wilkie’s paper goes
on to provide useful definitions for when an art work is truly site-specific by offering a scale of varying degrees of site-specificity.

Figure 2 shows Wilkie’s five degrees of site-specificity from ‘Inside a Concert Hall’, which in this case refers to a traditional performance situation for music. Often these performance spaces are built for the sole purpose of hosting performances with a stage area and seating so that there is a clear definition of where the listener is positioned to experience the performance. ‘Outside the Concert Hall’, refers to a similar traditional performance situation but in a different location, for example a ‘Symphony in the Park’ performance. In this case, a stage is built in an unorthodox location to accommodate traditional performance repertoire, and a seating area is created to house the listeners which replicates the experience of being inside a traditional performance space. In the case of my research I perform two of my pieces inside a concert hall setting but with a compositional context which is site-based. *Tunnel Listen* was presented in the most traditional setting out of the three compositions. It consisted of a ten piece ensemble, made up of acoustic instruments, set up on a stage facing an audience. I was in front of the ensemble conducting the performance for the audience sitting in the provided seating arrangement. While this performance demonstrates the first degree of Wilkie’s scale of site-specificity, it is the context of the compositional process, the musical material and its relationship to the site which makes this piece a complex case.

2.8.1 Site-Sympathetic
Wilkie uses ‘site-sympathetic’ to refer to the placing of a new or existing musical work into a site that is sympathetic to the essence of the musical work. It could be argued that
site-generic works could also work successfully in traditional performance spaces. This degree of site-specificity deals with metaphors and connections to site that do not run as deeply into the physical, cultural or historical significance of the site as the last two degrees of the scale (site-generic and site-specific), which is where most work that is usually referenced to as ‘site-specific’ falls between. An example of a site-generic work is American composer Meredith Monk’s *Songs of Ascension* (2009) which is described, in the liner notes of the 2011 recording, as having “rather site-specific origins” (Gann, p. 12). The work, composed for voices, strings, woodwinds and percussion, was performed in a tower designed by visual artist Ann Hamilton (USA, 1956-). The tower itself is an eight-story building in the form of a double helix and described by Gann as having “two staircases each spiralling up the interior of the structure opposite each other, only intersecting at the top” (2011, p. 12).

*Songs of Ascension* musically explores the physical and metaphysical “imagery associated with spiritual quests, including the circular symbols of Buddhism, and the sense of spiritual ascension common to many religions” (Kozinn, 2009). The religious passage of ascending into heaven toward the light is represented in the tower by the musicians travelling up the stairs while performing. The sound of the singers travels up the concrete cylinder and out the top of the tower like spirits leaving the earth.

Gann’s description of *Songs of Ascension* being of “rather site-specific origins” (2011, p. 12) helps Wilkie’s argument because it acknowledges that the work only deals with a conceptual connection to the site rather than historic, physical or acoustic connection. The metaphysical characteristics of the site fit the music, rather than the music being composed specifically for that site. To strengthen this point further, *Songs of Ascension* has been performed by Monk in orthodox performance spaces, such as standard theatre venues, across America since the premiere in Hamilton’s concrete tower, to critical acclaim.

Site-sympathetic was not a level of site-specificity I explored in my research but it does show the complex layers of what many people consider site-specific to mean. The next two levels of site-specificity are where my three compositions are positioned in Wilkie’s scale.
2.8.2 Site-Generic

The next degree of Wilkie’s scale of site-specificity is ‘site-generic’, which refers to works that are created incorporating characteristics of the performance site which could be found in other like sites. In a musical context this could be referred to as the sites having similar acoustic characteristics such as reverb. This would enable the work to be ‘toured’ to similar sites with equal success while still maintaining that deep connection to the characteristics of the performance site.

*Stairwell to Fifteen* includes a strong element of being site-generic, in regards to the use of the reverberant space. If this piece just used the reverberant space as its only compositional method, rather than also including the found sounds, it could be argued that this composition could be performed in any highly reverberant space with a similar reverb time. This site-generic approach to creating music is similar to American jazz flautist Paul Horn’s (1930-) recorded series of improvisations in the iconic Indian structure, the Taj Mahal, which later became the LP “*Inside the Taj Mahal*” (Horn, 1968). This work can be considered site-generic in relation to Wilkie’s scale as Horn interacts with the acoustic characteristics of the Taj Mahal to naturally alter and manipulate the sound of his solo flute improvisations through the use of the reverberant acoustics of the main dome. Importantly, this work is the first in a series of similar solo flute improvisations by Horn in similar highly reverberant sites from all over the world which includes *Inside the Great Pyramid* (1976) and *Inside the Cathedral* (1983).

The recording of these Taj Mahal improvisations captures the natural reverberation, unique to this particular site and is “made without any kind of electronic enhancement” (Schaefer, 2008). The reverb created by the building’s acoustics creates a long sustained delay of what is just played and is “suspended in the space for twenty-eight seconds” (Horn & Underwood, 1990, p. 71). Horn interacts with this delay by stating short melodic phrases, usually diatonic and consonant melodies, followed by short moments of not playing – allowing the echo to repeat what is played until it finally decays naturally. This creates what seems to be a ‘call and response’ effect between Horn and the space. Horn reflects after the performance and states “I listened and responded, as if I were playing with another musician” (Horn & Underwood, 1990, p. 200).
Horn’s response to the site in this situation is very much a performance ‘with’ the site, much like in a musical duet, rather than performing his improvisation ‘at’ the site. He studied how the site reacted to his musical input and then engaged with it musically by allowing the building’s response into his compositional process. The techniques of call and response, building harmonic layers and creating rhythmic pulses, are all compositional tools that I used in Stairwell to Fifteen, and ones that could be utilized in creating compositions for similar reverberant performance sites.

The difficulty with performing in these reverberant spaces is that the degree of reverberation is not variable – it has no ‘off switch’. Whilst providing challenges, this characteristic could be seen as a compositional device known as restriction. American composer, William Russo (1928-2003), in his book Composing Music: A New Approach (1980), believes compositional restrictions “lead to creativity and expansion” (p. 3). This restriction on the reverberation as a compositional device led me to think much more creatively about the musical gestures that I was to present to the site.

Another excellent example of a site-generic composition is Alvin Lucier’s I Am Sitting in a Room (1970). It uses the performance site prescribed in the score, a room, as the instrument. The performer, through the means of two tape recorders and a microphone, recycles a single iteration of read text by a repetitive process of recording and replaying the recorded text in the room where it is read. This process gradually reveals certain resonant frequencies that are specific to the room, and their interaction with the recorded voice. In the composer’s own words;

As the repetitive process continues and segments accumulate the resonant frequencies are reinforced, the others gradually eliminated. The space acts like a filter. We discover that each room has its own set of resonant frequencies in the same way that musical sounds have overtones. (1995, p. 418)

This work uses the physical architectural characteristics of the performance site as an instrument itself, and it behaves much like an improvising musician. Lucier’s text score provides instructions for the construction of a starting point that the room builds upon, just as an improvising musician may start with a thematic idea;
Choose a room the musical qualities of which you would like to evoke.

Use the following text or any other text of any length. (1995, p. 312)

As the exact text is not crucial to the work itself, it can be argued that any sounds could initiate this work within the physical site as it is the relationship between the sound source, time and space that informs the work. This work amplifies itself through repetition, creating a kind of feedback loop, and will develop, albeit at different rates, in any site or room. This characterises *I am Sitting in a Room* as site-generic in Wilkie’s scale, yet it is very different to Horn’s *Inside the Taj Mahal* as the centre of the work is the nature of the site slowly revealing itself over a period of time, rather than interacting with the immediate reaction to a sound source in the site.

### 2.8.3 Site-Specific

Wilkie’s description of ‘Site-Specific’ goes further again to a performance or work that is specifically generated from (or for) a selected site. For a work to be truly site-specific it must reference deeper layers of the site such as historical, social or physical characteristics such as found objects or sounds. Site-specific, as referenced by Wilkie, must be so connected to a site that it cannot be performed in any other place.

Argentinean born avant-garde composer, pianist and researcher Oscar Edelstein (1953-), is approaching the concept of site-specific composition by developing a way to interact and control the acoustic properties of a performance site by manipulating the physical space with what he calls *Sonic Crystals*. These *Sonic Crystals* are physical objects modelled on crystal formations, and are made up of individual cylinders and tubes constructed from various materials including metal and plastic. These objects are built into a space to control the acoustic characteristics of the performance site. Edelstein explains that “a typical crystal can occupy about three cubic meters and employ several tens of tubes” (Edelstein & Eguia, 2007, p. 8). These are usually built in a hexagonal formation as seen below in Figure 3.
These sonic crystals are currently a theoretical idea (no art works have been produced to date) tested by specialised simulation software using scatter theory. Scatter theory was first investigated by Lord Rayleigh in his book *That Theory of Sound* (1945). This theory deals with the way sound disperses or scatters, after coming into contact with a solid cylinder and is derived from how sound reacts in a similar situation, but in water, making it visible for analysis (Faran, 1951). Figure 4 shows one of Edelstein’s visual representations of the sound simulations emitted from a Sonic Crystal.
Edelstein proposes that acoustically produced sound can be manipulated by purely acoustic means with no use of electronic technology. This space, made up of a configuration of tubes, will be able to produce different acoustic filters, resonances, sound reflection, refraction and defraction. It will also have the ability to divide the sound spectrum and disperse parts of it into different areas within the space to create a new space.

Edelstein’s manipulation of the physical performance site, using his “sonic crystals to modulate the architecture of the acoustic space so as to add a new real-time parameter of control in a musical performance” (Edelstein & Proctor, 2012), directly informs his compositional process as well as the final musical outcome. This ability to control the performance site and “make the space itself an instrument for the contemporary composer” (Edelstein & Proctor, 2012) grounds Edelstein’s practice in site-specificity defined by Wilkie, as the composition process will evolve from the creation of the physical architectural space.

2.8.4 Summary

I found Wilkie’s scale provided a useful tool when discussing degrees of site-specificity in any art form, and used the scale to guide a methodology for this project. The result is the inclusion of two of Wilkie’s types of site specificity and the use of McAuley’s definition: a site generic (From Traffic Rises), a site specific (Stairwell to Fifteen) and a site-based (Tunnel Listen).

Fiona Wilkie and her work with site-specific theatre provided a scale and perspective to the various types of site-specific performance and degrees of site-specificity. Wilkie’s research has helped shape my view on site-specificity as well as different ways a performance site can be used in the compositional and performance process. Another influence has been dance choreographer Victoria Hunter’s methodology of engaging and working with the site and other artists, to discover the hidden music within the chosen sites.

2.9 A Methodology for Experiencing Site

Hunter’s examination of the relationships between site, dance performer and dance choreographer can be applied to musician and composer. Hunter’s methodology for the
various stages of the creative process in the creation of her dance work *Beneath* (2004) have been used to inform my own work, providing a way of approaching the performance site as an integral and necessary part of the compositional and performance process.

I have also explored Hunter’s fundamental desire to “reveal the site to the audience as opposed to imposing my own artistic vision upon the site” (2005, p. 368). This intention has been key in the creation of music that collaborates with the site, rather than just performed within the performance space. Whilst Hunter defines site-specific dance as;

\[
\text{created in response to and performed within a specific site or location, where dance and movement are the dominant components as opposed to theatre – or installation – derived genres. (Hunter, 2005, p. 367) [authors emphasis]}
\]

The emphasis of my research argues that a truly site-specific music composition and performance can be created through interaction and performance with a specific site or performance space rather than just within it. Whilst Hunter’s methodology applies to an abandoned site and uses the history of the space to add to its site-specificity, my compositions engage performance sites that are still in working order as man-made public spaces.

Hunter’s four stages of connecting with, and revealing the site, have been used as a methodological framework toward my own compositions from the earliest surveying of a particular performance space through to performance. The stages are:

1. Experiencing the Site.
2. Expressing the Site.
3. Embodying the Site.

**2.9.1 Experiencing the Site**

I have developed a methodology of testing sites that is based on Hunter’s own approach to experiencing a site above. She begins with a physical inspection of the site. At the beginning of this research project I did not start with a particular site in mind, rather I
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was out looking for a site which offered me acoustic characteristics that I could collaborate with in a compositional and musical way. I found three sites which I decided to investigate further; a stairwell, a pedestrian bridge and a tunnel.

These three sites were found by ‘accident’ during a period of time, early in the research journey, when I was searching for appropriate sites and had developed an awareness of acoustic phenomena in built structures, or as Hunter explains, I “adopted a formalistic approach addressing the architectural and the spatial qualities of the site” (2005, p. 371).

I realised the acoustic potential of the stairwell in building 15 at Edith Cowan University as soon as the door slammed behind me. The reverberation that resulted from just the door closing behind me was breathtaking. I had never experienced reverberation on that scale in such a small space. It seemed like every movement and sound my body made was amplified into the space. Site one had been found.

I discovered the possibilities of a pedestrian bridge and its immersive soundscape on a footbridge near the Frankfurt Airport on a trip to Germany in 2012. The traffic travelling underneath the bridge on the ten lane highway filled my ears with an immersive soundscape. The continuous but irregular pulse of the traffic passing underneath was a change from the reverberant site of the stairwell and what I had been recently exploring in it. The different sound of each vehicle worked as sustained tones fading in and out as well as panning from side to side as they travelled under the pedestrian bridge. The varying velocities, volumes and tones meant there was a constant soundscape, but one filled with rapidly shifting textures and tones. I was able to find a similar site over a freeway in Leederville.

The third site, a tunnel under the intersection of Railway Parade and Whatley Crescent in Bayswater, was found during a bike ride. This small tunnel contains a variety of acoustic characteristics depending on where you position yourself as both a sound maker and a listener. This idea of a changing and morphing acoustic space interested me as I stopped my bike and clapped and sang through the tunnel.

Once these three sites were chosen - stairwell, pedestrian bridge and tunnel – I went on to what Hunter calls the “pre-production research” (2005, p. 371). In her case, this involves delving deeper into the history of the site, previous inhabitants and previous
usage of the site much like Wilkie’s definition of what a site-specific work needs. My pre-production research included the development of ways of testing the site for what acoustic characteristics it offered for me to work with. To understand the potential of each site, I travelled to them with my tool kit and spent time just being in the space, experiencing what the site had to offer.

2.9.2 Expressing the Site

Next in Hunter’s methodology is expressing the site. This was a process where I engaged improvising musicians to interact with the site in musical terms. This shifts the focus from pre-production research to the collection of recordings and other materials.

I worked with different musicians at each location to explore and uncover musical potential in the site. Different musicians were used at the beginning of each piece because of their experience and instrumental expertise. Joshua Webster and I explored the stairwell site using Webster’s cimbalom because he had commissioned the piece, and myself on found percussive sounds. I tested the pedestrian bridge with saxophonist Ben Collins and trumpeter Ricki Malet because I needed musicians who I knew could improvise and interact together. In the tunnel I used trumpeter Callum G’Froerer because he is the most open-minded and technically capable brass player I know.

Engaging these musicians at this early part of the process allowed me to do three things:

1. Observe how other musicians interacted and collaborated with the site.
2. Listen to the sonic and acoustic possibilities in the space while others played my test examples.
3. Have an open conversational dialogue with the other musicians about their experience and observations of the site.

This idea of allowing others to interact in the site under guided creative supervision continues the trajectory established by Hunter;

*The dancers were invited to improvise movements in response to their sensory, phenomenological, and kinaesthetic experience of the site. The purpose of the exercise was to reveal and explore the performers’ corporeal responses.* (Hunter, 2005, p. 373)
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The compositional material that was developing from the sites was something very different to what I would normally create in my jazz compositions. I found myself trying to balance the material from the site with my own compositional vocabulary. I was continually confronted by the possibility that I may have been forcing my own compositional language onto the site rather than enabling a balanced collaboration with it. It was interesting to note that Hunter also had the same problems throughout this stage in her creative process.

*The Beneath project, then, began to call for a different movement approach, challenging my usual choreographic vocabulary as applied more frequently to a traditional, theatre context. ‘Theatre dance’ vocabulary appeared incongruous in this site, artificial and unrelated to the genius loci or ‘spirit’ of the place.* (2005, p. 374)

Addressing this challenge in my compositional process was an important aim of the project. The balance between what the site has to offer and my own compositional vocabulary is what makes this project unique and is the very focus of this exegesis.

2.9.3 Embodying the Site

Embodying the site is the part of Hunter’s methodology where the compositional process develops from tests and experiments into workable drafts, and forms the main focus of Part Two of this exegesis. From the preliminary experiments with participant musicians, my own site testing, focused listening and then the different approaches to experiencing the site, I created a number of compositional drafts for each site.

The stairwell was the first site I worked with in this project. I went through several drafts and changes of instrumentation before arriving at the final work. The first draft was a collection of musical ideas which was tested and workshopped in the stairwell with musicians and then, from those results, further drafts were created of site for further workshopping. This process continued until the final performance. This was in the stairwell with six musicians, me as conductor, and a limited number of audience members due to the effect of bodies reducing the reverberation in the space. This then led on to the final stage of Hunter’s methodology.
2.9.4 Receiving the Site
What became clear quite early on in this research was the importance of the experience of the audience or listener, which Hunter calls the receiver of the site. This “interactive relationship between the site, choreographer [composer], performer and audience” (Hunter, 2005, p. 367) is an interesting and somewhat problematic one when dealing with site-specific or site-generic musical works, more so than site-based works. This is because the audience has to be present in the specific site to fully experience the work.

Of the work created in the stairwell, I found that the amount of audience members attending a performance affected the success of the piece due to the reduction of reverb. The more people in the space dampened the effect. Also, the receiver’s experience of being inside the stairwell when the whole space is resonating with the sounds created in the space, the reverberation and the sympathetic vibrations, cannot be experienced in any other way than being there. The recordings, video or score cannot translate that into the experience of being actually present in the space for a composition that has been created for that specific space.

2.9.5 Summary
Hunter’s four step approach helped me to structure a methodological process approaching, revealing, interacting and presenting the findings found in the three sites. This methodology, although from a dance background, provided me with a flexible structure which I was able to adapt for the nuances and characteristics of each site. The result was that each site provided unique musical material which I was able to develop into new works which I would not have come up with in my usual composition practice.

2.10 Space and Spatialisation
The physical and acoustic spaces around us and the movement of sound in those spaces is a concept that is closely aligned to site-specificity. Spatialisation is a compositional process or concept that was popularised after the Second World War when composers started to think about music as a three dimensional spatial form. While spatiality was explored by composers much earlier to this, such as Thomas Tallis (UK, 1505-1585) in his forty voice motet *Spem in Alium* (1570), these more modern times “required a modification of the meaning of music’s dimensions from the temporal (simultaneity and
succession) to the geometric (vertical pitch and horizontal time)” (Harley, 1994, p. 76). What follows is a discussion about some different ways to think about sound in space.

2.10.1 Sound in Space

Whilst it has been long established that both time and space coexist (Minkowski, 2012); “space is experienced in time, time in space: in human experience there is no absolute space existing without time nor time without space” (Harley, 1994, p. 1), it is interesting to note that it wasn’t until the mid twentieth century that the notion of both time and space were considered as coexisting within the world of music composition and performance. As music is a temporal art, as opposed to the spatial object based arts of sculpture and architecture, it was assumed that music only dealt with the concept of time. “Music unfolds in time. Time unfolds in music... Music becomes meaningful in and through time” (Kramer, 1988, p. 1).

In the 1950’s and 1960’s many composers incorporated the concept of the space and spatialisation into their compositional process (Harley, 1994, p. 3). Artists such as Iannis Xenakis, Karlheinz Stockhausen (Germany, 1928-2007) and Charles Ives (USA, 1874-1954) (whose spatial works date from the 1910s) explored the idea that the performance space itself and the spatial distribution of the performers throughout the performance space could be a planned and become an “essential element of the music” (Brant, 1967, p. 223).

Stockhausen’s *Gruppen für drei Orchester* (1957) was composed for three orchestras with three conductors which surrounded the audience. The spatial distribution of the three orchestras meant that the listener’s perception was remarkably different depending on their positioning. In a performance of this orchestral work in 2008, *Gruppen* was performed twice so as to allow the audience members to change their listening position for each performance, “for a work as multidimensional as this, your perception changes drastically depending on where you are placed” (Goldmann, 2008).

The three spaces chosen for the creative works in the project were utilitarian in that they are designed to control and manoeuvre man through space and time creating patterns of behaviour which may or may not be obvious to the users of these everyday mundane spaces.
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Activity in space is restricted by that space; space 'decides' what activity may occur, but even this 'decision' has limits placed upon it. Space lays down the law because it implies a certain order - and hence also a certain disorder. Space commands bodies, prescribing or proscribing gestures, routes and distances to be covered. The 'reading' of space is thus merely a secondary and practically irrelevant upshot, a rather superfluous reward to the individual for blind, spontaneous and lived obedience. (Lefebvre, 1991, p. 143)

This theory of space highlights internal and external spaces created by the body, for example that “each living body is space and has its space: it produces itself in space and also it produces that space” (Lefebvre, 1991, p. 170). The effect the presence of the human body brings to the composition and performance of a work is an important aspect of the way sound behaves in a space for the listener.

With this definition of space established, the process of creating a musical work that is created within and from a specific space can be discussed. Site-based works interrogate these ideas of space and how sound moves in space is an important element in the creation of works with, and in a specific space, or a performance site.

2.10.2 Spatialisation

Spatialisation is explored in my compositions in varying degrees. Stairwell to Fifteen investigates the way sound interacts within the site due to the positioning of the instruments in that space, and the subsequent relationship to the reverberation created by them. From Traffic Rises experiments with creating the directional spatial effects produced by the passing traffic and how this is experienced by the audience’s listening position, which is surrounded by the ensemble and recorded soundscape.

Xenakis experimented with spatialisation in his works in the 1960’s including circular spatial movement of pitch in his composition Terret&ktorh (1966), which provided inspiration for From Traffic Rises. Xenakis, through careful developments in the design of his notation and ensemble set up, was able to create the sense that the music was spiralling and circling around the listeners.
Whilst there is a great deal of literature that discusses the creation of spatial environments using speaker diffusion controlled by software, there is significantly less about contemporary composers creating similar effects with acoustic instruments.

2.10.3 Soundscape

Canadian artist R. Murray Schafer’s (1933-) definition of soundscape is found in his seminal book, *Soundscape: The Tuning of the World*. He describes the soundscape as;

> The sonic environment. Technically, any portion of the sonic environment regarded as a field of study. The term may refer to actual environments, or to abstract constructions such as musical compositions and tape montages, particularly when considered as an environment. (Schafer, 1994, p. 274)

I based my early site choices on this definition as I was trying to discover spaces which had a useful sonic environment that could provide material for further compositional study. The pedestrian bridge’s sonic environment was the traffic soundscape present in the site, the tunnel and stairwell’s sonic environment differed as they were revealed when activated by musical instruments and from listening to found sounds within the site.

The traffic soundscape from the pedestrian bridge is present in the piece *From Traffic Rises*. It appears in the form of an electronically manipulated field recording, which is combined with the acoustic instrument ensemble to recreate the immersive spatial sensation that I felt when I first heard the soundscape on the bridge site. While both *Stairwell to Fifteen* and *Tunnel Listen* do not utilise the concept of soundscape as a compositional device in such an intensive way, they do still involve the interaction between a physical space and sound to create a sound environment, which could be said about most musical compositions.

2.10.4 Sound Art

A short discussion of sound art is merited here, as it is often site-specific.

"'Sound Art' seems to be a category which can include anything which has or makes sound and even, in some cases, things which don’t” (Neuhaus, 2000).
The term ‘sound art’ proves problematic to define clearly as it has been used as general terminology to describe experimental music and noise art. Alan Licht (USA, 1968-), in his book Sound Art (2010), defines sound art in three categories:

1. An installed sound environment that is defined by the space (and/or acoustic space) rather than time and can be exhibited as a visual artwork would be.

2. A visual artwork that also has a sound-producing function, such as sound sculpture.

3. Sound by visual artists that serves as an extension of the artist’s particular aesthetic, generally expressed in other media. (Licht, 2010, pp. 16-17)

The first category of Licht’s definitions, that concerns the relationship to either the physical architecture or the acoustic space, relates to this research project. However, this project is firmly rooted in music, rather than any other art forms. Although none of my compositions are ‘installed’, it could be argued that they are sound environments that are certainly defined and created from particular space. From Traffic Rises creates a sound environment that surrounds the listeners in such a way that it creates its own acoustic space within the performance space.

Campesato (2013) discusses the differences and similarities of ‘music’ and ‘sound art’ in her paper A Metamorphosis of the Muses: Referential and Contextual Aspects in Sound Art (2009). While she acknowledges that the main similarity between sound art and conventional music is the use of sound, she then goes on to define sound art as much closer to visual art practices as it “makes use of space and visual elements to project sound and create aural environments” (2009, p. 27). She defines the main characteristics of sound art as being the “conception and use of sound, the absence of a narrative discourse, an approach that emphasises contextual aspects, the interaction with the public, and the connection between body, space and time” (Campesato, 2009, p. 27).

It is the connection between the use of sound and the interaction with body, space and time that can help to contextualise Stairwell to Fifteen. This piece creates sounds that explore the relationship of the body in a reverberant public space. There is no other narrative other than the experience.
2.10.5 Musicalisation of Sound

Douglas Kahn (USA. 1951-) in his book *Noise Water Meat* (1999) introduces the term *musicalisation of sound* which he defines as a way to “identify and supersede techniques in which sounds and noises [are] made significant by making them musical” (Kahn, 1999, p. 18). This term provides a useful construct to describe the processes used to develop *From Traffic Rises*. Part of the compositional process was experimenting with the traffic soundscape and extracting musical ideas from this sound source, therefore creating the musicalisation of the traffic soundscape. This also applies to *Tunnel Listen*, where the composition becomes an exaggerated musicalisation of the effects that were discovered and workshopped in the different tunnels.

While the term is recent, the concept is not. The idea of the musicalisation of sound and noise is well documented in the 1913 futurist manifesto, *The Art of Noise* (Russolo, 2004) by Italian futurist painter Luigi Russolo (1885-1947). He talks about synthesising the current art music trend with its “shrilliest, strangest and most dissonant amalgams of sound” (Russolo, 2004, p. 5) with the introduction of noise which “was really not born before the 19th century, with the advent of machinery” (Russolo, 2004, p. 4). Russolo claims that, because of the existence of these two sound worlds, the ear of the listening audience was ready for “musical noise” (Russolo, 2004, p. 6).

A few decades after, the futurist’s “examples of ‘sound’ music, whether by Webern, Varese or Xenakis, similarly push us against the imagined boundary between musical and non-musical sounds, which calls into question the legitimacy of the borderline” (Schiff, 2012, p. 9). As music progressed through the decades, more and more non-musical sounds were accepted into conventional music, and can be found in statements such as Cage’s; “music is sounds, sounds around us whether we’re in or out of concert hall” (Hobba, 2003). This context for the musicalisation of sound describes the effect of bringing together an electronically manipulated field recording with acoustic instrument imitation of traffic sounds and the recreation of spatial effects created by the traffic soundscape in works such as *From Traffic Rises*.

2.11 A Practice-Led Methodology

The sections above have defined the context for the creative work and introduced a variety of theoretical and methodological frameworks that have been applied to the
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research. In addition, the overarching methodological framework of practice-led research enabled the development of the works in a free and intuitive way. Practice-led research can be described as

   *intrinsically experiential and comes to the fore when the researcher creates new artistic forms for performance and exhibition. The ‘practice’ in ‘practice-led research’ is primary – it is not an optional extra.* (Haseman, 2006)

I explored each site through my compositional practice. I developed a way of workshopping and testing chosen acoustic properties by constantly referring to the aspects of this practice, such as; careful listening, the drafting of musical ideas and the structural planning I engaged with for each composition. These experiments involved direct creative interaction and documentation with live musicians in or on specific chosen sites. Each site possessed unique acoustic qualities and challenges which required necessary pre-compositional experimentation to control and incorporate such qualities into the final compositions. Brandon LaBelle backs up this statement by noting that “it seems the very ‘stable medium’ of architecture and the unfixed network of sound, can come together in productive ways” (2004, p. 13).

The site and its acoustic properties are considered first, drawing inspiration from where the final performance will be - a reversal of my previous compositional methodology. David Byrne touches on this kind of reversal in one of his chapters in *How Music Works*;

   *I have a feeling that this somewhat reversed view of creation – that it is more pragmatic and adaptive than some might think – happens a lot, and in very different areas. It’s “reversed” because the venues – or the fields and woodlands, in the case of the birds – were not built to accommodate whatever egoistical or artistic urge the composers have. We and the birds adapt, and it's fine.* (2012, p. 29)

2.12 Chapter Summary

Chapter Two has combined a discussion of the positioning of my research in the current literature and key historical works, along with the introduction to the theoretical
concepts and methodologies that underpin this research project. The definition of terms will help the reader to understand my use of them throughout the next section of this thesis.

Part Two consists of three chapters, each discussing one of my three new works that have been introduced in Part One. Each chapter is structured with an introduction to the composition and then takes a chronological journey that discusses each work from the beginning of the compositional process through to the final performance of finished pieces. These final performances (final recital) took place in two performance spaces on campus at Edith Cowan University; The Roundhouse Theatre and building fifteen stairwell.
PART TWO: THE WORKS

Part Two provides a detailed discussion of the process of creating the three compositions in the research project. The following chapters discuss the ways I have interacted with each site to create new works by using the physical site as both a compositional inspiration and an integral part of the creative process. Each of the following three chapters individually discusses a single site and the corresponding composition. Why the site was chosen, what the site had to offer and how I went about distilling this musical material into a composition, provide the focus for each chapter. Wilkie’s scale of site-specificity is also discussed in relation to each work. Before beginning the discussions of processes specific to each work, the process and methods of selection common to them all will be introduced.
Chapter 3: Stairwell to Fifteen

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<td>Performed by</td>
<td>Joshua Webster, Ricki Malet, Matthew McGlynn, Blake Phillips, Robin Murray and Ben Collins.</td>
</tr>
<tr>
<td>Overview</td>
<td><em>Stairwell to Fifteen</em> is a site-specific composition that was developed between May 2012 and November 2013. It made up part of the final recital on December 17. Commissioned by Joshua Webster in May 2012.</td>
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</tbody>
</table>
2. November 21\textsuperscript{st} 2012: performance as part of the WAAPA Reading and Writing Group series. Cimbalom and stairwell found sound percussion.  
3. December 17\textsuperscript{th} 2013: final recital performance, ECU building fifteen stairwell. Two trumpets, trombone, tuba, cimbalom, stairwell found sound percussion. |

3.1 Introduction

This project began with cimbalom accompanied by the stairwell itself as a sound source, under the working title of *Duet of Cimbalom & Stairwell* (2012b, p. 52). Later a brass quartet was added with the intention of developing the space and its acoustic characteristics. This led to the formation of a different piece entitled *Stairwell to Fifteen* (Francis, 2013a).

When considering Wilkie’s scale of site-specificity, *Stairwell to Fifteen* is the most site-specific of the three compositions in this research project. While this composition is best experienced in the site during live performance, as it was in the final recital, it can be comprehended quite well from an audio recording as the acoustic effect of reverberation and found sounds in the space are easily captured by the recording process. However, the immersive resonance of the space and the physical experience of being inside an instrument are not captured on the recording.

3.2 Introduction to the Site

I first walked into the stairwell of building fifteen at the Edith Cowan University (ECU) Mt Lawley Campus, WA, on May 2\textsuperscript{nd} 2012. My reason for being in the building was unrelated to my research but as soon as the door closed behind me it created a loud
sound, which in turn created a long reverberation. I knew immediately that this space had potential in my research project. Every sound that I created in the space; closing the door, footsteps on the stairs or coughing, no matter how small or large, hung in the air, blending with the previous sounds. Aurally it felt like I was in a huge cathedral-like space but visually it looked like just another office stairwell. I had never been in a space that small in physical size but with long reverberation of approximately eight seconds.

The stairwell itself is three levels high, constructed of concrete and built less than six years ago. The internal dimensions of the stairwell are approximately six meters wide by eight meters deep and ten meters high. The interior is made of hard reflective surfaces such as cement walls, ceramic tiled floor surfaces, nine oval-shaped glass windows, hollow metal hand-railings and solid metal support railings as can be seen in Figure 5. Figure 6 shows the outside structure of this stairwell, which protrudes outside the building itself, rather than being internal.

An elevator rises up through the stairwell between the landings and the main building from which the stairwell protrudes. As the building is only three levels, there is quite a lot of foot traffic which happens during business hours. I experienced many people...
walking up and down the stairs while testing the space during these hours. After 5pm I did not experience anyone passing through, which was a consideration I noted when organising rehearsals and the performance as it is a utilitarian space. As well as providing challenges, the heavy use of the space also provided ideas on how it might be used.

External sounds are limited, as the thick cement walls create sound insulation from the outside. However, the elevator does create a loud mechanical hum which also resonates in the stairwell when being used. During the rehearsal period immediately before the performance, which took place during business hours, there were some issues with our sound creation interfering with the office workers on the third floor. This was resolved by speaking with them about the project rationale and timeframe.

Throughout this chapter I will be referring to different areas of the stairwell. Figure 7 is a hand drawn map from my journal indicating the way I have named the doors, landings and flights of stairs.

Figure 7. Map of the interior of the building fifteen stairwell (Francis, 2012a).
3.3 Pre-Production
I returned to the stairwell on May 11th 2012 to test the space in more detail. For this visit I bought my tool kit to test the site, which at this stage was fairly rudimentary. I began by testing the space with simple hand claps to experience how the sound filled the space and the length of the reverberation. I found so much beauty in the way the sound just hung in the air, suspended for a few seconds and then slowly dissolved. The reverberation of the hand claps was audible for approximately eight seconds. Even the quietest sounds reverberated in the space which indicated that volume was not a factor to initiate the reverberant response, though it did affect the length of the reverberation tail. While clapping in the space and moving up and down the levels, I accidently tapped one of the metallic hand railings (Figure 5) with my wedding ring resulting in a pitched tone. This instantly distracted me from the reverberation of the space to test the hand rails and their supports. This percussive testing with my wedding ring, and a drum-stick revealed that each one of these metallic hand rails and supports had its own character. While a clear pitch was not obvious, I could detect variations in pitch and tones in each hand-railing. When listening back to the audio recording of the tests, I noticed that many of the handrails, as well as the tones I heard, revealed lower harmonic resonances when struck. I was not aware of this while testing as these lower pitches seemed to reveal themselves further away from where they were produced.

I moved on from the handrails to make some sounds with my melodica, improvising in the space. Again, the notes produced hung in the air for approximately eight seconds and were only slightly affected by the volume, but the articulation of the notes did make a difference as to how they reacted in the space. I noted in my journal that the cutoff of the note was important to create different effects.

* A soft cutoff of the note means the transition point from the sound of melodica to the reverberation is not clear. (Francis, 2012a)*

On listening back to some of the notes I played, I was unable to determine where the melodica note stopped and the reverberation began. This might also have to do with the length of the note, as the reverberation needs enough sound in the space to then match the sound produced by the instrument. When I played shorter notes and repetitive short notes the reverberation had a rhythmic pulse. I again only discovered this by listening
back to the audio recording of the test. I noted these as compositional tools to explore further.

It was interesting to note that many of the compositional devices that I discovered in the space were only realised when listening back to the recordings of the site tests. This was because the recording device was some distance from where I was testing, offering a different aural point of listening. The distance meant that the space had time to manipulate and to ‘play’ with the sounds produced within it. From this early point in my research I knew that the audience positioning was going to be an issue, and that I would have to address this by positioning them at some distance from the sound sources.

It is possible to hypothesise about the recordings of Horn’s *Inside the Taj Mahal* flute improvisations and whether Horn heard any potentially interesting sound events in the recordings, compared to the real time improvisations, which he could have developed upon in later takes. Did the positioning of the tape recorder make any difference to what was recorded and was it different to what was heard in the space during the improvisations? I also asked these questions of my own tests and began searching the recordings made in the space for compositional ideas.

The pre-production stage demonstrated that this site was very promising as it had offered a lot of acoustic possibilities that could be translated into compositional starting points. The other exciting prospect was that there was the possibility to really ground the composition in being truly site-specific in relationship to Wilkie’s theory, as the combination of the reverberation and the use of the pitched handrails in the space meant that it could not be performed in any other stairwell or space.

**3.3.1 The Architecture of Stairs**

Using a stairwell for performance art is not a new one. Artists such as Meredith Monk and choreographer Noémie Lafrance (Canada, 1973-) used a similar kind of space in their work, though their results were very different to *Stairwell to Fifteen*.

As previously discussed, Meredith Monk’s piece *Songs of Ascension*, uses the physicality of movement and the unique shape of the stairs as a metaphor for religious and spiritual ascension found in many religious practices and to structure the musical form. The staircase itself, called “Tower – Oliver Ranch” (2007), was created by Ann
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Hamilton and is a space “conceived as an object in the landscape and a vocal chord to be animated by a series of commissioned projects” (Ann Hamilton, 2014). The eighty foot tower contains a double helix-like spiral staircase that both ascends and descends allowing for creative performance opportunities and ensemble set up. This uniquely shaped stairwell is very much like the structure of DNA, and was used as a formal structure in the compositional process. In Monk’s own words:

Musically, how would you make a structure that was like that, where the musical phrases would connect to be a continuous spiral? But then there could be these side connections. Because if you look at DNA, there are all of these little connections that are going in a different dimension. So how would you actually make a musical form that was like that? (Marranca, 2009, p. 18)

This work was particularly inspiring to me, as it provides an eloquent example of a purpose built stairwell venue, where the instrument and the venue are sometimes united. This is one element central to Stairwell to Fifteen, as the performance of the ‘venue’ was key to the piece. It is the delicate relationship between playing the site, for example the physical playing of the hand-railings, and interacting with the site through the reverberation and the sound creation that is the true purpose of this composition.

The stairwell or staircase can offer a different way to experience artworks by restricting audience numbers. Canadian born New York choreographer Noémie Lafrance creates

Figure 8. Interior of ‘Tower’ by Ann Hamilton (2014).
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site-specific performance, installations and films using human movement in man-made spaces. In her piece Descent (2001), a spiral stairwell is used as a lens for the viewer to observe her performance “looking down through the centre well of the stairs and to descend the entire staircase to experience each of the multiple tableaus of the spiral staircase” (Lafrance, 2012). During its season, the forty-five minute show is performed three times a day as the audience is limited to only twenty people at a time (Aloff, 2003), due to the limited amount of space for the audience to watch with the best perspective, and without interfering with the performers. Similarly, the stairwell I used for my performance called for restricted numbers of audience members. The more people in the stairwell, the less reverberation was created due to the absorptive nature of the human body. After some early workshops and informal performances of early iterations of the work, I concluded that seventeen audience members per performance were ideal for the final recital. This included the six musicians, me and ten audience members.

3.3.2 The Metaphor of Stairs

It wasn’t until after this second visit and the realisation that a truly site-specific composition could exist, that I began to consider the symbology of stairs and what they represent in different western cultural contexts. Hunter’s research led me to an awareness of what stairs might symbolise, and how that could influence the composition process.

The dominant ideology of any given society attaches labels of meaning to particular buildings and environments. These meanings are often constructed externally via architectural design and internally through conventions of use. (Hunter, 2009, p. 302)

The everyday use of the building fifteen stairwell is for the basic travel between the three floors in the building. While the stairwell is very functional for this travel, it is acoustically very difficult to talk to another person while travelling on the stairs. This stairwell does have a reputation around campus as being an annoying space for the reason that you cannot communicate with another person in the space. Making this mundane and sometimes annoying space into an artwork by using the very acoustics
which make it annoying, really appealed to me, to see if I could change the reputation of this space into a more positive one by re-contextualising its internal conventional use.

Monk’s performance piece *Songs of Ascension* used the stairwell to move her performers in an upwards motion “in a spiritual-like journey toward the light” (Gann, 2011, p. 12). *Songs of Ascension* musically explores the physical and metaphysical “imagery associated with spiritual quests, including the circular symbols of Buddhism, and the sense of spiritual ascension common to many religions” (Kozinn, 2009). It is the movement within the stairwell that is the source of these metaphors and provides an example of the meaning Hunter refers to in a site-specific practice. My use of movement in the space was aligned to the conventional use of the space rather than any deep metaphorical meaning. I decided to move the percussionist from one position in the stairwell to another. Rather than just walking down the stairs to the new position, the percussionist played the stairwell during the descent of the stairs. This movement reminded the listener of the space’s original intention while at the same time allowed the percussionist to produce very specific combination of sounds only found in that space.

### 3.3.3 Recording Sound in Architectural Space

Reverberant rooms such as bathrooms and stairwells have been used to enhance recorded performances of pop, rock and jazz in the first half of the twentieth century before digital technology was employed to replicate these effects. A famous example in the rock and roll genre is the drum sound created on Led Zepelin’s version of the Lizzy Douglas and Joe McCoy song “When the Levee Breaks” (1971). The ambient reverb and slap-back was created by using “two microphones strategically positioned on the second landing of a three-story staircase above a hallway” (Stackpole & Borden, 2013) of which drummer John Bonham was playing. The combination of the sound of the drum kit and the way the sound reacted in the space was what gave this composition its very specific sound and identity. I explored this same idea, but instead of letting the sound be effected by the space, I composed music that reacted with the effects in the space, creating a collaboration with the space and my musical ideas.

Contemporary Australian sound artist Tessa Elieff (aka Tattered-Kaylor) has used a stairwell in inner city Melbourne as a space to create a series of three works; *Stairwell*
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07 (2007), Blind City Flaneur (2008) and Resonant Stairwell (2009). She developed specific multi-track recording techniques “for the capture of sounds within the unique sonic architecture of a stairwell” (Elieff, 2010). Elieff’s focus is on the creation of a recorded works in 5.1 surround sound of which she translates the vertical sonic plane of the six level stairwell into a horizontal soundscape experience. It is the playback of a captured live performance within the space experienced elsewhere that is the core of Elieff’s pieces, rather than the live experience of a performance in the space. She comments that the concrete and metal interior surfaces along with the complex angular structures of the stairwell, “provide a sonic environment capable of producing acoustic phenomena via the collision between architecture and sound wave alone” (Elieff, 2010). Elieff’s work explores the possibilities of a link between architecture and sound in a recorded medium.

3.4 Testing Stage

On June 27th 2012 I revisited the site to conduct more tests. This further testing period focused on the stairwell railings as a musical instrument and what sounds and pitches I could produce from these metal railings. I decided to add felt-covered drum mallets, plastic chop sticks and a violin bow (see Figure 9) to my existing tool kit as I wanted to have a variety of options to percussively play the railings.

The felt covered mallets were chosen to exploit the low sounding pitches on the hand railings I heard in the audio recordings of the test, because of their ability to cause the metal to vibrate without creating a hard sounding attack. The plastic chop sticks were a light weight alternative to the drum sticks used previously. I thought that the lighter weight, hard sticks would create a quieter and clearer pitch when used on either the hand railings or supports. Finally the violin bow was added to create sustained sounds somewhere in the stairwell.
My initial attempts to produce single melodic pitches from the hand railings were not as successful as I initially thought it might be. It did not matter what I struck the railings with, drum stick or chop stick, I was unable to produce a pitch with a truly clear and audible fundamental, like a vibraphone or other tuned percussion might create. Instead, the sounds I created on the hand railings and supports appeared to contain rich overtones and harmonics, creating percussive sounds rather than pitches. Andy Hamilton, in his article in *The Wire - Adventures in Modern Music* publication describes these everyday found sounds or noises, similar to the ones found in the stairwell, as being “made up of complex overtones. You get them in percussion instruments and most of the sounds in daily life” (2003, p. 43). While this was not what I set out to discover, I did see a potential in these percussive sounds to being used to link the everyday sounds of the stairwell being used into the musical composition and therefore making it more site-specific.

The idea of bowing metallic objects in the stairwell came from seeing composer and drummer John Hollenbeck (USA 1968-) using a bow to create sustained pitches on his metallic cymbals and scoring bowed vibraphone in his big band composition *Music of Life* (Hollenbeck, 2003). This idea of bowing a non-string object is not a new one and has a long history. One of the earliest examples of bowing cymbals can be found in Arnold Schoenberg’s composition *Fünf Orchesterstücke* (Schoenberg, 1909) where a cello bow is used to create a tremolo effect on a cymbal in the fourth movement (Marino, 2010).
Bowing the supporting railings on landing two (see Figure 11) with a violin bow was successful as it produced a sustained tone of a high register B natural. It took some time to find the right positioning on the railing which would allow a consistent and steady pitch. This position was between fifteen centimetres and twenty centimetres from the top of the support railing. The violin bow did not feel strong enough to sustain the pitch for an extended time as the railing would vibrate quite a lot. In later tests I used a cello bow which was much more suitable to maintain the pitch because of its large size and strength. Unlike the percussive sounds created by striking the metallic surfaces with drum sticks and chop sticks, the bowed pitch was a very pure sounding and clear pitch, much like that produced by a cello or viola.

The felt tipped mallets are also a tool used by drummers to create a softer sound with cymbals without the attack of a hard stick. These mallets allowed the percussionist to gently activate a percussive sound and crescendo without hearing the attack. These mallets were also successful in creating low drone-like pitches by playing a drum roll technique on them softly.
3.4.1 The Cimbalom

As mentioned earlier, the first draft of this piece started as a duet composed to feature both the stairwell, with its interaction between the resonant hand railings and the reverberation of the space, and the traditional Hungarian instrument called the cimbalom - a four octave stringed instrument from the dulcimer family. The large wooden trapezoidal shaped instrument stands on four legs with a damper pedal. The musician plays the instrument in the seated position striking the strings with two wooden hammers covered with either hard or soft material (Unknown, 2011).

The working title for this early draft of the composition was *Duet from Cimbalom & Stairwell* and was commissioned by the cimbalom player, Joshua Webster who, at the time, was writing a composition manual for the cimbalom as part of his masters in research. Webster was interested in using the cimbalom in an unorthodox performance space as it had relevance to his research. He explains;

_I was curious about the concept of playing in a non-traditional performance venue, as it directly related to one of the main themes of the research: the desire to use and view the cimbalom in non-traditional ways. This concept of a duet for the cimbalom and a specific space was very exciting, as I had not seen any examples of this writing in the extant cimbalom repertoire._

(Webster, 2013, pp. 47-48)

Webster and I began by discussing the possibilities of the instrument, as it was the first time that I had ever seen or heard it. Webster showed me through technical aspects of cimbalom, different mallet options, dynamic considerations and extended techniques.

I was interested in how the sound of the cimbalom would react and interacted with the reverberant space of the stairwell as well as with the found sounds within the stairwell, especially as the cimbalom is not a very resonant instrument in its own right. We met at the stairwell so I could show Webster the various sound and acoustic possibilities. Both Webster and I improvised with the stairwell on this occasion producing sounds and interacting with the stairwell in a free and responsive way.
3.5 Composition Phase.
From the tests and workshops above I had collected a few clear musical ideas that served as compositional starting points. They were;

3.5.1 Reverberation
As previously mentioned, the reverberation in the stairwell was excessive for the size of the space. The focus on the decay of the reverberant sounds, which was around eight seconds, rather than the attack of the sounds would be used as compositional device.

3.5.2 Pitch Material
The clearest tonal material created by playing the stairwell was from the hollow metal hand-railings. On the top landing, left hand side hand-railing, a low register F natural pitch could be sounded by hitting the railing with a felt tipped drum mallet. With the same technique on the middle floor landing hand-railing (see Figure 10) a low Bb pitch could be sounded.

Another strong pitch was created by bowing the hand-railing supports with a cello bow. I was able to create a consistent high register B natural pitch.

3.5.3 Found Sounds from the Stairwell
The sound of the door slamming was an important part of the sound in this stairwell and it is what everyone experiences in the site when they enter. I also decided to use a range of percussive sounds I had discovered during the tests, made simply by hitting the metal surfaces of the hand-railings and supports with wooden drum sticks creating un-pitched sounds.
3.6 First Draft

The first draft started with four simple independent musical ideas that provided the foundation of the next workshop and improvisation. Using Hunter’s idea of “devised, collective exploration of site served to combine with my own responses, thereby broadening the resource and responses to the site-stimuli” (2005, p. 373). The first idea was based over the F which I was able to create on the top landing hand-railing. An ‘F minor(ish)’ tonal centre (Figure 14) was created by rapid arpeggios and Locrian mode melodic ideas over the hand-railing F tone that Webster remarked sounded “reminiscent of some Eastern European folk music” (2013, p. 50). The minor sound was chosen to create a darker texture and one that I thought would lead better into some dissonance later in the piece. The long delay would hold the darker sound longer, giving a more pensive serious tone to the composition rather than setting up the composition with a consonant major tonality which I thought could sound too contrived and one that I am not comfortable working with.

Upon reflection of the first idea, which I will call ‘idea one’, I noted that the bass note of F was the only melodic link to the physical space. The rest of the material had been created as I do with other compositions; that is, play the piano to find harmonic and melodic colours that appeal to my ear. The most effective part of the idea was the rapid arpeggio gesture at the start of each phrase. This was very effective as it was a way to build a harmonic colour in the space in a percussive manner. This was the only gesture
that remained in the following drafts, and I didn’t use any of the other melodic content from idea one.

The next two ideas were based on musical gestures that would complement the high B pitch created by bowing the hand-rail supports. Idea two (Figure 16) is made up of octave leaps to sustain and fill the space with a large tessitura of a single pitch. It was also an experiment of trying to combine the timbres of the two instruments. The loud attack of the cimbalom’s note and the decay of the reverberation would then lead into the sustained bowed pitch on the hand-railing. This created ambiguous textures by using the attack of one note and the sustain of another. This is repeated throughout this research and is especially amplified when reverberation is involved.

Idea three (Figure 15) was a simple four bar ostinato pattern to melodically and harmonically interact with the bowed B pitch to create dissonance and harmonic tension while at the same time creating a soothing, quiet moment. The first bar created a very open consonant sound with the E, B and D naturals. The second bar repeats the same melodic shape but lowers the D to a C which creates a semi-tone tension with the high bowed B. In the next bar the second note (B) lowers to a Bb which adds more tension to the other side of the high bowed B and the last bar lowers both pitches to round off the phrase and resolve back to the beginning of the ostinato.
Idea four (Figure 17) was for the Bb hand-railing in position two, and was an experiment in how moving chordal structures would sound over the Bb pedal pitch. Parallel suspended fourths were used because they don’t tend to be drawn towards a tonal centre, and can be moved freely over a single bass note. I have used this compositional tool in the past, and had learnt it from Bob Brookmeyer who once told me in a composition lesson “chords in fourths are very non-demanding, like whole-tones, but even more so because whenever you have chords in fourths, any kind of line over that works” (Francis, 2004b). The reasoning behind using this type of harmonically ambiguous device was to allow me to modulate or transition to different harmonic structures freely without the resolving pull of tonality.

Webster and I worked on this material in the stairwell with his cimbalom. The cimbalom sounded very clear in the space with a lot of reverberation, and the space seemed like a huge resonance box for it. When each note was sounded it was as if Webster had the sustain pedal held down, when in fact he had not.
There was no way of being able to play short notes in this space or turning the reverberation off. This re-enforced my intention to focusing on the decay, rather than the attack of the sounds in the piece. I decided to leave periods of time without playing after each musical gesture to enable the space’s response to the sounds that had been produced in it to be heard, much like the method Horn used in *Inside the Taj Mahal*. I found this to be an interesting way to ‘collaborate’ with the space. Performers produce the attack of each sound and then the space designed their decay.

As Webster played through the draft sketches and improvised with the compositional ideas I had provided, I experimented with creating sounds on the railings and other surfaces in the space. It was interesting to note, much like the early recording tests in the space, that where I was standing when playing the low resonant hand-rail pitches, I could not hear the lower fundamental pitch, only some upper register harmonics. At the time, I thought that it was no longer working until Webster commented on the beauty of the lower sound which he could hear from the landing below me. After a period of playing through the drafts, we decided to play each other’s instruments and improvise further so as to get a different aural perspective of the space. This allowed me to hear the low F hand-railing pitch from Webster’s performance position. This sound was much clearer and resonant than I previously had thought as the distance from the railing was an important factor. This discovery would inform the positioning of the listeners in the space, and I made sure to check all recordings to ensure I had an accurate sonic picture of each piece.

At the end of this improvisation session Webster walked down the third flight of stairs and dragged a drum stick along the rail supports. Each support had a similar, but slightly different pitch, much like the variation in pitch you get when performing vibrato on a stringed instrument. This physical movement in the space and the percussive interest it created was a way that I would be able to musically join the different playing positions for the percussionist, as well as incorporating the idea of movement and connection back to the stairwell’s everyday use.

### 3.7 Second Draft: Extended Material

To prepare for the second draft I used my journal notes taken during past tests to complement the audio recording I had made of the first draft. This gave me a different
perspective of how the sound reacted in the space. Draft two was the first incarnation of a linear composition, rather than a collection of musical ideas that draft one had provided.

3.7.1 Form
The structure of the second draft was created using a more site specific paradigm than the first draft. I based it on the three playing positions for the stairwell percussionist. These were physical places in the stairwell where the percussionist needed to be located in order to play selected parts of the stairwell. I had begun using the site to structure the composition based on its physical features. I had also decided the audience would enter the space from the ground floor entry, and that the musicians would begin from the top floor. The cimbalom was to be placed in the middle.

Position one was at the top of flight four and using mallets on the F sounding hand-railing. Position two was using mallets on the hand-railing on landing two. Position three was using the cello bow on the railing supports just below the hand-railing used in position two. I took on the role of the stairwell percussionist as I wanted to experiment possibilities in the space while workshopping and rehearsing. Once I got closer to finalising the compositional ideas for the percussionist, I engaged one to play these parts so I was able to direct the musicians.

I decided to structure the piece this way because of the harmonic progression of the found sounds in the space. By beginning with the F pitch in position one, this created a conceptual ‘perfect cadence’ (harmonic V-I movement) which lead to the Bb pitch in position two. I used this ‘perfect cadence’ as a structural idea to guide the form of the piece rather than as harmonic material. I have used this idea before in a composition called *the 12 bars are blue but not as blue as you* (Francis, 2007), where I used the bass notes of a twelve-bar blues progression as tonal centres for each part of this extended composition to inform the structure of the overall piece.

3.7.2 Melody
The focus in this piece was becoming the harmonic textures and how they interacted with the space. Most melodic material serves to build up or create the harmonic texture.
The pitches found from the hand-railings at the site were the primary resource when creating this melodic material.

The interval of a semi-tone was a new addition in draft two, and became a thematic device throughout. It was derived from the relationship of the Bb and B found in positions two and three. The semi-tone, plus its inversions of a major seventh and minor ninth was used throughout most of the draft two until it reached position three. The semi-tone provided harmonic tension and created a subtle pulsating effect in the space. This semi-tone theme was developed further in this draft, with the addition of an F# in the melodic material to accompany the F natural already found in the space.

This semi-tone theme is continued in the cimbalom part just after the percussion transition from position one to further down the stairwell. In Figure 18 the cimbalom plays sequences of a rising semi-tone interval moving downwards in the first bar and, continuing to the third bar where the semi-tone pattern changes slightly. The first and third note of the bar descends in semi-tones (A to G#) as do the second and fourth notes (F# to F).

![Figure 18. Semi-tone sequence pattern.](image)

### 3.7.3 Harmony

The harmonic information for the three sections was based on the pitches found in the three percussion playing positions. I built the harmonic information from the bottom up, as positions one and two feature the bass notes. The harmonic colour in position three centres around the bowed high B natural found in that position. Creating harmonic colour from single pitches was a new way of approaching this aspect of composition for me.
Position one was close to the top landing of the stairwell which had access to the top door in order to slam it close. This was a technique I wanted to use to signify the start of the composition. The audience was in the lower half of the stairwell and could not see the door slamming. This provided a dramatic gesture to simultaneously signify the beginning of the performance, draw everyone’s attention upward to the performers and share with the audience the same experience I had when first entering the space.

The top landing also had access to the hand-railing with the F sounding resonance that I wanted to use to start the composition. The F sounding hand-rail on the top landing was used as a bass note for the Locrian harmonic material, and to resolve some of the dissonances created. The F pitch was also used in the melodic material along with the Bb, which again features on another one of the other hand-railings.

3.7.4 Rhythm

The rhythmic theme of even eighth notes as seen in Figure 19 below is found throughout Part One and developed as a way to build a crescendo through the volume of the single pitch in the space, in this case an F natural and then ending the phrase with a pitch a semi-tone away (the F# is inverted an octave below) which adds a beautiful tension to the sound texture as it decays in the space.

‘Position two’ and ‘position three’ are both located on the second floor landing where we decided to place the cimbalom. ‘Position two’ asks for the stairwell percussionist to play the Bb hand-railing with felt-tipped mallets and ‘position three’ asks for the bowing of the hand-railing support with a cello bow to create the high B natural.

The transition from ‘position one’ to ‘position two’ meant that I had to walk down two flights of the stairwell. When discussing this, both Josh and I decided that this would be
an ideal place to add the percussive gesture of dragging a drum stick along the hand-railing supports as I made my way down the stairs to ‘position two’. Figure 20 is an example of the hand railing material, which matches the exact number railings in the transition between positions, as well as adding the cimbalom to build intensity with a semi-tone cluster.

![Figure 20. Transition from ‘position one’ to ‘position two’.](image)

This movement to the new playing position was an interesting way to bring the stairwell percussionist into view of the audience below, revealing the other character in this piece.

The next part of the composition incorporates the ostinato from idea four in the first draft with some variations. This was played under the high B created from bowing the hand-rail support in ‘position three’. Originally I planned to finish the piece by slamming the door on the middle floor to finish the way we started, but after the first run through, both Webster and I decided it would have disrupted the sonic environment we had created. I created a new ending that was ambiguous and I thought the listener would not be sure if it is in fact finished yet, much like the feeling of audience uncertainty created in Brookmeyer’s arrangement of Hoagy Carmichael’s composition *Skylark* (1980b) for the Mel Lewis Jazz Orchestra. In this piece the final melody is played by solo piano and finishes halfway through the main theme and is left...
unresolved. There is a momentary feeling from the audience on the live recording of the work that they are not sure if it has finished or not.

For the final gesture, I had written a descending octave line which finished with a low Bb on the second line of the bass clef (bar one in Figure 21), which was the lowest Bb on the cimbalom. After playing through this section he suggested that he could de-tune the lowest note on the cimbalom (D) down to the Bb below that (see bar two in Figure 21) so he could reach another octave and continue the gesture. This change was very effective and created a rich blend of sound between that low Bb and the Bb created from the hand-railing in ‘position two’.

It was important, when playing through this draft, that we both listened to the length and the behaviour of the reverb decay before moving on to the next musical gesture, as that was the experience that I wanted the listener’s attention to be on. If either of us started our next entry too early then the attention would be constantly distracted to the attack of the new sounds. I notated the ends of phrases with fermata markings to be read by performers as a time to listen for the decay. I wanted the audience to listen too. This was difficult to adjust to in the beginning as the time between the gestures seemed too long, but we soon learned to listen to the sound in the space, only turning our attention to the next gesture when it had concluded.

3.8 Performance of Duet of Cimbalom & Stairwell

Webster and I premiered this completed draft at the ECU Research Colloquium on September 19th 2012. There was a small audience of eight people, plus two performers, who were instructed to stand or sit on the first landing and the stairs leading up to it. The audience members were also instructed not to lean on any of the railings, as they
may inadvertently dampen the resonance. The audience was very quiet throughout the performance and we had a very positive response. The best comments being about how the space was transformed by the performance. One comment, from audience member D. Foley (personal communication, September 19, 2102), was that "it was like being inside an instrument" and another made comment made by Anomine (personal communication, September 19, 2102) was about how the composition made her rethink the space as a beautiful creative one rather than an annoying, mundane, everyday space. It was after this performance that I learnt about this stairwell’s reputation of being a frustrating space where you cannot hear what people are saying when you talk in the space as the reverberation is so active.

Webster and I performed this draft again at an informal performance for the WAAPA Reading and Writing Group on November 21st 2012, as there was interest from people who were not able to hear it the Research Colloquium. On this occasion there was an audience of thirteen people, plus two performers. The effect of having another five people in the space created a remarkable change, and resulted in a cap on audience numbers for future performances. The reverb was reduced by approximately two seconds, which is a substantial amount in the context of the piece, and both Webster and I noticed this as soon as I slammed the door to begin the performance. The reverb tail of the door slam was much shorter than we have ever experienced. Because the reverb was shorter, this meant that each pause between gestures was shorter, which reduced the overall duration of the piece.

3.9 Third Draft: The Final Work

On reflection of these two drafts and their performances, I concluded that the interaction between the found sounds and cimbalom was making a site-specific composition. However, I felt I could have utilised the reverberation of the space even more by including some instruments that had the ability to create a louder sound resulting in a longer sustain. I wanted to take advantage of the long reverberation and other effects I had earlier discovered when testing the space by playing long tones with my melodica, which was not possible on the percussive cimbalom. This is where the idea of adding a brass quartet (two trumpets, trombone and tuba) came from. The warm rich sound of these brass instruments were a contrast to the percussive found sounds of the stairwell.
and cimbalom. I took four brass players into the space on 26\textsuperscript{th} March 2013 to experiment with some sounds and effects that I thought would work well with natural reverb in the space.

In the first test I asked the brass players to play random pitches one at a time, as I directed them regarding the attack and duration of notes. We started off with a lot of space between the pitches and gradually decreased this space between phrases. There were some beautiful tonal colours created with the random selection of notes, chosen by the musicians in real time. I then asked one of the trumpet players to improvise over these tonal colours. He also improvised in long phrases over the other three musicians creating even more harmonic and rhythmic interest, influenced by the reverberation of the space.

I decided to use this open texture in the final draft of the piece. However, the danger of letting the musicians choose the pace was that the music got very complicated very quickly and the musicians stopped listening to each other. This created a cacophony of sound that I was not looking for. However, after work-shopping this for awhile and directing the brass myself, we were able to keep it under control in the space. Figure 22 shows how this section was communicated to the musicians in the final draft.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure22.png}
\caption{Notation for ad lib pitches and rhythm for the ensemble.}
\end{figure}
3.9.1 Brass Textures

I also had the brass players test four textural ideas (Figure 23). Idea one was trying to create a continual sound texture, combining two of the brass instruments and the reverb decay. Instrument one would crescendo up to forte with a tight cut off, as the sound decayed in the space, instrument two would sneak in, matching the dynamic of the reverb and then crescendo up to forte where the process would then happen again with instrument one. We tried this back and forth between the two trumpets, experimenting with different lengths of crescendo and dynamics with some relative success. This was an idea I had explored to some degree in *When Traffic Rises*, which had been completed by this stage in the research.

![Figure 23. Four brass ideas for experimentation taken from my journal.](image)

The second idea was the least successful of the four ideas, so we didn’t really give it any time as it was unclear what the difference between this and idea one was when it came to actually performing the ideas. Idea three was the most successful out of the four ideas after some experimentation. Two of the brass instruments play two notes together until instrument one cuts off their note, while instrument two diminuendos, blending with the reverb decay of instrument one. Once the delay of instrument one has disappeared, instrument two was still playing a pitch quietly. This idea worked best when the two brass instruments played different pitches as seen in Figure 24.
The fourth idea was to have one of the brass instruments play a long slow melody or long tone and then have the other instruments play short loud pitches to create layers over the melody. This was not very successful as the long notes of the melody filled most of the space and didn’t allow any clarity for the decay of the short notes. This idea didn’t make it into the next draft.

3.9.2 Final Draft - Stairwell to Fifteen

The final draft came together fairly quickly as I had spent significant time working with the space; understanding the found sounds, the way the reverberation reacts to different instruments, as well as hearing how the harmonic and melodic material from the cimbalom interacted with the space. Adding the brass instruments felt very comfortable for me as I had worked with these musicians in other works in the research project, and in my own jazz orchestra long before that.

The title for the final draft changed to Stairwell to Fifteen, a play on the title Stairway to Heaven (Page & Plant, 1971). The ensemble was now considerably larger (four brass, cimbalom and stairwell percussion) and although I had noticed the human bodies of a six-piece ensemble had reduced the reverberation in the space a little, I thought it was a worthwhile compromise to achieve the unique texture of brass working with the space.

After composing the final draft, I set the ensemble up in the space with cimbalom on landing two, the brass on landing three and me, as the stairwell percussionist, on the fourth flight of stairs. My positioning allowed me access to slam the door on position three with easy eye contact with the brass, as the door slam and brass chord must be attacked together in the opening gesture (see Figure 25).
Much of the melodic and harmonic material developed for *Duet for Cimbalom & Stairwell* was retained, but was re-orchestrated with the new instrumentation. All of the harmonic and melodic information from the beginning to bar twenty-four is made up entirely of the four notes found in the space.

The first half of the composition is made up of a series of short musical gestures which produced different sound textures in the space followed by a fermata which allows the space to respond. Figure 26 shows two of the main textures heard in the opening of this piece. The cimbalom set up the semi-tone colour, followed by a richer harmonic gesture using the four notes mentioned above, in a vertical harmonic formation.
The pacing of the piece develops from one or two bar gestures to longer, more continuous musical input in the space. This shifts the structural emphasis from a ‘call and response’ idea to an ensemble arrangement of collaboration, starting at bar forty-nine when the harmonic texture becomes very dense and leads into bar fifty-five where the ensemble is free to “ad lib pitches & rhythm” (Francis, 2013a).

This ad lib improvisation section is an idea which came from the first test I made with brass in the space. I set up the improvisation with a concept taken and adapted from composer Anthony Braxton called “alignment improvisation” (1988). Braxton’s concept is “an improvisation that is usually used to smoothly reconnect into a given notated section” (Braxton, 1988, p. i). In my situation I used notated sections to smoothly transition in and out of the improvisation section.

This short, open repeated section of group improvisation was important in this composition as it referenced my own jazz background and experience, plus it gave the musicians a moment to take their eyes off the written notation and to just listen and interact with each other and the space, whilst retaining the aesthetic of the ‘alignment’ material. I have used this technique in previous works such as *Lido Lowdown* (2004c), where I set up a notated sound colour which leads into the alignment improvisation of a

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*Figure 26. The two main opening textures.*
Dorian mode, which then in turn sets up the tonal centre and new tempo for the opening statement of the melody which can be seen in Figure 27 below.

![Figure 27. Example of my use of ‘alignment’ material in Lido Lowdown. (Francis, 2004c)](image)

The inclusion of this technique in *Stairwell to Fifteen* is evident between letters I to J in Figure 28 below. This texture is then expanded upon by the musicians, but by using their own pitch and rhythmic choices. As I discovered in the tests, the musicians start with the right texture but slowly get excited, play too much and get louder. My role was to direct the improvisations during the performance, and to cue the next section before the ensemble would become too chaotic. This freedom of listening and playing instead of reading notation allows the musicians freedom to work with the space more personally.
New material was developed in sections D, E and F, using the same pitches but using glissandi to blur the reverberant sound in the space. The trombone was used primarily to glissandi between F and Gb in the upper register of the instrument where the trombone’s tone is “brilliant and triumphant” (Rimsky-Korsakov, 1964, p. 24) with a singing quality. Over the trombone’s crotchet glissandi, I added the cimbalom on a semi-quaver quintuplet figure and trumpet 2 playing a quaver triplet figure to again add rhythmic and harmonic tension (see Figure 29).
During the workshops with the brass players I had them set up on landing three, but what became apparent was that the reverberation created was much shorter than anticipated and clearly shorter than the early tests and performances with just the cimbalom. I switched the brass to landing two with the cimbalom, and the reverb was instantly longer than the landing three position. It appeared the new brass position worked better on landing two because their sound was projected into the largest open chamber in the stairwell which opens up from landing two up to the high ceiling above landing four.

Before the final rehearsal, one of the trumpet players noted that he had problems seeing my direction, and that a percussionist should be engaged to perform the stairwell percussion parts so that I could dedicate my time to conducting. This would mean that the musicians would have a focal point for direction if I could position myself in the space so that everyone could see me. I was a little unsure about this idea to begin with because it meant that there would be another person in the space to negatively affect the reverb. Despite this caution, I went ahead with asking someone to come in to rehearse the percussion parts, just to see how it would go logistically and for the sound. I positioned myself halfway up the third flight of stairs, just above the cimbalom and brass, so I could see the stairwell percussionist above on the fourth flight. In this position I was able to see all the musicians at all times. Eye contact was important as there were many pauses and cues throughout the piece. As I was no longer playing the stairwell percussion, and the brass were positioned on a different landing, I had to find a new way of playing the opening door slam gesture, while the brass played their first chord. I asked one of the trumpet players if he could slam the door and play his first note at the same time. After a few tries he was able to co-ordinate it. We rehearsed this part a number of times to get the other brass in time with the door slam.

During this rehearsal, my positioning and role as conductor meant that I had control of the length of the pauses between the gestures and was able to keep the ensemble together. The ensemble commented afterwards that it was much easier to follow and they felt much more confident with their entries. I was also easily able to cue the stairwell percussionist who had the least amount of rehearsal time.
3.10 Final Recital Performance and Recording

This piece was the first of the three pieces performed at my recital. Because the recital was in two venues, I had the audience meet me at The Roundhouse Theatre at ECU at 7pm. From this location I was able to count the number of audience members and then escort them to the building fifteen stairwell, which was a three minute walk across campus.

Despite only inviting ten people to my recital, twenty attended, which meant I had to rethink how to present the concert, especially this piece. I decided to split the audience members into two groups and perform the piece twice as I knew that all twenty-seven people (audience, ensemble and myself), in that space would dramatically reduce the reverberation, possibly to a point that it wouldn’t work. I did not want to take this risk with twenty-seven people and knew from experience from the first performance of this piece in 2012 that having an audience of fifteen still worked.

I spoke with the audience outside to begin the concert, as I knew it would be very difficult to understand anyone speaking inside the space. The audience were instructed to stand on either the first landing or the first flight of stairs and to not lean on the handrailings as they add to the resonance of the piece.

The performances went very well and the goals of the piece were achieved. The audience stood and sat very quietly with many people just closing their eyes and letting
the sounds in the space saturate them. Audience member Daniel Hart commented afterwards that he had his eyes closed the whole time and did not know how the percussive sounds were made and this added to the wonderment of the space and experience (Hart, 2013).

Because of the logistics of the recital night being held in two different venues I decided to record and video this piece earlier in the day. This allowed me to capture the space without audience, or complications of moving equipment between venues. This is the video included at appendix 3.

3.11 Reflections

I think it is useful to include some personal reflections on the results of the process of testing the space, work-shopping material and completing a number of performances of the different drafts on this composition. I was really pleased with this site as a source for compositional inspiration. It was the first site that I explored and it offered me many obvious and literal acoustic characteristics that I could work and interact with directly, such as the long reverberation and pitched hand-railings.

The incorporation of more movement up and down the stairwell would link the site back to the actual everyday usage of the structure. The movement I used was very functional for the structure of the piece, linking the different percussion positions. In future compositions in similar spaces I would consider moving the brass musicians around the space during the performance, and even the audience members as well, so they can get a different perspective of the sound in the space.

I had some initial concerns that the possibility of the ‘found sounds’ would be interpreted as ‘accidental’ sound. However, I feel that the stairwell percussion always drew attention to the architecture of the site as a sound source and the site-specificity of the composition. This element was key to the work’s site-specificity and overcame my concern.

The freedom for the musicians to improvise and react to the space themselves at some stage in the piece was a highlight of the testing process. This freedom of expression enables musicians to connect with the space, and the sounds created in a site-specific
work in a more personal way, rather than focusing on my notes on the page. The space becomes the focus, not the notes.

I discovered that having more people in the ensemble changed the nature of the work considerably, through the effect of their bodies in the space. The relationship between the space and the performers is a delicate and complex one that I navigated intuitively. In addition, more people meant more choreography; designing placements of people in the rather small space. Whilst I decided to retain this ensemble size for the final recital, due to my enjoyment of the rich brass textures, I am aware that it may have compromised the nature of the acoustics in a way that was against the piece’s aims.

The live audience experiencing a site-specific composition in the space was a key element to the success of the piece. You cannot replicate this experience in a recording or for the listener any other way. Whilst audience numbers need to be carefully managed, a definite plan of how many can be in the space for the performance ensures the composition will be successful. Many new performance works explore limited audience numbers, featured in forums such as Perth’s Proximity Festival, a performance festival dedicated to small performances and audiences. Melbourne ensemble Aphids have also experimented with one on one performances in works such as Last Night Now (Dunn & Thoms, 2012) but these do not use the venue as an instrument, as Stairway to Fifteen has done. A limited number of audience members in an unorthodox performance space adds to the experience making the performance feel special for everyone involved.

3.12 Conclusion

Stairwell to Fifteen demonstrated how a built site could become part of a music composition at the most site-specific point on Wilkie’s scale of site-specificity. The development of the instrumentation in this piece from a solo instrument into a quintet provided an interrogation of the space and its acoustic condition, and the ways it could be incorporated into a musical composition. The final recital presented an original new musical work that engaged with space in new and innovative ways, especially in regard to my own compositional practice.
## Chapter 4: From Traffic Rises

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<td><em>From Traffic Rises</em> is a site-generic composition for instruments and electronics that was developed between March 2012 and December 2012. It made up part of the final recital on December 17th. Commissioned by Decibel New Music Ensemble in March 2012.</td>
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| **Performances** | 1. December 3rd 2012: *Sounding a Room*, Hackett Hall Gallery in the WA State Museum by Decibel with additional musicians. Flute, bass clarinet, alto saxophone, tenor saxophone, two trumpets, viola, cello, four speakers and soundscape.  
2. December 12th 2012: ABC Classic FM national broadcast, *Voices From the West* podcast of December 3 performance.  
   - [http://mpegmedia.abc.net.au/classic/australianmusic/201212/amu-2012-12-12.mp3](http://mpegmedia.abc.net.au/classic/australianmusic/201212/amu-2012-12-12.mp3)  

### 4.1 Introduction

*From Traffic Rises* went through many pre-production and testing phases before I settled on the final composition, especially when compared to other pieces in this project. This was because the sound worlds, electronically created spatial effects, soundscape recordings and graphic notation I wanted to create were outside of my expertise as a jazz composer. I needed time to develop new techniques and understandings during the process of creating the work.

After some testing at the footbridge over a freeway site with and without acoustic instruments, I decided to create a work that transported the site-generic characteristics of the soundscape into an orthodox performance space, but with a specific performance setup inspired by the Xenakis composition *Terrerēkorti*. In this piece Xenakis utilises an “entire orchestra over a circular space with the percussion on the periphery of the
instrumental circle to enclose the sounds” (Santana, 1998, p. 12) and the audience is seated amongst the orchestra. I created my own circular listening environment with the musicians and audio speakers forming a circle around the audience which was seated on the stage. This set up created a very specific listening space within the theatre where “the actual space remains the same while sound reshapes a virtual space” (2003, p. 6).

The compositional starting point for From Traffic Rises - traffic noise from a bridge - could have been sourced from any traffic from any bridge. Yet it is the translation of the chosen site into an immersive, circular concert hall listening environment that is the key to the work.

This chapter outlines the chronological process of creating this site-generic, spatial composition beginning with a chance encounter with this fascinating soundscape.

4.2 Introduction to the Site

From Traffic Rises (Francis, 2012c) began with a personal experience standing on a pedestrian bridge near the Frankfurt Airport on a trip to Germany in July, 2012. I was going for a leisurely walk and stopped for a moment on a bridge to watch the vehicle traffic travelling underneath on the ten lane highway. What immediately struck me was the spatial definition of this immersive soundscape, created by the continuous but irregular pulse of the traffic passing beneath me. The different sounds of each vehicle worked as sustained tones fading in and out and panning from side to side as they travelled under the pedestrian bridge, coming from both directions. The varying velocities, volumes and tones meant there was a constant soundscape but one with rapidly shifting textures and tones with an interesting listening frame.

In the film Listen (Sebestik, 1992) John Cage makes comment of his fascination with the sound of the traffic soundscape suggesting that “If you listen to Beethoven or to Mozart you see that they’re always the same. But if you listen to traffic you see it’s always different” (Sebestik, 1992). Here Cage indicates a detail that defines ‘found sound’ or ‘soundscape’ that he sees as more complex than many classical compositions.

This sentiment was first explored in The Art of Noise (Russolo, 2004) futurist manifesto by Luigi Russolo in 1913, stating that with the rise of industrial machinery and the development of the modern music towards more and more dissonance and complexity,
the listener’s ear was ready to embrace noise as musical material, with his preference towards this new “musical noise” (Russolo, 2004, p. 6) to previous orchestral sounds. His opinion is supported by Cage’s, again with reference to vehicle traffic sound, when he states;

*we get infinitely more pleasure imagining combinations of the sounds of trolleys, autos and other vehicles, and loud crowds, than listening once more, for instance, to the heroic or pastoral symphonies*” (Russolo, 2004, p. 6)

Max Neuhaus (USA, 1939-2009) also refers to the traffic soundscape as an interesting sound source when talking about his interactions with the Brooklyn Bridge.

*The idea came from a long fascination of mine with sounds of traffic moving across that bridge – the rich sound textures formed from hundreds of tires rolling over the open grating of the road bed – each with a different speed and tread.* (2013, p. 67)

Neuhaus’ admiration for what is commonly known as ‘traffic noise’ is not shared by most people. In the appendix of R. Murray Schafer’s seminal book *The Soundscape: The Sonic Environments and the Tuning of the World* (1994) he presents his findings of an “International Sound Preference Survey” (p. 268) where traffic noise was rated by eighty-three people out of 501 as “unpleasant” compared to four that said it was “pleasant”. It is that very fact, that the traffic sound is such an everyday, sometimes considered annoying, soundscape that has drawn me to it, as did the ‘annoying’ sound environment people described in the stairwell of the previous piece.

Considering a soundscape as compositional material was a very different way of experiencing a site, compared to the reverberant spaces I had been testing. The site already contained a soundscape without any interaction or need to produce sounds, not unlike one of French artists Marcel Duchamp’s (1887-1968) ‘readymades’ such as *In Advance of a Broken Arm* (1915) and *Fountain* (1917). These readymades were ordinary manufactured objects that Duchamp then slightly modified and displayed as art. They were already functioning objects without Duchamp’s creative perspective, much like the traffic soundscape existing without any creative input.
Duchamp’s reasoning for choosing the particular objects for his readymades “was never dictated by esthetic [sic] delectation. This choice was based on a reaction of visual indifference with at the same time a total absence of good or bad taste” (Sanouillet & Peterson, 1973, p. 141). This idea is similar to my attraction of everyday and mundane sites which I have been exploring in this research project. Like Duchamp, I eventually took the everyday element, in my case, the soundscape - and transported it to the musical equivalent of a gallery - the Concert Hall.

On my return to Perth from Germany I researched accessible pedestrian bridges close to where I live in the northern suburbs of Perth. I found the Britannia Road Footbridge in Leederville which crosses the eight-lane Mitchell Freeway and the Joondalup train line (see Figure 31). The footbridge is a suspension bridge structure approximately 120 meters in length and was opened on June 7th 1992. While the ten lane freeway I experienced in Frankfurt was not below it, I felt that the size and positioning of the bridge warranted a site visit for some active listening.

4.3 Pre-Production

On August 8th 2012, I spent an hour on the Britannia footbridge experiencing the site as Hunter suggests: “just to enter the space alone and simply ‘be’ in the space in a series of moments” (Hunter, 2005, p. 372). I was on the bridge at around 11:30am and the traffic was not dense. This meant that the vehicles were able to travel at their maximum speed, which created a much louder sound than if I was listening during peak hour and the vehicles could only travel slowly.

The traffic was quite even in each direction which gave the site a balanced and immersive sound when listening in the middle of the bridge. The closer I listened, the more detail I heard and the more interesting it became, a technique Cage speaks of in reference to boring things; “If something is boring after two minutes, try it for four. If still boring, then eight. Then sixteen. Then thirty-two. Eventually one discovers that it is not boring at all” (Helm, 2014). This was true of this soundscape which had the same mesmerising feeling of listening and watching waves crash onto the shore. There was a comfort in the constant pulsating monotonous soundscape.
Some vehicles were louder than others and had unique sound qualities to them. Motorbikes pierced the soundscape with a higher pitched louder timbre, while trucks had a deeper humming sound quality. On one occasion a ute passed carrying something wrapped in loose plastic which was vibrating very loudly creating an aggressive fluttering sound.

I spent this time just listening, journaling what I heard and making field recordings. As in Frankfurt, I was struck by the musical potential of this site. It featured many qualities that I would use to create a composition - pitch, rhythmic gestures, textural variation, colour and dynamic shape. It was on this first active listening and field recording session that I noted “volume swells, panning effects, sustained tones” (Francis, 2012a) in my journal. These elements would become the starting points for the composition.

Initially I wanted to compose this work so it could be performed live on the bridge, blending the acoustic instruments with the natural occurring soundscape. The traffic soundscape ranged between 70-80 decibels (dB), which led me to think that it was possible to blend acoustic instruments with the soundscape in a live performance setting, as the decibel range of the trumpet in its extreme ranges can measure between 25-111 dB (Meyer, 2009, p. 54) or more commonly between 55-95 dB (Fielding, 2010). To test this idea I invited two improvising jazz musicians to participate in some experiments on site.

On August 31st 2012 I took two close collaborators of mine, Ben Collins on saxophone and Ricki Malet on trumpet, to the footbridge (Figure 32) to document their responses to the soundscape and how they would express the site in their playing. Leading up to
the testing I gave them no information to what I wanted or was doing as I wanted to
gauge their initial responses and how they reacted directly with the site without any
preconceived ideas of what I was expecting or anticipating.

Figure 32. Ben Collins (sax) and Ricki Malet (trumpet) improvising on
the Britannia Footbridge. (photograph by Mace Francis)

The first task I asked of them was to freely improvise on the bridge. I gave them no
other instruction as I wanted to observe if, and how, they would engage with the
soundscape. They immediately started to interact with each other, playing call and
response like phrases and complementing each other melodically and harmonically very
much in a jazz style and as they had been trained. This idea of listening to the other
musicians is a major focus during jazz education, where “there is no substitution for
listening” (Lawn & Hellmer, 1993, p. 276). Not once during the four years of my
undergraduate studies do I ever recall anyone asking, or suggesting, for us to listen to
any of the sounds around us as a source for inspiration or interaction. If there were any
surrounding sounds, for example - construction work or an ensemble in the room next
door, it was either considered funny or annoying but never a musical inspiration. This
discovery made me aware that it is uncommon for most musicians to have an awareness
of the surrounding environmental sounds as a source of musical inspiration and that it
should not be assumed that this type of awareness will come naturally to all musicians.

I then asked the two musicians to focus on the sounds that surrounded them by guiding
them through some active listening, pointing out the sounds and musical elements I had
experienced at the site. I asked them to improvise again, this time interacting with the sounds around them rather than each other. The resulting new listening, focus and soundscape awareness completely changed the way the musicians improvised. It changed from a melodic and rhythmic jazz language to sound imitation, responding to the sounds of vehicle engines, copying the dynamic shape of sounds approaching and disappearing, as well as altering instrumental timbre to imitate vehicle sounds. The musicians’ improvisational approach also became quieter so they were able to blend with the soundscape rather than dominate it. There was a real sense that they were playing with the space rather than just in the space much like Horn’s solo flute improvisations in the Taj Mahal when he recalls that, “I listened and responded, as if I were playing with another musician” (Horn & Underwood, 1990, p. 200). It was that close connection between the musicians and the site that I was interested in and wanted to explore further.

This session with the two musicians gave me a clear idea and understanding of ways that acoustic instruments could imitate and blend with this soundscape. I also left the test with some clear compositional ideas and some more field recordings of the instruments interacting with the soundscape which I would use to develop the piece.

4.4 Pre-Production Findings

From these improvisations, my own active listening sessions and field recordings, four strong compositional elements were created - sustained notes, volume swells, glissandi and bidirectional spatial movement effects. These four musical elements were derived directly from the sound of the traffic passing under the footbridge. They are detailed below.

4.4.1 Sustained Notes/Continual Sound

This almost ever present, sustained soundscape is created by the continual appearance of vehicles on the freeway, “a flat continuous line in sound” (Schafer, 1994, p. 78) which Schafer describes when discussing what he call the “lo-fi soundscape” (Schafer, 1994, p. 71), the overpopulation of sounds with “so much acoustic information that little of it can emerge with clarity” (Schafer, 1994, p. 71). Schafer makes particular reference to the introduction and development of traffic sound from the industrial revolution;
As roads and railroads and flat-surfaced buildings proliferated in space, so did their acoustic counterparts in time; and eventually flat lines in sound slipped out across the countryside also, as the whine of the transport truck and the airplane drone demonstrate. (Schafer, 1994, p. 78)

I found the soundscape to consist of engine noise, the friction of the tyres on the road and the wind reacting with the shape and materials of the vehicles. Each vehicle approached and disappeared in one of two directions depending on what side of the freeway they were travelling.

4.4.2 Volume Swells
The volume swells are created as each vehicle approaches, fading in, and then fading away as the vehicle moves away from my position on the bridge, which was also the loudest point for the listener. The combination of these continual and subtle effects make up the larger sustained soundscape mentioned above.

4.4.3 Glissando
Glissando in musical terms describes the slide from one pitch to another (Kennedy, 1994, p. 346) through the infinite number of microtones between the ‘fixed’ notes of the tempered scale. String instruments are able to create this effect easily by sliding a finger up or down the neck of the instrument. The trombone is also able to produce an effective glissando between specific notes. The glissandi heard in the traffic soundscape is the result of what is known as the Doppler effect; a sound phenomenon created by the relationship of “movement between the sound source and the listener that provokes either a compression or an expansion of the sound wave” (Augoyard & Torgue, 2011, p. 39). As a vehicle approaches the listener, the sound waves compress, bending the pitch upwards, sharpening it slightly, and then as it passes, the sound waves expand causing the pitch to bend downwards, flattening as it moves away. The effect of the pitch bending downwards was more prominent in this particular soundscape.

The glissando in most traditional western music is used as an embellishment or a performative device between a few notes and does not have notation that “adequately describe one in fine detail” with the use of just a straight line between the two pitches.
(Linz, 2003). The direction of this traditional glissando is “either up or down, much more rarely up and then down, for instance” (Linz, 2003).

An example of glissandi as a textural device, moving both up and down, can be found in Bob Brookmeyer’s big band composition *Nasty Dance* (1980a). The trombone and trumpet section are instructed to play slow glissandi in a general shape with just a starting note given and no particular rhythmic instruction (see Figure 33). These glissandi overlap each other in pitch and time to give an unsettling sensation over the rhythmic crotchet beat rhythm section pulse.

The trombones are able to easily play this example as they are able to use their slides to produce the glissandi. However, on the recordings of this composition, the trumpets are not as successful to get the range of glissandi that Brookmeyer indicated on the score. The trumpets are able to create some individual glissando by use of half valve manipulation.

![Figure 33. Use of brass glissandi in Bob Brookmeyer’s big band composition Nasty Dance (1980a).](image)

### 4.4.4 Bidirectional Spatial Movement

The effect of bidirectional spatial movement was created by the aural sensation of the vehicle sounds passing in different directions. It was best experienced by standing in the middle of the bridge and facing the freeway so that each ear could evenly perceive the both sides of the panning. The left ear hears the vehicles approaching from behind and the right ear hears them approaching from the front.
4.5 Reflection on Early Findings

After the testing, while the musicians and I reflected on the findings, the topic of rhythm and tempo and how they would be dealt with was raised. The soundscape from the bridge is a constant flow of sounds and pitches fluctuating subtly in what seems to be a random series of events. The musicians noted that they were constantly trying to superimpose tempos that would work with the random fluctuations in the traffic noise, rather than just freely responding and interacting. This is another aspect of being educated in playing music that is always in metronomic time. This characteristic made me think about creating a composition that avoided obvious metronomic tempo throughout - just like the soundscape. Then I began to wonder how I could best communicate such an idea to the musicians. I considered the possibilities of traditional notation systems, guided improvisation and graphic notation.

I considered the bridge’s relationship to be site-generic on Wilkie’s scale, as my compositional idea could work with any other footbridge soundscape to some degree. The Britannia Footbridge soundscape sounds almost identical to that of the footbridge in Frankfurt, from memory. While this piece does not rely on a specific footbridge to be successful, it does need the soundscape of a footbridge to create the piece, so the definition in regards to the compositional process and material is site-generic.

As the soundscape exists naturally without any interaction, that is, the performance of the musicians on the bridge did not alter the sound of the traffic to a listener on the bridge, I considered making the field recording part of a work with acoustic instruments experienced in a traditional performance space. The challenge was to find an effective way to reference the field recording in the work.

To translate the four musical elements (sustained sound, volume swells, glissandi and bidirectional spatial movement) to acoustic instruments, I adopted some spatial characteristics of the site in early tests. By overlapping the instruments sustain time, just as the vehicles approaching the bridge overlapped due to the multiple lanes, a long continual sound can be created. This was particularly useful for instruments limited by breath. Volume swells are used regularly to create dynamic shape in music through crescendo and diminuendo.
However, the glissandi and bidirectional spatial movement required some further investigation, so I devised a series of tests to experiment with ways of creating these effects and sounds on acoustic instruments.

### 4.6 Compositional Testing

On September 23\textsuperscript{rd} 2012, I organised a test workshop of five musicians (three trumpets, alto sax and tenor sax) to meet off site to experiment with some of the musical elements discovered during the pre-production stage. The focus of this test was to try to recreate the soundscape of the bridge with just acoustic instruments, to try to recreate the bidirectional spatial movement effect created by the passing vehicles.

#### 4.6.1 Using the Soundscape

The testing session began by playing part of the field recording that I made on August 8th for all of the musicians to listen to. The playback system for the soundscape was in stereo so it did not have the same immersive surround sound quality as on site but I made sure the recording was played back for the musicians between 70-80db, the same volume it was on site, so as to give the musicians an indication of what kind of dynamic range was needed.

The first test required the musicians to imitate what they heard in the soundscape recordings, and to attempt to blend with it. Once again, it became apparent that the musicians began to listen to each other rather than the soundscape. This resulted in them playing long chords together like they were being cued by a director. This effect was undesirable as it distracted from the ‘flat line sound’ that was produced by the soundscape. I wanted the musicians to interact with the soundscape to enhance this idea of ‘flat line sound’ rather than just playing over the top of it.

On the second attempt a much quieter and subtle overall texture was created, much like what happened with the two musicians on the bridge when I asked them to blend with the soundscape. When the musicians’ focus was on listening to the soundscape, they played in a much calmer and focused way as they did not have the feeling of competing with the other musicians. Because the soundscape is quite monotonous in nature, with only subtle changes in the texture, it meant that the musicians had to acquire significant focus to develop or reflect a texture in the soundscape. Once everyone played more
subtly, the music and the soundscape were able to breathe and the musicians had room to express their ideas.

Also during this play through, some of the musicians started using more extended and textural techniques on their instruments, such as breathing air through the instrument and playing sub-tones. Blowing air through their instruments was an effective texture as it sounded like the wind as the vehicles were passing. Melbourne based trumpeter and improviser Peter Knight calls this technique “un-pitched breath sound” (Knight, 2011, p. 56) and describes it as “a unique aesthetic using breath blown through the trumpet [wind instrument] almost exclusively” (Knight, 2011, p. 56). Stockhausen used the term “coloured noise” (1955, p. 4) which he first used to describe white noise in electronic music but then adapted to describe sounds made by acoustic instruments, such as Knight’s ‘un-pitched breath sounds’. This was a useful texture and it can be produced at a very low volume as no pitch needs to be produced. I thought that this could be a subtle way to introduce the sounds of the instruments into the composition without the production of pitches, while still being related to the soundscape.

I also workshopped sub-tones with the group. The sub-tone is a “particularly soft way of playing, but is a technique in itself rather than just playing quietly. The sound is usually fatter, more spread and less edgy” (Thomas, 2003) and creates a soft breathy tone on the tenor saxophone, most effective in the lower register of the instruments range. When these sub-tones were played with the soundscape, the tenor sax blended in very well as it sounded like a truck or semi-trailer passing. I decided to use this sound but only sparingly, as these larger vehicles were not always present on the freeway when I was listening, and I wanted to represent my own experience on the bridge as much as possible.

The next test was to try and recreate the soundscape experience without the field recording. However, I found that this experiment resulted in a sparse, empty ensemble sound especially when compared to the soundscape. I wanted to try this to see if the musicians could recreate the soundscape in a different space with just acoustic instruments. We did not succeed, and I wondered if a large number of instruments would be able to create the full effect of the soundscape. I only had access to between eight and ten musicians for the project, so I didn’t test this idea. But this did make me
aware of how much the soundscape contributed to the overall texture of the ensemble. When all the instruments were playing together, there was a sense that something was lacking in either the fullness of the sound or the sonic support of the other instruments. This test re-enforced the idea that the soundscape could be an integral contributing member of the ensemble, as the stairwell was in the previous piece, to create an overall ensemble sound. The absence of the traffic soundscape led me to make the association of a jazz big band ensemble rehearsal without the bass player or drummer. It felt like the foundation of the ensemble sound was no longer there. From this point I decided that the inclusion of the field recording as part of the composition was essential.

Composer and guitarist Charles Underriner (USA, 1987-) has composed a series of works called *The Nocturne Series* which explores the “‘in-between-ness’: sounds in between music and environment, in between representation and reality, in between nothingness and the contingency of silence” (Underriner, 2011). In 2012 I saw the premiere of his composition titled *Nocturne Series 1: for electric guitar duet and field recording* (Underriner, 2012a) at The Global Composition Conference in Dieburg, Germany. This piece was intensely quiet and featured two electric guitarists reading a traditionally notated score with a field recording playback of a soundscape of a dry river bed in Texas. The score performance notes direct this intensity of dynamic and explain why;

> **Utmost care should be given to this balance, especially since the field recording and two guitars should be quite quiet. At its best, this combination should create a new and unstable environment.** (*Underriner, 2012b, p. 2*)

It was an engaging performance because the volume of the musicians and the field recording were at such a low volume that the environmental sounds of the performance space were also able to blend into this ‘new and unstable environment’. It was the idea of interaction with a space that *From Traffic Rises* drew from its initial stages. While the dynamic of the traffic soundscape is much louder and denser than Underriner’s subtle field recording, it was the intention and the real focus on combining “the musical sound into the field recording itself rather than use the field recording as a background
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to the musical sound” (Underriner & Couck, 2012, p. 422) that informed my approach to this composition.

4.6.2 Realising the Bidirectional Spatial Movement
The next test was designed to create the spatial sensation similar to that of traffic passing by the listener on the bridge with only acoustic instruments. The idea was to create the feeling, or sensation, of making a pitch travel from one side of the room to the other without the physical movement of the musicians. This would be unlike the Xenakis composition *Eonta* (1964) where the listener “perceives the movement of the sound created from the changing locations of the performers” (Kerm-Canfield, 2013, p. 30) in the performance space.

When I first experienced this sensation on the bridge, I was not sure how I could use it as a compositional tool but I did note that it had potential. When standing in the middle of the bridge, facing the freeway, it allowed both ears to evenly perceive both sides of the traffic travelling in both directions. I will be using the term *bidirectional spatial movement* to describe this sensory perception of sound travelling through space in opposite directions on either side of my head. This was the first time I had ever considered a spatial sensation as a compositional device.

I initially tested the bidirectional spatial movement with two acoustic instruments, both trumpets, seated on either side of the room. I imagined trying to move a sound from one side of the room to the other like throwing a ball. I asked the first musician to play a single pitch and volume to gauge any kind of movement but I could find none. I then asked Musician One to play the same pitch as before but to use a volume swell to give the pitch some movement through the space, as this what I heard in the traffic soundscape. The fluctuation in dynamics gave the pitch a perception of physical movement within the space, travelling forwards and upwards when the volume was increased and downwards when the volume was decreased. While it created some movement, it did still feel like it was coming from a single source and not travelling across the room. The challenge was now to use that movement to pass the pitch to Musician Two on the other side of the space. We then experimented with Musician One creating a pitch, gradually getting louder and then stopping as musician two attacked his
note and then gradually got quieter. This did not work as the transition between the two instruments was too obvious.

After some discussion and experimenting with note lengths, speed of crescendo and diminuendo, attack and dynamic range, I came to the conclusion that the transition worked best when a second musician would anticipate the peak dynamic of the pitch and, in a way, initiate the transition by matching Musician One’s pitch, volume and tone, then taking the pitch to his side of the space by gradual diminuendo. At this stage it was important for the first musician, after passing the note, to make sure that his diminuendo was even, but under the dynamic of the second musician. A notated representation of how this experiment worked can be seen below in Figure 34.

![Figure 34. A musical representation of bidirectional spatial movement.](image)

This experiment involved the listener positioned at the side perceiving the pitch travelling from left to right, in a somewhat two dimensional way. When this technique was performed correctly I could perceive, especially with my eyes closed, the pitch travelling through the space from one side of the room to the other. The success of this experiment led to creating a more immersive sound with the pitch circling the listener.

Since we could pass a pitch from one side of the room to the other, I wondered if we could create a sound that felt like it spun around the room. This idea was influenced by the immersive feeling of standing on the pedestrian bridge. To perceive the sound spinning around the space I thought the ideal listening position would have to be in the centre of the ensemble, much like positioning myself in the centre of the bridge to experience the full spatial effect.

To start this experiment I just followed on from previous tests. Instead of passing the pitch across the room, all five musicians stood in a wide circle and passed the pitch to
the person standing next to them around the circle, using the techniques learnt in the previous tests. What soon became obvious was that to keep the pitch moving seamlessly, the attack of a note should not be heard as it distracted the listener away from where the focus of the pitch was in the space.

To address these issues I had to allow the musicians enough time to prepare and sound their note without an audible attack. This was done by allowing the musicians enough time to anticipate their entry, well ahead of when the note needed to be at its loudest. This meant that all five musicians were playing all together to create the illusion of a pitch spinning around the room. Figure 35 is a notated representation of this experiment with five musicians.

![Figure 35. Musical representation of the circular spatial movement.]

I also found that the decrescendo of the note was just as important as the crescendo as it supported and created the effect of the sound moving away. If a musician faded too quickly it sounded like the pitch jumped abruptly to the next musician, rather than passing. This was an important discovery, as I had been focused on the beginning of the transition and not always listening for the transition after the note was passed.

The transitions between instruments sounded more successful between different instruments, for example between a trumpet and sax rather than trumpet to trumpet. When the same instruments were side by side, the transitions did not blend as well because the instrument timbres were too similar and so showed up any imperfections or variations in tone or tuning. When different instruments passed the pitch to each other, there was a better blend to create a musical texture rather than the sound of two trumpets. This was a contributing factor to how I would choose and position the musicians in the space.
Xenakis experimented with circular movement of pitch through space in his composition *Terretēktorh* (1966), where the circular ensemble and audience setup (see Figure 37) allowed Xenakis to create “sonic spatial movement, notably the rotation of sound” (Santana, 1998, p. 14) which Xenakis realised as a series of small and large circles, and mathematical spirals within the ensemble set up. *Terretēktorh* begins with the rotation of a “single pitch (E4) around the string instruments located in the outermost two rings” (Kermit-Canfield, 2013, p. 50) of the ensemble. This complete rotation around the ensemble is utilised in the second half of *From Traffic Rises*. My ensemble set up is different however, with the audience in the middle of the space and the musicians and speakers dispersed evenly around them to make sure that each audience member can have a very similar listening experience. This is different to *Terretēktorh* because the size of the ensemble and the physical space that it takes up means that the “rotation will be more apparent depending on the listener’s location” (Kermit-Canfield, 2013, p. 50).
Xenakis created his circular movement with the same process I had experimented with in the early tests for *From Traffic Rises*. Figure 38 below shows the effectiveness of the opening string section playing crescendos and diminuendos throughout the ensemble similar to my experiment with the five musicians above in Figure 35. The problem we had with the audible note attack of the brass instruments would not have been an issue with the string instruments as they are able to start their note at a much lower volume with almost no attack. This means that each musician in the example below didn’t need to anticipate their entry ahead of time.
There was a difficulty with pacing when working with the ensemble on this idea of circular movement. In the beginning we tried to rely on the musicians listening to each other, but this became more and more problematic depending on the ensemble size and the space we were workshopping in. I decided to direct the circular movement myself, by standing in the middle of the space and spinning in an anti-clockwise direction. I used my left hand to direct the musician to start their note and crescendo until my right hand was pointing at them. This direction informed the musicians of their entry point and the moment that their pitch should be at their loudest. They were responsible for the gradual diminuendo that was required. This idea for circular ensemble direction came from Schafer’s book, *Ear Cleaning*, (Figure 39) where he instructs the conductor to work with a circular formation of students singing to create a similar circular movement in the space; “The student conductor with both arms outstretched slowly pivots so that only one portion of the class is heard singing the tone as it slowly moves about the room in a circle” (Byrne, 2012, p. 10).
This technique of directing the ensemble was successful and did produce the best results so far. However, it was not practical to do over a period of time as I got dizzy and would need to be in the centre of the space, which is where the ideal listening position would be. It was at this stage that the importance of notating the piece came into the planning. I needed a way to communicate the piece to the musicians, which was free of tempo and without the use of a conductor to hold the ensemble together. Graphic notation seemed like the best way to communicate this musical idea.

4.6.3 Space

After some reflection of previous tests, I began to formulate some compositional scenarios to utilise what I had achieved in the last session whilst maintaining the composition as site-specific. I was considering whether to perform the work live on the bridge, utilising the natural occurring soundscape, or to use the field recording and translate the work into a more formal performance setting. The audience logistics and inconsistency of the outdoor bridge venue made me lean towards using the soundscape field recording in a concert hall performance. This decision was also strengthened when I was able to hear how both the acoustic instruments and the field recording sounded in a rehearsal space. The spatial movement, especially in its circular form, would have been difficult to present on the bridge as it is not wide enough to create the ideal circle around the listeners. Whilst I was not able to realise this ideal listening environment at the premiere of the piece in the hall at the Western Australian State Museum, I was able
to rectify this problem for the second performance of the piece on December 17th, 2013 in the Roundhouse Theatre at ECU as part of my examination recital.

4.6.4 Glissandi

The other compositional element found in the soundscape was glissandi, produced by the Doppler effect. A long glissandi is difficult to produce on most brass and woodwind instruments as the musician needs to press down keys and valves to produce their ‘in between’ pitches. Stringed instruments with no frets and instruments with slides are able to produce longer glissandi as they are able to slide between the set pitches. While most brass and woodwind instruments can’t produce long glissandi, they can produce a short one by adjusting their tuning with either their embouchure or half-valve techniques. Trumpeter Ricki Malet was so successful with his small glissandi that ABC presenter Stephen Adams assumed that Malet was playing “¼ tone flugelhorn” (2012). My thought was that we could create a long glissandi between all of the musicians by passing the pitch around in the circular formation.

For this test I used eight musicians; three trumpets, two alto saxes, one tenor sax and two trombones. The focus for this test was to recreate the same circular bidirectional spatial movement exercise we performed the last time, but as the pitch passed to each musician they would slightly sharpen the pitch. The next musician would then listen to, match the pitch and then bend a bit further once it was their turn. Because the musicians were anticipating their notes ahead of time, to avoid hearing their attack, and crescendoing slowly, it gave them time to aurally match the pitch and continue to bend it. This produced a long glissandi over a much larger range than what is easily possible for a single woodwind or brass instrument.

Because I had different instruments with different range considerations the starting note was important. After some attempts I decided on the D, a tone above middle C. This allowed the trumpets to be in their lower register, saxophones in their middle register and the trombones in their higher register, whilst still all being able to play in perfect unison. I only had plans to glissandi upwards for an octave, so this register also allowed that for this combination of instruments.
The group was creating a smooth sounding circular pitch but the glissandi were difficult to get sounding consistent, as the musicians were finding it difficult to keep track of where the pitch was and when it was their turn to contribute. In some cases the pitch would arrive to a musician in between a pitch from the tempered scale, and depending on what instrument they were playing, this was not easy to pitch or create on their instrument. Some of the musicians asked if there was a way that I could notate this so that the glissandi could be distributed more evenly over the ensemble. After some discussion I decided that a semi-tone could be divided between two musicians to allow a slow, deliberate glissando. We tried to do this without notation but again the same problems occurred as the musicians could not keep track of where the pitch was at any given time.

4.7 Testing Stage Three

The third testing stage was designed to work with the four acoustic instrumentalists (flute, bass clarinet, viola and cello) of the commissioning ensemble, Decibel, to gauge the effectiveness of the panning ideas with their instrumentation. These instruments had very different timbres and dynamic characteristics to the instruments I was working with previously. We began with the bidirectional spatial movement techniques and tried different paired combinations of the four instruments. What became apparent was that the flute was much better suited to projecting the sounds across the space through the crescendoing technique as seen in Figure 34 as opposed to receiving the pitch. This was because the flute seemed to have a much stronger sound when crescendoing rather than supporting the transition with a diminuendo, especially in a lower range, which was needed to match a unison pitch between all four instruments.

The best pairing combinations for the bidirectional spatial movement was flute with viola, and bass clarinet with cello because they were able to play in similar ranges and the dynamic and orchestration characteristics were also closely related. Because we rehearsed and workshopped in this formation, I decided to keep these pairings when it came to diffusing the instrumentation in the space.
4.8 First Compositional Drafts

4.8.1 The Soundscape

As this project progressed it became clear, with all the circular effects, that the ideal listening position would have to be in the centre of the ensemble. This would now affect how I would use the soundscape, as originally I was going to compose this piece to be played on the bridge with acoustic instruments. I now needed the right physical space to position the musicians around the listeners.

To make the relationship between the acoustic instruments and the soundscape more meaningful, I decided to manipulate the field recording of the soundscape to complement the spatial effects played by the acoustic instruments. To do this, I asked Decibel member and MaxMSP programmer, Stuart James, to electronically manipulate my soundscape field recording live during the performance.

James was able to separate, through the use of spectral noise reduction software, the environmental background noise from the traffic movement; a process which allowed the separation of “both sounds to be panned independently using a different kind of spatial motion: the vectorial spaces of the moving traffic and the panoramic space created by the background environment” (James & Hope, 2013, p. 82). Once this was achieved, we were able to construct a soundtrack to accompany the score. This soundtrack was diffused in real time by James using MaxMSP, across four speakers with background noise “dispersed randomly around the space, surrounding the audience, and the moving sounds were spatialised using translations across the space spectrally in a bidirectional way synonymous with the flow of traffic” (James & Hope, 2013, p. 82).

4.8.2 Notation

Other artists use graphic notation to communicate an experience, as Mace Francis does in his attempts at drawing the audio shapes of passing traffic through his preferred acoustic instruments in When Traffic Rises. [sic] (Hope, 2013)

Schaffer defines the notation of sound as “an attempt to render aural facts by visual signs” (1994, p. 123). Music notation, including traditional and graphic, is “generally
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prescriptive – it gives a recipe for sounds to be made” (Schafer, 1994, p. 123). Perth composer and musician Cat Hope defines graphic notation “as the representation of music through the use of visual symbols that do not make part of traditional music notation, or are used in conjunction with it” (2013). From Traffic Rises was my first experience in creating graphic notation for a composition. I usually employ conventional notation systems but I found that because of the spatial and textural nature of this composition, it was necessary to communicate the score through graphic means. My score was hand-drawn using coloured pencils onto four pieces of A4 graph paper in the landscape format (see Appendix 1b), scanned and then stitched together using Adobe InDesign computer software to create a long PDF version of the score which was then translated to the Decibel ScorePlayer (Wyatt, 2013).

The Decibel ScorePlayer is an application (app) which “enables network-synchronised scrolling of proportional colour music scores on multiple tablet computers” (Decibel, n.d), specifically the iPad (Wyatt & Hope, 2013, p. 206). The ScorePlayer provides a linear, time-based, visual scrolling score player that enables any image file to be read at any speed across a line indicating the point of performance. It allows the musicians to visually follow the composition in coordinated time without the feeling of an internal metric pulse allowing the music a rhythmic freedom which is what I was trying to communicate in From Traffic Rises.

Each horizontal square of the graph paper represented one second of time passing, indicating the pace which the score scrolled by in the player. Each musician used individual iPads, which were networked together enabling coordinated synchronization of the scores, eradicating the need for a conductor. It also meant that each musician could be positioned anywhere in the performance space with no worry about being able to see each other or a conductor.
My score for *From Traffic Rises*, while graphic, did still indicate specific pitches. The advantage of the graphic score and the reading of it in the *Decibel ScorePlayer* was that the ensemble was able to play without the “traditional notions of rhythm and tempo” (Wyatt & Hope, 2013, p. 202). This was what I had experienced in the soundscape and what I wanted to communicate to the ensemble.

Austrian composer Werner Dafeldecker’s (1964-) graphic score for *Small Worlds* (Dafeldecker, 2004) was an influence on my score, in regards to the time-based layout, as *Small Worlds* was the first time I had played a score like this on the *Decibel ScorePlayer* in a workshop with the ensemble and the composer in 2012. It gave me a sense of what was possible as I had only ever experienced these types of time-based graphic score in books or online.
I was also influenced by the use of the coloured instrumental lines in Cat Hope’s scores, such as *In the Cut* (2010), which featured the simple visual representation of a coloured line for each performer, that determines the pitch direction of a unbroken sound: “A horizontal line is a continuous pitch, when it stops, the player stops, when it angles down, the player descends in pitch” (Hope & Vickery, 2011, pp. 11-12).

The musicians were placed on the score in the order in which they were positioned in the space (see above in Figure 42). Each instrument was to read the score from left to right along their horizontal ‘pitch line’ which was coloured for ease of reference. The order for the premiere performance can be seen below in Figure 43 – alto sax (pink),
viola (orange), trumpet 1 (purple), flute (green), trumpet 2 (yellow), bass clarinet (red),
tenor sax (brown) and cello (blue).

The musician’s entries are indicated when the Decibel ScorePlayer’s vertical red line
joins up with the vertical black ‘entry line’ of the instrumental part. The example below
(Figure 44) shows the score players red line at the 1’16’ entry for alto sax. The alto sax
then finishes playing when the score player’s red line gets to the end of the instruction.
4.8.3 Playing Instructions

The musician’s playing instructions are indicated before the entry line, allowing the musicians time to prepare for the next instruction before playing. There are only a few performance instructions in this piece to avoid confusion.

When the word **AIR** is seen before the entry line, the musician is asked to blow air through their instrument without creating a pitch. The first of these entries can be seen above in Figure 44 at forty-five seconds, with trumpet one being asked to blow air through his instrument for three seconds.

The horizontal black block on the musician’s coloured play line indicates the length of the note, in the example mentioned above, three seconds. The black line below the coloured play line is for the dynamic instructions. In the Figure 44 trumpet one part, it is a solid block which means keep at a steady dynamic. If the dynamic shape undulates, then the musician is asked to follow the dynamic contour.

The next performance instruction is ?. This asks the musician to improvise, imitating and interacting with what they hear in the recorded soundscape. These improvisation techniques had been workshopped with the musicians in numerous rehearsal sessions leading up to the performance. These improvisation sections were scored for the
musicians to improvise in a way that had been rehearsed, but still allowed freedom for the musician to make informed decisions based on what was happening in the soundscape at the time.

The first of these improvisational entries happens at 1’15” (marked along the top of the score) in the cello part, with the solid black block on the blue line indicating the length of the note and the dynamic contour is seen below the blue line.

Note names are indicated as English letters and given in concert pitch before the entry line. The arrows beside them indicate where the note is positioned in relationship to concert middle C. For example:

- E↑ E4: the E a major third above middle C
- E↑↑ E5: the E in the top space of treble clef
- A↓ A3: the A a minor third below middle C

If no instruction is given before the entry line then the previous instruction is assumed.

To create the Doppler effect and the ensemble glissandi section, it was necessary to coordinate the relationships between duration and tuning with each musician. Duration is indicated by the scrolling time, while the tuning of each pitch is indicated by a black line in relationship to the coloured play line. The coloured play line represents the pitch, in tune, which was indicated before the entry line. The distance away from the coloured play line and the curve in the pitch line instructs the musician to bend the pitch, within the semi-tone, depending on the direction.
When the pitch line above the coloured play line is curving upwards, this indicates either playing sharp or sharpening the pitch. When the pitch line is below the coloured play line or moving downwards, this instructs the musician to either play flat or flattening the pitch they are currently on. In Figure 46 at 3’10”, the viola (orange line) is instructed to play a concert C above middle C slightly sharp and then over the period of three seconds, flatten it back into tune while also playing a diminuendo to no sound.

Figure 46. Example of the glissandi section.

4.9 Premiere Performance

*From Traffic Rises* was premiered at *Sounding a Room*, as part of the Decibel 2012 concert series. The performance venue was a long narrow, high ceilinged open space approximately three stories high. The height of the venue and the access to a balcony that surrounded the perimeter of the performance space made me think of the possibilities of getting some spatial verticality into the acoustic instrument part.

I decided to position the two saxophones and two trumpets on the first balcony and the other four musicians and speakers on the ground floor. I thought this would work better acoustically because of the louder dynamic of the saxophones and trumpets, compared to the strings and woodwind instruments of the Decibel ensemble.
At the technical rehearsal I was able to position the musicians and the speakers into enough of a circle, as per the ensemble plan in Figure 42, to make sure the circular movement was effective. Also, from the centre of the ensemble circle, the bidirectional movement was working well and the instrumental pairing meant that the instruments on the two different levels were passing pitches to each other on these levels, giving the music height in the space.

What soon became apparent, was that the audience seating plan would not be able to be moved during the concert and that it was not even partly in the ensemble circle, let alone the ideal positioning centre. This was a major oversight on my behalf and one that affected the success of the piece from the listener’s point of view because they were not able to experience the bidirectional or circular movement. In fact, the audience was divided into two halves, as seen in Figure 47, making it even more difficult for them to experience the spatial movement across the speakers and instruments.

While experiencing the piece at the premiere and later listening back to the ABC Classic FM stereo broadcast of the piece, it really confirmed the importance of the ensemble and audience set up, which I had been experimenting with, and also the instrumentation.
choices. In the context of the whole piece I didn’t think the balance of instruments worked so well. The flute and viola, especially at the range it was written for, could not produce a loud enough sound to keep a constant sound in the circular movement section. I decided, for the next performance, to keep with the saxophones and brass instruments with whom I had been working with from the beginning, as they were able to produce a consistent sound throughout the whole piece.

The acoustics of the performance space were also much more important for the successful realisation of the work than I had first thought. The Museum was quite reverberant which meant, especially when sitting outside of the ensemble circle, that it was difficult to identify the direction of the sound. A much less reverberant sound was needed to make sure that the clarity, the sound and the direction it was travelling was clear to the listener. This discovery only re-enforced my decision to use the Roundhouse Theatre for my final recital because of its round physical shape and its dry acoustic sound.

4.10 Recital Performance

*My heart rate and breathing had sped up and I was feeling quite emotionally overloaded. Whether it was because my brain felt like I was in danger sitting still in the middle of intense traffic, or was it just the overload on my ears and brain in a way I had never experienced? C. Stephens (personal communication, January 3, 2014)*

*From Traffic Rises* was the final piece in my recital. I used the musicians’ chairs from *Tunnel Listen* (discussed in the next chapter), plus some others to form a listening space in the centre of the performance space on stage. Some audience members found this experience quite overwhelming with one listener, C. Stephens (personal communication, January 3, 2014), communicating to me afterwards; “this experience alone had made me feel slightly anxious, as I am not at all comfortable on a stage”.

While the audience was being seated, the musicians had a chance to position themselves around the stage in a circular formation, which in this performance space was mostly in the audience seats (see photos below in Figure 48).
The Roundhouse Theatre was the ideal space for performing this composition because of its very dry acoustics, which allowed the sound to move with clarity and no reverberation to diffuse the direction of the acoustic sounds produced. The round shape and the size of the space was the ideal performance situation, as it allowed me to position the musicians and the speakers in the very best position for the success of the work. The spacing between the audience and the musicians was approximately one metre further away from what we had been experimenting with in the early stages of testing, but this did not affect the listener’s experience at all.

Because of the space and the acoustic instruments chosen, I was able to get a good balance between the manipulated soundscape and the instruments. This was the key to the success of the piece as the listener needed to hear all the elements of both the electronic and acoustic parts clearly to perceive the spatial motion. It also reinforces the necessity of having a specific performance set up to facilitate this site-generic composition.
I was able to sit in the audience and listen to this piece, just as I did in the premiere performance. This version of the composition was a much truer representation of this piece and I was happy with the final result.

4.11 Reflections

*From Traffic Rises* was the composition in this project which took me the furthest away from my usual composition techniques. There was no real sense of traditional musical elements like melody, harmony or even rhythm and it was my first foray into using graphic notation. Even using an electronic element in a composition was new to me.

Although I was dealing with a new compositional process using new sounds and musical elements, the process did not feel forced, as if I was trying to do anything new for the sake of it, because all the ideas began and grew from the development and exploration of the pedestrian bridge site. It was a very satisfying process to begin with a physical site that did not necessarily offer any acoustic response as such, but rather a soundscape that exists when in the space. This was very different to working with the stairwell in the previous chapter as the soundscape already existed as a source of compositional information, compared to a space which reacted with the sounds that were produced in it. Both sites offered a different perspective to working with a site for compositional material.
4.12 Conclusion

*From Traffic Rises* demonstrates a site-generic compositional process when considering Wilkie’s scale of site-specificity. The site and soundscape, which became the only source of musical material from this site, could have been experienced at any similar site. The development of this piece involved a greater deal of experimentation and testing as it needed techniques which were outside the area of expertise; such as creating the bidirectional spatial movement and the ensemble glissandi. A specific ensemble set up was required for the audience to experience the piece at its best, and I was able to do this with a space containing controlled acoustics.

Unlike *Stairwell to Fifteen* this piece does need to be experienced in a specific listening environment to fully appreciate the work. However, consideration should be given to the performance environment for optimal results. Its musical content can be comprehended from an audio recording, but it is important to note that the spatial effects cannot.
Chapter 5: *Tunnel Listen*

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5.1 Introduction

*Tunnel Listen* is a composition for four woodwinds and five brass instruments and is a musical caricature of the way a solo trumpet improvisation responds inside an enclosed pedestrian tunnel under a road in the Perth suburb of Maylands. An instrumental exaggeration of the acoustic phenomena of reverb, echo and diffractions are created by a nine-piece ensemble performing in an orthodox concert performance environment.

This interaction with the site as a compositional device combines literal and metaphorical representation of the acoustic characteristics. I have combined elements of literal musical transcriptions of sounds on the site with more abstract ways of interpreting the acoustic characteristics of the site, such as musical material and compositional tools.

*Tunnel Listen* is divided into three parts, with each section exploring a different acoustic phenomenon existing in the tunnel. The conceptual narrative of the piece is that a ‘solo’ trumpeter starts improvising on one side of the tunnel and then moves through the space, experiencing various acoustic effects with his instrument and then finally making out the other side. I use the term caricature because it describes the “over-emphasis of individual characteristics” (Johnston, 1984, p. 103), usually of people, and in a comical way but in this case, it is the idea of taking a characteristic which I heard in the tunnel and over-emphasising or exaggerating it.
Much of the musical material for the three parts came from listening to the acoustic characteristics of the tunnel and then devising ways of recreating them with acoustic instruments. In some way this informed the idea of musical caricature, as exaggerating the acoustic characteristic made more musical sense to me rather than attempting to recreate the subtle sounds. Once the characteristics were identified, I set about a plan to recreate these with acoustic instruments.

The first part exaggerates the reverberation and resonances created by the solo trumpet performing in the tunnel. This is done by featuring one of the trumpet players as a ‘solo’ musician who establishes the melodic material, while the ensemble recreates reverberation and resonant pitches derived from it. This is facilitated by Olivier Messiaen’s concept of added resonance and drawing on the workshop experience for Stairwell to Fifteen.

The second part uses the acoustic effect of echo as a rhythmic device. The notes that the ‘solo’ trumpet plays are repeated by the other instruments, in an echo-like effect to create a groove which supplies the rhythmic and harmonic support for the melodic material to continue in this section. I drew influence from the echo phenomenon itself for the rhythmic ideas, as well as concepts from minimalist composers such as Steve Reich (USA, 1936-).

The third and final part is a build up of all the sounds resonating in the space, creating waves of harmonic information. The resonance builds in dissonance, over time, and then returns to consonance. The ‘solo’ trumpet reprises the original melody, finishing outside the other side of the tunnel.

The ‘solo’ trumpet and one of the trombone players improvise throughout using a call and response technique, which for me, is a conceptual play on echo where, “one musician offers a phrase and a second player answers with a direct commentary or response to the offered phrase” (Meazell, 2013). This technique of allowing the two musicians freedom to interact with the harmonic colour of the ensemble, and each other, is a very familiar technique for me as a jazz composer and the players themselves. I feel very comfortable allowing this musical freedom when I am able to choose the right
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musicians. The call and response in this part of the composition also helps to build momentum and tension along with the resonant dissonance building over time.

A site-generic approach was taken towards this site. Wilkie's definition suggests that a composition which uses a particular site for its performance, such as a stairwell, can be performed in other stairwells to equal success, therefore using a generic approach to the acoustic characteristics (Wilkie, 2003, p. 149). In *Tunnel Listen*, acoustic elements from the tunnel were treated as compositional models, which were exaggerated with the aim to transfer these acoustic effects as part of the compositional framework for the site-specific sounds in a new performative context.

The compositional relationship with site in this piece is different from the relationships of *Stairwell to Fifteen* and *From Traffic Rises*, as it takes a site-generic approach to the compositional process itself, rather than it being a categorisation of the work. Also, it uses the acoustic characteristics as models for compositional processes rather than being reproduced literally, like the traffic sounds in *From Traffic Rises* or the percussive playing of the physical space in *Stairwell to Fifteen*.

5.2 Introduction to the Site

During the course of the research for this piece I investigated four tunnels of varying size and length: the University of Western Australia (UWA) underpass, the McIver train station underpass, the Swan View tunnel and the Railway Parade underpass. While they all contained some acoustic characteristics of interest, it was the Railway Parade underpass in Bayswater that I chose as it offered me a greater range of acoustic characteristics.

I discovered the Railway Parade tunnel on a bike ride, just after I had explored the Swan View tunnel. This tunnel passes under the Railway Parade and Whatley Cres intersection in Bayswater, eight kilometres north of Perth CBD. The concrete tunnel is four metres wide, three and a half metres high and thirty-five metres long with a slight curve, but maintains the same width and height throughout the length.

The way the sound of my bike reacted to the architecture and acoustics in the tunnel while passing through caught my attention, and was interesting enough to make me stop and explore the sound further. With just simple hand claps and singing throughout the
whole length of the tunnel, I was able to gather that there was enough acoustic interest in this space for me to explore this site further.

The tunnel is a very active space for pedestrians and bike riders and is on a bend on the bike path, which meant I had to always be aware of my safety, that of my participants and the bike riders. It was for this reason, that I decided early on in the project that I would not write the composition to be performed on site. This early decision meant that I was thinking of ways to translate the site to another space from the beginning of the process, but it wasn’t until I was in the space with another musician that the ideas started to crystallise.

5.3 Pre-Production

I returned to the space within a few days of my first visit with my tool kit. I needed some time to experience the space in more detail to make sure that my initial interest was valid and worth pursuing. It was important at this stage to record the findings with my digital audio recorder and make notes in my journal for future reference.

I started by testing the space again with hand claps. I started at the southern entrance, about one metre inside the tunnel, clapping my hands and slowly moving to the centre
of the space. There was the presence of some reverberation but not a great deal, and there was little variation as I moved towards the middle of the space. Before going further, I decided to test the sound of my hand claps outside of the space to hear the difference between ‘outside’ and ‘inside’ the tunnel. I started about four metres from the entrance of the tunnel, clapping and walking slowly towards the entrance. The sounds of my hand claps were as expected in an outdoor space, with no reverberation or other acoustic effect, but as soon as I was in the very opening of the tunnel I heard a clear and distinct slap-back echo. As I took another step inside of the tunnel, it disappeared. The echo was only present when standing within a thirty centimetre space from the mouth of the south entrance.

The echo created by my single hand clap was a clear slap-back echo, defined as “a single rapid repeat of the source sound, spaced with sufficient delay time to make the repeat clearly audible, but near enough in time to the source to provide a rhythmic effect” (P. Doyle, 2005, p. 235). This definition puts emphasis on the fact that the repeat comes back to the listener quickly enough to be able to create a rhythmic pattern. I was able to do this by creating a steady rhythmic pattern at approximately sixty-six beats per minute. Figure 52, below, shows my hand claps on the down beat with the echo returning on the offbeat, represented by the ‘x’ note heads.

To do this I had to clap and wait to hear the slap back echo and try to feel the return echo as the eighth note subdivision. After some trial and error of speeding up and slowing down my hand claps, I was able to maintain a steady rhythmic pattern (seen below in Figure 52) which I was able to then match to a metronome from the recording of this test.

![Figure 52. Echo rhythmic pattern created by hand claps.](image)

From this discovery at the southern entrance I moved directly to the northern entrance to see if the same phenomenon occurred. I started testing at the northern entrance, just inside the tunnel and with only hand claps observed that, while there was some
reverberation, it was similar to the southern entrance. It sounded just like an average space with a small amount of reverb. It wasn’t until I moved just outside of the tunnel that the sound of my hand claps changed, not creating an echo but different again to the southern entrance. The further I moved out of the tunnel the more it changed. My hand claps started to resonate with a metallic sound and with a slight distortion or interference in the sound. As I moved further away from the tunnel entrance my hand claps started to produce a Gb pitch as a resonant pitch. This metallic sound must have been produced by my hand claps reacting to the built up cement walls, the overhead metal hand-railing and the metallic pipe over the path, as seen in Figure 50. The tunnel must have had some influence to this sound as this acoustic effect stopped at approximately five metres away from the northern entrance of the tunnel. I then made my way into the middle of the tunnel, again with just hand claps, and it became clear that, while there was reverberation of approximately two seconds, the inside of the tunnel offered much less acoustic possibilities, with the tools I had with me, than the two entrances.

The plan from there was to invite an improvising musician to interact with the site to hopefully uncover some more possibilities, especially inside the tunnel. I invited trumpet player, Callum G’Froerer, as I thought the attack, volume and timbre of the trumpet and the technique and improvisational skills of this musician would be suitable to interact with the space.

5.3.1 Architecture of Tunnels
A Professor of Acoustic Engineering, Trevor Cox, makes special mention of tunnels as containing interesting acoustic characteristics in his book, *The Sound Book: The Science of the Sonic Wonders of the World* (2014). His investigation of tunnels feature in the chapter in regards to echo and explains some of the acoustic characteristics that I discovered in my tunnel. It was interesting to note that much of Cox’s acoustic testing, which he talks about throughout the book, was done with hand claps.

Cox talks of the “metallic twang” (2014, p. 136) or why his “clapping developed a robotic quality” (p. 137) much like the acoustic characteristic which I discovered just outside of the northern entrance with my own hand clap tests. This is created by the space having only a few harmonics which are “not simple multitudes of the
fundamental” therefore creating “irregular frequencies and sound dissonant” (Cox, 2014, p. 138). Cox goes on to say that these “discordant frequencies adds a metallic quality” (Cox, 2014, p. 138).

5.3.2 Recreating the Architectural Space

One example of recreating an acoustic characteristic from the tunnel in this piece was in the imitation of this metallic quality. I was able to re-create a metallic sound quality with the acoustic instruments to some degree in the final composition, by using a harmon mute in one of the trumpets. The harmon mute is placed in the bell of the trumpet and effects its sound creating a “light, dry, and metallic” (Russo, 1961, p. 58) quality. This metallic quality that Russo talks about “is more like the rustle of silver foil than the smack of a hammer on an anvil” (1961, p. 58). This matches the sound quality that I heard at the northern entrance and what Cox refers to in his study. By orchestrating the second trumpet in its higher register, in either unison or the octave above the solo trumpet, as its use in “the low register is not recommended” (Russo, 1961, p. 58); I was able to create a metallic timbre similar to what I heard in the tunnel space.

The idea of recreating the acoustic characteristics of a space, especially using reverb modelling, is not a new one and is especially present in the field of post production recording and electronic instrumental effects. Guitar players have been using reverb and delay effect pedals to give the illusion of a bigger, fuller sound for decades. The recording process is always utilising reverberation to create a bigger sound for a recording in the post production process. American record producer Phil Spector (1939-) used reverberation to help create his ‘wall of sound’ production method “characterized by high-sounding, reverberating instruments that often threatened to drown out the vocals” (Herald, 2013).

Convolution Reverb is a technology which records and processes “the reverberant behavior [sic] unique to a real acoustic space” (Hamberg, 2007). This is different to algorithmic reverb and is created by activating a space “with either a sweep tone, starter gun, or snare drum crack” (Hamberg, 2007) and recording the impulse responses (IR) in the space and transforming them into a plug-in device that “then filters your sound
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through this impulse response to generate a ‘believable organic tail’ based on the characteristics of a real room” (B. Doyle, 2011).

In some ways, the process of creating convolution reverb is similar to my creative process of recreating a reverberant space but, in my case, with only acoustic instruments. Instead of using technology to create an exact model of the reverb produced in a specific space for sound to be enhanced by, I have taken the idea of reverb and used acoustic instruments to create an impulse response model as part of the compositional process. My model has become a compositional tool to add to the melodic, rhythmic, harmonic and timbre information where the electronic convolution reverb only adds to the timbre.

5.4 Testing Stage

For the next testing phase of this site I invited trumpeter Callum G’Froerer to join me in the tunnel to interact with the acoustic properties which I found at the two openings, as well as experimenting within the tunnel to see what other acoustic properties were available. I pursued this test with an acoustic instrument to stay consistent with the other sites and because I wanted this piece to be composed for acoustic instruments only.

We started at the southern entrance to see if a trumpet could initiate an echo like the hand claps of the previous test. These attempts proved to be less successful than the hand claps and cow bell. I asked G’Froerer to try various attacks, tessitura, and note lengths but none of these produced a clear slap back echo which could create a simple rhythmic pattern as did the hand claps. While this was disappointing it did not deter me from still considering echo as a compositional device in this composition.

I then asked G’Froerer to move towards the middle of the tunnel, stopping every five metres to test the space by asking him to start playing short notes in different registers and then gradually lengthening the notes to get a full range of attack and sustain. The space between the southern entrance and the middle of the tunnel offered very little acoustic interest, except for the short reverberation of the notes being played.

When we reached the middle of the tunnel G’Froerer was able to produce a resonant frequency with a pitch slightly lower than a concert C#. This was an interesting development as I had been unable to produce this effect, or any other resonance while I
was in the tunnel myself using hand claps or my melodica. I believe this was possible due to the extended range, timbre and quality of attack that G’Froerer was able to produce on his trumpet. The trumpet has a stronger and richer tone compared to anything in my tool kit.

As G’Froerer moved towards the northern entrance, his improvisations started to create a spatial effect in the tunnel. G’Froerer was approximately seven metres from the northern entrance while I was still in the middle, and it still sounded like he was playing in the middle right next to me. The sound was bouncing down the tunnel and giving the aural illusion that he was right there in the middle. I could also obviously hear him playing the original pitch, but the note that I was hearing near me was very clear. The effect was almost like a reverse echo where the original note sounds distant and the echo sounds closer.

While G’Froerer was activating the site with his trumpet, I made sure that I moved around the space listening for any variations in the sound depending on my positioning. This proved very useful as the acoustics were very different depending on my positioning, which further prompted my interest in the listeners’ position in the composition. I wanted this piece to be different again to Stairwell to Fifteen where the listeners themselves were parts of the reverberation experience and affected the performance by manipulating the amount of reverberation produced by their presence. The listening experience in From Traffic Rises was a deliberate immersive environment created by positioning the speakers and the ensemble around the listeners in a certain way. I wanted Tunnel Listen to deliver the different acoustic effects from the different positions in the tunnel to the listener in an orthodox performance setting of an ensemble on stage and the audience in seats. The composition itself takes you through the space aurally in a more conceptual way, compared to the literal experiences in the other two compositions. I was concerned with how I was going to translate the experience of the site to the listener through the acoustic ensemble.

5.5 Draft One
The first draft consisted of two separate musical ideas, each using the acoustic characteristics of reverberation and echo which were found in the tunnel. I found these
two acoustic characteristics the easiest to start with as they had a clear quality that I was able to translate into musical techniques.

5.5.1 Echo

I started with echo as a rhythmic device which I was able to create in the space with my hand claps at the southern entrance. I translated this acoustic characteristic by using the ‘solo’ trumpet as the original sound source, despite not being able to actually create a clear echo in the space with G’Froerer’s trumpet. I wanted to combine and creatively recreate the acoustic characteristics into musical material, much closer to my previous creative works before the research, rather than just translate the sounds directly like a field recording.

I used a three pitch melodic motif of Ab, C and G that G’Froerer played during part of the testing session while trying to create the echo. I will now refer to this as ‘Theme One’. This combination of pitches was aurally pleasing to me, and gave me a melodic starting point which I then developed into a short rhythmic motive (see Figure 53) which worked well when repeated and would help interact with the idea of echo.

It could be said that this theme developed from the intimate relationship between a specific improviser and a specific space. It was then translated into a melodic tool to communicate the acoustic characteristics of the space into a traditional performance space. This theme, created in a moment in time between improviser and space, was developed rhythmically to enable a translation of that space in the form of a musical composition.

This relationship, while still connected and related to the site, is a much more complex one than the pedestrian bridge and stairwell. The thematic and acoustic material were sourced from a direct interaction with a specific site. However, the way this musical

![Figure 53. Theme One as played by the solo trumpet at the beginning of Part Two.](image)
information has been translated could be seen as a site-generic relationship, according to Wilkie’s scale of site-specificity. During the musical translation process, I felt that the acoustic characteristics needed to be exaggerated and extended to become usable for a musical composition, rather than a representation of the site. This exaggeration of the acoustic characteristics removed the composition away from the definition of site-specific and, even to some degree, from site-generic but not in the direction of site-sympathetic. It is this relationship and the difficulty to define it, which is the basis of the complexity. Perhaps there is a need for another definition for works that use a physical site for its musical material but do not have any other physical connection. McAuley’s term ‘site-related’ could be more suited in this situation as the “site becomes the dominant signifier rather than simply being that which contains the performance” (2007, p. 7). It could be that either this work does not fit on Wilkie’s scale of site-specificity, because it is too removed from the physical site and performed in a traditional performance setting, or that it draws from each step on the scale in some way. Maybe this work has made its way back to the beginning of Wilkie’s scale (inside the concert hall) but with source material gathered from the site.

I created the echo effect by using the same compositional model I found in the tunnel. I was able to create an eighth note rhythm by clapping on the beat and letting the echo respond off the beat. I was able to create this effect by writing a part for the other trumpet to play an eighth note behind the ‘solo’ trumpet. Figure 54 shows both trumpets starting in pitch and rhythmic unison and then, in the second bar, the second trumpet starts to echo the first trumpet part.

To build on the concept of echo and to transform it from a representation of an echo and into a compositional device, I continued to gradually add instruments. Theme One was
played an eighth note behind each other, by five instruments, until every beat was filled (see Figure 55) much like a cannon, defined by the Oxford Dictionary of Music as the “strictest form of contrapuntal imitation... in which one melodic strand gives the rule to another, or to all the others, which must, at an interval of time, imitate it, note for note” (Kennedy, 1994, p. 147).

A similar concept to this has been used by Perth composer Johannes Luebbers. In his composition titled “Eternity in an Hour” (Luebbers, 2006a) Luebbers “creates the effect of an echo” (Luebbers, 2006b, p. 85) by using what he calls “shadowing” (2006b, p. 79). The difference here is that Luebbers orchestrates the first entry as the dominant line with the ‘shadowing’ lines at a quieter dynamic and orchestrated in mutes, so the first entry is “more prominent than the others” (Luebbers, 2006b, p. 85). My intention was to have each line sound equal, much like the slap back echo I heard in the tunnel with my hand claps.

5.5.2 Reverberation

In this first draft I also used reverberation as a compositional device as it did exist in the tunnel and I had been working with reverb in the stairwell for Stairwell to Fifteen. I was comfortable with the effect, but I was interested in re-creating this acoustic characteristic with just acoustic instruments.

I wanted to create a musical statement that sounded like the ‘solo’ trumpet testing the space for what reverberation could be created. To do this, I had the solo trumpet play a

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**Figure 55. Cannon used to build on the echo effect (transposed score)**

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large intervallic leap of a major seventh, from the middle register of the instrument to the higher register (see Figure 56) which I will refer to as ‘Theme Two’. To create the reverberation, I initially had the soprano sax and other trumpet double each of the solo trumpet notes, in the same octave, but hold their note for an extra three beats and fading out as seen in Figure 56, but the overall sound was too weak and did not create the full rich sound of reverberation that I had heard in the tunnel and the stairwell.

To create a rich and full sound, I referred back to recordings I made in the tunnel and the stairwell to study the reverb, and what I realised was, that the full sound was created by what sounded like resonances and harmonics of the pitches bouncing around in the space. To try to create this effect, I had the ‘reverb’ pitches play at different octaves to the solo trumpet. In Figure 57 it can be seen that the alto and tenor sax were written to play in the lower octaves while I had the second trumpet, in a harmon mute, in the upper octave giving a metallic sound to the overall texture. These various sounds, which all moved at slightly different rates of crescendo, created a much closer resemblance to a reverberation in a space.
It should be noted that the rehearsal and performance spaces had an extremely dry natural acoustic characteristic, which meant it was easy to workshop and to hear if my instrumental acoustic effects were working. This was one of the reasons I chose the Roundhouse Theatre performance space for my final recital, as I didn’t want a room that contributed its own reverberant characteristics to the composition like the stairwell performance site.

In this first compositional draft I also experimented with the subtle relationship between the two characteristics of echo and reverberation. They are very similar and are produced by the same reflective sound phenomenon. Reverberation could be described as the build up and then decay of a number of small echoes. I used this idea compositionally through the use of overlapping rhythmic groupings as well as each part fading out at different times. The example below in Figure 58 shows the solo trumpet playing the sound source, and the rest of the ensemble playing rhythmic phrases to create the pulsing reverb effect created by playing short rhythmic phrases in the space.
5.5.3 Draft One Testing

During the rehearsal of this first draft it became clear that rhythmic precision, ensemble balance and dynamics were the most important elements to the success of the music. It was important that, in the reverberation section, the solo trumpet stayed as the predominant voice with the other voices crescendo-ing and diminuendo-ing evenly underneath the lead voice. It was also important for the staggered diminuendos, as seen above in Figure 58, to be even and gradual to give the illusion of the reverberation fading away in the space.

Rhythmic ensemble precision was especially important in regards to the echo techniques, as each of the instruments involved had to individually contribute their part of the cannon to fill the whole phrase with eighth notes. The rehearsal difficulty was making sure everyone could feel the tempo the same and create a rhythmic groove.

I was happy with both the echo and reverberation ideas, and wanted to develop the ideas I already had, rather than add too many new sections. I decided to continue to use the
three pitch melodic theme in the rest of the composition, to make sure there was a unified thematic idea in each section.

For the next draft I expanded the two sections from draft one by developing the melodic material for the solo trumpet, and continued to add the acoustic effects. Part Three developed from the idea of resonant frequencies that can build up and develop in built environments. In the case of the tunnel, these frequencies where heard during my hand clap tests and exaggerated by G’Froerer’s trumpet improvisations.

5.6 Draft Two

I spent time creating a melody for the solo trumpet to play at the beginning of the composition to introduce the melodic material that will be heard throughout. This opening melody combined both Theme One and Theme Two explored in draft one. Theme One (see above in Figure 53) opens the trumpet melody and is then immediately followed by the major seventh interval of Theme Two (G-Gb). The melody continues with a similar intervallic shape as the first bar from the C; descending interval followed by a rising seventh, followed by a descending interval which finished on the G natural. The second phrase starts again on an Ab an octave higher, this time descending to the C, rising scale wise to an Eb, which resolves back to the Ab to repeat theme one with some rhythmic variation which references itself when it is heard in Part Two.

![Figure 59. The first half of the opening solo trumpet melody. (concert pitch)](image)

The first two bars of the second half of this opening melody (see Figure 60) takes almost directly from the opening phrase above, starting on beat three. The material from the third bar of Figure 60 below is a melodic means to get back to Theme One at the end of the phrase, with a descending phrase to contrast the rising phrases preceding it.
This eleven bar opening melodic statement is played just by the solo trumpet alone, to establish the thematic material, with no other acoustic effects, much like I experienced with my hand claps outside of the southern entrance of the tunnel. The acoustic effects are then introduced at the very end of this opening statement to introduce the effect of reverberation and to connect the reverberation section which was composed for draft one.

The reverberation effect is introduced here (see Figure 61) by utilising the two clarinets and alto sax to repeat, or echo, each pitch played by the trumpet as they change for five beats. Each pitch is given the same amount of repetition so that the reverberation effect fades out at the same rate that it is introduced. Figure 61 above shows the reverberation effect being introduced at the last time that Theme One is stated in the opening melody. Clarinet two joins the Ab when it is first played and then continues for five beats after it is played for the last time on beat two in the second bar. Clarinet one joins the C and
plays off beats for five beats, and the alto sax joins the G at the end of the phrase and plays for five beats to end the phrase.

It was important that each of the reverb notes were behind the trumpet melody in an accompanying role, with special attention made to the diminuendo into nothing at the end of the phrases. These diminuendos needed to be even, and to emulate the sound of reverb decaying in a space. I had deliberately made the score and parts simplistic as I knew that much of this material would be workshopped and changed in the rehearsal as I worked with the ensemble sound.

The next time the solo trumpet melody is heard in its entirety is at letter D (see Figure 62) and is accompanied by the whole ensemble except for the tuba, which does not play until Part Two. The trumpet melody is the same as the opening statement but extra beats are added to simulate the pauses played at the beginning, and to allow the accompanying instruments time for the reverb parts to sustain and decay for three beats each.

![Figure 62. Trumpet one melody accompanied by the ensemble to create reverberation. (concert pitch)](image)

A three beat reverb was chosen here, to contrast the five beat reverb in the previous section which would have been ‘too reverberant’ for the melody. The choice here to
reduce the reverb effect was a luxury that you do not have when working with the actual physical site. This was not an option that I had in the stairwell for *Stairwell to Fifteen* and means that alternate compositional decisions can be made.

Each instrument in the accompanying ensemble was assigned a pitch found in the solo trumpet melody. For example, trombone one was the reverb whenever a C is found in the melody and the tenor sax was the G etc. The soprano sax is an exception taking on a few different pitches.

### 5.6.1 Resonance

To add another dimension to this section I added some resonance similar to what I heard in the middle tunnel when G’Froerer was improvising. This was done by giving the clarinet one high register pitches that related to the melodic and harmonic material created by the reverberation effect. These ‘resonant’ clarinet pitches are informed by the tunnel space itself and a technique used by Olivier Messiaen called ‘added resonance’. Messiaen referred to the overtone series as chords of resonance (Messiaen, 1956a, p. 51) and used his ‘added resonances’ as an orchestration effect that consisted “of a note or chord played quietly in the bass or upper register over louder principle material” (Van Der Walt, 2007, p. 17). The high register chordal structures in the second bar of Figure 63 below is an example of Messiaen’s use of this technique in his work for piano and voice called *Minuit Pile et Face* (1939). My use of this technique gives the feeling of the space just in control of its acoustics and reminds me of that moment just before the PA starts to feedback in a sound check.

*Figure 63. An example of Messiaen’s use of added resonance in Minuit Pile et Face (1939).* (Messiaen, 1956b, p. 39).
I continued the idea of added resonance, again with clarinet one, into the next section with a high B sustaining over the Gb and F of Theme Two. The B was chosen as it is the eleventh partial of the F fundamental overtone series, and continues on with Messiaen’s idea of the connection between the overtone series and the sound of resonance. The high clarinet is again orchestrated quietly with only a small crescendo so it is just audible over the rest of the ensemble (Figure 64).

Figure 64. Clarinet one added resonance.
(concert pitch)

5.6.2 Developing the Echo
When developing Part Two in draft two, I retained all of the rhythmic echo material, as seen in Figure 55 earlier in this chapter, but needed a better way to transition between the two sections. To do this, I superimposed the opening melody with a great deal of rhythmic variation over the top of the rhythmic echo effect. This melody as played by clarinet one was also accompanied by clarinet one, soprano sax and alto sax to create the reverberation effect as in Part One. Because the tempo was a lot faster, each reverb note was extended for six beats. Figure 65 below shows the rhythmic echo effect being played by trumpet one, trumpet two and tenor sax and the variation on the melody being played by the upper woodwinds.
This coexistence of two of the acoustic effects also references the site as many of the acoustic characteristics co-existed in the space. Putting them together in this creative representation not only shows this but it also allows the composition to work as a piece of music rather than just a representation of the space.

A variation to the eighth note rhythmic echo material, as seen above in Figure 55 was added in draft two to establish a lower register ‘groove’, which is closer to the musical convention of jazz. This rhythmic pattern does not directly relate to any of the acoustic characteristics, but it develops on the theme one idea played by G’Froerer, and the idea of echo, this time with trombone two echoing the tuba part a crotchet apart and up the octave. Trombone one and clarinet two also echo each other a crotchet apart but in unison. These two melodic lines lock together to create another eighth note rhythmic pattern that fills every beat in the bar (see below in Figure 66).
This rhythmic pattern sets up the harmonic and rhythmic foundation for new melodic information that has been treated with the ‘shadowing’ technique. This new melodic material was developed from the trombone one and clarinet two melodic lines from the rhythmic accompanying pattern as seen above in Figure 66. In Figure 67 below it can be seen that the soprano sax takes the lead melody, while the alto sax and tenor sax shadow this melody as it is an eighth note behind. The repetitive C note at the end of the phrase, again creates the feel of the eighth note echo that I had created with my hand claps in the tunnel.

Throughout this section I continued to utilise the idea of ‘added resonance’ to give the feeling that there was a gentle build up of resonant frequencies. Clarinet one was used to
play high register pitches, crescendo-ing up and down throughout melodic phrases to
give this aural illusion. Towards the end of Part Two each of the instruments sustain a
constant pitch which transitions into Part Three.

5.6.3 Creating Part Three
Part Three developed from the idea of resonance and resonant frequencies, which were
discovered as a compositional idea in the tunnel. It is a series of harmonic structures
which gradually get more and more dissonant over time and then slowly dissolve and
resolve back to a C unison pedal.

The conceptual idea behind Part Three is that all of the pitches that were played in Parts
One and Two have slowly built in resonance over time to create swells of resonant
sound, which have created waves of harmonic structures. Over these harmonic
structures, which get more and more dissonant through the addition of new pitches over
time, trumpet one and trombone one are instructed to improvise in a call and response
which is a reference to the idea of echo which was explored in Part Two.

These harmonic structures are played by the ensemble on a cue from a conductor, to
create a sound that resembles the brass quartet playing chords in the stairwell. There is a
crescendo that builds to its maximum volume and then a slow and gradual diminuendo
that sounds like the reverberation of the space. To listener C. Stephens (personal
communication, January 3, 2014) it resembled the “rising and falling, like waves of
giant breaths until they all unite into a new sound”.

5.7 Final Draft and Rehearsal
Not many changes were made from draft two to the final draft, only dynamic changes
after work-shopping the draft. Once these small changes were made we began
rehearsing the piece for the upcoming recital performance. The music was technically
quite simple to play with no complex rhythmic and technical phrases that needed
individual attention. The focus in these rehearsals was to get the orchestral balance of
the ensemble right, with special attention made to the dynamics, as well as the rhythmic
accuracy of the echo effect in Part Two.

The resonant crescendos in Part Three needed quite a lot of explaining and rehearsing to
sound correct. The main challenge was getting the diminuendo of each chord to fall
away evenly when each chord was on cue. I had to adjust my conducting directions to make sure that each aspect of the chord was directed clearly; the attack of the chord, the rate and length of the crescendo, the beginning of the diminuendo, the rate and length of the diminuendo and the cut off. This was a lot more information than I normally give when I am conducting a jazz orchestra.

It was in these final rehearsals that I experimented with different ensemble set ups to see if any spatial effects could be created, especially in regards to the rhythmic movement of the echo effect. I tried different seating arrangements for the ensemble, so that when we got to Part Two each of instruments involved in the rhythmic echo patterns were distanced evenly from each other so that the feeling of an aural space was created.

5.8 Recital Performance and Recording

*Tunnel Listen* was the second piece in the recital program and the first to be performed in the Roundhouse Theatre after the site-specific *Stairwell for Fifteen* composition. The audience was led from the stairwell in building fifteen to the Roundhouse Theatre, where they were directed to sit in the seating directly in front of the ensemble, which was set up on the stage in a semi circle configuration as seen in Figure 68.

![Figure 68. Tunnel Listen ensemble set up and audience position. (photograph by Lyndall Adams)](image)

I would have liked the ensemble to have been spread out wider, to increase the spatial effects of the echo bouncing from one side of the ensemble to the other, but this was difficult due to the stage width and the ability for each musician to hear each other in
the very dry space. I feel that the spatial effects would not have been as obvious to the audience as *From Traffic Rises*, due to the audience and ensemble positioning and the fact that it was a lot more subtle than the other composition. This was a discovery made only once we were able to access the space, and is common to many stage spaces.

For performance purposes the semi circle ensemble set up was ideal as each musician could see and hear each other well, they could see me clearly, and it allowed for a central microphone set up for the recording.

5.9 Reflections

The very dry acoustics of the performance space allowed for the created acoustic effects to sound without too much interference from any naturally occurring reverberation. At the time I did not realise how important this would be as I was more focused on the space for *From Traffic Rises*, but on reflection this helped the piece to prove its point. It is also interesting to note that to recreate a reverberant space with acoustic instruments, it is important that a dry space is chosen for the performance. The necessity of a generic dry performance space adds another layer to the relationship to site when composing and performing these pieces.

While this composition was the furthest removed from the original site, and did not have a clear relationship to site in regards to Wilkie’s scale of site-specificity, I was most excited about the outcomes and the potential of this piece. I felt as if *Tunnel Listen* contained the right balance between my previous compositional style, and seeking out new sources of compositional inspiration as well as devices that have come out of the research project.

By right balance, I mean I can see myself being able to use the methods developed while creating this composition, in a variety of compositional methodologies performed in traditional performance settings. The techniques learnt and developed from the site interaction with both *Stairwell to Fifteen* and *From Traffic Rises* was a big influence on the way *Tunnel Listen* developed, because I had immersed myself in those spaces and acoustic phenomena, which allowed me to gain a better understanding to interpret these for acoustic instruments.
5.10 Conclusion

*Tunnel Listen* is a composition for ten acoustic instruments that recreates a sound event of a solo trumpeter playing in a pedestrian tunnel. The piece is structured in three parts, each of which presents a different acoustic characteristic which was discovered in the site. These characteristics were exaggerated so they were able to be used as compositional devices. Echo was used to create rhythmic gestures, and reverberation was used to create harmonic colour to the ‘solo’ melodic instrument. This piece demonstrated a complex relationship to site, as it used multiple levels of Wilkie’s scale of site-specificity.
Chapter 6: Conclusion

This research has explored the possibilities of architectural spaces and what their acoustic characteristics can offer the compositional process. The acoustic qualities, physical design features and found sounds of unorthodox performances spaces have each contributed to a series of three compositions and their performances in this research project. The project has examined ways to integrate acoustic characteristics of architectural space into my own compositional process, and has proposed a methodology that has been applied to different levels of site-specificity and site experience in music composition and performance.

The reason I embarked on this research was to extend my own compositional practice and explore new ways of composing music with a focus on acoustic instruments. Exploring physical sites has provided new musical inspiration for me as a composer, quite a remarkable outcome given that the project stemmed from a poor musical experience in 2007 when performing in a large reverberant performance space.

This exegesis has provided an outline of my engagement with three sites (a stairwell, a bridge and a tunnel) and the different musical material that they provided to new compositions. In each case the musical material was discovered and exploited from the site according to a range of different approaches I developed throughout the project, with each site providing a unique point of focus for the compositions. Using a practice-led methodology, each site was interrogated using a series of tests and workshops tailored to discover the potential of each location. The reverberation and found sounds of the stairwell, for example, required very different testing strategies from the traffic soundscape at the bridge, or the tunnel. The results of these tests provided the fundamental pre-compositional material which led to new ways of composing music.

Three very different approaches and relationships to site-specificity emerged from the original idea of utilising the acoustic characteristics of a site in compositions. This demonstrates that each site has, in fact, contributed its own individual compositional material which can guide a composer in the creation of new music.

The first work in the research project, Stairwell to Fifteen was the most site-specific composition in relationship to Wilkie’s scale of site-specificity. The site itself provided
Music in Site

found sound percussion and a strong reverberation effect which, when combined, meant that this piece could not be performed in any other space. Even the effect of the audience members on the length of the reverberation grounds the performance practice in a very specific way.

The next piece, From Traffic Rises, is further removed from the literal site-specific relationship of Stairwell to Fifteen. The connection to the bridge site comes to the composition by way of a field recording made at the site location, which was electronically manipulated to interact with an acoustic ensemble. The spatial effects applied to the soundscape were used as a part of the compositional materials, taking the site to the concert hall. By applying Wilkie’s scale, a site-generic approach was taken to create the musical material as I have argued that the soundscape had a generic quality that could have been taken from any bridge. What makes this composition unique is its site-generic relationship to site contained within a spatialisation of the field recording that interacts with the structure of an acoustic ensemble. The material for the acoustic instruments has been inspired by the aural motion of traffic as experienced on the bridge, a motion highlighted in the spatialisation of the recording.

The final piece in the project, Tunnel Listen, has the most complex relationship to site of the three compositions as it was an artistic representation of an acoustic space created by acoustic instruments. The tunnel site was used to gather acoustic characteristics and effects which I adapted in a composition for acoustic instruments. Despite the site being an integral part of the composition process, the relationship does not fit easily onto Wilkie’s scale. In this work, I have moved beyond the original scale of site-specific representation, and have proposed a new term, site-related, to define this compositions relationship to site.

The relationship between music and physical sites has proven a complex one throughout history. Both Wilkie’s scale of site-specificity and Hunter’s methodology of experiencing the site provided me with theoretical tools to assist in the preparation of these three new works. There is a tendency to locate the engagement of site only with sound art, rather than acoustic instrumental composition, and the results of this research project has demonstrated that a range of architectural spaces and their acoustic characteristics can offer unique musical material for the compositional process. It also
demonstrates that the acoustic and physical design features of spaces, not usually used for music performances, can become an integral part of new works that provide an important contribution to the possibilities of acoustic music.
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Appendices

Appendix 1: Scores

1a: Stairwell to Fifteen
STAIRWELL TO FIFTEEN

composed by Mace Francis

2013

Cimbalom

Trumpet 1

Trumpet 2

Trombone

Tuba

Stairwell (building 15 at Edith Cowan University Mt Lawley Campus, Door No 15.143)

with mallets & bow

www.macefrancis.com
PERFORMANCE INSTRUCTIONS

This space was chosen for its reverberation and percussive surfaces which need to be activated by a percussionist.

THE PERFORMERS

Cimbalom is to be set up on the second landing facing the stairs.

Brass players are to be set up on the second landing with the cimbalom.

Stairwell percussionist is to use mallets and a bow (preferably cello) to active the sounds of the stairwell.

Trumpet 1 is to slam door two to start the performance.

*Position 1 (beginning to section H)*
- Drum felt-tipped mallets
- Hand-railing located on the left hand side (facing away from the door) on the 3rd floor

*Stick on Handrails (section H)*
Position 2 (section K)
Drum felt-tipped mallets
Hand-railing located on the landing of 2nd floor

![Image of stairway with railing]

Position 3 (section L)
Cello bow
Hand-railing supports on the 2nd floor landing

![Image of stairway with railing]
Stairwell to Fifteen
(transposed score - no key signature)

Music in Site
Music in Site

Atempo

On Cue

Free Time

Tpt.1

Tpt.2

Tbn.

Tba.

Cimb.

Mallets - position 2

FS Perc.

Atempo

sneak in 72

to position 3 (bow)
1b: From Traffic Rises
From Traffic Rises

composed by mace francis
2012

Clarinet
2x Alto Sax
Tenor Sax
2x Trumpets
2x Trombone
4 Speakers
Performance Notes


Instructions on how to make the image into a score readable by the player, and how to upload this formatted score, can be found at [http://www.decibelnewmusic.com/decibel-scoreplayer.html](http://www.decibelnewmusic.com/decibel-scoreplayer.html)

A copy of the .dsz file for this score can be obtained by emailing the composer at mf@macefrancis.com

The ensemble is to set up in a circle in the configuration below. Speakers are to be placed where the black boxes are positioned. The audience must sit in the centre of the ensemble.
**Score**
Each musician has a coloured line to follow
Alto Sax 1    Pink
Trumpet 1    Orange
Clarinet    Purple
Trombone 1    Green
Alto 2    Yellow
Trumpet 2    Red
Tenor Sax    Brown
Trombone 2    Blue

The scrolling score will indicate your entry when the vertical black line lines up with the score players red line.

**Pitches**
Your pitch will be indicated before the entry line. Note name will be in concert. The arrows after the note indicate where the note positioned in relationship to your written middle C.

For example;
E↑↑    the E a major 3rd above middle C
E↑↑↑    the E in the top space of treble clef
A↓↓    the A a minor 3rd below middle C

**Other Symbols**
AIR    blow air through the instrument.
?    improvise imitating/reacting what you hear on soundscape.

If no instruction is indicated then the previous instruction is replayed.

**Pitch Line**
The duration and relationship to the pitch will be indicated by a black line. The distance away from the coloured line and the curve in the pitch line instructs pitch bending. Upwards = Sharp. Downwards = Flat.

**Dynamics**
Below the pitch line is the dynamic instruction. The bottom black line refers to silence. The dynamic range is indicated by a solid block.
1c: Tunnel Listen
TUNNEL LISTEN

composed by Mace Francis

2013

Instrumentation and Set up Instructions
from Left to Right

CLARINET 1
TROMBONE 2
TENOR SAX
SOPRANO SAX
TRUMPET 1
TROMBONE 1
CLARINET 2
TRUMPET 2
ALTO SAX
TUBA

www.macefrancis.com
Tunnel Listen
in three parts
(transposed score - no key signature)
mace francis

Part 1

Rubato

Clarinet 1

Clarinet 2

Soprano Saxophone

Alto Saxophone

Tenor Saxophone

Trumpet 1

Trumpet 2

Trombone 1

Trombone 2

Tuba
Music in Site
Music in Site
Music in Site
Music in Site
start to fade you to nothing

start to fade you to nothing
Appendix 2: Audio Recording of Performance

Track 1:  Stairwell to Fifteen
Track 2:  Tunnel Listening
Track 3:  From Traffic Rises
Appendix 3: Video of Performance

Scene 1:  *Stairwell to Fifteen*
Scene 2:  *Tunnel Listen*
Scene 3:  *From Traffic Rises*